

Freeland Community Schools

PROJECT MANUAL



Freeland Community Schools

BP 1 2024 Classroom/Secure Vestibule

December 20, 2024

ARCHITECTS/ENGINEERS

The Collaborative
One Sea Gate, Park Level 118
Toledo, Ohio 43604
Telephone: 419-242-7405
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THE
COLLAB
ORATIVE

Architecture
Planning &
Design

CONSTRUCTION MANAGER

Wolgast Corporation
4835 Towne Centre Road, Suite 203
Saginaw, Michigan 48604
Telephone: (989) 790-9120
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Wolgast 
CORPORATION

Bidding Requirements, Contract Forms, and Conditions of the Contract

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END OF SECTION 00005

Freeland Community Schools will receive sealed bid proposals for construction trade work from qualified contractors for the **Freeland Community Schools, BP 1 2024 Classroom/Secure Vestibule**. A pre-bid meeting and project walk-through will be conducted by the Construction Manager, Wolgast Corporation, and the Architect, **The Collaborative**, on **Tuesday, January 7, 2025**, at **3:30 PM** (local time) at **Middle School Room 91**.

Proposals may be mailed or delivered in person to **Marcus Hillborg, Superintendent**, c/o **Freeland Community Schools, 710 Powley Drive, Freeland, MI 48623**. Proposals must be received prior to **3:30 PM** (local time) on **Tuesday, January 21, 2025**, at the **Freeland Community Schools Administration Building** or upload to Building Connected <https://app.buildingconnected.com/login?retUrl=%2F>. Proposals will be publicly opened and read aloud at **3:30 PM** in the **Elementary School**. All bids will be evaluated after the bid opening. All bids received after **3:30 PM** of the bid date will be returned to the Bidder unopened. If you would like to listen in while bids are being opened, please use this <https://8x8.vc/wolgast/lisa.donahue>

The Project will utilize separate prime contractors. All contracts for construction will be direct contracts with the Owner. Overall administration of the Project will be the responsibility of the Construction Management Firm, Wolgast Corporation, 4835 Towne Centre, Suite 203, Saginaw, Michigan 48604, Phone: (989) 790-9120, Fax: (989) 790-9063. The Owner will award contracts on or about **Monday, February 3, 2025**, to separate prime contractors for separate bid divisions or combinations of bid divisions. A Bidder may submit a proposal on more than one Bid Division; however, a separate bid must be submitted for each Bid Division of a combined bid. All bids shall be submitted on the bid forms provided in the project specifications, completely filled in, and executed (copies of the bid forms are acceptable). Facsimile bids will not be accepted.

The Bidders shall read and review the Bidding Documents carefully and familiarize themselves thoroughly with all requirements.

Requests by Contractors for inclusion, as Bidders shall be addressed to Wolgast Corporation. One (1) set of Bidding Documents will be provided to each contractor through Wolgast Corporation. Plans may be obtained from Wolgast Corporation, attention **Lisa Donahue** ldonahue@wolgast.com. All questions regarding the bidding procedures, design, and drawing/specification intent are to be directed to the Construction Manager on a Clarification Request Form (Section 00310), attention **Clint Clark** cclark@wolgast.com.

A Bid Security by a qualified surety authorized to do business in the state where the Project is located in the amount of five percent (5%) of Base Bids shall accompany each proposal or proposal combination. The Bid Security may be in the form of a Bid Bond, Cashier's Check, or Money Order. Personal checks are NOT acceptable. Bids may not be withdrawn for a period of sixty (60) days after the bid date. Successful Bidders may be required to furnish Surety Bonds as stated in the Project Specifications (Section 00600).

The Owner reserves the right to reject any or all proposals, accept a bid other than the low bid, and to waive informalities, irregularities, and/or errors in the bid proposals, which they feel to be in their own best interest.

All bidders must provide familial disclosure in compliance with MCL 380.1267 and attach this information to the bid. The bid shall be accompanied by a sworn and notarized statement disclosing any familial relationship that exists between the Owner or the employee of the bidder and any member of the board, intermediate school board, or board of directors or the superintendent of the school district, intermediate superintendent of the intermediate school district, or chief executive officer of the public-school academy. The district shall not accept a bid that does not include this sworn and notarized disclosure statement.

END OF SECTION 00010

PART 1 – GENERAL

1.01 DEFINITIONS

- A. The Owner is: **Freeland Community Schools.**
- B. The Architect is: **The Collaborative.**
- C. The Construction Manager is: **Wolgast Corporation.**
- D. The Project Team consists of the Construction Manager, the Architect, and other design professionals providing services in connection with the project.
- E. The Project is: **Freeland Community Schools, BP 1 2024 Classroom/Secure Vestibule**
- F. Work is any portion of the Project.
- G. The Bidding Documents include (as applicable to the Project):
 - 1. The Notice to Bidders.
 - 2. The Instructions to Bidders.
 - 3. Bid Division Descriptions.
 - 4. Proposal Forms.
 - 5. Sample Contract Forms.
 - 6. The Specifications for the Project.
 - 7. The Drawings for the Project.
 - 8. All Addenda issued for the Project.
 - 9. The Preliminary Milestone Schedule.
- H. Addenda are written and/or graphic instruments issued by the Architect, which add to, delete from, clarify, or correct the Bidding Documents.
- I. Bids are sums stipulated in Proposals for which Bidders propose to perform the Work of Bid Divisions.
- J. Base Bids are sums stipulated in Proposals for which Bidders offer to perform the Work of Bid Divisions, and which Alternate Bids may be added to or deleted from.
- K. Alternate Bids are sums that may be added to or deleted from Base Bids for the performance of Alternate Work, as delineated in the Bidding Documents.
- L. Unit Prices are sums included in the Proposals as Bids per unit measure of materials and/or services, as required by the Bidding Documents.
- M. Proposals are complete, properly executed forms including Base Bids, Alternate Bids, Unit Prices, and other information requested by the Owner.
- N. Bidders are pre-qualified contractors who submit proposals to the Owner for Work as Prime Contractors on the Project.
- O. Bid Divisions are the divisions of Work into which the Project is divided for bidding. Bid Divisions shall not be confused with Technical Specification Divisions.
- P. Bid Division Descriptions (Section 00309) are written descriptions of the Work included in the Bid Divisions.

1.02 MULTIPLE PRIME CONTRACTS/BID DIVISIONS

- A. This is an Owner Represented Project. There is no General Contractor. All contracts awarded on the Project shall be prime contracts. The Owner will award contracts for each Bid Division and/or for groups of Bid Divisions. The Construction Manager will administrate the Project.
- B. Although each Bid Division involves an obvious and recognizable segment of “conventional” trade contracting, multiple contract project delivery requires that adjustments be made to permit the completion of each Bid Division as a separate segment of construction. Each bidder shall carefully review the total scope of their responsibilities with respect to the Work of their Bid Division(s) and shall provide for the total scope in their Proposal.
- C. Bid Division Descriptions (Section 00309) have been written to clearly delineate each Bid Division. The Owner is not responsible for a Bidder’s interpretation of the Bid Division Descriptions. Bidders are encouraged to request information by calling or emailing the Project Manager:

Clint Clark, Project Manager, Wolgast Corporation, (989) 790-9120, extension **754** or cclark@wolgast.com .

- D. For the purpose of clarity, the scope of work for each Bid Division may be divided into four categories: “GENERAL INCLUSIONS,” “DIVISION INCLUSIONS,” “PROJECT INCLUSIONS,” AND “EXCLUDED.”
1. Information provided under the heading “GENERAL INCLUSIONS” is the obvious and/or “conventional” work scope of each Bid Division.
 2. Information provided under “DIVISION INCLUSIONS” or “PROJECT INCLUSIONS” points out items which may be considered less obvious or “unconventional,” but which are included in the work scope of a particular Bid Division. (Information under these headings are not always necessary to delineate a Bid Division.)
 3. Information provided under “EXCLUDED” is for the purpose of indicating beginning and termination points, and/or to provide an understanding of fringe involvement included in Bid Divisions. (Information under this heading is not always necessary to delineate a Bid Division.)
- E. **Bidders shall construe nothing contained in the Bidding Documents, including the Bid Division Descriptions, as an assignment of work to any construction industry trade. Each Bidder is responsible for their own work assignments when making their proposal.**

1.03 INTERFACING BID DIVISIONS

- A. Each Bidder shall familiarize themselves with the work scope of all Bid Divisions that interface with their own. Each Bidder shall consider that the work of their Bid Division(s) may follow the work of another Division or other Divisions, and that other Contractors may perform work after the work of their Bid Division(s), and that other Contractors may work simultaneously with the work of their own Bid Division(s). Each Bidder shall include provisions for such interfaces and for cooperation with interfacing Contractors in their Proposal.

1.04 PRE-BID CONFERENCE

- A. **Middle School Room 91
Tuesday, January 7, 2025 at 3:30 PM
710 Powley Drive
Freeland, MI 48623**

1.05 BIDDING DOCUMENTS

- A. Qualified Bidders have received sets of Bidding Documents. Requests from Bidders for additional sets of Bidding Documents will be honored under the conditions set forth in the Notice to Bidders (Section 00010).
- B. Following the award of construction contracts for the Project, all sets of Bidding Documents, plans, and specifications, except sets in possession of Contractors who have been awarded contracts, shall be returned to the Project Team.
- C. Bidders who return sets of Bidding Documents, plans, and specifications, in reasonably good condition shall have their plan deposit returned within ten (10) days of the Project Team's receipt of the documents.
- D. Bidders shall use complete sets of Bidding Documents in preparing Proposals. Bidders are responsible for ascertaining that the Bidding Documents upon which their Proposals are based are complete.
- E. Bidding Documents are provided to Bidders for uses pertaining to bidding only. No other use is permitted.
- F. Bidders shall promptly notify the Project Team of any ambiguities, inconsistencies, errors, and/or omissions they may discover in the Bidding Documents.
- G. Requests from Bidders for clarification or interpretation of the Bidding Documents must reach the Project Team five days before the bid date or by the date addressed in the pre-bid agenda. Any bidder clarifications which reach the Project Team after such dates have passed will not be considered.
- H. Changes and corrections to the Bidding Documents will be made by Addendum and distributed to Bidders.
- I. Each Bidder shall ascertain prior to submitting their Proposal that they have considered every Addendum issued prior to the Bid Date and shall acknowledge receipt of each Addendum in writing in their Proposal.

1.06 PRELIMINARY MILESTONE SCHEDULE

- A. The Preliminary Milestone Schedule is Section 00999 of this Project Manual.
- B. A Preliminary Milestone Schedule has been developed by the Construction Manager and supplied to the Bidders. Each Bidder is required to review the dates indicated in that Schedule, and either endorse or amend them within the context of the Bid Division(s) they are bidding. Space is provided on the Proposal Form for endorsement or amendment. The Milestone Schedule and the information it provides are not part of the Contract Documents.
- C. The milestone dates as endorsed and/or amended by successful bidders and accepted by the Owner will be used in the development of a Master Schedule to be used as a guide during the construction of the Project.
- D. Each Bidder is obligated to comment, in writing, on the Milestone Schedule if, in their opinion, the dates do not depict realistic time interval(s) for performance of the Work of their Bid Division(s)
- E. The effect of endorsements of and amendments to the Milestone Schedule will be considered when selecting Bidders for contract awards.

1.07 BID SECURITY

- A. Bid Security is required for this Project in the amount of five percent (5%). A surety company licensed, as such, to do business in the State of Michigan must issue a Bid Bond, and all other Bonds. For additional information and instructions regarding Bid Security, refer to Section 00410.
- B.

1.07.1 AFFIDAVITS ACCOMPANYING BID PROPOSALS

- A. All Bid Proposals shall include the Familial Affidavit form (see Section 00306 – Familial Affidavit) to be included as part of the Bid Proposal.
- B. All Bid Proposals shall include the State of Michigan required Iran Economic Sanctions Affidavit form (see Section – 00307 – Iran Economic Sanctions) to be included as part of the Bid Proposal.

1.08 SUBSTITUTIONS

- A. The materials, products, and equipment described in the Bidding Documents establish the quality standard, required function, dimensions, and appearance, which shall be met by all substitutions.
- B. Contractors may request items not included in the construction bid documents be considered for inclusion as acceptably specified items by submitting a written request to the Project Team addressed to the Construction Manager not later than ten (10) days prior to the bid date. The Construction Manager will forward these written requests to the Architect who will make the determination whether the requested item is an acceptable “equal”. These acceptable “equal” items will be identified as acceptable by their inclusion in a written Addendum.
- C. Each substitution request will include a complete description of the proposed substitute, drawings, cuts, performance and test data, the name of the material or equipment for which it is to be substituted, and any other information necessary for evaluation. A statement setting forth any changes in other materials, equipment, or work that incorporation of the substitute would require should also be included. The burden of proof of the merit of the proposed substitute is upon the Bidder. The Architect’s approval or disapproval of a proposed substitution shall be final.
- D. The bidder’s Base Bid contained in the Bid Proposal Form shall be the exact items contained in the construction bid documents (plans, specifications, or addenda). The Base Bid contained in the Bid Proposal Form shall not include any substitute items not allowed in the construction bid documents.
- E. Bidders that have other substitutions to be considered for inclusion in the Project must identify them as Voluntary Alternates in the portion of the Bid Proposal Form so designated. The identity of these items must include the all-product information and the dollar amount of increase or decrease associated with each individual substitute item.
- F. By making requests for any substitution, the Contractor represents:
 - 1. The Contractor has personally investigated the proposed substitution product and determined that it is equal to or superior to the product specified.
 - 2. The Contractor will provide the warranty for the substitution as the product specified.
 - 3. The cost data presented is complete and includes all related costs required for it to be incorporated into the Project including costs for additional Architectural and/or Construction Management services.
- G. The Architect will reply in writing to the Contractor, through the Construction Manager, stating whether the Owner or Architect, after due investigation, has reasonable objection to any substitution request. The decision of the Architect shall be final.

1.09 VOLUNTARY ALTERNATES/VALUE ENGINEERING SUGGESTIONS

- A. Base Bids and Alternate Bids shall be based upon the Bidding Documents, including approved substitutions, and on the Bidders’ evaluation of the Project Site. However, the Owner invites Voluntary Alternates or Value Engineering suggestions consistent with the intent of the Bidding Documents. Such Alternates and suggestions, if submitted, shall be incorporated into Proposals by describing Voluntary Alternate(s) on company letterhead and attached to the Bid Proposal Form.

1.10 BID OPENING AND CONTRACT AWARDS

- A. Bids will be opened publicly after the time and date established for receipt of Proposals. Bid Summaries will be made available to Bidders by request after the Bid Date, but not before Post Bid Interviews have been conducted.
- B. Contract awards will be based on Bidders' Proposals and ability to perform. The Owner intends to award contracts to Bidders who submit proper Proposals in accordance with the requirements of the Bidding Documents.
- C. Decisions regarding Bidders abilities affecting contract awards will be made by the Owner.
- D. The Owner reserves the right to waive any informality or irregularity in any Proposal.
- E. The Owner reserves the right to reject any Proposal.
- F. All awards will be made in the Owner's best interest.

1.11 POST-BID INTERVIEWS

- A. Bidders in contention for contract awards will be required to attend Post-Bid Interviews and submit post-bid submittals in rough draft for review.

1.12 POST-BID SUBMITTALS

- A. Bidders who have been notified of the Owner's intent to award a contract shall submit the following items to the Construction Manager:
 - 1. A Schedule of Values utilizing the level of detail requested by the Owner (reference Section 00670).
 - 2. A list of all subcontractors and suppliers to be used, and all items of material and equipment to be incorporated into the Project (reference Section 00680).
 - 3. The name(s) of the on-site supervisor(s) whom the Bidder proposes to employ to accomplish the Work (reference Section 00690).
 - 4. Sample copies of the construction contracts are included in Sections 00510.

1.13 OWNER'S RIGHT TO APPROVE SUPPLIERS, SUBCONTRACTORS, MATERIALS, EQUIPMENT, AND EMPLOYEES

- A. Bidders will be required to establish, to the satisfaction of the Owner, the reliability and responsibility of proposed employees, suppliers and subcontractors, and the suitability of proposed materials and equipment.
- B. Prior to the award of a contract, the Construction Manager will notify the Bidder if the Owner has reasonable and substantial objection to any person, organization, material, or equipment listed by the Bidder. If the Owner has a reasonable and substantial objection, the Bidder shall amend their Proposal by providing an acceptable substitute. The Owner may, at their discretion, accept such a substitute, or they may disqualify the Proposal.
- C. Suppliers, subcontractors, employees, materials, and equipment proposed by the Bidder and accepted by the Owner shall be used on the Work for which they are proposed and accepted and shall not be changed except with the written approval of the Owner.

1.14 BONDS

- A. Refer to Section 00600 for information and instructions regarding the bond requirements of this Project.

1.15 INSURANCE

- A. Refer to Sections 00650, and 00700 for information and instructions regarding insurance requirements for this Project.

PART 2 – FORMS FOR BIDDING

2.0 PROPOSAL FORMS

- A. Bidders are required to use the forms provided by the Owner for bidding purposes.
- B. Sample form(s) and instructions are in Section 00305 of this project manual.

PART 3 – PROCEDURES AND CONDITIONS FOR BIDDING

3.01 COMPLETION OF PROPOSAL FORMS

- A. Refer to Section 00300 for detailed information and instructions regarding completion of Proposal Forms.

3.02 SUBMISSION OF PROPOSALS

- A. Proposals shall be submitted to:

Freeland Community Schools
Marcus Hillborg, Superintendent
710 Powley Drive
Freeland, MI 48623

Or upload to Building Connected <https://app.buildingconnected.com/login?retUrl=%2F>

If you would like to listen in while the bids are being opened, please use this link

<https://8x8.vc/wolgast/lisa.donahue>

(Refer to Section 00010 – Notice to Bidders for additional information and instructions regarding the location for submittal of Proposals.)

- B. Proposals shall be submitted by **3:30 PM** on **Tuesday, January 21, 2025**.
(Refer to Section 00010 – Notice to Bidders for additional information and instructions regarding the date and time of submittal of Proposals.)
- C. **Bidders shall bear full responsibility for delivering Proposals to the required location by the time and date established.**

3.03 MODIFICATION OR WITHDRAWAL OF PROPOSALS

- A. A Proposal may not be modified, withdrawn, or cancelled by the Bidder within sixty (60) days following the time and date designated for the receipt of Proposals and the Bidder so agrees in submitting their Proposals.
- B. Prior to the time and date designated for receipt of Proposals, Proposals may be modified or withdrawn. Modifications and withdrawals shall be in writing or by telegram. If by telegram, written confirmation shall have been mailed and postmarked before the date and time set for receipt of Proposals. Telegraphic communications shall be worded so that the amounts of the original Proposals are not revealed.
- C. Withdrawn Proposals may be resubmitted up to the time and date designated for receipt of Proposals.

3.04 BIDDERS' REPRESENTATION AND ACKNOWLEDGEMENTS

A. In submitting their Proposal, each Bidder represents that:

1. They have read and understand the Bidding Documents.
2. Their Proposal is made in accordance with the Bidding Documents.
3. They have visited the Project Site and have familiarized themselves with the local conditions under which the Work they are bidding will be performed.
4. **They will accept the contract award, regardless of the identity of other Contractors on the Project.**
5. **During contract performance, they will not interrupt their Work nor impede the progress of other Contractors as a result of prejudice based on sex, race, color, creed, labor affiliation, or lack of labor affiliation of Contractors or employees of Contractors engaged on this Project.**

B. In submitting their Proposal each bidder acknowledges:

1. The right of the Owner to accept or reject any Proposal, to waive any informality or irregularity in any Proposal received, and to accept other than the low Bid.
2. The right of the Owner to accept any combination of Bid Divisions they desire.
3. The right of the Owner to award contracts in their own best interest.

3.05 OTHER INFORMATION

A. All Bidders shall comply with the requirements of the Bidding Documents, Addenda, and all applicable codes, laws, and regulations in preparing and submitting their Proposals.

B. Refer to Section 00300 – Instructions for Proposals and Bid Division Descriptions for additional information and instructions regarding Proposals.

END OF SECTION 00100

PART 1 – GENERAL

1.01 PROPOSAL FORMS

- A. A separate set of Proposal Forms, Bid Division Descriptions, Drawings, Contract Conditions, Specifications, and Preliminary Milestone Schedule(s).
- B. Bidders shall use the copies of Proposal Forms included in the separate sets of Bidding Documents. Copies of the Proposal Forms are acceptable.

1.02 BID DIVISION DESCRIPTIONS

- A. Section 00309 contains the Bid Division Descriptions. Each Bid Division Description represents a separate, self-contained Scope of Work. Bid Divisions are the basic divisions of Work into which the Project has been divided for bidding and construction.

PART 2 – PROPOSAL FORMAT

2.01 BID PROPOSALS

- A. Bidders are required to use the Proposal Forms provided by the Owner.
- B. A complete Proposal consists of:
 - 1. **Submit 1 complete copy of your proposal, on the Proposal Form – Section 00305.**
 - 2. Alternate Pricing forms (if applicable to this Project).
- C. Each Proposal shall have a Bid Security in the amount of five percent (5%) attached to the proposal.
- D. All spaces provided on the Proposal Form(s) shall be filled in. If any space provided is not utilized by the Bidder, that space shall be filled in with the notation "N/A" (Not Applicable).
- E. The Proposal Form(s) shall be filled in by typewriter or printed manually in ink.
- F. Where indicated, all sums shall be expressed in words and figures.
In case of discrepancy, the words shall govern.
- G. **Bidders shall not make unsolicited notations or statements on the Proposal Form(s). Alteration of the Proposal Form(s) is not permitted.**
- H. All changes to and erasures of the Bidder's entries shall be initialed by the signer of the Proposal.
- I. Each Proposal shall include the legal name of the Bidder and a statement regarding whether the Bidder is a sole proprietor, a partnership, a corporation, or other type of legal entity. Proposals submitted by corporations shall have the state of incorporation noted and shall have corporate seals affixed. Any Bid submitted by an agent shall have a current Power of Attorney attached, certifying the agent's power to bind the Bidder.

2.02 ALTERNATES

- A. **All requested Alternates shall be bid with all lines completed or the Proposal will be considered incomplete.**

PROPOSAL FOR MULTIPLE BID DIVISIONS

- A. Each Bidder shall submit only one (1) Proposal for each Bid Division the Contractor is bidding. There is no limit to the number of Bid Divisions a Bidder may bid on.
- B. Each Bidder is required to include a separate Bid for each Bid Division in order to be considered for a contract award. Spaces are provided in the Proposal Form(s) to reference multiple Proposals.
- C. Multiple Bid Proposals shall contain separate Proposal Forms for each Bid Division being bid.
 - 1. Each Proposal Form shall be fully completed.
 - 2. The Bid for each Bid Division shall be independent of Bids for other Bid Divisions.
 - 3. Bidders shall use the "Combined Bid Deduct" section of the Proposal Form (Section 00305) to finalize multiple Bid Proposals.

PART 3 – COMPLETION OF PROPOSAL FORMS AND SEALED BID ENVELOPE

3.01 PROPOSAL FOR (SECTION 00305)

- A. Each Bid Division shall be submitted in a separate envelope, with a separate Bid Bond.
- B. Fill in the legal name of the Bidder, the address, the telephone number, fax number, contact name and contact email.
- C. Fill in the name and number of the Bid Division covered by the Proposal.
- D. Fill in the numbers and dates of all Addenda issued, received, and considered a part of the Proposal. Proposals must include acknowledgement of all Addenda issued up to the Bid Date.
- E. On the Proposal Form(s), fill in the Lump Sum Base Bid for the Bid Division. Fill in the amount in both words and figures. DO NOT include costs for Performance Bonds or Labor/Materials Payment Bond in the Base Bid amount.
- F. Fill in the cost(s) for Performance Bond(s) and Labor and Material Payment Bond(s) in the amount(s) requested (reference Section 00600), in the space(s) provided. Fill in the amount(s) in both words and figures.
- G. In the "Combined Bid Deduct" portion of the Proposal Form(s), state the amount(s) to be deducted from the total of your Base Bid should you be awarded contracts for multiple Bid Divisions. State the numbers of the Bid Divisions included in each combination, and the amount to be deducted from the total of all Base Bids in each combination.
- H. If Alternate Bid(s) have been requested, fill in the Lump Sum Bid for each Alternate Bid in the space provided. DO NOT include costs for Performance Bonds or Labor and Material Payment Bonds.
- I. Fill in the anticipated date(s) of indicated Shop Drawings and/or Sample Submittal(s) in the space(s) provided.
- J. Fill in the anticipated number of weeks needed for fabrication of indicated items, beginning on the Bid Date.
- K. Fill in the anticipated number of on-site staff.
- L. Fill in the anticipated number of days to complete the Work.
- M. Fill in the anticipated number of weeks needed for delivery of indicated items, beginning on the Bid Date.
- N. Fill in the names of the manufacturers, suppliers, and/or subcontractors of indicated items.

- O. If you choose to submit Voluntary Alternates or Value Engineering Suggestions, please summarize your suggestions and state the amount to be deducted from the Base Bid.
- P. Review the “Bid Division Responsibilities” portion of the Proposal Form.
- Q. Review the “Schedule” portion of the Proposal Form.
- R. If the Proposal includes exceptions or substitutions to any part of the Bidding Documents or the Contract Documents, state the exceptions or substitutions in writing on the Proposal Form.
- S. Fill in the Bidder’s legal name.
- T. Indicate the Bidder’s status as a sole proprietor, partnership, corporation, or other type of entity.
- U. Sign the Proposal Form in the space provided.
- V. Type or print the signer’s name and title in the spaces provided below the signature line.
- W. Date the Proposal Form in the space provided.
- X. Provide a phone number, fax number and email address on the space provided.

3.02 SEALED BID ENVELOPE

- A. Bids submitted must be sealed, preferably in a 9” x 12” manila envelope.
- B. Each Bid Division is to be submitted in a separate envelope.
- C. **Label the sealed bid as follows:**

<p>TO:</p> <p>Freeland Community Schools Attn: Marcus Hillborg 710 Powley Drive Freeland, MI 48623</p> <p><u>SEALED BID FOR:</u></p> <p>Freeland Community Schools BP 1 2024 Classroom/Secure Vestibule</p> <p>Bid Division No: _____</p>
--

END OF SECTION 00300

Project: Freeland Community Schools
BP 1 2024 Classroom/Secure Vestibule

Submitted By: _____
(Bidder's Company Name)

Address: _____

City / State / Zip: _____

Phone: _____

Contact Name: _____

Email: _____

Bid Proposal Deadline: Prior to Tuesday, January 21, 2025 at 3:30 PM (local time) to:

Freeland Community Schools
Marcus Hillborg, Superintendent,
710 Powley Drive
Freeland, MI 48623.

Or upload to Building Connected <https://app.buildingconnected.com/login?retUrl=%2F>

Bid Division Name: _____

Bid Division Number: _____

ADDENDA

We (the Bidder) acknowledge receipt of the following Addenda:

- Addendum #__ Dated _____
- Addendum #__ Dated _____
- Addendum #__ Dated _____

BID BOND ATTACHED?

- Yes, 5% Bid Bond is Attached**
- Certified Check/Money Order for 5% of Base Bid is Attached**

BASE BID for Freeland Community Schools – BP 1 (not including Labor Bond, Material Bond, and/or Performance Bond Costs):

_____ Dollars and 00/100ths

\$ _____

BOND COST for Freeland Community Schools – BP 1 (Cost to provide Labor Bond, Material Bond, and/or Performance Bonds on Base Bid):

_____ Dollars and 00/100ths

\$ _____

COMBINED BID DEDUCT

If awarded a contract for the Work, combining the following Bid Division(s), the corresponding amount(s) may be deducted from the Base Bid(s) of each of the involved Bid Divisions.

Bid Divisions Combined

Deduct from each Bid Division:

Bid Breakdown

	Base Bid	Bond	Alternate	Total
MS Classrooms				
MS Vestibule				
Total				

ALTERNATES

Alternate 1 – Access Control for Classroom Door Hardware.

Base Bid Item – Utilize door hardware as noted on the door schedule and associated door hardware specifications.

Alternate Item – Utilize denoted hardware set A-1 within the door hardware specifications, understanding these are intended to allow for access control at the associated classroom doors which includes necessary conduit routing with rough-in.

Alt 1 Add/Deduct _____

Alt 1 Bond _____

SUBMITTALS

Anticipated Date of Shop Drawing Submittal at Post Bid Interview: _____

Anticipated Number of Days to Begin: _____

Anticipated Number of On-site Staff: _____

Anticipated Number of Days to Complete: _____

Anticipated Number of Days for Delivery of Needed Items: _____

Proposed Manufacturers, Suppliers, and/or Subcontractors:

<u>Item(s)</u>	<u>Manufacturer/Subcontractor/Supplier</u>
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

VOLUNTARY ALTERNATES / VALUE ENGINEERING SUGGESTIONS

We suggest the following alternate procedure(s) and/or material(s):

<u>Summary of Suggestions</u>	<u>Deduct from Base Bid</u>
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

BID DIVISION RESPONSIBILITY

We recognize that the Scope of Work within a Bid Division represents a construction segment that is not necessarily restricted to a single construction trade, and our Proposal includes work of all trades required to fully and successfully complete all of the Work required in the Bid Division(s) we have submitted Proposals for:

SCHEDULE

We have reviewed the Preliminary Milestone Schedule and hereby endorse it with regard to the Work of Bid Division(s) we have bid. ALL WORK MUST BE COMPLETED BY **Refer to Milestone Schedule.**

EXCEPTIONS AND/OR SUBSTITUTIONS

We have submitted our Proposal, as specified, complete and in accordance with the Bidding Documents, including Addenda and the Contract Documents, without exceptions or substitutions, unless otherwise noted in the "Voluntary Alternate / Value Engineering Suggestions" portion of this Proposal Form.

EXECUTION

Name of Bidder: _____

Bidder's Status:
__Corporation; __Partnership; __Sole Proprietor; __Other: (Please Specify: _____)

By/Signature: _____

Name: _____

Title: _____

Date: _____

Email: _____

Phone: _____ Fax: _____

END OF SECTION 00305

Familial Relationship Sworn Statement

_____ does hereby disclose that per MCL 380.1267:
Company Name

YES, there exists a familial relationship between the Owner of the project or any member of their Board, or Board of Directors, or the Superintendent of the School district, intermediate superintendent of the intermediate school district, or chief executive officer of the public-school academy and the Owner or an employee(s) of _____.
Company Name

Disclosure Between:

Name _____ AND Name _____

Title: _____ Title: _____

Relationship: _____ Relationship: _____

NO, there does not exist a familial relationship between the Owner of the project or any member of their Board, or Board of Directors, or the Superintendent of the School district, intermediate superintendent of the intermediate school district, or chief executive officer of the public school academy and the Owner or an employee(s) of _____.
Company Name

Name (printed): _____

Position: _____

Signature: _____

Date: _____

Notary Public(printed): _____

Signature: _____

County: _____

Date: _____ My Commission Expires: _____

Affix Notary Seal Here:



END OF SECTION 00306

Iran Business Relationship Affidavit

Effective April 1, 2013, all bids, proposals, and/or qualification statements received in the State of Michigan must comply with the "Iran Economic Sanctions Act". The following certification is to be signed and included at time of submittal.

CERTIFICATION

Pursuant to the Michigan Iran Economic Sanctions Act, 2012 P.A. 517, by submitting a bid, proposal or response, Respondent certifies, under civil penalty for false certification, that it is fully eligible to do so under law and that it is not an "Iran linked business," as that term is defined in the Act.

Signature

Title

Company

Date

IRAN ECONOMIC SANCTIONS ACT
Act 517 of 2012

AN ACT to prohibit persons who have certain economic relationships with Iran from submitting bids on requests for proposals with this state, political subdivisions of this state, and other public entities; to require bidders for certain public contracts to submit certification of eligibility with the bid; to require reports; and to provide for sanctions for false certification.

History: 2012, Act 517, Eff. Apr. 1, 2013.

The People of the State of Michigan enact:

129.311 Short title.

Sec. 1. This act shall be known and may be cited as the "Iran economic sanctions act".

History: 2012, Act 517, Eff. Apr. 1, 2013.

129.312 Definitions.

Sec. 2. As used in this act:

(a) "Energy sector of Iran" means activities to develop petroleum or natural gas resources or nuclear power in Iran.

(b) "Investment" means 1 or more of the following:

(i) A commitment or contribution of funds or property.

(ii) A loan or other extension of credit.

(iii) The entry into or renewal of a contract for goods or services.

(c) "Investment activity" means 1 or more of the following:

(i) A person who has an investment of \$20,000,000.00 or more in the energy sector of Iran.

(ii) A financial institution that extends \$20,000,000.00 or more in credit to another person, for 45 days or more, if that person will use the credit for investment in the energy sector of Iran.

(d) "Iran" means any agency or instrumentality of Iran.

(e) "Iran linked business" means either of the following:

(i) A person engaging in investment activities in the energy sector of Iran, including a person that provides oil or liquefied natural gas tankers or products used to construct or maintain pipelines used to transport oil or liquefied natural gas for the energy sector of Iran.

(ii) A financial institution that extends credit to another person, if that person will use the credit to engage in investment activities in the energy sector of Iran.

(f) "Person" means any of the following:

(i) An individual, corporation, company, limited liability company, business association, partnership, society, trust, or any other nongovernmental entity, organization, or group.

(ii) Any governmental entity or instrumentality of a government, including a multilateral development institution, as defined in section 1701(c)(3) of the international financial institutional act, 22 USC 262r(c)(3).

(iii) Any successor, subunit, parent company, or subsidiary of, or company under common ownership or control with, any entity described in subparagraph (i) or (ii).

(g) "Public entity" means this state or an agency or authority of this state, school district, community college district, intermediate school district, city, village, township, county, public authority, or public airport authority.

History: 2012, Act 517, Eff. Apr. 1, 2013.

129.313 Ineligibility of Iran linked business to submit request for proposal bid; certification.

Sec. 3. (1) Beginning April 1, 2013, an Iran linked business is not eligible to submit a bid on a request for proposal with a public entity.

(2) Beginning April 1, 2013, a public entity shall require a person that submits a bid on a request for proposal with the public entity to certify that it is not an Iran linked business.

History: 2012, Act 517, Eff. Apr. 1, 2013.

129.314 Effect of false certification.

Sec. 4. If a public entity determines, using credible information available to the public, that a person has submitted a false certification under section 3(2), the public entity shall provide the person with written notice of its determination and of the intent not to enter into or renew a contract with the person. The notice shall include information on how to contest the determination and specify that the person may become eligible for a

future contract with the public entity if the person ceases the activities that cause it to be an Iran linked business. The person shall have 90 days following receipt of the notice to respond in writing and to demonstrate that the determination of false certification was made in error. If a person does not make that demonstration within 90 days after receipt of the notice, the public entity may terminate any existing contract and shall report the name of the person to the attorney general together with information supporting the determination.

History: 2012, Act 517, Eff. Apr. 1, 2013.

129.315 Civil action; penalty.

Sec. 5. The attorney general may bring a civil action against any person reported under section 4. If a civil action results in a finding that the person submitted a false certification, the person is responsible for a civil penalty of not more than \$250,000.00 or 2 times the amount of the contract or proposed contract for which the false certification was made, whichever is greater, the cost of the public entity's investigation, and reasonable attorney fees, in addition to the fine. A person who submitted a false certification shall be ineligible to bid on a request for proposal for 3 years from the date the public entity determines that the person has submitted the false certification.

History: 2012, Act 517, Eff. Apr. 1, 2013.

129.316 Conditional effect.

Sec. 6. The provisions of this act are effective only if Iran is a state sponsor of terror as defined under section 2 of the divestment from terror act, 2008 PA 234, MCL 129.292.

History: 2012, Act 517, Eff. Apr. 1, 2013.

END OF SECTION 00307

Bid Division: 030100 – Concrete

Bid to Include:

Total Responsibility for Specification Sections:

Section 031000 – Concrete Forming and Accessories
Section 032000 – Concrete Reinforcing
Section 033000 – Cast-In-Place Concrete
Section 321313 – Concrete Paving
Section 321373 – Concrete Paving Joint Sealants

Limited Responsibility for Specification Sections (as it relates to work in this Bid Division):

Section 3123165 – Excavation (As it relates to fine grading, final compaction & footing and foundation excavation and backfill)
Section 072100 – Thermal Insulation (As it relates to building insulation under slab and interior of foundation walls)
Section 079200 – Joint Sealants

Provide all labor, materials, tools, and equipment necessary to perform the work of the specified bid sections. The contractor must also furnish, deliver, unload, store, protect, erect and install all items required for the completion of the work of this bid division in compliance with all drawings and specifications for a complete operational system including but not limited to:

Sidewalks, curbs, floor slabs, grouting base plates, fine grading, foundations, footing excavation, and backfill, etc. Saw cutting of concrete and slab insulation.

General Inclusions:

1. There is no general contractor associated with this project; any and all reference to a “general contractor” related to the work of this bid division shall be understood to mean the contractor of this bid division.
2. The contractor for this bid division work is required to include but is not limited to all items, services, tasks, materials, personnel, equipment, etc. identified in this bid division description regardless of the presence of language in other bid division descriptions that is the same or is similar to that found in this contractor’s bid division description.
3. Coordination of the work of this bid division with any and all work of other bid division contractors for the scheduling and integration of the work of this contractor.
4. All contractors are responsible for the entire set of plans and specifications, including tables, schedules, and notes.
5. Provide continuous housekeeping and clean-up, and proper legal off-site disposal of any debris generated by this Bid Division’s work.
6. All Contractors are required to inspect the existing project components and are to include all work necessary to complete the work to deliver a fully operational system in compliance with all governing codes.
7. This Contractor shall be responsible for performing all work in full compliance with all health and safety standards including Asbestos Awareness and Notification, Lead Paint Abatement, and all MIOSHA Standards. This Contractor shall also be responsible for satisfying all safety violations and/or fines resulting from the actions or lack of action by this Contractor at the sole expense of this Contractor.
8. Any contractor who compounds a mistake by installing their product on another Contractor’s obvious faulty work will assume responsibility for repair of said work.
9. This contractor shall repair and restore any damaged area to an original or better condition with no detectable evidence that the area has been repaired. Repairs must be done by personnel qualified in the execution of the work skilled and licensed in that trade. Whenever possible, repairs to work shall be done by the original installer of the work.
10. Submittal of all insurance, unit pricing, schedule of values, required product data and shop drawings within (2) two weeks of Owner’s Notice to commence work.

Wolgast Corporation – Construction Management

Bid Division: 030100 – Concrete

11. Must provide all submittals within 20 working days of contract award or sooner, unless specifically clarified with the construction manager prior to contract award.
12. Provide all layout and measurements required to perform the work of this Bid Division.
13. The Owner reserves the right to salvage any materials removed from the site during the duration of the project.
14. Coordinate delivery of materials with Construction Manager (48 hours) in advance of the delivery, and provide proper personnel and equipment to perform the unloading.
15. Contractor shall submit to the field construction manager a complete written daily field report stating the work being done on site and the number of employees performing the work for each day the Contractor has representatives on site.
16. Contractor shall have a supervisor on site at all times when a crew is present on the job.
17. On Friday, or last workday of each week, the Contractor must update the Master Copy of As-Built, as it applies to the work of their Bid Division.
18. **Wolgast uses Procore for their CM Software. Please note: We will upload all drawings, and drawing revisions as they are approved, to the Drawings tool. However, it is each contractor's responsibility to verify that they are working from the most up-to-date, approved, drawings.**

Division Inclusions:

1. Removal of excess spoils generated by this bid division from site.
2. Grout under steel column base plates.
3. Provide dewatering as needed for work in this Bid Division, if required.
4. No concrete is to be installed until acceptable density testing has been verified. Any concrete installed without density verification will become the sole responsibility of the Contractor and may be required to be replaced at the Contractor's expense.
5. Mechanical and electrical housekeeping pads.
6. Install all miscellaneous embedded items supplied by others (i.e. anchor bolts, bumper posts, inserts).
7. Coordination with electrician on installation of the under-floor raceway and boxes.
8. Finish grade of all sand or other fill cushion under interior and exterior slabs on grade, walks, pads, or aprons.
9. Provide temporary weather protection as needed, including temporary enclosures, temporary heat and temporary heating fuel, concrete additives and accelerators as required.
10. All exterior concrete. (Including, but not limited to sidewalks, curbs, trash corral pad, footings, chiller pad, etc.)
11. This contractor is responsible for compaction at footing bottoms.
12. Furnish and install foundation and under slab insulation.
13. Provide excavation and backfill of footings.
14. Patch all concrete floors as shown on Demolition drawings.
15. Provide all thickened slabs.
16. Furnish and install reinforced concrete pad for discus. Keynote 8 on C2.1.
17. Excavate and backfill all interior footings.
18. All interior concrete slabs, walks and pads must be finished to a levelness tolerance of a maximum ¼" in ten (10') feet unless specifically stated other wise by the construction documents.
19. Contractor must provide written certification by an independent testing agency of all slabs, walk and pad level tolerances. Certification to be established using a five (5') foot grid.
20. Provide written acceptance of grade elevations to Construction Manager after Site Work contractor has established the building pad.

Project Inclusions:

1. Review the milestone schedules. This bid division's work will require it to be completed at multiple locations and concurrently for some of the work. Prepare your bid proposal accordingly to allow for sufficient manpower and resources.
2. Furnish and install all required exterior and interior concrete work.

Bid Division: 030100 – Concrete

3. Perform all excavating, backfill, and compaction required for footings and foundations.
4. Furnish and install all horizontal and vertical rigid insulation below slabs.
5. Provide all required concrete patching, as documented. Refer to architectural, plumbing and electrical drawings for locations of slab changes. This bid division contractor is responsible for all floor patching as indicated in the drawings.
6. Provide reinforcing steel shop drawings and mix designs with the first submittals.
7. Provide all concrete footings and foundation walls.
8. Furnish and install all concrete at supported slabs, including installation of metal deck furnished by others where noted.
9. Provide all strip footings as required.
10. Furnish and install steel reinforcement embedded in concrete as indicated.
11. Pour thickened slabs as indicated.
12. Install concrete locker bases.
13. Furnish and install all required vapor barriers, expansion joint materials and all interior and exterior joint sealants as it pertains to concrete work.
14. Furnish and install all required dowels at new to existing concrete slabs, sidewalks, curbs, footings, foundations, etc.
15. Coordinate with Bid Division 222300 and 260000 contractors prior to installation of all floor drains and floor boxes.
16. Must provide all submittals within 20 working days of contract award or sooner, unless specifically clarified with the construction manager prior to contract award.
17. Mandatory attendance at all required pre-installation meetings.
18. Completion of all punch list work within 15 working days or less upon receipt of punch list items, unless specific circumstances occur that are out of control of this bid division contractor dictate otherwise.
19. Verify with the construction manager that required inspections have been completed, prior to pouring concrete. Any contractor that pours concrete without verification of the required inspections, may be subject to removal and replacement of that concrete, at the building officials' discretion.

Excludes:

1. Concrete Testing
2. Floor patching for mechanical and electrical trades, beyond what is required on the demolition drawings.
3. Demolition of exterior concrete surfaces by Bid Division 024200.

Consideration for award:

The ability to begin as soon as areas of work become available. To have proper equipment and responsible personnel to complete the above list of work. To repair any adjacent materials damaged in the execution of the above listed work. Close cooperation with the Construction Manager and other bid divisions to provide input to develop a working schedule. An approved schedule of values will be required before approval is granted for the first payment request. Expediting communication and follow-up as required.

END OF BID DIVISION 030100

Wolgast Corporation – Construction Management



Wolgast Corporation

Freeland Comm. Schools - Main
 710 Powley Drive
 Freeland, Michigan 48623
 9896955527

Submittal Packages

Spec Section	#	Rev.	Title	Type	Status	Responsible Contractor	Submit By	Received From	Received Date	Ball In Court	Approvers	Response	Sent Date	Returned Date	Final Due Date	Distributed Date
#1 03 01 00 - Concrete																
321373 - Concrete Paving Joint Sealant	321373-2	0	Concrete Paving Joint Sealant - color samples	Sample	Draft											
321373 - Concrete Paving Joint Sealant	321373-1	0	Concrete Paving Joint Sealant - product data	Product Information	Draft											
321313 - Concrete Paving	321313-1	0	Concrete Paving - product data mix design	Product Information	Draft											
072100 - Thermal Insulation	072100-1	0	Thermal Insulation - product data	Product Information	Draft											
033000 - Cast In Place Concrete	033000-1	0	Cast In Place Concrete - product data mix design	Product Information	Draft											
032000 - Concrete Reinforcing	032000-2	0	Concrete Reinforcing - shop drawings	Shop Drawing	Draft											
032000 - Concrete Reinforcing	032000-1	0	Concrete Reinforcing - product data	Other	Draft											
031000 - Concrete Forming and Accessories	031000-1	0	Concrete Forming & Accessories - product data	Product Information	Draft											
#2 03 01 00 - Concrete Start Up																
	11	0	Copy of all Permits		Draft											
	10	0	Hazardous/AHERA Notifications		Draft											
	9	0	Sub/Supplier Form		Draft											
	8	0	Safety Data Sheets (SDS)		Draft											
	7	0	Safety Policy		Draft											
	6	0	On Site Employee List		Draft											
	5	0	Insurance/Letter of Compl		Draft											
	4	0	Payment/Performance Bonds		Draft											
	3	0	Contracts Signed/Returned		Draft											
	2	0	Schedule of Values		Draft											
	1	0	Post Bid Interview/Proposal Forms		Draft											
#3 03 01 00 - Concrete Close Out																
	23	0	Final Inspections on permits		Draft											
	22	0	O&M Manuals		Draft											
	21	0	Warranties for Equipment Installed		Draft											
	20	0	Asbestos Materials Affidavits		Draft											
	19	0	Signed Hazardous Materials		Draft											
	18	0	Insurance Up-To-Date		Draft											
	17	0	All CO Signed/Returned		Draft											
	16	0	As Built Drawings		Draft											
	15	0	Completed Punch List		Draft											
	14	0	Substantial Completion		Draft											
	13	0	Consent of Surety		Draft											
	12	0	Contractor (2) Yr Guarantee		Draft											

Bid Division: 040000 – Masonry

Bid to Include:

Total Responsibility for Specification Sections:

Section 042000 – Unit Masonry
Section 042200 – Concrete Unit Masonry

Limited Responsibility for Specification Sections (as it relates to work in this Bid Division):

Section 024119 – Selective Demolition
Section 072100 – Thermal Insulation (Insulation between CMU and Veneer)
Section 072726 – As it relates to this bid division.
Section 078400 – Firestopping (As it relates to this Bid Division)
Section 078401 – Firestopping Systems Schedule
Section 079200 – Joint Sealants (Exterior control joints)

Provide all labor, materials, tools, and equipment necessary to perform the work of the specified bid sections. The contractor must also furnish, deliver, unload, store, protect, erect and install all items required for the completion of the work of this bid division in compliance with all drawings and specifications for a complete operational system including but not limited to:

Mortar, block, brick, scaffolding, shoring, toothing of existing masonry, installing of embedded items, caulking, reinforcing, etc.

General Inclusions:

1. There is no general contractor associated with this project; any and all reference to a “general contractor” related to the work of this bid division shall be understood to mean the contractor of this bid division.
2. The contractor for this bid division work is required to include but is not limited to all items, services, tasks, materials, personnel, equipment, etc. identified in this bid division description regardless of the presence of language in other bid division descriptions that is the same or is similar to that found in this contractor’s bid division description.
3. Coordination of the work of this bid division with any and all work of other bid division contractors for the scheduling and integration of the work of this contractor.
4. All contractors are responsible for the entire set of plans and specifications, including tables, schedules, and notes.
5. Provide continuous housekeeping and clean-up, and proper legal off-site disposal of any debris generated by this Bid Division’s work.
6. Contractor is responsible for own dumpster(s) and all removal and disposal charges thereof. (Use of the Owner’s dumpsters is strictly prohibited.)
7. All Contractors are required to inspect the existing project components and are to include all work necessary to complete the work to deliver a fully operational system in compliance with all governing codes.
8. This Contractor shall be responsible for performing all work in full compliance with all health and safety standards including Asbestos Awareness and Notification, Lead Paint Abatement, and all MIOSHA Standards. This Contractor shall also be responsible for satisfying all safety violations and/or fines resulting from the actions or lack of action by this Contractor at the sole expense of this Contractor.
9. Any contractor who compounds a mistake by installing their product on another Contractor’s obvious faulty work will assume responsibility for repair of said work.
10. This contractor shall repair and restore any damaged area to an original or better condition with no detectable evidence that the area has been repaired. Repairs must be done by personnel qualified in the execution of the work skilled and licensed in that trade. Whenever possible, repairs to work shall be done by the original installer of the work.

Bid Division: 040000 – Masonry

11. Submittal of all insurance, unit pricing, schedule of values, required product data and shop drawings within (2) two weeks of Owner's Notice to commence work.
12. Must provide all submittals within 20 working days of contract award or sooner, unless specifically clarified with the construction manager prior to contract award.
13. Provide all layout and measurements required to perform the work of this Bid Division.
14. The Owner reserves the right to salvage any materials removed from the site during the duration of the project.
15. Coordinate delivery of materials with Construction Manager (48 hours) in advance of the delivery and provide proper personnel and equipment to perform the unloading.
16. Contractor shall submit to the field construction manager a complete written daily field report stating the work being done on site and the number of employees performing the work for each day the Contractor has representatives on site.
17. Contractor shall have a supervisor on site at all times when a crew is present on the job.
18. On Friday, or last workday of each week, the Contractor must update the Master Copy of As-Built, as it applies to the work of their Bid Division.
19. **Wolgast uses Procore for their CM Software. Please note: We will upload all drawings, and drawing revisions as they are approved, to the Drawings tool. However, it is each contractor's responsibility to verify that they are working from the most up-to-date, approved, drawings.**

Division Inclusions:

1. Caulking of all exterior control joints.
2. Temporary weather protection as needed, including temporary enclosures, temporary heat, temporary heating fuel. Mason to heat sand water & mixture.
3. Installation of miscellaneous steel lintels.
4. Installation of bolts and grouted anchors.
5. Coordinate the location of all masonry openings and penetrations with the trade requiring same.
6. Coordinate masonry opening sizes and locations with all contractors.
7. Layout for opening for other trades to be performed by that trade.
8. Verify correct window rough opening sizes for all new and relocated existing window units prior to building masonry window openings.
9. Provide all required masonry sealants and caulking for wall flashing, weep holes, and rigid insulation.
10. Provide patching of all wall penetrations as required.
11. All toothing and patching as required for all work related to this project. (Coordinate with Bid Division 024200.)
12. Grout all jambs and headers of all hollow metal frames, and brass doorjambs per manufacturer's recommendation.
13. The brick is the responsibility of the masonry contractor, to purchase and install.
14. The mason contractor is responsible to remove all excess mortar from salvaged brick prior to installation.
15. Removal of mortar from floors, clean with cleaner and water to remove excess mortar and mortar dust.
16. Cavity wall insulation includes all insulation extending beyond the top of the brick or veneer line but laying against the CMU wall as specified.
17. Provide through wall flashing at building tie-ins, including any demolition required.
18. Temporarily brace masonry as required by industry standards and MIOSHA, to include temporary warning signage and barricades.
19. Samples of brick for exterior walls will be tested for efflorescence per ASTM C67 prior to acceptance of brick.
20. In the event that efflorescence appears after walls are in place, the Architect shall select samples of brick and mortar taken directly from the wall to be tested for chemical content. If efflorescence producing materials are found in the brick or mortar in amounts exceeding the limits called for by this specification and referenced in the ASTM standards, the contractor shall bear the cost of the testing and all remedial, additional or replacement work. If efflorescence producing materials in both the brick and the mortar do not exceed the limits as stated above, the cost of the testing and patching of the areas where samples were removed shall be borne by the Owner.
21. Install access doors in masonry walk

Bid Division: 040000 – Masonry

Project Inclusions:

1. Review the milestone schedules. This bid division's work will require it to be completed at multiple locations and concurrently for some of the work. Prepare your bid proposal accordingly to allow for sufficient manpower and resources.
2. Furnish and install all required masonry materials.
3. Provide all interior and exterior masonry demolition as documented.
4. Complete all masonry demo as indicated in drawings.
5. This bid division must provide their own dumpster for their work or remove the masonry debris by truck throughout the course of the masonry work.
6. Provide all required masonry patching, including all required cutting and toothing to existing at finished locations as documented. The masonry contractor is responsible for cutting all cutting of mortar joints and removal of brick for installation of new and/or re-used existing brick.
7. Provide all required masonry toothing and patching of CMU and brick.
8. Rub walls smooth.
9. Furnish and install bullnose CMU at locations as documented.
10. Furnish and install all required cavity wall insulation and rigid insulation against masonry construction, as documented.
11. Provide and install all required shoring for existing masonry work at the cafeteria doors, that are indicated to have larger openings created and doors installed.
12. Provide all required grouting of all hollow metal frames in masonry work.
13. Bid division 060000 will complete the initial installation and bracing of all hollow metal frames. **The masonry contractor is responsible for maintaining level and square door frames during the masonry installation.** Any additional cost incurred by another bid division contractor, to correct a frame that is not level and square due to lack of proper installation, will be the responsibility of this contractor.
14. Provide all caulking of all exterior control joints. The first joint caulked must be approved by the Construction Manager to set the level of acceptance for all caulking. All unsatisfactory caulking will be required to be removed and re-installed. Confirm color of exterior caulking with the Architect prior to installation.
15. Furnish and install all required masonry for interior and exterior columns.
16. Construct a sample brick masonry wall for owner approval prior to any brick installation. Refer to specifications.
17. Infill removed windows with brick cmu exterior veneer and cmu interior at the new vestibule addition as indicated in the drawings and specifications.

Excludes:

1. Foundation perimeter interior slab insulation.
2. Steel doorframes to be provided and initially installed by Bid Division 060000.

Consideration for award:

The ability to begin as soon as areas of work become available. To have proper equipment and responsible personnel to complete the above list of work. To repair any adjacent materials damaged in the execution of the above listed work. Close cooperation with the Construction Manager and other bid divisions to provide input to develop a working schedule. An approved schedule of values will be required before approval is granted for the first payment request. Expediting communication and follow-up as required.

END OF BID DIVISION 040000

Wolgast Corporation – Construction Management



Wolgast Corporation

Freeland Comm. Schools - Main
710 Powley Drive
Freeland, Michigan 48623
989695527

Submittal Packages

Spec Section	#	Rev.	Title	Type	Status	Responsible Contractor	Submit By	Received From	Received Date	Ball In Court	Approvers	Response	Sent Date	Returned Date	Final Due Date	Distributed Date
#4 04 00 00 - Masonry																
079200 - Joint Sealants	079200-3	0	Joint Sealants at exterior control joints - sealant schedule	Other	Draft											
079200 - Joint Sealants	079200-2	0	Joint Sealants at exterior control joints - color samples	Sample	Draft											
079200 - Joint Sealants	079200-1	0	Joint Sealants at exterior control joints - product data	Product Information	Draft											
078400 - Firestopping	078400-2	0	Firestopping - product data	Product Information	Draft											
078400 - Firestopping	078400-1	0	Firestopping - schedule	Other	Draft											
072726 - Fluid Applied Membrane Air Barriers	072726-2	0	Fluid Applied Membrane Air Barrier - shop drawings	Shop Drawing	Draft											
072726 - Fluid Applied Membrane Air Barriers	072726-1	0	Fluid Applied Membrane Air Barrier - product data	Product Information	Draft											
042200 - Concrete Unit Masonry	042200-3	0	Concrete Unit Masonry - mix design	Other	Draft											
042200 - Concrete Unit Masonry	042200-2	0	Concrete Unit Masonry - shop drawings	Shop Drawing	Draft											
042200 - Concrete Unit Masonry	042200-1	0	Concrete Unit Masonry - product data	Product Information	Draft											
042000 - Unit Masonry	042000-4	0	Unit Masonry - Mix Design	Other	Draft											
042000 - Unit Masonry	042000-3	0	Unit Masonry - samples	Sample	Draft											
042000 - Unit Masonry	042000-2	0	Unit Masonry - shop drawings	Shop Drawing	Draft											
042000 - Unit Masonry	042000-1	0	Unit Masonry - Product data	Product Information	Draft											
#5 04 00 00 - Masonry Start Up																
	11	0	Copy of all Permits		Draft											
	10	0	Hazardous/AHERA Notifications		Draft											
	9	0	Sub/Supplier Form		Draft											
	8	0	Safety Data Sheets (SDS)		Draft											
	7	0	Safety Policy		Draft											
	6	0	On Site Employee List		Draft											
	5	0	Insurance/Letter of Compl		Draft											
	4	0	Payment/Performance Bonds		Draft											
	3	0	Contracts Signed/Returned		Draft											
	2	0	Schedule of Values		Draft											
	1	0	Post Bid Interview/Proposal Forms		Draft											
#6 04 00 00 - Masonry Close Out																
079200 - Joint Sealants	079200-4	0	Joint Sealants for Exterior Control Joints - Warranty	Closeouts	Draft											
078400 - Firestopping	078400-3	0	Firestopping - Warranty	Closeouts	Draft											
	23	0	Final Inspections on permits		Draft											
	22	0	O&M Manuals		Draft											
	21	0	Warranties for Equipment Installed		Draft											
	20	0	Asbestos Materials Affidavits		Draft											
	19	0	Signed Hazardous Materials		Draft											
	18	0	Insurance Up-To-Date		Draft											



Wolgast Corporation

Spec Section	#	Rev.	Title	Type	Status	Responsible Contractor	Submit By	Received From	Received Date	Ball In Court	Approvers	Response	Sent Date	Returned Date	Final Due Date	Distributed Date
	17	0	All CO Signed/Returned		Draft											
	16	0	As Built Drawings		Draft											
	15	0	Completed Punch List		Draft											
	14	0	Substantial Completion		Draft											
	13	0	Consent of Surety		Draft											
	12	0	Contractor (2) Yr Guarantee		Draft											

Bid Division: 050000 – Metals

Bid to Include:

Total Responsibility for Specification Sections:

Section 051200 – Structural Steel Framing
Section 052100 – Steel Joist Framing
Section 053100 – Steel Decking
Section 054000 – Cold-Formed Metal Framing
Section 055000 – Metal Fabrications

Limited Responsibility for Specification Sections (as it relates to work in this Bid Division):

Section 033000 – Cast-in- Place Concrete (Provide steel to be embedded in concrete)
Section 042200 – Concrete Unit Masonry (Provide steel to be embedded in masonry)

Provide all labor, materials, tools, and equipment necessary to perform the work of the specified bid sections. The contractor must also furnish, deliver, unload, store, protect, erect and install all items required for the completion of the work of this bid division in compliance with all drawings and specifications for a complete operational system including but not limited to:

Welding, structural steel, stud joists, shoring, decking, etc., for complete operational system.

General Inclusions:

1. There is no general contractor associated with this project; any and all reference to a “general contractor” related to the work of this bid division shall be understood to mean the contractor of this bid division.
2. The contractor for this bid division work is required to include but is not limited to all items, services, tasks, materials, personnel, equipment, etc. identified in this bid division description regardless of the presence of language in other bid division descriptions that is the same or is similar to that found in this contractor’s bid division description.
3. Coordination of the work of this bid division with any and all work of other bid division contractors for the scheduling and integration of the work of this contractor.
4. All contractors are responsible for the entire set of plans and specifications, including tables, schedules, and notes.
5. Provide continuous housekeeping and clean-up, and proper legal off-site disposal of any debris generated by this Bid Division’s work.
6. Contractor is responsible for own dumpster(s) and all removal and disposal charges thereof. (Use of the Owner’s dumpsters is strictly prohibited.)
7. All Contractors are required to inspect the existing project components and are to include all work necessary to complete the work to deliver a fully operational system in compliance with all governing codes.
8. This Contractor shall be responsible for performing all work in full compliance with all health and safety standards including Asbestos Awareness and Notification, Lead Paint Abatement, and all MIOSHA Standards. This Contractor shall also be responsible for satisfying all safety violations and/or fines resulting from the actions or lack of action by this Contractor at the sole expense of this Contractor.
9. Any contractor who compounds a mistake by installing their product on another Contractor’s obvious faulty work will assume responsibility for repair of said work.
10. This contractor shall repair and restore any damaged area to an original or better condition with no detectable evidence that the area has been repaired. Repairs must be done by personnel qualified in the execution of the work skilled and licensed in that trade. Whenever possible, repairs to work shall be done by the original installer of the work.
11. Submittal of all insurance, unit pricing, schedule of values, required product data and shop drawings within (2) two weeks of Owner’s Notice to commence work.
12. Provide all layout and measurements required to perform the work of this Bid Division.

Wolgast Corporation – Construction Management

Bid Division: 050000 – Metals

13. Must provide all submittals within 20 working days of contract award or sooner, unless specifically clarified with the construction manager prior to contract award.
14. The Owner reserves the right to salvage any materials removed from the site during the duration of the project.
15. Coordinate delivery of materials with Construction Manager (48 hours) in advance of the delivery and provide proper personnel and equipment to perform the unloading.
16. Contractor shall submit to the field construction manager a complete written daily field report stating the work being done on site and the number of employees performing the work for each day the Contractor has representatives on site.
17. Contractor shall have a supervisor on site at all times when a crew is present on the job.
18. On Friday, or last workday of each week, the Contractor must update the Master Copy of As-Built, as it applies to the work of their Bid Division.
19. **Wolgast uses Procore for their CM Software. Please note: We will upload all drawings, and drawing revisions as they are approved, to the Drawings tool. However, it is each contractor's responsibility to verify that they are working from the most up-to-date, approved, drawings.**

Division Inclusions:

1. Furnish and install roof sump pans.
2. Supply all anchor bolts to installing contractors.
3. Provide all metal fabrications to be installed by Bid Division 030100/040000, including anchor bolts and imbeds.
4. Provide prime touch-up paint and cleaning of erected steel as required for proper finish painting of all steel.
5. Maintain cleanliness of steel until erected.
6. Clean any dirt or debris from steel in a condition ready to receive paint and acceptable by painting contractor.
7. Provide all steel angle or beam lintels for all required masonry penetrations over 24" wide in addition to any listed in lintel and beam schedules.
8. Provide all special inspections required per specifications.
9. This Contractor is responsible to follow all MIOSHA standards, including, but not limited to the Revised Part 26 of the MIOSHA standard, all fall protection, site-specific planning meetings, etc.
10. Provide all perimeter roof angles.
11. Provide and install all miscellaneous steel for roof curbs and roof draining and RTU.
12. Prime all weldings with primer.
13. Furnish & Install bridging, fasteners, and the accessories for a complete installation.
14. Furnish bearing plates, sleeves and guard posts for installation by others.

Project Inclusions:

1. Review the milestone schedules. This bid division's work will require it to be completed at multiple locations and concurrently for some of the work. Prepare your bid proposal accordingly to allow for sufficient manpower and resources.
2. Coordinate steel per window and door details.
3. Follow all structural details for steel.
4. Furnish and install all required structural and miscellaneous steel.
5. Furnish all required metal deck at supported slabs, to be installed by concrete contractor.
6. Furnish and install all bar joists and deck.
7. Furnish and install all steel angles at the roof.
8. Furnish and install all steel angles at roof top units as indicated.
9. Furnish and install all steel angles for supporting metal decking.
10. Furnish and install all steel angles for concrete pour stops.
11. Furnish all steel lintels for installation in masonry-by-masonry contractor.
12. Furnish and install all required roof opening frames.
13. Furnish and install all required reinforcing of existing roof steel framing.
14. Furnish and install CMU lateral walls supports to steel framing.
15. Furnish and install angles at fire-rated walls as documented.

Wolgast Corporation – Construction Management

Bid Division: 050000 – Metals

16. Must provide all submittals within 20 working days of contract award or sooner, unless specifically clarified with the construction manager prior to contract award.
17. Mandatory attendance at all required pre-installation meetings.
18. Completion of all punch list work within 15 working days or less upon receipt of punch list items, unless specific circumstances occur that are out of control of this bid division contractor dictate otherwise.

Excludes:

1. Installation of imbedded steel (anchor bolts, lintels, etc.)

Consideration for award:

The ability to begin as soon as areas of work become available. To have proper equipment and responsible personnel to complete the above list of work. To repair any adjacent materials damaged in the execution of the above listed work. Close cooperation with the Construction Manager and other bid divisions to provide input to develop a working schedule. An approved schedule of values will be required before approval is granted for the first payment request. Expediting communication and follow-up as required.

END OF BID DIVISION 050000



Wolgast Corporation

Freeland Comm. Schools - Main
710 Powley Drive
Freeland, Michigan 48623
9896955527

Submittal Packages

Spec Section	#	Rev.	Title	Type	Status	Responsible Contractor	Submit By	Received From	Received Date	Ball In Court	Approvers	Response	Sent Date	Returned Date	Final Due Date	Distributed Date
#7 05 00 00 - Metals																
055000 - Metal Fabrications	055000-1	0	Metal Fabrications - shop drawings	Shop Drawing	Draft											
054000 - Cold Formed Metal Framing	054000-2	0	Cold Formed Metal Framing - Shop drawings	Shop Drawing	Draft											
054000 - Cold Formed Metal Framing	054000-1	0	Cold Formed Metal Framing - product data	Product Information	Draft											
053100 - Steel Decking	053100-2	0	Steel Decking - shop drawings	Shop Drawing	Draft											
053100 - Steel Decking	053100-1	0	Steel Decking - product data	Product Information	Draft											
052100 - Steel Joist Framing	052100-2	0	Joist Framing - Shop Drawings	Shop Drawing	Draft											
052100 - Steel Joist Framing	052100-1	0	Joist Framing - product data	Product Information	Draft											
051200 - Structural Steel Framing	051200-3	0	Steel Framing - welding certs	Other	Draft											
051200 - Structural Steel Framing	051200-2	0	Steel Framing - shop drawings	Shop Drawing	Draft											
051200 - Structural Steel Framing	051200-1	0	Steel Framing - product data	Product Information	Draft											
#8 05 00 00 - Metals Start Up																
	11	0	Copy of all Permits		Draft											
	10	0	Hazardous/AHERA Notifications		Draft											
	9	0	Sub/Supplier Form		Draft											
	8	0	Safety Data Sheets (SDS)		Draft											
	7	0	Safety Policy		Draft											
	6	0	On Site Employee List		Draft											
	5	0	Insurance/Letter of Compl		Draft											
	4	0	Payment/Performance Bonds		Draft											
	3	0	Contracts Signed/Returned		Draft											
	2	0	Schedule of Values		Draft											
	1	0	Post Bid Interview/Proposal Forms		Draft											
#9 05 00 00 - Metals Close Out																
	23	0	Final Inspections on permits		Draft											
	22	0	O&M Manuals		Draft											
	21	0	Warranties for Equipment Installed		Draft											
	20	0	Asbestos Materials Affidavits		Draft											
	19	0	Signed Hazardous Materials		Draft											
	18	0	Insurance Up-To-Date		Draft											
	17	0	All CO Signed/Returned		Draft											
	16	0	As Built Drawings		Draft											
	15	0	Completed Punch List		Draft											
	14	0	Substantial Completion		Draft											
	13	0	Consent of Surety		Draft											
	12	0	Contractor (2) Yr Guarantee		Draft											

Bid Division: 060000 – General Trades

Bid to Include:

Total Responsibility for Specification Sections:

Section 061000 – Rough Carpentry
Section 061600 – Sheathing
Section 062023 – Interior Finish Carpentry
Section 074213.13 – Metal Wall Panels
Section 081113 – Hollow Metal Doors and Frames
Section 084123 – Fire Rated Steel Entrances and Storefronts
Section 087100 – Door Hardware
Section 101100 – Visual Display Units
Section 101400 – Signage
Section 102113.19 – Solid Plastic Toilet Compartments
Section 102800 – Toilet, Bath, and Laundry Accessories
Section 104400 – Fire Protection Specialties
Section 104416 – Fire Extinguishers
Section 122400 – Roller Window Shades

Limited Responsibility for Specification Sections (as it relates to work in this Bid Division):

Section 024119 – Selective Demolition
Section 079200 – Joint Sealants (As it relates to work in this Bid Division)
Section 080671 – Door Hardware Schedule (As it relates to this bid division)
Section 081700 – Integrated Door Opening Assemblies. (As it relates to this bid division.)
Section 083113 – Access Doors and Frames (As it relates to access panels installed in masonry)
Section 087100 – Door Hardware (As it relates to this bid division)

Provide all labor, materials, tools, and equipment necessary to perform the work of the specified bid sections. The contractor must also furnish, deliver, unload, store, protect, erect and install all items required for the completion of the work of this bid division in compliance with all drawings and specifications for a complete operational system including but not limited to:

All required nailers, fasteners, blocking, etc for a complete operational system.

General Inclusions:

1. There is no general contractor associated with this project; any and all reference to a “general contractor” related to the work of this bid division shall be understood to mean the contractor of this bid division.
2. The contractor for this bid division work is required to include but is not limited to all items, services, tasks, materials, personnel, equipment, etc. identified in this bid division description regardless of the presence of language in other bid division descriptions that is the same or is similar to that found in this contractor’s bid division description.
3. Coordination of the work of this bid division with any and all work of other bid division contractors for the scheduling and integration of the work of this contractor.
4. All contractors are responsible for the entire set of plans and specifications, including tables, schedules, and notes.
5. Provide continuous housekeeping and clean-up, and proper legal off-site disposal of any debris generated by this Bid Division’s work.
6. Contractor is responsible for own dumpster(s) and all removal and disposal charges thereof. (Use of the Owner’s dumpsters is strictly prohibited.)
7. All Contractors are required to inspect the existing project components and are to include all work necessary to complete the work to deliver a fully operational system in compliance with all governing codes.

Wolgast Corporation – Construction Management

Bid Division: 060000 – General Trades

8. This Contractor shall be responsible for performing all work in full compliance with all health and safety standards including Asbestos Awareness and Notification, Lead Paint Abatement, and all MIOSHA Standards. This Contractor shall also be responsible for satisfying all safety violations and/or fines resulting from the actions or lack of action by this Contractor at the sole expense of this Contractor.
9. Any contractor who compounds a mistake by installing their product on another Contractor's obvious faulty work will assume responsibility for repair of said work.
10. This contractor shall repair and restore any damaged area to an original or better condition with no detectable evidence that the area has been repaired. Repairs must be done by personnel qualified in the execution of the work skilled and licensed in that trade. Whenever possible, repairs to work shall be done by the original installer of the work.
11. Submittal of all insurance, unit pricing, schedule of values, required product data and shop drawings within (2) two weeks of Owner's Notice to commence work.
12. Must provide all submittals within 20 working days of contract award or sooner, unless specifically clarified with the construction manager prior to contract award.
13. Provide all layout and measurements required to perform the work of this Bid Division.
14. The Owner reserves the right to salvage any materials removed from the site during the duration of the project.
15. Coordinate delivery of materials with Construction Manager (48 hours) in advance of the delivery and provide proper personnel and equipment to perform the unloading.
16. Contractor shall submit to the field construction manager a complete written daily field report stating the work being done on site and the number of employees performing the work for each day the Contractor has representatives on site.
17. Contractor shall have a supervisor on site at all times when a crew is present on the job.
18. On Friday, or last workday of each week, the Contractor must update the Master Copy of As-Built, as it applies to the work of their Bid Division.
19. **Wolgast uses Procore for their CM Software. Please note: We will upload all drawings, and drawing revisions as they are approved, to the Drawings tool. However, it is each contractor's responsibility to verify that they are working from the most up-to-date, approved, drawings.**

Division Inclusions:

1. Unloading, protection and record of all hollow metal doors and frames.
2. All wood nailers for roof blocking, fascia, masonry, etc.
3. Wood blocking around windows and doors.
4. All temporary shoring as required for work in this Bid Division.
5. Provide, receive, store, protect, inventory, and install all described bid items.
6. Submittal of required product data and shop drawings within two (2) weeks of Construction Contract or Owner's Letter of Intent.
7. Provide for proper legal off-site disposal off all construction debris generated by the described work.
8. Sufficient numbers of shop drawings are to be provided to the affected contractors (i.e. mason, electrician, etc.)
9. Provide wood base for lockers, if required.
10. Remove items indicated: clean, service and otherwise prepare them for reuse; store and protect against damage. Reinstall items in the same locations or in locations indicated.
11. Remove and legally dispose of items not indicated to be reinstalled, salvaged or to remain the Owner's property.
12. Install all doorframes, and coordinate with mason contractor.
13. Cover all countertops with double layered corrugated cardboard.
14. Clean and dust all casework upon completion.
15. Clean, prep and adjust all equipment immediately prior to Owner occupancy.
16. Patch walls after removal of existing tack strips and tack boards that are not covered by new strips or boards. Walls shall be brought to a surface ready to receive new paint.
17. Patch all demolished areas and items affected by demolition to a condition ready to receive finishes and finish materials.

Bid Division: 060000 – General Trades

18. Furnish and install all joint sealants and fire stopping as indicated in specifications and drawings including but not limited to perimeter joints of doors and louvers at interior and exterior, perimeter joints between interior wall surfaces and frames of interior doors and all other joints indicated.
19. The contractor shall broom sweep building daily.
20. Provide all temporary enclosures as required, review demo drawings throughout the duration of construction.
21. Contractor shall furnish and install temporary insulated weather-tight closures of openings created as a result of the work in this scope in exterior surfaces to provide acceptable working conditions and protection for materials, to allow for temporary heating, and for building security. Provide doors with self-closing hardware and locks.
22. Provide all wood framing, plywood and nailers as shown and specified.
23. Review alternates.
24. Provide all wood blocking in metal stud walls for all materials that will require it, including but not limited to, casework, fixtures, toilet accessories, coat racks, signage, curtains, marker & tack boards, etc.
25. The contractor shall engage an authorized factory service representative to perform a start-up service prior to the acceptance of the doors by the owner and construction manager. The start-up service certification shall include: verification of correct motor wiring and voltage; adjusting the door for proper operation; testing, adjusting and correcting the door controls and safeties; testing the door for proper function as required by the architect's specifications; the formal training of the owner and owner's representatives for the proper operation and maintenance of the door. The authorized factory service representative shall provide a written certification with the request for final payment stating that the start-up service has been performed and that each of the above items have been verified for proper operation.

Project Inclusions:

1. Review the milestone schedules. This bid division's work will require it to be completed at multiple locations and concurrently for some of the work. Prepare your bid proposal accordingly to allow for sufficient manpower and resources.
2. Note drawing D2.0. Complete demolition as indicated in drawing. Masonry demo by that contractor.
3. Furnish and install all bathroom accessories. Owner to provide toilet tissue, paper towel, and soap dispensers for installation by this contractor. This includes owner provided dispensers in science room.
4. Furnish and install all blocking and sheathing as required, including fire-rated and treated as documented. This includes all roof Blocking / Nailers, as indicated in the wall details and specifications.
5. Furnish and install all hollow metal frames, doors, and finish hardware. This contractor will complete the initial installation and bracing of all hollow metal frames. The masonry contractor is responsible for maintaining level and square door frames during the masonry installation. Any additional cost incurred by another bid division contractor, to correct a frame that is not plumb due to lack of proper installation during masonry installation, will be the responsibility of the masonry contractor.
6. When installing door frames, this contractor must consider floor thickness and install accordingly to ensure doors to not rub on floors.
7. Provide and install all signage.
8. Provide and install all exterior metal panels including blocking for lights, horns, cameras, etc.
9. Provide and install new metal closure trim at removed lockers as indicated in drawings and specifications. Paint by Painting contractor.
10. Provide and install interior FRP panels as indicated in drawings and specifications.
11. Provide and install access panels in CMU walls as indicated in drawings and specifications.
12. Provide and install all marker boards and tack boards as indicated in the drawings and specifications.
13. Install owner furnished smart monitors as indicated in drawings.
14. Deliver all hollow metal frames to the siter prior to the installation of any masonry walls that have hollow metal frames installed in them. Provide manpower as needed to complete the initial installation of hollow metal frames.
15. Demolition of existing hollow metal doors and frames at the cafeteria. Temporary shoring of masonry to be completed by masonry bid division prior to door demolition.

Bid Division: 060000 – General Trades

16. All masonry demolition is by bid division 040000 Masonry.
17. Complete demolition of existing windows and door systems as indicated in the drawings.
18. **This contractor to include an allowance of 120 worker hours for cleaning of the work areas during the project and prior to turnover to the owner, in the base bid. Include the hourly rate used to calculate this allowance. This allowance is to be used at the discretion of and scheduled by the construction manager. Time and material invoices for this work shall be managed and approved daily by the field manager. This allowance must be included by line item in the schedule of values. Any remaining balance at the completion will be credited to the owner.**
19. **Note Keynote 1 on M2.11. The removal and re-installation of the existing acoustical ceilings is the responsibility of the acoustical contractor, not general trades.**

Excludes:

1. All demolition of conduits, ducts, pipes, fixtures, etc. (demolition required for all mechanical, plumbing, and electrical work) is to be performed by the specific mechanical, plumbing and electrical contractors.
2. Hardware for aluminum entries.
3. Aluminum frames
4. FRP Doors and Hardware.
5. Masonry demolition.

Consideration for award:

The ability to begin as soon as areas of work become available. To have proper equipment and responsible personnel to complete the above list of work. To repair any adjacent materials damaged in the execution of the above listed work. Close cooperation with the Construction Manager and other bid divisions to provide input to develop a working schedule. An approved schedule of values will be required before approval is granted for the first payment request. Expediting communication and follow-up as required.

END OF BID DIVISION 060000

Wolgast Corporation – Construction Management



Wolgast Corporation

Freeland Comm. Schools - Main
710 Powley Drive
Freeland, Michigan 48623
9896955527

Submittal Packages

Spec Section	#	Rev.	Title	Type	Status	Responsible Contractor	Submit By	Received From	Received Date	Ball In Court	Approvers	Response	Sent Date	Returned Date	Final Due Date	Distributed Date
#10 06 00 00 - General Trades																
122400 - Roller Window Shades	122400-3	0	Roller Window Shades - samples	Sample	Draft											
122400 - Roller Window Shades	122400-2	0	Roller Window Shades - shop drawings	Shop Drawing	Draft											
122400 - Roller Window Shades	122400-1	0	Roller Window Shades - product data	Product Information	Draft											
104400 - Fire Protection Specialties	104400-1	0	Fire Protection - extinguishers/ cabinets - product data	Product Information	Draft											
102800 - Toilet Bath and Laundry Accessories	102800-1	0	Toilet Bath Laundry Accessories - product data	Product Information	Draft											
102113 - Solid plastic Toilet Compartments	102113-3	0	Toilet Compartments - samples	Sample	Draft											
102113 - Solid plastic Toilet Compartments	102113-2	0	Toilet Compartments - shop drawings	Shop Drawing	Draft											
102113 - Solid plastic Toilet Compartments	102113-1	0	Toilet Compartments - product data	Product Information	Draft											
101400 - Signage	101400-3	0	Signage - samples	Sample	Draft											
101400 - Signage	101400-2	0	Signage - sign schedule	Other	Draft											
101400 - Signage	101400-1	0	Signage - product data	Product Information	Draft											
101100 - Visual Display Units	101100-3	0	Visual Display Units - samples	Sample	Draft											
101100 - Visual Display Units	101100-2	0	Visual Display Units - Shop Drawings	Shop Drawing	Draft											
101100 - Visual Display Units	101100-1	0	Visual Display Units - product data	Product Information	Draft											
087100 - Door Hardware	087100-4	0	Door Hardware - Keying schedule	Other	Draft											
087100 - Door Hardware	087100-3	0	Door Hardware - shop drawings	Shop Drawing	Draft											
087100 - Door Hardware	087100-2	0	Door Hardware - schedule	Other	Draft											
087100 - Door Hardware	087100-1	0	Door Hardware - product data	Product Information	Draft											
084123 - Fire Rated Steel Entrances and Storefronts	084123-4	0	Fire Rated Steel Entrances - glazing schedule	Other	Draft											
084123 - Fire Rated Steel Entrances and Storefronts	084123-3	0	Fire Rated Steel Entrances - samples	Sample	Draft											
084123 - Fire Rated Steel Entrances and Storefronts	084123-2	0	Fire Rated Steel Entrances - shop drawings	Shop Drawing	Draft											
084123 - Fire Rated Steel Entrances and Storefronts	084123-1	0	Fire Rated Steel Entrances - product data	Product Information	Draft											
083100 - Access Doors and Panels	083100-2	0	Access Doors and Panels - product schedule	Other	Draft											
083100 - Access Doors and Panels	083100-1	0	Access Doors and Panels - product data	Product Information	Draft											
081700 - Integrated Door Opening Assemblies	081700-4	0	Door Opening Assembly - keying schedule	Other	Draft											
081700 - Integrated Door Opening Assemblies	081700-3	0	Door Opening Assembly - shop drawings	Shop Drawing	Draft											
081700 - Integrated Door Opening Assemblies	081700-2	0	Door Opening Assembly - door hardware schedule	Other	Draft											
081700 - Integrated Door Opening Assemblies	081700-1	0	Door Opening Assembly - product data	Product Information	Draft											



Wolgast Corporation

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Spec Section	#	Rev.	Title	Type	Status	Responsible Contractor	Submit By	Received From	Received Date	Ball In Court	Approvers	Response	Sent Date	Returned Date	Final Due Date	Distributed Date
079200 - Joint Sealants	079200-7	0	Joint Schedule - product schedule	Document	Draft											
079200 - Joint Sealants	079200-6	0	Joint Sealant - color samples	Sample	Draft											
079200 - Joint Sealants	079200-5	0	Joint Sealant - product data	Product Information	Draft											
074213 - Metal Wall Panels	074213-3	0	Metal Wall Panels - color samples	Sample	Draft											
074213 - Metal Wall Panels	074213-2	0	Metal Wall Panels - shop drawings	Shop Drawing	Draft											
074213 - Metal Wall Panels	074213-1	0	Metal Wall Panels - product data	Product Information	Draft											
061600 - Sheathing	061600-1	0	Sheathing - product data	Product Information	Draft											
061000 - Rough Carpentry	061000-1	0	Rough Carpentry - product data for items listed	Product Information	Draft											
#11 06 00 00 - General Trades Start Up																
	11	0	Copy of all Permits		Draft											
	10	0	Hazardous/AHERA Notifications		Draft											
	9	0	Sub/Supplier Form		Draft											
	8	0	Safety Data Sheets (SDS)		Draft											
	7	0	Safety Policy		Draft											
	6	0	On Site Employee List		Draft											
	5	0	Insurance/Letter of Compl		Draft											
	4	0	Payment/Performance Bonds		Draft											
	3	0	Contracts Signed/Returned		Draft											
	2	0	Schedule of Values		Draft											
	1	0	Post Bid Interview/Proposal Forms		Draft											
#12 06 00 00 - General Trades Close Out																
122400 - Roller Window Shades	122400-6	0	Roller Window Shades - Warranty	Closeouts	Draft											
122400 - Roller Window Shades	122400-5	0	Roller Window Shades - manuals	Closeouts	Draft											
122400 - Roller Window Shades	122400-4	0	Roller Window Shades - install instructions	Closeouts	Draft											
104400 - Fire Protection Specialties	104400-2	0	Fire Protection - maintenance	Other	Draft											
102800 - Toilet Bath and Laundry Accessories	102800-2	0	Toilet Bath Laundry Accessories - install instructions	Closeouts	Draft											
102113 - Solid plastic Toilet Compartments	102113-4	0	Toilet Compartments - install instructions	Closeouts	Draft											
101100 - Visual Display Units	101100-4	0	Visual Display Units - warranty	Closeouts	Draft											
087100 - Door Hardware	087100-6	0	Door Hardware - Warranty	Closeouts	Draft											
087100 - Door Hardware	087100-5	0	Door Hardware - maintenance manuals	Other	Draft											
084123 - Fire Rated Steel Entrances and Storefronts	084123-5	0	Fire Rated Steel Entrances - Warranty	Closeouts	Draft											
081700 - Integrated Door Opening Assemblies	081700-6	0	Door Opening Assemblies - Warranty	Closeouts	Draft											
081700 - Integrated Door Opening Assemblies	081700-5	0	Door Opening Assembly - maintenance manuals	Closeouts	Draft											
081113 - Hollow Metal Doors and Frames	081113-1	0	HM Doors and Frames - Warranty	Closeouts	Draft											
079200 - Joint Sealants	079200-8	0	Joint Sealant - Warranty	Closeouts	Draft											
074213 - Metal Wall Panels	074213-4	0	Metal Wall Panels - Warranty	Closeouts	Draft											
	23	0	Final Inspections on permits		Draft											



Wolgast Corporation

Spec Section	#	Rev.	Title	Type	Status	Responsible Contractor	Submit By	Received From	Received Date	Ball In Court	Approvers	Response	Sent Date	Returned Date	Final Due Date	Distributed Date
	22	0	O&M Manuals		Draft											
	21	0	Warranties for Equipment Installed		Draft											
	20	0	Asbestos Materials Affidavits		Draft											
	19	0	Signed Hazardous Materials		Draft											
	18	0	Insurance Up-To-Date		Draft											
	17	0	All CO Signed/Returned		Draft											
	16	0	As Built Drawings		Draft											
	15	0	Completed Punch List		Draft											
	14	0	Substantial Completion		Draft											
	13	0	Consent of Surety		Draft											
	12	0	Contractor (2) Yr Guarantee		Draft											

Bid Division: 075000 – Roofing

Bid to Include:

Total Responsibility for Specification Sections:

Section 075423 – Thermoplastic Polyolefin (TPO) Roofing
Section 076200 – Sheet Metal Flashing and Trim
Section 077100 – Roof Specialties
Section 077200 – Roof Accessories

Limited Responsibility for Specification Sections (as it relates to work in this Bid Division):

Section 024119 – Selective Demolition (as it relates to tying into the existing building)
Section 079513 – Expansion Joint Cover Assemblies. (As it relates to this bid division.)
Section 079200 – Joint Sealants (As it pertains to roofing)

Provide all labor, materials, tools, and equipment necessary to perform the work of the specified bid sections. The contractor must also furnish, deliver, unload, store, protect, erect and install all items required for the completion of the work of this bid division in compliance with all drawings and specifications for a complete operational system including but not limited to:

Fasteners, sealants, flashing, etc., for a complete weather & water tight system.

General Inclusions:

1. There is no general contractor associated with this project; any and all reference to a “general contractor” related to the work of this bid division shall be understood to mean the contractor of this bid division.
2. The contractor for this bid division work is required to include but is not limited to all items, services, tasks, materials, personnel, equipment, etc. identified in this bid division description regardless of the presence of language in other bid division descriptions that is the same or is similar to that found in this contractor’s bid division description.
3. Coordination of the work of this bid division with any and all work of other bid division contractors for the scheduling and integration of the work of this contractor.
4. All contractors are responsible for the entire set of plans and specifications, including tables, schedules, and notes.
5. Provide continuous housekeeping and clean-up, and proper legal off-site disposal of any debris generated by this Bid Division’s work.
6. Contractor is responsible for own dumpster(s) and all removal and disposal charges thereof. (Use of the Owner’s dumpsters is strictly prohibited.)
7. All Contractors are required to inspect the existing project components and are to include all work necessary to complete the work to deliver a fully operational system in compliance with all governing codes.
8. This Contractor shall be responsible for performing all work in full compliance with all health and safety standards including Asbestos Awareness and Notification, Lead Paint Abatement, and all MIOSHA Standards. This Contractor shall also be responsible for satisfying all safety violations and/or fines resulting from the actions or lack of action by this Contractor at the sole expense of this Contractor.
9. Any contractor who compounds a mistake by installing their product on another Contractor’s obvious faulty work will assume responsibility for repair of said work.
10. This contractor shall repair and restore any damaged area to an original or better condition with no detectable evidence that the area has been repaired. Repairs must be done by personnel qualified in the execution of the work skilled and licensed in that trade. Whenever possible, repairs to work shall be done by the original installer of the work.
11. Submittal of all insurance, unit pricing, schedule of values, required product data and shop drawings within (2) two weeks of Owner’s Notice to commence work.

Bid Division: 075000 – Roofing

12. Must provide all submittals within 20 working days of contract award or sooner, unless specifically clarified with the construction manager prior to contract award.
13. Provide all layout and measurements required to perform the work of this Bid Division.
14. The Owner reserves the right to salvage any materials removed from the site during the duration of the project.
15. Coordinate delivery of materials with Construction Manager (48 hours) in advance of the delivery and provide proper personnel and equipment to perform the unloading.
16. Contractor shall submit to the field construction manager a complete written daily field report stating the work being done on site and the number of employees performing the work for each day the Contractor has representatives on site.
17. Contractor shall have a supervisor on site at all times when a crew is present on the job.
18. On Friday, or last workday of each week, the Contractor must update the Master Copy of As-Built, as it applies to the work of their Bid Division.
19. **Wolgast uses Procore for their CM Software. Please note: We will upload all drawings, and drawing revisions as they are approved, to the Drawings tool. However, it is each contractor's responsibility to verify that they are working from the most up-to-date, approved, drawings.**

Division Inclusions:

1. Remove and replace all existing rain conductors and splash blocks.
2. Demolition, removal and proper legal off-site disposal of existing roofing and sub roofing where new additions tie-in.
3. Installation of roof edging.
4. Repair roofing around new and revised vent stacks throughout the building, as required.
5. Cut and tie back into existing building roofing and flashing (i.e., cut back existing roofs as needed), rework and repair metal soffit material as needed for tie-in.
6. Maintain weather protection during tie-in.
7. Furnish and install all joint sealants and fire stopping as indicated in specifications and drawings.
8. Responsible for all roof trim.
9. Supply and install all required fasteners.
10. Coordinate all finishing connections with appropriate contractors.
11. Coordinate all roof penetrations with appropriate contractors, flash and seal. (Please review roof plans, mechanical plans, and electrical plans.)
12. Remove all snow, ice, and other weather-related items for proper installation of roofing system.
13. Protect Acoustical roof deck prior to application of tar.

Project Inclusions:

1. Review the milestone schedules. This bid division's work will require it to be completed at multiple locations and concurrently for some of the work. Prepare your bid proposal accordingly to allow for sufficient manpower and resources.
2. Provide all required demolition of roofing materials.
3. Provide complete, weather-tight protection of each roof location at the completion of each day's work or as required during the workday. Cost to replace all water-damaged materials in the buildings due to the lack of proper protection, will be the responsibility of this Bid Division.
4. Furnish and install all materials for patching and repairs of existing roof as documented.
5. Furnish and install all materials for a complete installation of the membrane roof systems, including all insulation, fascia sheet metal materials, and top of wall flashings as documented.
6. Tie-in all roof drains to achieve proper flashing and drainage.
7. Provide all new roof openings in existing roofs where new mechanical work occurs.
8. Provide and install walkway pads as indicated in the drawings and specifications.

Bid Division: 075000 – Roofing

9. Provide all required flashing work for a permanent, weather-tight condition at existing roofing for roof-mounted equipment as documented. Provide all required wood to extend mechanical curbs to achieve minimum height requirements per roof manufacturer's guidelines. Coordinate with mechanical and electrical contractors for removal and reinstallation of existing roof-mounted equipment and new equipment as required for the proper installation of the flashing. Provide all required termination bars and sealants for a permanent, weather-tight condition as documented.
10. Must provide all submittals within 20 working days of contract award or sooner, unless specifically clarified with the construction manager prior to contract award.
11. Mandatory attendance at all required pre-installation meetings.
12. Completion of all punch list work within 15 working days or less upon receipt of punch list items, unless specific circumstances occur that are out of control of this bid division contractor dictate otherwise.

Consideration for award:

The ability to begin as soon as areas of work become available. To have proper equipment and responsible personnel to complete the above list of work. To repair any adjacent materials damaged in the execution of the above-mentioned work. Close cooperation with the Construction Manager and other bid divisions to provide input to develop a working schedule. An approved schedule of values will be required before approval is granted for the first payment request. Expediting communication and follow-up as required.

END OF BID DIVISION 075000



Wolgast Corporation

Freeland Comm. Schools - Main
710 Powley Drive
Freeland, Michigan 48623
989695527

Submittal Packages

Spec Section	#	Rev.	Title	Type	Status	Responsible Contractor	Submit By	Received From	Received Date	Ball In Court	Approvers	Response	Sent Date	Returned Date	Final Due Date	Distributed Date
#13 07 50 00 - Roofing																
079513 - Expansion joint Cover Assemblies	079513-3	0	Expansion Joint Cover - color and finish samples	Sample	Draft											
079513 - Expansion joint Cover Assemblies	079513-2	0	Expansion Joint Cover - shop drawings	Shop Drawing	Draft											
079513 - Expansion joint Cover Assemblies	079513-1	0	Expansion Joint Cover - product data	Product Information	Draft											
079200 - Joint Sealants	079200-10	0	Joint Sealant/Caulk - color samples	Sample	Draft											
079200 - Joint Sealants	079200-9	0	Joint Sealant/Caulk - product data	Product Information	Draft											
077200 - Roof Accessories	077200-1	0	Roof Accessories - Product Data	Product Information	Draft											
077100 - Roof Specialties	077100-3	0	Roof Specialties - color samples of metal finish	Sample	Draft											
077100 - Roof Specialties	077100-2	0	Roof Specialties - shop drawings	Shop Drawing	Draft											
077100 - Roof Specialties	077100-1	0	Roof Specialties - product data	Product Information	Draft											
076200 - Sheet Metal Flashing and Trim	076200-3	0	Sheet Metal Flashing and Trim - samples	Sample	Draft											
076200 - Sheet Metal Flashing and Trim	076200-2	0	Sheet Metal Flashing and Trim - shop drawings	Shop Drawing	Draft											
076200 - Sheet Metal Flashing and Trim	076200-1	0	Sheet Metal Flashing and Trim - product data	Product Information	Draft											
075423 - Thermoplastic Polyolefin (TPO) Roofing	075423-2	0	Thermo Poly TPO Roofing - shop drawings	Shop Drawing	Draft											
075423 - Thermoplastic Polyolefin (TPO) Roofing	075423-1	0	Thermo Poly TPO Roofing - product data	Product Information	Draft											
#14 07 50 00 - Roofing Start Up																
	11	0	Copy of all Permits		Draft											
	10	0	Hazardous/AHERA Notifications		Draft											
	9	0	Sub/Supplier Form		Draft											
	8	0	Safety Data Sheets (SDS)		Draft											
	7	0	Safety Policy		Draft											
	6	0	On Site Employee List		Draft											
	5	0	Insurance/Letter of Compl		Draft											
	4	0	Payment/Performance Bonds		Draft											
	3	0	Contracts Signed/Returned		Draft											
	2	0	Schedule of Values		Draft											
	1	0	Post Bid Interview/Proposal Forms		Draft											
#15 07 50 00 - Roofing Close Out																
079200 - Joint Sealants	079200-11	0	Joint Sealant/Caulk - warranty - see spec	Closeouts	Draft											
077200 - Roof Accessories	077200-2	0	Roof Accessories - Warranty	Closeouts	Draft											
077100 - Roof Specialties	077100-4	0	Roof Specialties - Warranty	Closeouts	Draft											
076200 - Sheet Metal Flashing and Trim	076200-4	0	Sheet Metal Flashing and Trim - Warranty	Closeouts	Draft											
075423 - Thermoplastic Polyolefin (TPO) Roofing	075423-3	0	Thermo Poly TPO Roofing - Warranty	Closeouts	Draft											



Wolgast Corporation

Spec Section	#	Rev.	Title	Type	Status	Responsible Contractor	Submit By	Received From	Received Date	Ball In Court	Approvers	Response	Sent Date	Returned Date	Final Due Date	Distributed Date
	23	0	Final Inspections on permits		Draft											
	22	0	O&M Manuals		Draft											
	21	0	Warranties for Equipment Installed		Draft											
	20	0	Asbestos Materials Affidavits		Draft											
	19	0	Signed Hazardous Materials		Draft											
	18	0	Insurance Up-To-Date		Draft											
	17	0	All CO Signed/Returned		Draft											
	16	0	As Built Drawings		Draft											
	15	0	Completed Punch List		Draft											
	14	0	Substantial Completion		Draft											
	13	0	Consent of Surety		Draft											
	12	0	Contractor (2) Yr Guarantee		Draft											

Bid Division: 084000 – Glass & Glazing

Bid to Include:

Total Responsibility for Specification Sections:

Section 084113 – Aluminum-Framed Entrances and Storefronts
Section 084413 – Glazed Aluminum Curtain Walls
Section 088000 – Glazing

Limited Responsibility for Specification Sections (as it relates to work in this Bid Division):

Section 072726 – As it relates to this bid division.
Section 078400 – Firestopping (As it relates to this Bid Division)
Section 078401 – Firestopping Systems Schedule (As it relates to this Bid Division)
Section 079200 – Joint Sealants (As it relates to this Bid Division)
Section 079513 – Expansion Joint Cover Assemblies. (As it relates to this bid division.)
Section 080671 – Door Hardware Schedule (As it relates to this Bid Division)
Section 081700 – Integrated Door Opening Assemblies. (As it relates to this bid division.)
Section 087100 – Door Hardware (As it relates to this Bid Division)

Provide all labor, materials, tools, and equipment necessary to perform the work of the specified bid sections. The contractor must also furnish, deliver, unload, store, protect, erect and install all items required for the completion of the work of this bid division in compliance with all drawings and specifications for a complete operational system including but not limited to:

Joint sealants; finish hardware, glass, screens and fasteners, for a complete operational system.

General Inclusions:

1. There is no general contractor associated with this project; any and all reference to a “general contractor” related to the work of this bid division shall be understood to mean the contractor of this bid division.
2. The contractor for this bid division work is required to include but is not limited to all items, services, tasks, materials, personnel, equipment, etc. identified in this bid division description regardless of the presence of language in other bid division descriptions that is the same or is similar to that found in this contractor’s bid division description.
3. Coordination of the work of this bid division with any and all work of other bid division contractors for the scheduling and integration of the work of this contractor.
4. All contractors are responsible for the entire set of plans and specifications, including tables, schedules, and notes.
5. Provide continuous housekeeping and clean-up, and proper legal off-site disposal of any debris generated by this Bid Division’s work.
6. Contractor is responsible for own dumpster(s) and all removal and disposal charges thereof. (Use of the Owner’s dumpsters is strictly prohibited.)
7. All Contractors are required to inspect the existing project components and are to include all work necessary to complete the work to deliver a fully operational system in compliance with all governing codes.
8. This Contractor shall be responsible for performing all work in full compliance with all health and safety standards including Asbestos Awareness and Notification, Lead Paint Abatement, and all MIOSHA Standards. This Contractor shall also be responsible for satisfying all safety violations and/or fines resulting from the actions or lack of action by this Contractor at the sole expense of this Contractor.
9. Any contractor who compounds a mistake by installing their product on another Contractor’s obvious faulty work will assume responsibility for repair of said work.

Bid Division: 084000 – Glass & Glazing

10. This contractor shall repair and restore any damaged area to an original or better condition with no detectable evidence that the area has been repaired. Repairs must be done by personnel qualified in the execution of the work skilled and licensed in that trade. Whenever possible, repairs to the work shall be done by the original installer of the work.
11. Submittal of all insurance, unit pricing, schedule of values, required product data and shop drawings within (2) two weeks of Owner's Notice to commence work.
12. Must provide all submittals within 20 working days of contract award or sooner, unless specifically clarified with the construction manager prior to contract award.
13. Provide all layout and measurements required to perform the work of this Bid Division.
14. The Owner reserves the right to salvage any materials removed from the site during the duration of the project.
15. Coordinate delivery of materials with Construction Manager (48 hours) in advance of the delivery and provide proper personnel and equipment to perform the unloading.
16. Contractor shall submit to the field construction manager a complete written daily field report stating the work being done on site and the number of employees performing the work for each day the Contractor has representatives on site.
17. Contractor shall have a supervisor on site at all times when a crew is present on the job.
18. On Friday, or last workday of each week, the Contractor must update the Master Copy of As-Built, as it applies to the work of their Bid Division.
19. **Wolgast uses Procore for their CM Software. Please note: We will upload all drawings, and drawing revisions as they are approved, to the Drawings tool. However, it is each contractor's responsibility to verify that they are working from the most up-to-date, approved, drawings.**

Division Inclusions:

1. Provide and install all hardware required for this Bid Division.
2. Field measures all openings to verify size, square, and plumb of opening.
3. Make certain all aluminum entrances conform to the Americans with Disabilities Act (as required).
4. Supply and install all glass in wood doors, hollow metal doors, frames, entrances, safety plate glass, etc.
5. Final cleaning of all installed doors. (Prior to punchlist).
6. Furnish and install all caulking and sealing associates with the work of this Bid Division.
7. Supply and install window hardware and screens (as required).
8. Completely clean all windows, frames and glass prior to occupancy.
9. Provide all shop drawings and field verification of dimensions as required.
10. All entrances, windows, doors, and frames are to conform all Fire Safety Codes.

Project Inclusions:

1. Review the milestone schedules. This bid division's work will require it to be completed at multiple locations and concurrently for some of the work. Prepare your bid proposal accordingly to allow for sufficient manpower and resources.
2. Must be able to furnish and install all doors, windows, framing, hardware, etc., per the milestone schedules.
3. Furnish and install all aluminum storefront, frames, windows, doors and all associated window and door hardware associated with FRP /Aluminum Hybrid doors and windows.
4. Provide pull ropes in door frames for access control wiring installation. Consult with construction manager and access control contractor prior to installation.
5. Remove existing window unit in its entirety and reinstall according to the drawings and specifications. See Keynote 3 on A1.0 for demolition and keynote 4 on A2.0 for installation location.
6. When installing door frames, this contractor must consider floor finish thickness such as ceramic tile and install accordingly to ensure doors do not rub on floors.

Bid Division: 084000 – Glass & Glazing

Consideration for award:

The ability to begin as soon as areas of work become available. To have proper equipment and responsible personnel to complete the above list of work. To repair any adjacent materials damaged in the execution of the above listed work. Close cooperation with the Construction Manager and other bid divisions to provide input to develop a working schedule. An approved schedule of values will be required before approval is granted for the first payment request. Expediting communication and follow-up as required

END OF BID DIVISION 084000



Wolgast Corporation

Freeland Comm. Schools - Main
710 Powley Drive
Freeland, Michigan 48623
989695527

Submittal Packages

Spec Section	#	Rev.	Title	Type	Status	Responsible Contractor	Submit By	Received From	Received Date	Ball In Court	Approvers	Response	Sent Date	Returned Date	Final Due Date	Distributed Date
#16 08 40 00 - Glass & Glazing																
088000 - Glazing	088000-2	0	Glazing - samples	Sample	Draft											
088000 - Glazing	088000-1	0	Glazing - product data	Product Information	Draft											
084413 - Glazed Aluminum Curtain Walls	084413-3	0	Curtain Wall - finish samples	Sample	Draft											
084413 - Glazed Aluminum Curtain Walls	084413-2	0	Curtain Walls - shop drawings	Shop Drawing	Draft											
084413 - Glazed Aluminum Curtain Walls	084413-1	0	Curtain Walls - product data	Product Information	Draft											
084113 - Aluminum Framed Entrances and Storefronts	084113-4	0	Alum Entrances and Storefronts - hardware schedule	Other	Draft											
084113 - Aluminum Framed Entrances and Storefronts	084113-3	0	Alum Entrances and Storefronts - color samples	Sample	Draft											
084113 - Aluminum Framed Entrances and Storefronts	084113-2	0	Alum Entrances and Storefronts - shop drawings	Shop Drawing	Draft											
084113 - Aluminum Framed Entrances and Storefronts	084113-1	0	Alum Entrances and Storefronts - product data	Product Information	Draft											
080671 - Door Hardware Schedule	080671-2	0	Door Hardware - schedules - keying	Other	Draft											
080671 - Door Hardware Schedule	080671-1	0	Door Hardware - product data	Product Information	Draft											
079200 - Joint Sealants	079200-13	0	Joint Sealants - Color Samples	Sample	Draft											
079200 - Joint Sealants	079200-12	0	Joint Sealant - product data	Product Information	Draft											
078400 - Firestopping	078400-5	0	Firestopping - Schedule	Document	Draft											
078400 - Firestopping	078400-4	0	Firestopping - product data	Product Information	Draft											
#17 08 40 00 - Glass & Glazing Start Up																
	11	0	Copy of all Permits		Draft											
	10	0	Hazardous/AHERA Notifications		Draft											
	9	0	Sub/Supplier Form		Draft											
	8	0	Safety Data Sheets (SDS)		Draft											
	7	0	Safety Policy		Draft											
	6	0	On Site Employee List		Draft											
	5	0	Insurance/Letter of Compl		Draft											
	4	0	Payment/Performance Bonds		Draft											
	3	0	Contracts Signed/Returned		Draft											
	2	0	Schedule of Values		Draft											
	1	0	Post Bid Interview/Proposal Forms		Draft											
#18 08 40 00 - Glass & Glazing Close Out																
088000 - Glazing	088000-3	0	Glazing - Warranty	Closeouts	Draft											
084413 - Glazed Aluminum Curtain Walls	084413-4	0	Curtain Walls - Warranty	Closeouts	Draft											
084113 - Aluminum Framed Entrances and Storefronts	084113-5	0	Alum Entrances and Storefronts - Warranty	Closeouts	Draft											
080671 - Door Hardware Schedule	080671-3	0	Door Hardware - maintenance manuals	Closeouts	Draft											
079200 - Joint Sealants	079200-14	0	Joint Sealant - Warranty - see spec	Closeouts	Draft											
078400 - Firestopping	078400-6	0	Firestopping - Warranty - see spec	Closeouts	Draft											



Wolgast Corporation

Spec Section	#	Rev.	Title	Type	Status	Responsible Contractor	Submit By	Received From	Received Date	Ball In Court	Approvers	Response	Sent Date	Returned Date	Final Due Date	Distributed Date
	23	0	Final Inspections on permits		Draft											
	22	0	O&M Manuals		Draft											
	21	0	Warranties for Equipment Installed		Draft											
	20	0	Asbestos Materials Affidavits		Draft											
	19	0	Signed Hazardous Materials		Draft											
	18	0	Insurance Up-To-Date		Draft											
	17	0	All CO Signed/Returned		Draft											
	16	0	As Built Drawings		Draft											
	15	0	Completed Punch List		Draft											
	14	0	Substantial Completion		Draft											
	13	0	Consent of Surety		Draft											
	12	0	Contractor (2) Yr Guarantee		Draft											

Bid Division: 091000 – Drywall, Insulation & Acoustical

Bid to Include:

Total Responsibility for Specification Sections:

Section 092216 – Non-Structural Metal Framing
Section 092900 – Gypsum Board
Section 095113 – Acoustical Panel Ceilings
Section 098430 – Sound-Absorbing Wall and Ceiling Units

Limited Responsibility for Specification Sections (as it relates to work in this Bid Division):

Section 024119 – Selective Demolition (As it relates to removal of and reinstallation of existing acoustical ceilings.)
Section 072100 – Thermal Insulation (Excludes below concrete insulation and exterior CMU insulation)
Section 078100 – Applied Fireproofing. (As it relates to this bid division.)
Section 078400 – Firestopping (As it relates to this bid division. See Project Inclusions.)
Section 078401 – Firestopping Systems Schedule (As it relates to this bid division)
Section 079200 – Joint Sealants (Miscellaneous caulking, control joints, etc.)
Section 079513 – Expansion Joint Cover Assemblies. (As it relates to this bid division.)
Section 083100 – Access Doors and Panels (Installation of access panels in drywall or acoustical walls or ceilings.
Access doors and panels to be provided by other trades.)

Provide all labor, materials, tools, and equipment necessary to perform the work of the specified bid sections. The contractor must also furnish, deliver, unload, store, protect, erect and install all items required for the completion of the work of this bid division in compliance with all drawings and specifications for a complete operational system including but not limited to:

All required hangers, fasteners, nailers, etc.

General Inclusions:

1. There is no general contractor associated with this project; any and all reference to a “general contractor” related to the work of this bid division shall be understood to mean the contractor of this bid division.
2. The contractor for this bid division work is required to include but is not limited to all items, services, tasks, materials, personnel, equipment, etc. identified in this bid division description regardless of the presence of language in other bid division descriptions that is the same or is similar to that found in this contractor’s bid division description.
3. Coordination of the work of this bid division with any and all work of other bid division contractors for the scheduling and integration of the work of this contractor.
4. All contractors are responsible for the entire set of plans and specifications, including tables, schedules, and notes.
5. Provide continuous housekeeping and clean-up, and proper legal off-site disposal of any debris generated by this Bid Division’s work.
6. The contractor is responsible for own dumpster(s) and all removal and disposal charges thereof. (Use of the Owner’s dumpsters is strictly prohibited.)
7. All Contractors are required to inspect the existing project components and are to include all work necessary to complete the work to deliver a fully operational system in compliance with all governing codes.
8. This Contractor shall be responsible for performing all work in full compliance with all health and safety standards including Asbestos Awareness and Notification, Lead Paint Abatement, and all MIOSHA Standards. This Contractor shall also be responsible for satisfying all safety violations and/or fines resulting from the actions or lack of action by this Contractor at the sole expense of this Contractor.
9. Any contractor who compounds a mistake by installing their product on another Contractor’s obvious faulty work will assume responsibility for repair of said work.

Bid Division: 091000 – Drywall, Insulation & Acoustical

10. This contractor shall repair and restore any damaged area to an original or better condition with no detectable evidence that the area has been repaired. Repairs must be done by personnel qualified in the execution of the work skilled and licensed in that trade. Whenever possible, repairs to work shall be done by the original installer of the work.
11. Submittal of all insurance, unit pricing, schedule of values, required product data and shop drawings within (2) two weeks of Owner's Notice to commence work.
12. Must provide all submittals within 20 working days of contract award or sooner, unless specifically clarified with the construction manager prior to contract award.
13. Provide all layout and measurements required to perform the work of this Bid Division.
14. The Owner reserves the right to salvage any materials removed from the site during the duration of the project.
15. Coordinate delivery of materials with Construction Manager (48 hours) in advance of the delivery and provide proper personnel and equipment to perform the unloading.
16. Contractor shall submit to the field construction manager a complete written daily field report stating the work being done on site and the number of employees performing the work for each day the Contractor has representatives on site.
17. Contractors shall have a supervisor on site at all times when a crew is present on the job.
18. On Friday, or last workday of each week, the Contractor must update the Master Copy of As-Built, as it applies to the work of their Bid Division.
19. **Wolgast uses Procore for their CM Software. Please note: We will upload all drawings, and drawing revisions as they are approved, to the Drawings tool. However, it is each contractor's responsibility to verify that they are working from the most up-to-date, approved, drawings.**

Divisions Inclusions:

1. All metal stud framing and drywall for bulkheads and light coves.
2. All building insulation except for that specifically defined in bid division 030100, 040000, and 075000.
3. Supply and install drywall and metal framing as design and specified.
4. Supply and install all gypsum board, studs and insulation as indicated.
5. Supply and install all bulkheads.
6. Coordination with mechanical and electrical trades on layout of ceiling grid.
7. Provide Owner with the amount specified of each type of ceiling tile, suspension system, and wall panels, upon completion.
8. Patch existing remodeled areas as required.
9. Supply and install fire rated gypsum board tight to roof deck as indicated.
10. Expansion and control joints as required by design or product manufacturer.
11. Prior to layout of ceilings, contractors accept humidity and temperature levels in the building.
12. Provide all drywall and plaster on metal as well as wood as indicated.
13. The on-site foreman for this Bid Division must be able to communicate with all employees and the Construction Manager's staff.
14. Follow room finish schedule.
15. Provide all vapor barriers as required by design and product manufacturers.
16. Provide all nailers and underlayment.
17. Provide all trim as it relates to Acoustical Ceiling System.
18. Provide all fasteners.
19. Furnish and install all caulking as required for the work of this Bid Division.
20. Replacement and/or repair of defective and/or misaligned material installed by this contractor.
21. To repair any adjacent material damaged in the execution of the above listed work.
22. Provide smooth transition from existing work to new work.
23. Install louvers and access panels furnished by each architectural, mechanical and electrical contractor in locations encased in this contractor's work.
24. Provide all caulking and sealants for plasterwork or drywall as required.
25. Provide all EIFS work per manufacturer recommendations.

Bid Division: 091000 – Drywall, Insulation & Acoustical

26. All gypsum board walls, gypsum board wall systems, gypsum board ceilings and/or gypsum board ceiling systems must be constructed with expansion joints at a maximum spacing of 30'-0" on-center in both directions as manufactured by the gypsum board manufacturer regardless of the all other specification requirements.

Project Inclusions:

1. Review the milestone schedules. This bid division's work will require it to be completed at multiple locations and concurrently for some of the work. Prepare your bid proposal accordingly to allow for sufficient manpower and resources.
2. Furnish and install all required light-gage metal framing material and drywall, glass mat sheathing, etc. at all walls, ceilings, bulkheads, parapets, etc.
3. **Carefully remove existing 2 rows of ceilings for installation of water and electrical lines. Reinstall upon completion. Include an allowance of 25% of the materials for replacement of damaged tiles and cross T's. Refer to Overall electrical plan E1.01 for routing of new conduit and wire in existing building, and overall first floor plan.**
4. **Note Keynote 1 on M2.11. The removal and re-installation of the existing acoustical ceilings is the responsibility of the acoustical contractor, not general trades.**
5. Provide all metal framing, drywall and insulation at all walls, including up to the roof deck at locations as documented.
6. Furnish and install all the metal framing at the entrance canopies.
7. Provide and install all sound absorbing wall and ceiling units.
8. Furnish and install all acoustic ceiling systems, as documented.
9. Furnish and install all materials for the bulkheads as documented.
10. **Provide and install all Fire Spray Applied Proofing as indicated in drawings. See Fire Safety and building section plans.**
11. Must provide all submittals within 20 working days of contract award or sooner, unless specifically clarified with the construction manager prior to contract award.
12. Mandatory attendance at all required pre-installation meetings.
13. Completion of all punch list work within 15 working days or less upon receipt of punch list items, unless specific circumstances occur that are out of control of this bid division contractor dictate otherwise.

Excludes:

Consideration for award:

The ability to begin as soon as areas of work become available. To have proper equipment and responsible personnel to complete the above list of work. To repair any adjacent materials damaged in the execution of the above listed work. Close cooperation with the Construction Manager and other bid divisions to provide input to develop a working schedule. An approved schedule of values will be required before approval is granted for the first payment request. Expediting communication and follow-up as required.

END OF BID DIVISION 091000



Wolgast Corporation

Freeland Comm. Schools - Main
710 Powley Drive
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989695527

Submittal Packages

Spec Section	#	Rev.	Title	Type	Status	Responsible Contractor	Submit By	Received From	Received Date	Ball In Court	Approvers	Response	Sent Date	Returned Date	Final Due Date	Distributed Date
#19 09 10 00 - Drywall, Insulation & Acoustical																
098430 - Sound Absorbing Wall and Ceiling Units	098430-3	0	Sound Absorbing Wall and Ceiling Panels - Samples	Sample	Draft											
098430 - Sound Absorbing Wall and Ceiling Units	098430-2	0	Sound Absorbing Wall and Ceiling Panels - shop drawings	Shop Drawing	Draft											
098430 - Sound Absorbing Wall and Ceiling Units	098430-1	0	Sound Absorbing Wall and Ceiling Panels - product data	Other	Draft											
095113 - Acoustical Panel Ceilings	095113-2	0	Acoustical Panels Ceiling - Samples	Sample	Draft											
095113 - Acoustical Panel Ceilings	095113-1	0	Acoustical Panels Ceiling - product data	Product Information	Draft											
092900 - Gypsum Board	092900-2	0	Gypsum Board - shop drawings	Shop Drawing	Draft											
092900 - Gypsum Board	092900-1	0	Gypsum Board - product data	Product Information	Draft											
092216 - Non Structural Metal Framing	092216-2	0	Non Structural Metal Framing - product data	Product Information	Draft											
092216 - Non Structural Metal Framing	092216-1	0	Non Structural Metal Framing - shop drawings	Shop Drawing	Draft											
078100 - Applied Fireproofing	078100-3	0	Applied Fireproofing - color samples	Sample	Draft											
078100 - Applied Fireproofing	078100-2	0	Applied Fireproofing - shop drawings	Shop Drawing	Draft											
078100 - Applied Fireproofing	078100-1	0	Applied Fireproofing - product data	Other	Draft											
#20 09 10 00 - Drywall, Insulation & Acoustical Start Up																
	11	0	Copy of all Permits		Draft											
	10	0	Hazardous/AHERA Notifications		Draft											
	9	0	Sub/Supplier Form		Draft											
	8	0	Safety Data Sheets (SDS)		Draft											
	7	0	Safety Policy		Draft											
	6	0	On Site Employee List		Draft											
	5	0	Insurance/Letter of Compl		Draft											
	4	0	Payment/Performance Bonds		Draft											
	3	0	Contracts Signed/Returned		Draft											
	2	0	Schedule of Values		Draft											
	1	0	Post Bid Interview/Proposal Forms		Draft											
#21 09 10 00 - Drywall, Insulation & Acoustical Close Out																
095113 - Acoustical Panel Ceilings	095113-3	0	Acoustical Panel Ceiling - Extra Materials	Closeouts	Draft											
078100 - Applied Fireproofing	078100-4	0	Applied Fireproofing - Warranty	Closeouts	Draft											
	23	0	Final Inspections on permits		Draft											
	22	0	O&M Manuals		Draft											
	21	0	Warranties for Equipment Installed		Draft											
	20	0	Asbestos Materials Affidavits		Draft											
	19	0	Signed Hazardous Materials		Draft											
	18	0	Insurance Up-To-Date		Draft											
	17	0	All CO Signed/Returned		Draft											
	16	0	As Built Drawings		Draft											



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Spec Section	#	Rev.	Title	Type	Status	Responsible Contractor	Submit By	Received From	Received Date	Ball In Court	Approvers	Response	Sent Date	Returned Date	Final Due Date	Distributed Date
	15	0	Completed Punch List		Draft											
	14	0	Substantial Completion		Draft											
	13	0	Consent of Surety		Draft											
	12	0	Contractor (2) Yr Guarantee		Draft											

Bid Division: 093000 – Tile

Bid to Include:

Total Responsibility for Specification Sections:

Section 093000 – Tiling

Limited Responsibility for Specification Sections (as it relates to work in this Bid Division):

Section 079200 – Joint Sealants (As it relates to work in this Bid Division)

Section 079513 – Expansion Joint Cover Assemblies. (As it relates to this bid division.)

Provide all labor, materials, tools, and equipment necessary to perform the work of the specified bid sections. The contractor must also furnish, deliver, unload, store, protect, erect and install all items required for the completion of the work of this bid division in compliance with all drawings and specifications for a complete operational system including but not limited to:

Floor prep, floor patching of base and terrazzo for a complete project.

General Inclusions:

1. There is no general contractor associated with this project; any and all reference to a “general contractor” related to the work of this bid division shall be understood to mean the contractor of this bid division.
2. The contractor for this bid division work is required to include but is not limited to all items, services, tasks, materials, personnel, equipment, etc. identified in this bid division description regardless of the presence of language in other bid division descriptions that is the same or is similar to that found in this contractor’s bid division description.
3. Coordination of the work of this bid division with any and all work of other bid division contractors for the scheduling and integration of the work of this contractor.
4. All contractors are responsible for the entire set of plans and specifications, including tables, schedules, and notes.
5. Provide continuous housekeeping and clean-up, and proper legal off-site disposal of any debris generated by this Bid Division’s work.
6. Contractor is responsible for own dumpster(s) and all removal and disposal charges thereof. (Use of the Owner’s dumpsters is strictly prohibited.)
7. All Contractors are required to inspect the existing project components and are to include all work necessary to complete the work to deliver a fully operational system in compliance with all governing codes.
8. This Contractor shall be responsible for performing all work in full compliance with all health and safety standards including Asbestos Awareness and Notification, Lead Paint Abatement, and all MIOSHA Standards. This Contractor shall also be responsible for satisfying all safety violations and/or fines resulting from the actions or lack of action by this Contractor at the sole expense of this Contractor.
9. Any contractor who compounds a mistake by installing their product on another Contractor’s obvious faulty work will assume responsibility for repair of said work.
10. This contractor shall repair and restore any damaged area to an original or better condition with no detectable evidence that the area has been repaired. Repairs must be done by personnel qualified in the execution of the work skilled and licensed in that trade. Whenever possible, repairs to work shall be done by the original installer of the work.
11. Submittal of all insurance, unit pricing, schedule of values, required product data and shop drawings within (2) two weeks of Owner’s Notice to commence work.
12. Must provide all submittals within 20 working days of contract award or sooner, unless specifically clarified with the construction manager prior to contract award.
13. Provide all layout and measurements required to perform the work of this Bid Division.
14. The Owner reserves the right to salvage any materials removed from the site during the duration of the project.

Wolgast Corporation – Construction Management

Bid Division: 093000 – Tile

15. Coordinate delivery of materials with Construction Manager (48 hours) in advance of the delivery, and provide proper personnel and equipment to perform the unloading.
16. Contractor shall submit to the field construction manager a complete written daily field report stating the work being done on site and the number of employees performing the work for each day the Contractor has representatives on site.
17. Contractor shall have a supervisor on site at all times when a crew is present on the job.
18. On Friday, or last workday of each week, the Contractor must update the Master Copy of As-Built, as it applies to the work of their Bid Division.
19. **Wolgast uses Procore for their CM Software. Please note: We will upload all drawings, and drawing revisions as they are approved, to the Drawings tool. However, it is each contractor's responsibility to verify that they are working from the most up-to-date, approved, drawings.**

Division Inclusions:

1. Preparation of existing areas to receive new flooring, install as shown and specified. (Floor prep is this Bid Division's responsibility.)
2. Cleaning of floor prior to occupancy per specifications.
3. Transition strips between all like and/or (per specifications) dissimilar floors and flooring material.
4. Expansion and control joints as required by design and/or product manufacturer's recommendations.
5. Follow finish schedule.
6. Clean and prepare floor including leveling and filling of voids prior to starting work, and in accordance with specifications.
7. Furnish and install all caulking required for the work of this Bid Division.
8. Provide Owner with one (1) box for each 50 boxes or fraction thereof for each type, color, pattern and size installed. (Per specifications), or a minimum of 1 box if under 50.
9. Replacement and/or repair of defective and/or misaligned material installed by this contractor.
10. To repair any adjacent material damaged in the execution of the above-listed work.
11. All adhesives and grout.
12. This contractor must accept the sub floor prior to installation, if work commences before contractor approval; the contractor has assumed the approval of the sub floor.

Project Inclusions:

1. Review the milestone schedules. This bid division's work will require it to be completed at multiple locations and concurrently for some of the work. Prepare your bid proposal accordingly to allow for sufficient manpower and resources.
2. Installation of all new wall tile and trim.
3. Furnish and install manufacturer's trim as specified. Cut field tile will not be allowed as trim material unless prior written approval from Architect is achieved.

Excludes:

Consideration for award:

The ability to begin as soon as areas of work become available. To have proper equipment and responsible personnel to complete the above list of work. To repair any adjacent materials damaged in the execution of the above listed work. Close cooperation with the Construction Manager and other bid divisions to provide input to develop a working schedule. An approved schedule of values will be required before approval is granted for the first payment request. Expediting communication and follow-up as required.

END OF BID DIVISION 093000

Wolgast Corporation – Construction Management



Wolgast Corporation

Freeland Comm. Schools - Main
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Submittal Packages

Spec Section	#	Rev.	Title	Type	Status	Responsible Contractor	Submit By	Received From	Received Date	Ball In Court	Approvers	Response	Sent Date	Returned Date	Final Due Date	Distributed Date
#22 09 30 00 - Tile																
093000 - Tiling	093000-2	0	Tile - samples	Sample	Draft											
093000 - Tiling	093000-1	0	Tile - Product Data	Product Information	Draft											
090561 - Common Work Results for Flooring Preparation	090561-1	0	Flooring Prep - product data	Product Information	Draft											
#23 09 30 00 - Tile Start Up																
	11	0	Copy of all Permits		Draft											
	10	0	Hazardous/AHERA Notifications		Draft											
	9	0	Sub/Supplier Form		Draft											
	8	0	Safety Data Sheets (SDS)		Draft											
	7	0	Safety Policy		Draft											
	6	0	On Site Employee List		Draft											
	5	0	Insurance/Letter of Compl		Draft											
	4	0	Payment/Performance Bonds		Draft											
	3	0	Contracts Signed/Returned		Draft											
	2	0	Schedule of Values		Draft											
	1	0	Post Bid Interview/Proposal Forms		Draft											
#24 09 30 00 - Tile Close Out																
093000 - Tiling	093000-5	0	Tile - Warranty	Closeouts	Draft											
093000 - Tiling	093000-4	0	Tile - Extra Materials	Closeouts	Draft											
093000 - Tiling	093000-3	0	Tile - maintenance data	Closeouts	Draft											
	23	0	Final Inspections on permits		Draft											
	22	0	O&M Manuals		Draft											
	21	0	Warranties for Equipment Installed		Draft											
	20	0	Asbestos Materials Affidavits		Draft											
	19	0	Signed Hazardous Materials		Draft											
	18	0	Insurance Up-To-Date		Draft											
	17	0	All CO Signed/Returned		Draft											
	16	0	As Built Drawings		Draft											
	15	0	Completed Punch List		Draft											
	14	0	Substantial Completion		Draft											
	13	0	Consent of Surety		Draft											
	12	0	Contractor (2) Yr Guarantee		Draft											

Bid Division: 096500 – Flooring

Bid to Include:

Total Responsibility for Specification Sections:

Section 096500 – Resilient Flooring
Section 096513 – Resilient Base and Accessories
Section 096700 – Fluid-Applied Flooring
Section 096813 – Tile Carpeting

Limited Responsibility for Specification Sections (as it relates to work in this Bid Division):

Section 079513 – Expansion Joint Cover Assemblies. (As it relates to this bid division.)
Section 079200 – Joint Sealants (As it relates to work in this Bid Division)
Section 090561 – Common Work Results for Flooring Preparation

Provide all labor, materials, tools, and equipment necessary to perform the work of the specified bid sections. The contractor must also furnish, deliver, unload, store, protect, erect and install all items required for the completion of the work of this bid division in compliance with all drawings and specifications for a complete operational system including but not limited to:

All adhesives, base, sealants, etc.

General Inclusions:

1. There is no general contractor associated with this project; any and all reference to a “general contractor” related to the work of this bid division shall be understood to mean the contractor of this bid division.
2. The contractor for this bid division work is required to include but is not limited to all items, services, tasks, materials, personnel, equipment, etc. identified in this bid division description regardless of the presence of language in other bid division descriptions that is the same or is similar to that found in this contractor’s bid division description.
3. Coordination of the work of this bid division with any and all work of other bid division contractors for the scheduling and integration of the work of this contractor.
4. All contractors are responsible for the entire set of plans and specifications, including tables, schedules, and notes.
5. Provide continuous housekeeping and clean-up, and proper legal off-site disposal of any debris generated by this Bid Division’s work.
6. The contractor is responsible for own dumpster(s) and all removal and disposal charges thereof. (Use of the Owner’s dumpsters is strictly prohibited.)
7. All Contractors are required to inspect the existing project components and are to include all work necessary to complete the work to deliver a fully operational system in compliance with all governing codes.
8. This Contractor shall be responsible for performing all work in full compliance with all health and safety standards including Asbestos Awareness and Notification, Lead Paint Abatement, and all MIOSHA Standards. This Contractor shall also be responsible for satisfying all safety violations and/or fines resulting from the actions or lack of action by this Contractor at the sole expense of this Contractor.
9. Any contractor who compounds a mistake by installing their product on another Contractor’s obvious faulty work will assume responsibility for repair of said work.
10. This contractor shall repair and restore any damaged area to an original or better condition with no detectable evidence that the area has been repaired. Repairs must be done by personnel qualified in the execution of the work skilled and licensed in that trade. Whenever possible, repairs to work shall be done by the original installer of the work.

Bid Division: 096500 – Flooring

11. Submittal of all insurance, unit pricing, schedule of values, required product data and shop drawings within (2) two weeks of Owner's Notice to commence work.
12. Must provide all submittals within 20 working days of contract award or sooner, unless specifically clarified with the construction manager prior to contract award.
13. Provide all layout and measurements required to perform the work of this Bid Division.
14. The Owner reserves the right to salvage any materials removed from the site during the duration of the project.
15. Coordinate delivery of materials with Construction Manager (48 hours) in advance of the delivery and provide proper personnel and equipment to perform the unloading.
16. Contractor shall submit to the field construction manager a complete written daily field report stating the work being done on site and the number of employees performing the work for each day the Contractor has representatives on site.
17. Contractor shall have a supervisor on site at all times when a crew is present on the job.
18. On Friday, or last workday of each week, the Contractor must update the Master Copy of As-Built, as it applies to the work of their Bid Division.
19. **Wolgast uses Procore for their CM Software. Please note: We will upload all drawings, and drawing revisions as they are approved, to the Drawings tool. However, it is each contractor's responsibility to verify that they are working from the most up-to-date, approved, drawings.**

Division Inclusions:

1. Preparation of existing areas to receive new flooring, install as shown and specified. (Prep is this Bid Division's responsibility.)
2. Strip, clean and finish all floors immediately prior to the Owner's occupancy.
3. Transition strips from new VCT to existing or new ceramic and/or carpet, and/or terrazzo.
4. Expansion and control joints as required by design and/or product manufacturer.
5. Follow finish schedule.
6. Clean and prepare floor including leveling and filling of voids prior to starting work.
7. Provide all floor striping and graphics, if required.
8. Vacuum and spot clean carpet prior to Owner occupancy.
9. Provide and install all required base.
10. Transition and provider stripes.
11. Furnish and install all caulking required for the work of this Bid Division.
12. Provide Owner with additional flooring for each type, color, pattern and size installed. (Per specifications)
13. Replacement and/or repair of defective and/or misaligned material installed by this contractor.
14. To repair any adjacent material damaged in the execution of the above-listed work.
15. All adhesives.
16. Provide and install thresholds as required.

Project Inclusions:

1. Review the milestone schedules. This bid division's work will require it to be completed at multiple locations and concurrently for some of the work. Prepare your bid proposal accordingly to allow for sufficient manpower and resources.
2. Clean and prepare floors to receive new flooring, including leveling and filling of voids prior to starting work, and in accordance with specifications and manufacturer's requirements. This contractor is responsible for furnishing and installing leveling materials to create a smooth finish flooring transition at dissimilar flooring materials or new to existing slabs.
3. Furnish and install LVT and base.
4. Furnish and install all carpet and base.
5. Furnish and install all required transition strips.
6. Furnish and install all epoxy painted flooring.

Wolgast Corporation – Construction Management

Bid Division: 096500 – Flooring

7. Provide and install all rubber wall base.
8. Must provide all submittals within 20 working days of contract award or sooner, unless specifically clarified with the construction manager prior to contract award

Excludes:

1. Floor Demo (Carpet, terrazzo and tile by Bid Division 024200)

Consideration for award:

The ability to begin as soon as areas of work become available. To have proper equipment and responsible personnel to complete the above list of work. To repair any adjacent materials damaged in the execution of the above listed work. Close cooperation with the Construction Manager and other bid divisions to provide input to develop a working schedule. An approved schedule of values will be required before approval is granted for the first payment request. Expediting communication and follow-up as required.

END OF BID DIVISION 096500



Wolgast Corporation

Freeland Comm. Schools - Main
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Submittal Packages

Spec Section	#	Rev.	Title	Type	Status	Responsible Contractor	Submit By	Received From	Received Date	Ball In Court	Approvers	Response	Sent Date	Returned Date	Final Due Date	Distributed Date
#25 09 65 00 - Flooring																
096813 - Tile Carpeting	096813-2	0	Tile Carpeting - Samples	Sample	Draft											
096813 - Tile Carpeting	096813-1	0	Tile Carpeting - Product Data	Product Information	Draft											
096700 - Fluid Applied Flooring	096700-2	0	Fluid Applied Flooring - samples	Sample	Draft											
096700 - Fluid Applied Flooring	096700-1	0	Fluid Applied Flooring - product data	Product Information	Draft											
096513 - Resilient Base and Accessories	096513-2	0	Resilient Base and Accessories - samples	Sample	Draft											
096513 - Resilient Base and Accessories	096513-1	0	Resilient Base and Accessories - product data	Product Information	Draft											
096500 - Resilient Flooring	096500-2	0	Resilient Flooring - samples	Sample	Draft											
096500 - Resilient Flooring	096500-1	0	Resilient Flooring - product data	Product Information	Draft											
090561 - Common Work Results for Flooring Preparation	090561-2	0	Floor Prep - Product data	Product Information	Open						Lisa Donahue (WOLGAST CORPORATION)					
#26 09 65 00 - Flooring Start Up																
	11	0	Copy of all Permits		Draft											
	10	0	Hazardous/AHERA Notifications		Draft											
	9	0	Sub/Supplier Form		Draft											
	8	0	Safety Data Sheets (SDS)		Draft											
	7	0	Safety Policy		Draft											
	6	0	On Site Employee List		Draft											
	5	0	Insurance/Letter of Compl		Draft											
	4	0	Payment/Performance Bonds		Draft											
	3	0	Contracts Signed/Returned		Draft											
	2	0	Schedule of Values		Draft											
	1	0	Post Bid Interview/Proposal Forms		Draft											
#27 09 65 00 - Flooring Close Out																
096813 - Tile Carpeting	096813-6	0	Tile Carpeting - Warranty	Closeouts	Draft											
096813 - Tile Carpeting	096813-5	0	Tile Carpet - Extra Materials	Closeouts	Draft											
096813 - Tile Carpeting	096813-4	0	Tile Carpeting - maintenance	Closeouts	Draft											
096813 - Tile Carpeting	096813-3	0	Tile Carpeting - install instructions	Other	Draft											
096700 - Fluid Applied Flooring	096700-5	0	Fluid Applied Flooring - Warranty	Closeouts	Draft											
096700 - Fluid Applied Flooring	096700-4	0	Fluid Applied Flooring - Maintenance	Closeouts	Draft											
096700 - Fluid Applied Flooring	096700-3	0	Fluid Applied Flooring - install instructions	Other	Draft											
096513 - Resilient Base and Accessories	096513-3	0	Resilient Base and Accessories - extra material	Closeouts	Draft											
096500 - Resilient Flooring	096500-4	0	Resilient Flooring - Warranty	Closeouts	Draft											
096500 - Resilient Flooring	096500-3	0	Resilient Flooring - Extra Materials	Closeouts	Draft											



Wolgast Corporation

Spec Section	#	Rev.	Title	Type	Status	Responsible Contractor	Submit By	Received From	Received Date	Ball In Court	Approvers	Response	Sent Date	Returned Date	Final Due Date	Distributed Date
	23	0	Final Inspections on permits		Draft											
	22	0	O&M Manuals		Draft											
	21	0	Warranties for Equipment Installed		Draft											
	20	0	Asbestos Materials Affidavits		Draft											
	19	0	Signed Hazardous Materials		Draft											
	18	0	Insurance Up-To-Date		Draft											
	17	0	All CO Signed/Returned		Draft											
	16	0	As Built Drawings		Draft											
	15	0	Completed Punch List		Draft											
	14	0	Substantial Completion		Draft											
	13	0	Consent of Surety		Draft											
	12	0	Contractor (2) Yr Guarantee		Draft											

Bid Division: 099000 – Painting

Bid to Include:

Total Responsibility for Specification Sections:

Section 070553 – Fire and Smoke Assembly Identification
Section 099113 – Exterior Painting
Section 099123 – Interior Painting

Limited Responsibility for Specification Sections (as it relates to work in this Bid Division):

Section 072726 – As it relates to this bid division.
Section 079200 – Joint Sealants (Interior Control Joints and all dissimilar products)

Provide all labor, materials, tools, and equipment necessary to perform the work of the specified bid sections. The contractor must also furnish, deliver, unload, store, protect, erect and install all items required for the completion of the work of this bid division in compliance with all drawings and specifications for a complete operational system including but not limited to:

All painting of doors, frames, CMU walls, drywall, access panels, caulking and sealing of interior control joints, expansion joints and imperfections on finish surfaces.

General Inclusions:

1. There is no general contractor associated with this project; any and all reference to a “general contractor” related to the work of this bid division shall be understood to mean the contractor of this bid division.
2. The contractor for this bid division work is required to include but is not limited to all items, services, tasks, materials, personnel, equipment, etc. identified in this bid division description regardless of the presence of language in other bid division descriptions that is the same or is similar to that found in this contractor’s bid division description.
3. Coordination of the work of this bid division with any and all work of other bid division contractors for the scheduling and integration of the work of this contractor.
4. All contractors are responsible for the entire set of plans and specifications, including tables, schedules, and notes.
5. Provide continuous housekeeping and clean-up, and proper legal off-site disposal of any debris generated by this Bid Division’s work.
6. Contractor is responsible for own dumpster(s) and all removal and disposal charges thereof. (Use of the Owner’s dumpsters is strictly prohibited.)
7. All Contractors are required to inspect the existing project components and are to include all work necessary to complete the work to deliver a fully operational system in compliance with all governing codes.
8. This Contractor shall be responsible for performing all work in full compliance with all health and safety standards including Asbestos Awareness and Notification, Lead Paint Abatement, and all MIOSHA Standards. This Contractor shall also be responsible for satisfying all safety violations and/or fines resulting from the actions or lack of action by this Contractor at the sole expense of this Contractor.
9. Any contractor who compounds a mistake by installing their product on another Contractor’s obvious faulty work will assume responsibility for repair of said work.
10. This contractor shall repair and restore any damaged area to an original or better condition with no detectable evidence that the area has been repaired. Repairs must be done by personnel qualified in the execution of the work skilled and licensed in that trade. Whenever possible, repairs to work shall be done by the original installer of the work.
11. Submittal of all insurance, unit pricing, schedule of values, required product data and shop drawings within (2) two weeks of Owner’s Notice to commence work.
12. Must provide all submittals within 20 working days of contract award or sooner, unless specifically clarified with the construction manager prior to contract award.

Wolgast Corporation – Construction Management

Bid Division: 099000 – Painting

13. Provide all layout and measurements required to perform the work of this Bid Division.
14. The Owner reserves the right to salvage any materials removed from the site during the duration of the project.
15. Coordinate delivery of materials with Construction Manager (48 hours) in advance of the delivery and provide proper personnel and equipment to perform the unloading.
16. Contractor shall submit to the field construction manager a complete written daily field report stating the work being done on site and the number of employees performing the work for each day the Contractor has representatives on site.
17. Contractor shall have a supervisor on site at all times when a crew is present on the job.
18. On Friday, or last workday of each week, the Contractor must update the Master Copy of As-Builts, as it applies to the work of their Bid Division.
19. **Wolgast uses Procore for their CM Software. Please note: We will upload all drawings, and drawing revisions as they are approved, to the Drawings tool. However, it is each contractor's responsibility to verify that they are working from the most up-to-date, approved, drawings.**

Division Inclusions:

1. Finishing of wood casings and trim.
2. Follow room finish and door schedules.
3. Painting of all electrical and mechanical lines and equipment (as specified).
4. Paint all bulkheads.
5. Paint exposed structural components as specified.
6. Provide one (1) gallon of each color used (in unopened cans) to Owner at completion of Project.
7. Remove all foreign items and substances on existing surfaces (including, but not limited to, nails, hangers, tape, screws, etc.) and patch prior to painting.
8. All surfaces to be painted, including but not limited to drywall and masonry, are to be inspected and accepted by this contractor prior to application of paint. Surface imperfections not repaired prior to painting or submitted to the construction manager in writing as existing defects prior to painting, will be repaired by the painting contractor at no additional cost.
9. Painting Contractor is responsible for removing or protecting all cover plates, trim and other pre-finished surfaces necessary for the completion of this work scope. This Contractor is responsible for replacing anything removed upon completion of work.
10. Provide final cleaning of work prior to Owner occupancy.
11. Furnish and install all caulking required for the work of this Bid Division.
12. To repair any adjacent material damaged in the execution of the above-listed work.
13. All caulking of interior control joints
14. All caulking of interior joints between all dissimilar surfaces including door and window frames, CMU & Drywall.
15. Clean, dust and dirt off bar joist, deck and ductwork prior to painting.

Project Inclusions:

1. Review the milestone schedules. This bid division's work will require it to be completed at multiple locations and concurrently for some of the work. Prepare your bid proposal accordingly to allow for sufficient manpower and resources.
2. All surfaces to be painted, including but not limited to drywall, steel and masonry are to be inspected and accepted by this contractor prior to application of paint. Surface imperfections not repaired prior to painting or submitted to the Construction Manager in writing as existing defects prior to painting, will be repaired by the painting contractor at no additional cost.
3. Paint all gas lines as documented.
4. Paint new metal closure trim at removed lockers to match new lockers as indicated in the drawings and specifications.
5. Provide complete prep and painting of existing surfaces as documented.

Bid Division: 099000 – Painting

6. Provide complete prep and painting of existing and new exposed steel materials as documented.
7. Prep and paint all exposed roof framing, duct work, conduits and any other materials as documented.
8. Paint all exposed drywall and CMU as documented.
9. Paint all hollow metal frames and doors as documented.
10. Paint all bulkheads.
11. Paint access panels to match wall or ceiling.
12. **Provide and install Vinyl Graphic as indicated in the drawings and specifications.**
13. **This contractor to stencil paint or install signs / stickers indicating firewalls above ceilings per code. See fire safety plan for firewall locations and ratings.**
14. Provide all caulking of interior control joints in masonry, drywall, and drywall to dissimilar materials and inside masonry corners.
15. Must provide all submittals within 20 working days of contract award or sooner, unless specifically clarified with the construction manager prior to contract award.
16. Mandatory attendance at all required pre-installation meetings.

Consideration for award:

The ability to begin as soon as areas of work become available. To have proper equipment and responsible personnel to complete the above list of work. To repair any adjacent materials damaged in the execution of the above listed work. Close cooperation with the Construction Manager and other bid divisions to provide input to develop a working schedule. An approved schedule of values will be required before approval is granted for the first payment request. Expediting communication and follow-up as required.

END OF BID DIVISION 099000



Wolgast Corporation

Submittal Packages

Spec Section	#	Rev.	Title	Type	Status	Responsible Contractor	Submit By	Received From	Received Date	Ball In Court	Approvers	Response	Sent Date	Returned Date	Final Due Date	Distributed Date
#28 09 90 00 - Paint																
099123 - Interior painting	099123-2	0	Interior Paint - samples	Sample	Draft											
099123 - Interior painting	099123-1	0	Interior Paint - product data	Product Information	Draft											
099113 - Exterior Painting	099113-2	0	Exterior Paint - samples	Sample	Draft											
099113 - Exterior Painting	099113-1	0	Exterior Paint - product data	Product Information	Draft											
070553 - Fire and Smoke Assembly Identification	070553-1	0	Fire and Smoke Assembly Identification - product data	Product Information	Draft											
#29 09 90 00 - Paint Start Up																
	11	0	Copy of all Permits		Draft											
	10	0	Hazardous/AHERA Notifications		Draft											
	9	0	Sub/Supplier Form		Draft											
	8	0	Safety Data Sheets (SDS)		Draft											
	7	0	Safety Policy		Draft											
	6	0	On Site Employee List		Draft											
	5	0	Insurance/Letter of Compl		Draft											
	4	0	Payment/Performance Bonds		Draft											
	3	0	Contracts Signed/Returned		Draft											
	2	0	Schedule of Values		Draft											
	1	0	Post Bid Interview/Proposal Forms		Draft											
#30 09 90 00 - Paint Close Out																
099123 - Interior painting	099123-4	0	Interior Paint - extra material	Closeouts	Draft											
099123 - Interior painting	099123-3	0	Interior Painting - maintenance data	Closeouts	Draft											
099113 - Exterior Painting	099113-4	0	Exterior Paint - Extra materials	Closeouts	Draft											
099113 - Exterior Painting	099113-3	0	Exterior paint - maintenance data	Closeouts	Draft											
	23	0	Final Inspections on permits		Draft											
	22	0	O&M Manuals		Draft											
	21	0	Warranties for Equipment Installed		Draft											
	20	0	Asbestos Materials Affidavits		Draft											
	19	0	Signed Hazardous Materials		Draft											
	18	0	Insurance Up-To-Date		Draft											
	17	0	All CO Signed/Returned		Draft											
	16	0	As Built Drawings		Draft											
	15	0	Completed Punch List		Draft											
	14	0	Substantial Completion		Draft											
	13	0	Consent of Surety		Draft											
	12	0	Contractor (2) Yr Guarantee		Draft											

Bid Division: 105100 – Metal Lockers

Bid to Include:

Total Responsibility for Specification Sections:

Section 105113 – Metal Lockers

Provide all labor, materials, tools, and equipment necessary to perform the work of the specified bid sections. The contractor must also furnish, deliver, unload, store, protect, erect and install all items required for the completion of the work of this bid division in compliance with all drawings and specifications for a complete operational system including but not limited to:

General Inclusions:

1. There is no general contractor associated with this project; any and all reference to a “general contractor” related to the work of this bid division shall be understood to mean the contractor of this bid division.
2. The contractor for this bid division work is required to include but is not limited to all items, services, tasks, materials, personnel, equipment, etc. identified in this bid division description regardless of the presence of language in other bid division descriptions that is the same or is similar to that found in this contractor’s bid division description.
3. Coordination of the work of this bid division with any and all work of other bid division contractors for the scheduling and integration of the work of this contractor.
4. All contractors are responsible for the entire set of plans and specifications, including tables, schedules, and notes.
5. Provide continuous housekeeping and clean-up, and proper legal off-site disposal of any debris generated by this Bid Division’s work.
6. Contractor is responsible for own dumpster(s) and all removal and disposal charges thereof. (Use of the Owner’s dumpsters is strictly prohibited.)
7. All Contractors are required to inspect the existing project components and are to include all work necessary to complete the work to deliver a fully operational system in compliance with all governing codes.
8. This Contractor shall be responsible for performing all work in full compliance with all health and safety standards including Asbestos Awareness and Notification, Lead Paint Abatement, and all MIOSHA Standards. This Contractor shall also be responsible for satisfying all safety violations and/or fines resulting from the actions or lack of action by this Contractor at the sole expense of this Contractor.
9. Any contractor who compounds a mistake by installing their product on another Contractor’s obvious faulty work will assume responsibility for repair of said work.
10. This contractor shall repair and restore any damaged area to an original or better condition with no detectable evidence that the area has been repaired. Repairs must be done by personnel qualified in the execution of the work skilled and licensed in that trade. Whenever possible, repairs to work shall be done by the original installer of the work.
11. Submittal of all insurance, unit pricing, schedule of values, required product data and shop drawings within (2) two weeks of Owner’s Notice to commence work.
12. Must provide all submittals within 20 working days of contract award or sooner, unless specifically clarified with the construction manager prior to contract award.
13. Provide all layout and measurements required to perform the work of this Bid Division.
14. The Owner reserves the right to salvage any materials removed from the site during the duration of the project.
15. Coordinate delivery of materials with Construction Manager (48 hours) in advance of the delivery and provide proper personnel and equipment to perform the unloading.
16. Contractor shall submit to the field construction manager a complete written daily field report stating the work being done on site and the number of employees performing the work for each day the Contractor has representatives on site.
17. Contractor shall always have a supervisor on site when a crew is present on the job.
18. On Friday, or last workday of each week, the Contractor must update the Master Copy of As-Built, as it applies to the work of their Bid Division.

Wolgast Corporation – Construction Management

Bid Division: 105100 – Metal Lockers

19. Wolgast uses Procore for their CM Software. Please note: We will upload all drawings, and drawing revisions as they are approved, to the Drawings tool. However, it is each contractor's responsibility to verify that they are working from the most up to date, approved, drawings.

Division Inclusions:

1. Clean, prep, and adjust all equipment immediately prior to Owner occupancy.
2. Protection of floor during installation.
3. Field verify measurements before installation of equipment.
4. Supply and install fillers as required.
5. Provide and install all lockers and locker bases.
6. Provide all number plates, and coordinate numbering with the Owner.
7. Master key to existing system if possible.

Project Inclusions:

1. Review the milestone schedules. This bid division's work will require it to be completed at multiple locations and concurrently for some of the work. Prepare your bid proposal accordingly to allow for sufficient manpower and resources.
2. Furnish and supply all required blocking, shims, etc. for a complete installation.
3. Furnish and install all filler panels and finished sloped tops with all required trims for a complete installation.
4. Furnish and install all required numbering and locks as specified.
5. Lockers will be installed on concrete bases by bid division 030100.
6. Furnish and install ADA units as documented.
7. Must provide all submittals within 20 working days of contract award or sooner, unless specifically clarified with the construction manager prior to contract award.
8. Mandatory attendance at all required pre-installation meetings.
9. Completion of all punch list work within 15 working days or less upon receipt of punch list items, unless specific circumstances occur that are out of control of this bid division contractor dictate otherwise.

Consideration for award:

The ability to begin as soon as areas of work become available. To have proper equipment and responsible personnel to complete the above list of work. To repair any adjacent materials damaged in the execution of the above-listed work. Close cooperation with the Construction Manager and other bid divisions to provide input to develop a working schedule. An approved schedule of values will be required before approval is granted for the first payment request. Expediting communication and follow-up as required.

END OF BID DIVISION 105100

Wolgast Corporation – Construction Management



Wolgast Corporation

Submittal Packages

Spec Section	#	Rev.	Title	Type	Status	Responsible Contractor	Submit By	Received From	Received Date	Ball In Court	Approvers	Response	Sent Date	Returned Date	Final Due Date	Distributed Date
#31 10 51 00 - Metal Lockers																
105113 - Metal Lockers	105113-3	0	Metal Lockers - samples	Sample	Draft											
105113 - Metal Lockers	105113-2	0	Metal Lockers - shop drawings	Shop Drawing	Draft											
105113 - Metal Lockers	105113-1	0	Metal Lockers - product data	Product Information	Draft											
#32 10 51 00 - Metal Lockers Start Up																
	11	0	Copy of all Permits		Draft											
	10	0	Hazardous/AHERA Notifications		Draft											
	9	0	Sub/Supplier Form		Draft											
	8	0	Safety Data Sheets (SDS)		Draft											
	7	0	Safety Policy		Draft											
	6	0	On Site Employee List		Draft											
	5	0	Insurance/Letter of Compl		Draft											
	4	0	Payment/Performance Bonds		Draft											
	3	0	Contracts Signed/Returned		Draft											
	2	0	Schedule of Values		Draft											
	1	0	Post Bid Interview/Proposal Forms		Draft											
#33 10 51 00 - Metal Lockers Close Out																
105113 - Metal Lockers	105113-5	0	Metal Lockers - Warranty	Closeouts	Draft											
105113 - Metal Lockers	105113-4	0	Metal Lockers - install instructions	Closeouts	Draft											
	23	0	Final Inspections on permits		Draft											
	22	0	O&M Manuals		Draft											
	21	0	Warranties for Equipment Installed		Draft											
	20	0	Asbestos Materials Affidavits		Draft											
	19	0	Signed Hazardous Materials		Draft											
	18	0	Insurance Up-To-Date		Draft											
	17	0	All CO Signed/Returned		Draft											
	16	0	As Built Drawings		Draft											
	15	0	Completed Punch List		Draft											
	14	0	Substantial Completion		Draft											
	13	0	Consent of Surety		Draft											
	12	0	Contractor (2) Yr Guarantee		Draft											

Bid Division: 123000 – Casework

Bid to Include:

Total Responsibility for Specification Sections:

Section 123200 – Manufactured Wood Casework
Section 123600 – Countertops

Provide all labor, materials, tools, and equipment necessary to perform the work of the specified bid sections. The contractor must also furnish, deliver, unload, store, protect, erect and install all items required for the completion of the work of this bid division in compliance with all drawings and specifications for a complete operational system including but not limited to:

General Inclusions:

1. There is no general contractor associated with this project; any and all reference to a “general contractor” related to the work of this bid division shall be understood to mean the contractor of this bid division.
2. The contractor for this bid division work is required to include but is not limited to all items, services, tasks, materials, personnel, equipment, etc. identified in this bid division description regardless of the presence of language in other bid division descriptions that is the same or is similar to that found in this contractor’s bid division description.
3. Coordination of the work of this bid division with any and all work of other bid division contractors for the scheduling and integration of the work of this contractor.
4. All contractors are responsible for the entire set of plans and specifications, including tables, schedules, and notes.
5. Provide continuous housekeeping and clean-up, and proper legal off-site disposal of any debris generated by this Bid Division’s work.
6. Contractor is responsible for own dumpster(s) and all removal and disposal charges thereof. (Use of the Owner’s dumpsters is strictly prohibited.)
7. All Contractors are required to inspect the existing project components and are to include all work necessary to complete the work to deliver a fully operational system in compliance with all governing codes.
8. This Contractor shall be responsible for performing all work in full compliance with all health and safety standards including Asbestos Awareness and Notification, Lead Paint Abatement, and all MIOSHA Standards. This Contractor shall also be responsible for satisfying all safety violations and/or fines resulting from the actions or lack of action by this Contractor at the sole expense of this Contractor.
9. Any contractor who compounds a mistake by installing their product on another Contractor’s obvious faulty work will assume responsibility for repair of said work.
10. This contractor shall repair and restore any damaged area to an original or better condition with no detectable evidence that the area has been repaired. Repairs must be done by personnel qualified in the execution of the work skilled and licensed in that trade. Whenever possible, repairs to work shall be done by the original installer of the work.
11. Submittal of all insurance, unit pricing, schedule of values, required product data and shop drawings within (2) two weeks of Owner’s Notice to commence work.
12. Must provide all submittals within 20 working days of contract award or sooner, unless specifically clarified with the construction manager prior to contract award.
13. Provide all layout and measurements required to perform the work of this Bid Division.
14. The Owner reserves the right to salvage any materials removed from the site during the duration of the project.
15. Coordinate delivery of materials with Construction Manager (48 hours) in advance of the delivery, and provide proper personnel and equipment to perform the unloading.
16. Contractor shall submit to the field construction manager a complete written daily field report stating the work being done on site and the number of employees performing the work for each day the Contractor has representatives on site.
17. Contractor shall have a supervisor on site at all times when a crew is present on the job.

Wolgast Corporation – Construction Management

Bid Division: 123000 – Casework

18. On Friday, or last workday of each week, the Contractor must update the Master Copy of As-Builts, as it applies to the work of their Bid Division.
19. **Wolgast uses Procore for their CM Software. Please note: We will upload all drawings, and drawing revisions as they are approved, to the Drawings tool. However, it is each contractor's responsibility to verify that they are working from the most up-to-date, approved, drawings.**

Division Inclusions:

1. Only final connections are provided by other trade contractors.
2. Clean, prep, and adjust all equipment immediately prior to Owner occupancy.
3. Provide prep for installation.
4. Protection of floor during installation.
5. Verify all power requirements and coordinate with other Bid Divisions.
6. Provide and completely install all science equipment and casework to allow for final plumbing, mechanical, and electrical connection by others (coordinate installation of plumbing & electrical during installation).
7. Field verify measurements before fabrication of equipment.
8. Supply and install fillers as required.
9. Supply and install all epoxy resin top and sinks.
10. Supply and install new Fume Hoods.
11. All tops shall be pre-drilled to accept accessories and mounted fixtures.
12. Provide all filler panels to match cabinets and/or countertops.

Project Inclusions:

1. Review the milestone schedules. This bid division's work will require it to be completed at multiple locations and concurrently for some of the work. Prepare your bid proposal accordingly to allow for sufficient manpower and resources.
2. Furnish and install all casework as documented.
3. Furnish and install all materials required for custom casework, including all wall framing/blocking integral with the casework, as documented.
4. Furnish and install all countertop materials.
5. Furnish and install all caulking of countertops and all backsplashes at walls.
6. Must provide all submittals within 25 working days of contract award or sooner, unless specifically clarified with the construction manager prior to contract award.
7. Mandatory attendance at all required pre-installation meetings.
8. Completion of all punch list work within 15 working days or less upon receipt of punch list items, unless specific circumstances occur that are out of control of this bid division contractor dictate otherwise.
9. Cover all countertops with double layered corrugated cardboard upon installation for protection.
10. Provide and install all science grade casework and countertops.
11. Clean and dust all casework upon completion.

Excludes:

1. Electrical and mechanical final connections.
2. Installation of gas and water fixtures.

Consideration for award:

The ability to begin as soon as areas of work become available. To have proper equipment and responsible personnel to complete the above list of work. To repair any adjacent materials damaged in the execution of the above-listed work. Close cooperation with the Construction Manager and other bid divisions to provide input to develop a working schedule. An approved schedule of values will be required before approval is granted for the first payment request. Expediting communication and follow-up as required.



Wolgast Corporation

Submittal Packages

Spec Section	#	Rev.	Title	Type	Status	Responsible Contractor	Submit By	Received From	Received Date	Ball In Court	Approvers	Response	Sent Date	Returned Date	Final Due Date	Distributed Date
#34 12 30 00 - Casework																
123600 - Countertops	123600-3	0	Countertops - samples	Sample	Draft											
123600 - Countertops	123600-2	0	Countertops - Shop Drawings	Shop Drawing	Draft											
123600 - Countertops	123600-1	0	Countertops - product data	Product Information	Draft											
123200 - Manufactured Wood Casework	123200-3	0	Wood Casework - finish samples	Sample	Draft											
123200 - Manufactured Wood Casework	123200-2	0	Wood Casework - Shop drawings	Shop Drawing	Draft											
123200 - Manufactured Wood Casework	123200-1	0	Wood Casework - product data	Product Information	Draft											
#35 12 30 00 - Casework Start Up																
	11	0	Copy of all Permits		Draft											
	10	0	Hazardous/AHERA Notifications		Draft											
	9	0	Sub/Supplier Form		Draft											
	8	0	Safety Data Sheets (SDS)		Draft											
	7	0	Safety Policy		Draft											
	6	0	On Site Employee List		Draft											
	5	0	Insurance/Letter of Compl		Draft											
	4	0	Payment/Performance Bonds		Draft											
	3	0	Contracts Signed/Returned		Draft											
	2	0	Schedule of Values		Draft											
	1	0	Post Bid Interview/Proposal Forms		Draft											
#36 12 30 00 - Casework Close Out																
123600 - Countertops	123600-6	0	Countertops - Warranty	Closeouts	Draft											
123600 - Countertops	123600-5	0	Countertops - maintenance	Closeouts	Draft											
123600 - Countertops	123600-4	0	Countertops - install instructions	Closeouts	Draft											
123200 - Manufactured Wood Casework	123200-6	0	Wood Casework - Warranty	Closeouts	Draft											
123200 - Manufactured Wood Casework	123200-5	0	Wood Casework - extra material	Closeouts	Draft											
123200 - Manufactured Wood Casework	123200-4	0	Wood Casework - maintenance data	Closeouts	Draft											
	23	0	Final Inspections on permits		Draft											
	22	0	O&M Manuals		Draft											
	21	0	Warranties for Equipment Installed		Draft											
	20	0	Asbestos Materials Affidavits		Draft											
	19	0	Signed Hazardous Materials		Draft											
	18	0	Insurance Up-To-Date		Draft											
	17	0	All CO Signed/Returned		Draft											
	16	0	As Built Drawings		Draft											
	15	0	Completed Punch List		Draft											



Wolgast Corporation

Freeland Comm. Schools - Main
710 Powley Drive
Freeland, Michigan 48623
989695527

Spec Section	#	Rev.	Title	Type	Status	Responsible Contractor	Submit By	Received From	Received Date	Ball In Court	Approvers	Response	Sent Date	Returned Date	Final Due Date	Distributed Date
	14	0	Substantial Completion		Draft											
	13	0	Consent of Surety		Draft											
	12	0	Contractor (2) Yr Guarantee		Draft											

Bid Division: 222300 – Plumbing & HVAC Systems

Bid to Include:

Total Responsibility for Specification Sections:

Section 220500 – Plumbing Requirements
Section 220510 – Plumbing Systems Testing, Cleaning, Water Treatment and Startup
Section 220553 – Plumbing System Identification
Section 220600 – Plumbing Specialties
Section 220700 – Plumbing Pipe Insulation
Section 221000 – Plumbing Piping
Section 230500 – HVAC Requirements
Section 230516 – Piping Expansion Compensation
Section 230519 – Gages and Meters
Section 230548 – Vibration Isolation
Section 230593 – Testing, Adjusting and Balancing
Section 230713 – External Duct Insulation
Section 230714 – Internal Acoustical Duct Lining
Section 230719 – HVAC Pipe Insulation
Section 232100 – Hydronic Piping
Section 232116 – Hydronic Specialties
Section 232500 – HVAC Systems Testing, Cleaning, Water Treatment and Startup
Section 233000 – Air Distribution 23 74 00 Rooftop HVAC Unit
Section 237400 – Rooftop HVAC Unit
Section 238200 – Liquid Heat Transfer Equipment

Limited Responsibility for Specification Sections (as it relates to work in this Bid Division):

Section 024119 – Selective Demolition (As it relates to this bid division)
Section 078400 – Firestopping (As it relates to this bid division)
Section 078401 – Firestopping Systems Schedule
Section 079200 – Joint Sealants
Section 083100 – Access Doors and Panels (As required by this bid division.)

Provide all labor, materials, tools, and equipment necessary to perform the work of the specified bid sections. The contractor must also furnish, deliver, unload, store, protect, erect and install all items required for the completion of the work of this bid division in compliance with all drawings and specifications for a complete operational system including but not limited to:

Plumbing, heating, ventilating, air conditioning, balancing, temperature control, etc., for a complete operational system.

General Inclusions:

1. There is no general contractor associated with this project; any and all reference to a “general contractor” related to the work of this bid division shall be understood to mean the contractor of this bid division.
2. The contractor for this bid division work is required to include but is not limited to all items, services, tasks, materials, personnel, equipment, etc. identified in this bid division description regardless of the presence of language in other bid division descriptions that is the same or is similar to that found in this contractor’s bid division description.
3. Coordination of the work of this bid division with any and all work of other bid division contractors for the scheduling and integration of the work of this contractor.
4. All contractors are responsible for the entire set of plans and specifications, including tables, schedules, and notes.

Wolgast Corporation – Construction Management

Bid Division: 222300 – Plumbing & HVAC Systems

5. Provide continuous housekeeping and clean-up, and proper legal off-site disposal of any debris generated by this Bid Division's work.
6. Contractor is responsible for own dumpster(s) and all removal and disposal charges thereof. (Use of the Owner's dumpsters is strictly prohibited.)
7. All Contractors are required to inspect the existing project components and are to include all work necessary to complete the work to deliver a fully operational system in compliance with all governing codes.
8. This Contractor shall be responsible for performing all work in full compliance with all health and safety standards including Asbestos Awareness and Notification, Lead Paint Abatement, and all MIOSHA Standards. This Contractor shall also be responsible for satisfying all safety violations and/or fines resulting from the actions or lack of action by this Contractor at the sole expense of this Contractor.
9. Any contractor who compounds a mistake by installing their product on another Contractor's obvious faulty work will assume responsibility for repair of said work.
10. This contractor shall repair and restore any damaged area to an original or better condition with no detectable evidence that the area has been repaired. Repairs must be done by personnel qualified in the execution of the work skilled and licensed in that trade. Whenever possible, repairs to work shall be done by the original installer of the work.
11. Submittal of all insurance, unit pricing, schedule of values, required product data and shop drawings within (2) two weeks of Owner's Notice to commence work.
12. Must provide all submittals within 20 working days of contract award or sooner, unless specifically clarified with the construction manager prior to contract award.
13. Provide all layout and measurements required to perform the work of this Bid Division.
14. The Owner reserves the right to salvage any materials removed from the site during the duration of the project.
15. Coordinate delivery of materials with Construction Manager (48 hours) in advance of the delivery and provide proper personnel and equipment to perform the unloading.
16. Contractor shall submit to the field construction manager a complete written daily field report stating the work being done on site and the number of employees performing the work for each day the Contractor has representatives on site.
17. Contractor shall have a supervisor on site at all times when a crew is present on the job.
18. On Friday, or last workday of each week, the Contractor must update the Master Copy of As-Built, as it applies to the work of their Bid Division.
19. **Wolgast uses Procore for their CM Software. Please note: We will upload all drawings, and drawing revisions as they are approved, to the Drawings tool. However, it is each contractor's responsibility to verify that they are working from the most up-to-date, approved, drawings.**

Division Inclusions:

1. Concrete Patching for mechanical and electrical trades by Bid Division 15000 and 16000
2. Selective Demolition (concrete floors, etc.).
3. No concrete is to be installed until verification of acceptable density testing. Any concrete installed without density verification will become the sole responsibility of the Contractor and may be required to be replaced at the Contractor's expense.
4. Provide all blocking required for plumbing fixture mounting.
5. Perform all connections between site utilities and building, coordinate with site contractor on utilities.
6. Patch floors with concrete, where existing fixtures and pipe are removed and capped.
7. Removal of all plumbing and heating fixtures.
8. Provide proper repair of all ceilings, walls, floors, etc., when installing new piping fixtures and hangers.
9. Furnish and install all fixtures in cabinetry as required.
10. Provide all final connections and hook-ups for kitchen equipment.
11. Furnish all louvers and access panels to masonry and drywall contractors for installation.
12. Provide shop drawings to State Fire Marshall for Plan Review (allowing sufficient time for changes that may be made and must be completed prior to beneficial occupancy).

Bid Division: 222300 – Plumbing & HVAC Systems

13. Patch all demolished areas and items affected by HVAC & plumbing demolition to a condition ready to receive finishes and finish materials (finish materials by others, i.e. carpet, tile paint, etc.).
14. Perform all excavating, backfill, and compaction required for the work of this bid division.
15. Furnish and install duct detectors, back draft dampers, etc. as shown and specified, and/or required by Code.
16. Perform all demolition necessary for the completion of the work of this Bid Division as shown and specified.
17. Provide all final plumbing hook-ups to all plumbing related fixtures and equipment.
18. Provide coordination with roofing and metal contractors for roof penetrations, equipment rails and pipe boots including layouts.
19. Maintain fire rating in all walls penetrated.
20. Remove spoils from site.
21. Provide all required layout and verify that no conflict occurs with other trades.
22. Furnish operating and maintenance manuals.
23. Provide record and as-built drawings.
24. Provide all necessary connection between temperature control and instrumentation devices and equipment to be controlled.
25. Provide roof curbs for rooftop equipment.
26. Provide all permits required.
27. Provide all required work to prepare each piece of equipment to receive and allow for proper installation and operation of the temperature control modules and related automatic temperature control devices.
28. Provide temporary water distribution as required.
29. Provide all State Certification for equipment (boilers, etc.).
30. Refer to all equipment schedules for additional equipment to be furnished and installed (including kitchen equipment and kitchen equipment schedules).
31. Abandoning of retired plumbing.
32. Furnish test and balance reports.
33. Contractor shall coordinate phased delivery of all pre-purchased equipment with supplier.
34. Contractor shall maintain existing HVAC systems in fully functional order in occupied areas of the building throughout the duration of the project.
35. Contractor shall furnish and install temporary insulated weather-tight closures of openings created as a result of the work in this scope in exterior surfaces to provide acceptable working conditions and protection for materials, to allow temporary heating, and building security.
36. Remove, clean and reinstall all existing grids, vents, registers and diffusers including those mounted in metal ceiling grid systems.
37. All HVAC equipment is to be completed with all motor starters, disconnects or other items to allow for the proper operation of the system.
38. Disconnect all roof top units to allow roofing contractor to raise and replace flashings as required.
39. Provide start-up training with Owner Representative, Architect and Construction Manager for all equipment installed.
40. Final installation and all work by this bid division must comply with governing building and life safety codes.
41. Provide water test approval two weeks prior to Owner Occupancy.

Project Inclusions:

1. Review the milestone schedules. This bid division's work will require it to be completed at multiple locations and concurrently for some of the work. Prepare your bid proposal accordingly to allow for sufficient manpower and resources.
2. Include cost for all required permits in bid proposal and coordinate all required inspections.
3. Provide all required plumbing and HVAC demolition as documented.
4. Remove all existing concrete, masonry, etc. as required for the installation of new plumbing and HVAC work unless the demolition scope of work is specifically indicated in the documents to be completed by another bid division.

Bid Division: 222300 – Plumbing & HVAC Systems

5. Provide all required concrete, masonry and drywall patching work associated with the installation of plumbing and HVAC work unless the patching scope of work is specifically indicated in the documents to be completed by another bid division.
6. All plumbing and HVAC installations to meet all required governing requirements.
7. Furnish and install all pre-fabricated curbs and/or wood material as required for mechanical equipment curbing.
8. Furnish all access panels as required for the installation of the bid division's work.
9. Furnish and install all required gas piping.
10. Furnish and install all required hydronic piping.
11. Furnish and install all required refrigerant lines.
12. Furnish and install all required waste, water supply and vent piping.
13. Furnish and install all roof sumps and all rainwater conductor lines.
14. Provide all required plumbing and HVAC insulation.
15. Provide all required test and balance work.
16. **Provide and complete all controls connections and programming. This contractor must use Honeywell as the controls contractor.**

Consideration for award:

The ability to begin as soon as areas of work become available. To have proper equipment and responsible personnel to complete the above list of work. To repair any adjacent materials damaged in the execution of the above listed work. Close cooperation with the Construction Manager and other bid divisions to provide input to develop a working schedule. An approved schedule of values will be required before approval is granted for the first payment request. Expediting communication and follow-up as required.

END OF BID DIVISION 222300



Wolgast Corporation

Freeland Comm. Schools - Main
710 Powley Drive
Freeland, Michigan 48623
989695527

Submittal Packages

Spec Section	#	Rev.	Title	Type	Status	Responsible Contractor	Submit By	Received From	Received Date	Ball In Court	Approvers	Response	Sent Date	Returned Date	Final Due Date	Distributed Date
#37 22 23 00 - Plumbing & HVAC System																
230516 - Piping Expansion Compensation	230516-1	0	Pipe Expansion Compensation - product data	Product Information	Draft											
230500 - HVAC Requirements	230500-1	0	HVAC Permits	Other	Draft											
220553 - Plumbing System identification	220553-1	0	Plumbing ID - product data	Product Information	Draft											
220510 - Plumbing Systems Testing, Cleaning, Water Treatment and Startup	220510-1	0	Water Treatment - product data	Product Information	Draft											
079200 - Joint Sealants	079200-17	0	Joint Sealant - Schedule	Document	Draft											
079200 - Joint Sealants	079200-16	0	Joint Sealant - Color Samples	Document	Draft											
079200 - Joint Sealants	079200-15	0	Joint Sealant - product data	Product Information	Draft											
078400 - Firestopping	078400-8	0	Firestopping - schedule	Document	Draft											
078400 - Firestopping	078400-7	0	Firestopping - product data	Product Information	Draft											
#38 22 23 00 - Plumbing & HVAC System Start Up																
	11	0	Copy of all Permits		Draft											
	10	0	Hazardous/AHERA Notifications		Draft											
	9	0	Sub/Supplier Form		Draft											
	8	0	Safety Data Sheets (SDS)		Draft											
	7	0	Safety Policy		Draft											
	6	0	On Site Employee List		Draft											
	5	0	Insurance/Letter of Compl		Draft											
	4	0	Payment/Performance Bonds		Draft											
	3	0	Contracts Signed/Returned		Draft											
	2	0	Schedule of Values		Draft											
	1	0	Post Bid Interview/Proposal Forms		Draft											
#39 22 23 00 - Plumbing & HVAC System Close Out																
237400 - Rooftop HVAC Unit	237400-2	0	Rooftop HVAC Unit - Warranty	Closeouts	Draft											
237400 - Rooftop HVAC Unit	237400-1	0	Rooftop HVAC Unit - Extra Materials	Closeouts	Draft											
230593 - Testing, Adjusting and Balancing	230593-1	0	Test and Balance Reports	Closeouts	Draft											
230516 - Piping Expansion Compensation	230516-2	0	Piping Expansion Compensation - Warranty	Closeouts	Draft											
079200 - Joint Sealants	079200-18	0	Joint Sealant - Warranty	Closeouts	Draft											
078400 - Firestopping	078400-9	0	Firestopping - Warranty	Closeouts	Draft											
	23	0	Final Inspections on permits		Draft											
	22	0	O&M Manuals		Draft											
	21	0	Warranties for Equipment Installed		Draft											
	20	0	Asbestos Materials Affidavits		Draft											
	19	0	Signed Hazardous Materials		Draft											
	18	0	Insurance Up-To-Date		Draft											
	17	0	All CO Signed/Returned		Draft											



Wolgast Corporation

Spec Section	#	Rev.	Title	Type	Status	Responsible Contractor	Submit By	Received From	Received Date	Ball In Court	Approvers	Response	Sent Date	Returned Date	Final Due Date	Distributed Date
	16	0	As Built Drawings		Draft											
	15	0	Completed Punch List		Draft											
	14	0	Substantial Completion		Draft											
	13	0	Consent of Surety		Draft											
	12	0	Contractor (2) Yr Guarantee		Draft											

Bid Division: 260000 – Electrical

Bid to Include:

Total Responsibility for Specification Sections:

Section 260000 – Basic Electrical Requirements
Section 260505 – Selective Demolition for Electrical
Section 260519 – Low-Voltage Electrical Power Conductors and Cables
Section 260526 – Grounding and Bonding for Electrical Systems
Section 260529 – Hangers and Supports for Electrical Systems
Section 260533.13 – Conduit for Electrical Systems
Section 260533.16 – Boxes for Electrical Systems
Section 260536 – Cable Trays for Electrical Systems
Section 260553 – Identification for Electrical Systems
Section 260583 – Wiring Connections
Section 216923 – Lighting Control Devices
Section 262200 – Low Voltage Transformers
Section 262416 – Panelboards
Section 262716 – Electrical Cabinets and Enclosures
Section 262726 – Wiring Devices
Section 262813 – Fuses
Section 262816 – Enclosed Switches and Circuit Breakers
Section 262913 – Enclosed Controllers
Section 263323.13 – Central Battery Equipment for Emergency Lighting
Section 265100 – Interior Lighting
Section 265600 – Exterior Lighting
Section 270528 – Pathways for Communication System
Section 271500 – Communications Horizontal Cabling
Section 274125 – Public Address Intercom Communication System
Section 281500 – Integrated Access Control Communication System
Section 281523 – Intercom Entry Systems
Section 284613 – Fire Alarm System

Limited Responsibility for Specification Sections (as it relates to work in this Bid Division):

Section 024119 – Selective Demolition (As it relates to this bid division).
Section 078400 – Firestopping (As it relates to this bid division).
Section 078401 – Firestopping Systems Schedule
Section 079200 – Joint Sealants

Provide all labor, materials, tools, and equipment necessary to perform the work of the specified bid sections. The contractor must also furnish, deliver, unload, store, protect, erect and install all items required for the completion of the work of this bid division in compliance with all drawings and specifications for a complete operational system including but not limited to:

All conduits, boxes, switches, etc., for a complete operational system.

General Inclusions:

1. There is no general contractor associated with this project; any and all reference to a “general contractor” related to the work of this bid division shall be understood to mean the contractor of this bid division.

Bid Division: 260000 – Electrical

2. The contractor for this bid division work is required to include but is not limited to all items, services, tasks, materials, personnel, equipment, etc. identified in this bid division description regardless of the presence of language in other bid division descriptions that is the same or is similar to that found in this contractor's bid division description.
3. Coordination of the work of this bid division with any and all work of other bid division contractors for the scheduling and integration of the work of this contractor.
4. All contractors are responsible for the entire set of plans and specifications, including tables, schedules, and notes.
5. Provide continuous housekeeping and clean-up, and proper legal off-site disposal of any debris generated by this Bid Division's work.
6. Contractor is responsible for own dumpster(s) and all removal and disposal charges thereof. (Use of the Owner's dumpsters is strictly prohibited.)
7. All Contractors are required to inspect the existing project components and are to include all work necessary to complete the work to deliver a fully operational system in compliance with all governing codes.
8. This Contractor shall be responsible for performing all work in full compliance with all health and safety standards including Asbestos Awareness and Notification, Lead Paint Abatement, and all MIOSHA Standards. This Contractor shall also be responsible for satisfying all safety violations and/or fines resulting from the actions or lack of action by this Contractor at the sole expense of this Contractor.
9. Any contractor who compounds a mistake by installing their product on another Contractor's obvious faulty work will assume responsibility for repair of said work.
10. This contractor shall repair and restore any damaged area to an original or better condition with no detectable evidence that the area has been repaired. Repairs must be done by personnel qualified in the execution of the work skilled and licensed in that trade. Whenever possible, repairs to work shall be done by the original installer of the work.
11. Submittal of all insurance, unit pricing, schedule of values, required product data and shop drawings within (2) two weeks of Owner's Notice to commence work.
12. Must provide all submittals within 20 working days of contract award or sooner, unless specifically clarified with the construction manager prior to contract award.
13. Provide all layout and measurements required to perform the work of this Bid Division.
14. The Owner reserves the right to salvage any materials removed from the site during the duration of the project.
15. Coordinate delivery of materials with Construction Manager (48 hours) in advance of the delivery and provide proper personnel and equipment to perform the unloading.
16. Contractor shall submit to the field construction manager a complete written daily field report stating the work being done on site and the number of employees performing the work for each day the Contractor has representatives on site.
17. Contractor shall have a supervisor on site at all times when a crew is present on the job.
18. On Friday, or last workday of each week, the Contractor must update the Master Copy of As-Builts, as it applies to the work of their Bid Division.
19. **Wolgast uses Procore for their CM Software. Please note: We will upload all drawings, and drawing revisions as they are approved, to the Drawings tool. However, it is each contractor's responsibility to verify that they are working from the most up-to-date, approved, drawings.**

Division Inclusions:

1. Contractor shall maintain existing electrical systems in fully functional order in all areas of the building during the duration of the project.
2. Contractor shall coordinate with utility company for purchase and installation of exterior transformers and associated work, if required.
3. Contractor shall coordinate with concrete contractor for locations of housekeeping pads and transformer pads. Concrete is by concrete contractor, layout and coordination is by electrical contractor.
4. Contractor shall furnish and install temporary insulated weather-tight closures of openings created as a result of the work in this scope in exterior surfaces to provide acceptable working conditions and protection for materials, to allow temporary heating, and building security.

Bid Division: 260000 – Electrical

5. Contractor is responsible for disconnecting, removing and legal and proper off site disposal of all indicated existing light fixtures including ballasts and bulbs. Ballasts shall be assumed to contain PCB's. Provide Owner with appropriate documentation of disposal.
6. Remove, clean and reinstall light fixtures where indicated.
7. Removal of electrical line power pole to old portable location.
8. Concrete Patching for mechanical and electrical trades by Bid Division 15000 and 16000.
9. Selective Demolition.
10. No concrete is to be installed until verification of acceptable density testing. Any concrete installed without density verification will become the sole responsibility of the Contractor and may be required to be replaced at the Contractor's expense.
11. Provide hook-up, final connection and interlocks for kitchen exhaust fan and kitchen make-up air units to hood controls.
12. Provide all permits required.
13. Supply and install exterior lights. (Including parking lot light bases.)
14. Remove spoils from site.
15. Provide all means necessary to provide temporary transformers to keep the school in operation before the final power turnover is complete.
16. Provide all cutting and patching required for existing tie-ins.
17. Maintain fire rating at all walls penetrated.
18. All excavation, backfill, compaction, and disposal of spoil for any electrical work placed below finish grade.
19. Coordinate with other trades for rough-in locations.
20. Provide temporary lighting and power distribution. A minimum of 100 watts of temporary lighting per 250 SF of floor area.
21. Provide all plywood or nailers required for mounting of electrical, audio, fire alarm or phone equipment.
22. Furnish any access hatches to mason and drywall contractors for installation required for electrical work.
23. Final hook-up of all equipment for other disciplines of work.
24. Patch all demolished areas affected by the electrical demolition to a condition ready to receive finish materials (finish materials by others, i.e. tile, carpet, etc.).
25. Perform all required demolition required for this trade as shown and specified.
26. Furnish and install all light and power fixtures in cabinetry.
27. Provide all final connection for kitchen equipment.
28. Supply and install a complete & operational fire protection alarm system.
29. Contractor is responsible for complete code compliance of Fire Alarm System.
30. Provide "As Built" Drawings for work.
31. Provide shop drawings to State Fire Marshal Plan Review or governing authority (allowing sufficient time for changes that may be made and must be completed prior to beneficial occupancy.)
32. Provide proper repair of all damaged ceilings, walls, floors, etc., when installing new fixtures.
33. Install pull box and chase conduit for temp control.
34. Provide Owner with training of new equipment.

Project Inclusions:

1. Review the milestone schedules. This bid division's work will require it to be completed at multiple locations and concurrently for some of the work. Prepare your bid proposal accordingly to allow for sufficient manpower and resources.
2. Include costs for all required permits in bid proposal.
3. Provide all required electrical demolition work as documented and for the completion of the new work.
4. Provide all required temporary power and lighting.
5. Provide all required electrical work for switch over from existing system to new system for entire building, existing and addition.

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Bid Division: 260000 – Electrical

6. Remove all existing concrete, drywall, masonry, etc. as required for the installation of new electrical work unless the demolition scope of work is specifically indicated in the documents to be performed by another bid division.
7. Provide all required patching work associated with the installation of electrical work unless the patching scope of work is specifically indicated in the documents to be performed by another bid division.
8. Furnish and install all required backer boards for electrical equipment, fire rated as documented.
9. Provide all required coordination with other Bid Division contractors for installation of all electrical materials and equipment prior to the work commencing.
10. Provide all required power disconnection at existing mechanical equipment and new power connections for new mechanical equipment.
11. Provide final electrical connection for all equipment.
12. Provide service and connections for electric water coolers.
13. Provide service and connections for fume hood.
14. Provide all required demolition of electrical items. Salvage as documented.
15. Provide all required fire alarm / detection items. Provide all required paperwork, payments, certification coordination with Office of Fire Safety and the State Fire Marshal.
16. Furnish and install intercom and clocks at the additions and renovated areas.
17. Provide and install all intercom and access control hardware, conduits, cabling and programming.
18. Furnish and install all lighting control systems and provide Owner training of systems.
19. Furnish and install all conduits for cabling and data outlets as documented.
20. Furnish and install all required raceways and wire mold as documented.
21. Provide power and connection to door hold opens and connect to fire alarm system.
22. Furnish and install all smoke detectors.
23. Furnish access doors as required for installation by other contractors.
- 24. Provide and install all low voltage wiring and connections. Owners access control contractor to make final connections for access control.**
25. This contractor will be required to provide information pertaining to the energy incentive program of the utility company.
26. This bid division is responsible for all cabling work for this project and all final connections to devices and equipment.
27. Must provide all submittals within 25 working days of contract award or sooner, unless specifically clarified with the construction manager prior to contract award.
28. Mandatory attendance at all required pre-installation meetings.
29. Completion of all punch list work within 15 working days or less upon receipt of punch list items, unless specific circumstances occur that are out of control of this bid division contractor dictate otherwise.

Consideration for award:

The ability to begin as soon as areas of work become available. To have proper equipment and responsible personnel to complete the above list of work. To repair any adjacent materials damaged in the execution of the above-listed work. Close cooperation with the Construction Manager and other bid divisions to provide input to develop a working schedule. An approved schedule of values will be required before approval is granted for the first payment request. Expediting communication and follow-up as required.

END OF BID DIVISION 260000

Wolgast Corporation – Construction Management



Wolgast Corporation

Freeland Comm. Schools - Main
710 Powley Drive
Freeland, Michigan 48623
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Submittal Packages

Spec Section	#	Rev.	Title	Type	Status	Responsible Contractor	Submit By	Received From	Received Date	Ball In Court	Approvers	Response	Sent Date	Returned Date	Final Due Date	Distributed Date
#40 26 00 00 - Electrical																
284613 - Fire Alarm System	284613-2	0	Fire Alarm - shop drawings	Shop Drawing	Draft											
284613 - Fire Alarm System	284613-1	0	Fire Alarm - Product Data	Product Information	Draft											
281523 - Intercom Entry Systems	281523-2	0	Intercom - Shop Drawings	Shop Drawing	Draft											
281523 - Intercom Entry Systems	281523-1	0	Intercom - product data	Product Information	Draft											
281500 - Integrated Access Control Hardware Devices	281500-2	0	Controls - shop drawings	Shop Drawing	Draft											
281500 - Integrated Access Control Hardware Devices	281500-1	0	Controls - product data	Product Information	Draft											
274125 - Public Address Intercom Communication System	274125-2	0	Public Intercom - shop drawings	Shop Drawing	Draft											
274125 - Public Address Intercom Communication System	274125-1	0	Public Intercom - product data	Product Information	Draft											
271500 - Communications Horizontal Cabling	271500-1	0	Comm Cabling - product data	Product Information	Draft											
265600 - Exterior Lighting	265600-2	0	Exterior Lighting - product data	Other	Draft											
265600 - Exterior Lighting	265600-1	0	Exterior Lighting - Shop Drawings	Shop Drawing	Draft											
265100 - Interior Lighting	265100-2	0	Interior Lighting - product data	Product Information	Draft											
265100 - Interior Lighting	265100-1	0	Interior Lighting - shop drawings	Shop Drawing	Draft											
263323.13 - Central Battery Equipment	263323.13-2	0	Battery Eqp for Emerg. Lighting	Product Information	Draft											
263323.13 - Central Battery Equipment	263323.13-1	0	Battery Eqp for Emerg. lighting	Shop Drawing	Draft											
262913 - Enclosed Controllers	262913-1	0	Enclosed Controllers - product data	Product Information	Draft											
262816 - Enclosed Switches and Circuit Breakers	262816-1	0	Switches and Breakers - product data	Product Information	Draft											
262716 - Electrical Cabinets and Enclosures	262716-2	0	Electrical Cabinets and Enclosures - product data	Other	Draft											
262416 - Panelboards	262416-1	0	Panelboard - product data and shops	Product Information	Draft											
262200 - Low Voltage Transformers	262200-1	0	Low Voltage Transformers - product data	Product Information	Draft											
260923 - Lighting Control Devices	260923-1	0	Lighting Control Devices - product data and shops	Product Information	Draft											
260536 - Cable Trays for Electrical Systems	260536-2	0	Cable Trays - product data	Product Information	Draft											
260536 - Cable Trays for Electrical Systems	260536-1	0	Cable Trays - shop drawings	Shop Drawing	Draft											
260000 - Basic Electrical Requirements	260000-2	0	Electrical - Shop Drawings	Shop Drawing	Draft											
260000 - Basic Electrical Requirements	260000-1	0	Electrical - Product Data for items listed	Product Information	Draft											
079200 - Joint Sealants	079200-20	0	Joint Sealant - product schedule	Document	Draft											
079200 - Joint Sealants	079200-19	0	Joint Sealant - product data	Product	Draft											



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				Information												
078400 - Firestopping	078400-11	0	Firestopping - product schedule	Document	Draft											
078400 - Firestopping	078400-10	0	Firestopping - product data	Product Information	Draft											
#41 26 00 00 - Electrical Start Up																
	11	0	Copy of all Permits		Draft											
	10	0	Hazardous/AHERA Notifications		Draft											
	9	0	Sub/Supplier Form		Draft											
	8	0	Safety Data Sheets (SDS)		Draft											
	7	0	Safety Policy		Draft											
	6	0	On Site Employee List		Draft											
	5	0	Insurance/Letter of Compl		Draft											
	4	0	Payment/Performance Bonds		Draft											
	3	0	Contracts Signed/Returned		Draft											
	2	0	Schedule of Values		Draft											
	1	0	Post Bid Interview/Proposal Forms		Draft											
#42 26 00 00 - Electrical Close Out																
284613 - Fire Alarm System	284613-4	0	Fire Alarm - close out	Closeouts	Draft											
284613 - Fire Alarm System	284613-3	0	Fire Alarm - manuals	Closeouts	Draft											
281523 - Intercom Entry Systems	281523-3	0	Intercom - manuals	Closeouts	Draft											
281500 - Integrated Access Control Hardware Devices	281500-4	0	Controls - Warranty	Closeouts	Draft											
281500 - Integrated Access Control Hardware Devices	281500-3	0	Controls - maintenance manuals	Closeouts	Draft											
274125 - Public Address Intercom Communication System	274125-5	0	Public Intercom - Warranty	Closeouts	Draft											
274125 - Public Address Intercom Communication System	274125-4	0	Public Intercom - owner training	Closeouts	Draft											
274125 - Public Address Intercom Communication System	274125-3	0	Public Intercom - maintenance data	Closeouts	Draft											
262913 - Enclosed Controllers	262913-2	0	Enclosed Controllers - install instructions	Closeouts	Draft											
262816 - Enclosed Switches and Circuit Breakers	262816-2	0	Switches and Breakers - manufacturers instructions	Closeouts	Draft											
262716 - Electrical Cabinets and Enclosures	262716-3	0	Electrical Cabinets and Enclosures - manufactures instructions	Closeouts	Draft											
262416 - Panelboards	262416-3	0	Panelboard - extra materials	Closeouts	Draft											
262416 - Panelboards	262416-2	0	Panelboard - install instructions	Closeouts	Draft											
262200 - Low Voltage Transformers	262200-2	0	Low Voltage Transformers - install instructions	Closeouts	Draft											
260000 - Basic Electrical Requirements	260000-3	0	Electrical - manuals	Closeouts	Draft											
079200 - Joint Sealants	079200-21	0	Joint Sealant - Warranty	Closeouts	Draft											
078400 - Firestopping	078400-12	0	Firestopping - Warranty	Closeouts	Draft											
	23	0	Final Inspections on permits		Draft											
	22	0	O&M Manuals		Draft											
	21	0	Warranties for Equipment Installed		Draft											
	20	0	Asbestos Materials Affidavits		Draft											
	19	0	Signed Hazardous Materials		Draft											



Wolgast Corporation

Spec Section	#	Rev.	Title	Type	Status	Responsible Contractor	Submit By	Received From	Received Date	Ball In Court	Approvers	Response	Sent Date	Returned Date	Final Due Date	Distributed Date
	18	0	Insurance Up-To-Date		Draft											
	17	0	All CO Signed/Returned		Draft											
	16	0	As Built Drawings		Draft											
	15	0	Completed Punch List		Draft											
	14	0	Substantial Completion		Draft											
	13	0	Consent of Surety		Draft											
	12	0	Contractor (2) Yr Guarantee		Draft											

Bid Division: 310000 – Site Work

Bid to Include:

Total Responsibility for Specification Sections:

Section 003100.1 – Geotechnical Report
Section 311000 – Site Clearing
Section 312000 – Grading
Section 312323 – Fill
Section 329115 – Soil Preparation
Section 329219 – Seeding

Limited Responsibility for Specification Sections (as it relates to work in this Bid Division):

Section 024200 – Selective Demolition
Section 078413 – Penetration Firestopping
Section 079200 – Joint Sealants
Section 312316 – Excavation (Excludes footing and foundation excavation and backfill)

Provide all labor, materials, tools, and equipment necessary to perform the work of the specified bid sections. The contractor must also furnish, deliver, unload, store, protect, erect and install all items required for the completion of the work of this bid division in compliance with all drawings and specifications for a complete operational system including but not limited to:

Clearing and stump removal of site and building areas, rough and fine grading, mass and building excavation, backfill, import and export of soils/fill, topsoil replacement and seeding. Provide all sand base course material for concrete sidewalks, exterior slabs, pads, etc. including placement, grading and compaction.

General Inclusions:

1. There is no general contractor associated with this project; any and all reference to a “general contractor” related to the work of this bid division shall be understood to mean the contractor of this bid division.
2. The contractor for this bid division work is required to include but is not limited to all items, services, tasks, materials, personnel, equipment, etc. identified in this bid division description regardless of the presence of language in other bid division descriptions that is the same or is similar to that found in this contractor’s bid division description.
3. Coordination of the work of this bid division with any and all work of other bid division contractors for the scheduling and integration of the work of this contractor.
4. All contractors are responsible for the entire set of plans and specifications, including tables, schedules, and notes.
5. Provide continuous housekeeping and clean-up, and proper legal off-site disposal of any debris generated by this Bid Division’s work.
6. Contractor is responsible for own dumpster(s) and all removal and disposal charges thereof. (Use of the Owner’s dumpsters is strictly prohibited.)
7. All Contractors are required to inspect the existing project components and are to include all work necessary to complete the work to deliver a fully operational system in compliance with all governing codes.
8. This Contractor shall be responsible for performing all work in full compliance with all health and safety standards including Asbestos Awareness and Notification, Lead Paint Abatement, and all MIOSHA Standards. This Contractor shall also be responsible for satisfying all safety violations and/or fines resulting from the actions or lack of action by this Contractor at the sole expense of this Contractor.
9. Any contractor who compounds a mistake by installing their product on another Contractor’s obvious faulty work will assume responsibility for repair of said work.

Bid Division: 310000 – Site Work

10. This contractor shall repair and restore any damaged area to an original or better condition with no detectable evidence that the area has been repaired. Repairs must be done by personnel qualified in the execution of the work skilled and licensed in that trade. Whenever possible, repairs to work shall be done by the original installer of the work.
11. Submittal of all insurance, unit pricing, schedule of values, required product data and shop drawings within (2) two weeks of Owner's Notice to commence work.
12. Must provide all submittals within 20 working days of contract award or sooner, unless specifically clarified with the construction manager prior to contract award.
13. Provide all layout and measurements required to perform the work of this Bid Division.
14. The Owner reserves the right to salvage any materials removed from the site during the duration of the project.
15. Coordinate delivery of materials with Construction Manager (48 hours) in advance of the delivery and provide proper personnel and equipment to perform the unloading.
16. Contractor shall submit to the field construction manager a complete written daily field report stating the work being done on site and the number of employees performing the work for each day the Contractor has representatives on site.
17. Contractor shall have a supervisor on site at all times when a crew is present on the job.
18. On Friday, or last workday of each week, the Contractor must update the Master Copy of As-Builts, as it applies to the work of their Bid Division.
19. **Wolgast uses Procore for their CM Software. Please note: We will upload all drawings, and drawing revisions as they are approved, to the Drawings tool. However, it is each contractor's responsibility to verify that they are working from the most up-to-date, approved, drawings.**

Division Inclusions:

1. Removal of excess spoils generated by this bid division from site.
2. Barricade trees to protect from construction.
3. Excavation for foundation is by the Concrete Contractor - Bid Division 030100.
4. Selective Demolition of site to within 5 feet of building, including but not limited to fencing, asphalt removal, curb, sidewalk, landscaping, concrete stoops, pipe railings, playground equipment, flag pole, etc.
5. Provide de-watering for work in your Bid Division.
6. Furnish and install all gravel base material; finish grading of gravel, compaction and preparation for all placement of asphalt paving.
7. Finish grading of all topsoil, plant beds and seed. Excavation, backfill, removal and disposal of spoil for all planting and landscape items. Repair all areas of construction to original state, or improving upon by seeding. INCLUDE HERE IF THERE IS NO BID DIVISION 329000.
8. Review the complete geotechnical report, particularly the soil borings. This Bid Division contractor is responsible to provide all designated fill for this project. Any assumed fill to be used from the project site is at the risk of the Contractor.
9. Provide all aggregate base course and sand cushions directly below concrete slabs on grade for buildings and sidewalks and all other exterior concrete +/- 0.1. Cushions to be depth as indicated in contract documents and specifications.
10. All site demolition required for installation of asphalt work and final site work.
11. Engineering layout and grade certifications. All associated excavation, backfill, compaction, and clean up. Connection charges. Street, concrete and pavement cutting, removal, and patching. Barricades and traffic control.
12. Responsible for all required permit for erosion and sedimentation control.
13. Must provide all submittals within 20 working days of contract award or sooner, unless specifically clarified with the construction manager prior to contract award.
14. All seeding required for all areas affected by construction.
15. Aggregate base course to be finished graded after placement and also immediately prior to lay down of asphaltic concrete paving.

Bid Division: 310000 – Site Work

16. All required topsoil. Topsoil to be graded to + .1 feet of designed finish grade after placement and also immediately prior to landscaping activities.
17. All site utilities as it relates to water, storm, sanitary, and gas to within 5 feet of building.
18. Review soil borings, the Sitework Contractor is responsible to provide all designated fill for this project. Any assumed fill to be used from the project site is at the risk of the Contractor.
19. Provide temporary fencing around all additions during construction.
20. Provide all required permits.
21. Patching of asphalt on parking lot disturbed during construction if caused by this Bid Division.
22. Provide all import fill soils and export of all spoil or unusable soils necessary to complete all work or required by the construction documents.
23. Temporary care & maintenance of all plants and lawns until final completion of all work and acceptance by Owner.
24. Notify and correspond with Miss Dig before work commences and throughout the project.
25. All saw cutting of asphalt and concrete as required on site.
26. Tie into all downspouts within 5 feet of the buildings. (Coordinate with Bid Division 222300 – Mechanical)
27. Furnish and install irrigation sleeves as required.
28. Site work Contractor is responsible to provide, install and maintain all erosion control requirements.

Project Inclusions:

1. Review the milestone schedules. This bid division's work will require it to be completed at multiple locations and concurrently for some of the work. Prepare your bid proposal accordingly to allow for sufficient manpower and resources.
2. Provide all required permits. Soil Erosion permit will be provided by this contractor. This contractor is responsible for installation of all required soil erosion materials and all maintaining, monitoring and reporting required for the erosion and sedimentation control permit for the entire duration of the project. Provide inlet filters at all storm catch basins.
3. Remove storm sewer and structure as indicated in the drawings.
4. Install sediment control silt fence. Once the turf is established and final approvals have been received, remove.
5. Install sediment control, inlet protection, and filter drop at catch basins. Upon completion of the project, remove and clean all accumulated sediment at catch basins as documented.
6. All concrete stoops and walks to be removed by this Bid Division.
7. Provide all required saw-cutting and removal of asphalt and concrete material.
8. Provide all stripping of site materials as required for the installation of new work.
9. Provide and install silt fence around topsoil stockpile as indicated in drawings and specifications.
10. Provide all required proof rolling of existing soil.
11. Provide all required stone and sand fill and compaction as required.
12. Provide all required re-grading with fill and removal as necessary to achieve revised grades as documented.
13. Provide all required water, storm sewer and sanitary sewer work 5' outside building wall line unless noted otherwise.
14. Provide and install temporary traffic tracking pads at drives entrances.
15. Provide traffic control as needed.
16. Provide sand base for walks and building pad as documented.
17. Furnish and install all storm and sanitary piping.
18. Provide and install proposed manhole as indicated in drawings and specifications.
19. Provide all required topsoil and fine grading as necessary for the installation of hydroseeding.
20. Patching of existing asphalt drive disturbed during construction if caused by this Bid Division.
21. Provide complete turf restoration including all removal and prep of existing surface and all required watering and fertilizing until the seed is established and is accepted by the owner.
22. Must provide all submittals within 15 working days of contract award or sooner, unless specifically clarified with the construction manager prior to contract award.
23. Mandatory attendance at all required pre-installation meetings.

Bid Division: 310000 – Site Work

24. Completion of all punch list work within 15 working days or less upon receipt of punch list items, unless specific circumstances occur that are out of control of this bid division contractor dictate otherwise.
25. Include an allowance of \$7500.00 for temporary fencing. This must be included by line item on the schedule of values. Temporary fencing allowance to be used at the discretion of the construction manager.

Excludes:

1. Concrete Testing
2. Temporary Bracing.
3. Soil Density Testing
4. Final Site Utility hook-up by Bid Division 222300.

Consideration for award:

The ability to begin as soon as areas of work become available. To have proper equipment and responsible personnel to complete the above list of work. To repair any adjacent materials damaged in the execution of the above listed work. Close cooperation with the Construction Manager and other bid divisions to provide input to develop a working schedule. An approved schedule of values will be required before approval is granted for the first payment request. Expediting communication and follow-up as required.

END OF BID DIVISION 310000



Wolgast Corporation

Freeland Comm. Schools - Main
 710 Powley Drive
 Freeland, Michigan 48623
 9896955527

Submittal Packages

Spec Section	#	Rev.	Title	Type	Status	Responsible Contractor	Submit By	Received From	Received Date	Ball In Court	Approvers	Response	Sent Date	Returned Date	Final Due Date	Distributed Date
#43 31 00 00 - Site Work																
329219 - Seeding	329219-1	0	Seeding - product data	Product Information	Draft											
329115 - Soil Preparation	329115-1	0	Soil - product data	Product Information	Draft											
#44 31 00 00 - Site Work Start Up																
	11	0	Copy of all Permits		Draft											
	10	0	Hazardous/AHERA Notifications		Draft											
	9	0	Sub/Supplier Form		Draft											
	8	0	Safety Data Sheets (SDS)		Draft											
	7	0	Safety Policy		Draft											
	6	0	On Site Employee List		Draft											
	5	0	Insurance/Letter of Compl		Draft											
	4	0	Payment/Performance Bonds		Draft											
	3	0	Contracts Signed/Returned		Draft											
	2	0	Schedule of Values		Draft											
	1	0	Post Bid Interview/Proposal Forms		Draft											
#45 31 00 00 - Site Work Close Out																
329219 - Seeding	329219-2	0	Seeding - maintenance data	Closeouts	Draft											
	23	0	Final Inspections on permits		Draft											
	22	0	O&M Manuals		Draft											
	21	0	Warranties for Equipment Installed		Draft											
	20	0	Asbestos Materials Affidavits		Draft											
	19	0	Signed Hazardous Materials		Draft											
	18	0	Insurance Up-To-Date		Draft											
	17	0	All CO Signed/Returned		Draft											
	16	0	As Built Drawings		Draft											
	15	0	Completed Punch List		Draft											
	14	0	Substantial Completion		Draft											
	13	0	Consent of Surety		Draft											
	12	0	Contractor (2) Yr Guarantee		Draft											

PART 1 – GENERAL

1.01 DEFINITION

- A. Clarification Request forms shall be used to document all questions regarding bidding documents and technical specifications. Please use **ONE** Clarification Form for each item.
- B. The Clarification Request form follows as page 2 of this Section.

1.02 PREPARATION OF CLARIFICATION REQUEST FORM

- A. The Contractor shall complete the following items on the Clarification Request form:
 - 1. Date
 - 2. Contractor Name
 - 3. Contractor contact person
 - 4. Contractor email, phone, and fax number
 - 5. Item(s) for clarification
- B. The Contractor shall forward the Clarification Request form, via fax or email, to the Construction Manager **no later than 5 days prior to bid due date**. Requests from bidders for clarification, or interpretation of the bidding documents must reach the Project Team five days before the bid date, or by the date addressed in the pre-bid agenda. Any bidder clarifications which reach the project team after such dates have passed will not be considered.

1.03 RESPONSIBILITIES FOR COMPLETION OF CLARIFICATION REQUEST FORMS

- A. The Construction Manager shall review and number Clarification Request forms as they are received.
- B. Clarification Requests regarding BIDDING INSTRUCTIONS OR PROCEDURES shall be answered by the Construction Manager.
- C. Clarification Requests regarding the DESIGN and/or TECHNICAL SPECIFICATIONS shall be answered by the Architect. The Construction Manager shall forward technical specification clarifications to the Architect, via fax or mail, as they are received.

1.04 RESPONSE TO CLARIFICATION REQUEST FORMS

- A. The Architect shall review each Clarification Request form received and return responses to the Construction Manager.
- B. As noted in Items 1.03.B and 1.03.C above, it is the responsibility of both the Construction Manager and the Architect to respond to Clarification Request forms.
- C. Responses shall be issued via the “Response” section of the Clarification Request form or Addenda.

CLARIFICATION REQUEST FORM

Date: _____

Wolgast Clarification Request #: _____

To: Wolgast Corporation
[Clint Clark cclark@wolgast.com](mailto:cclark@wolgast.com) or [Lisa Donahue ldonahue@wolgast.com](mailto:ldonahue@wolgast.com)
4835 Towne Centre Road, Suite 203
Saginaw, MI 48604
Phone (989) 790-9120, Fax (989) 790-9063

From: _____
Contractor Name _____
Contact Name _____
Email Address _____
Phone # _____ Fax # _____

Bid Division # and Name: _____

CSI Code (If Applicable): _____

Drawing #: _____ Detail or Item #: _____

Reason for Request: More Detail Needed Engineering Clarification Alternate Proposal Other

Project: Freeland Community Schools

Site Location: BP 1 2024 Classroom/Secure Vestibule

ITEM(S) FOR CLARIFICATION OF BID: (Please use one form for each item)

Please review and respond to the following item(s) for clarification:

RESPONSE: ITEM TO BE INCLUDED IN ADDENDUM

Construction Manager: _____
Signature Date

Architect: _____
Signature Date

END OF SECTION 00310

PART 1 – GENERAL

1.01 BID SECURITY

- A. Each Proposal shall be accompanied by Bid Security pledging that the Bidder will enter into a contract with the Owner on the terms stated in the Proposal, and will, if required, furnish bonds as described in Section 00600. Should the Bidder refuse to enter into such contract or fail to furnish such Bonds, the amount of the Bid Security shall be forfeited to the Owner as liquidated damages, not as a penalty.
- B. Bid Security shall be in the amount of five percent (5%) of the Base Bid(s).
- C. Bid Security for each Proposal containing Bids for multiple Bid Divisions shall be in the amount of five percent (5%) of the total Base Bids for the highest-priced combination of Bid Divisions included in the Proposal.
- D. Bid Security may take the form of a **Bid Bond, a Cashier's Check, or a Money Order made payable to the Owner.** When submitting a Cashier's Check or Money Order a separate check or money order must accompany each Bid Division.
- E. Bid Security that is in the form of a Cashier's Check or Money Order will be returned to Bidders within a reasonable period after construction contracts have been executed, returned, and approved by the Owner.

END OF SECTION 00410

PART 1 – GENERAL

1.01 OWNER/CONTRACTOR AGREEMENT

- A. The Agreement between the Owner and the Contractor will be written on the Owner's standard Owner/Contractor Agreement Form. A sample of this Form appears as Section 00510.
- B. The Owner/Contractor Agreement Form will be filled in by the Owner, as appropriate for each Contractor and will be sent to each Contractor.
- C. The executed Owner/Contractor Agreement, the General Conditions and the other Contract Documents will be the entire, integrated Contract between the Owner and each Contractor.
- D. Upon receipt of an Owner/Contractor Agreement, each successful Bidder shall review it for completeness and accuracy, execute it and return it to the Owner's Representative for delivery to the Owner.
- E. Each successful Bidder shall submit all required post-bid documents, including Labor and Material Payment Bond and Performance Bond (Section 00600) unless waived by the Owner, Certificates of Insurance (Section 00650), Schedule of Values (Section 00670), Subcontractor and Supplier Listing (Section 00680), and Employee Listing (Section 00690) as a prerequisite to execution of the Owner/Contractor Agreement
- F. The Owner will execute each Owner/Contractor Agreement after it has been properly executed by the Bidder and after all required post-bid documents have been submitted.

1.02 NOTICE TO PROCEED

- A. The Owner may elect to issue Notices to Proceed prior to the execution of Owner/Contractor Agreements.
- B. Upon receipt of Notice to Proceed, each Contractor shall commence work in accord with the conditions contained in the Notice to Proceed
- C. Regardless of the provisions of any Notice to Proceed or of this Section, no Contractor shall commence work until all required insurance is in force and Certificates of Insurance (Section 00650) have been submitted to the Owner's Representative for delivery to the Owner.
- D. Prior to commencement of work, Contractors shall submit evidence satisfactory to the Owner that required bonds will be furnished and shall deliver the Bonds by the date the Contractor executes the Owner/Contractor Agreement.
- E. The Owner may include Notice to Proceed in Purchase Orders.

1.03 COMMENCEMENT OF WORK

- A. Each Contractor shall commence work immediately upon receipt of Notice to Proceed under the conditions contained in the Notice to Proceed or upon execution of an Owner/Contractor Agreement, whichever is earlier.

END OF SECTION 00500

**SAMPLE
OWNER-CONTRACTOR
CONTRACT ON
FOLLOWING PAGE**

END OF SECTION 00510



Document A132™ - 2019

Standard Form of Agreement between Owner and Contractor, Construction Manager as Adviser Edition

AGREEMENT made as of the «Day» of «Month» in the year «Year»
(in words, indicate day, month and year)

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

«Owner Name»
«Owner Address»
«Owner CSZ»

Telephone:
Facsimile:

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

«Contractor»
«Address»
«CSZ»

Telephone:
Facsimile:

for the following Project:
(Name, legal status, address and other information)

«Project Description»
«Project Name»
«Project Address»
«Project CSZ»

«Bid Division» - «Description»

The Construction Manager is:
(Name, legal status, address and other information)

Wolgast Corporation
4835 Towne Centre Road, Suite 203
Saginaw, MI 48604
Telephone: (989) 790-9120
Facsimile: (989) 790-9120

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

«Architect Name»
«Architect Address»
«Architect CSZ»

Telephone:
Facsimile:

The Owner and Contractor agree as set forth below.

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

This document is intended to be used in conjunction with AIA Documents A232™-2019, General Conditions of the Contract for Construction. Construction Manager as Adviser Edition: B132™-2019, Standard Form of Agreement Between Owner and Architect, Construction Manager as Adviser Edition; and C132™-2019, Standard Form of Agreement Between Owner and Construction Manager as Adviser.

AIA Document A232™-2019 is adopted in this document by reference. Do not use with other general conditions unless this document is modified.

TABLE OF ARTICLES

1	THE CONTRACT DOCUMENTS
2	THE WORK OF THIS CONTRACT
3	DATE OF COMMENCEMENT AND DATES OF SUBSTANTIAL COMPLETION
4	CONTRACT SUM
5	PAYMENTS
6	DISPUTE RESOLUTION
7	TERMINATION OR SUSPENSION
8	MISCELLANEOUS PROVISIONS
9	ENUMERATION OF CONTRACT DOCUMENTS

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 the 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 Modifications, 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, or as follows:

§ 2.1 Provide all work described by but not limited to Bidding Requirements, Contract Forms and Conditions of the Contract, Additional Conditions of the Contract, General Conditions of the Contract for Construction, Division 1 General Requirements and:

BID DIVISION: _____ «Bid Division» - «Description»

Provide all labor, materials, tools and equipment necessary to perform the work of the specified bid sections. The Contractor must also furnish, deliver, unload, store, protect erect and install all items required for the satisfactory completion of the work of this bid division (as indicated on drawings and associated specifications.) Including but not limited to:

«Written Description» _____

INCLUDING SECTIONS: «Including Sections1» _____

Limited Responsibility: «Limited Responsibility» _____

§ 2.2 Pre-Bid Meeting Agenda and Meeting Minutes dated: _____ «Pre Bid Date»

§ 2.3 Post-Bid Interview dated: _____ «Post Bid Interview Date»

§ 2.4 Pre-Construction Meeting Agenda and Meeting Minutes dated: _____ «Pre Con Date»

§ 2.5 Performance Bond and Labor and Material Payment Bond required: _____ «Bond Required»

§ 2.6 Project Start Date: _____ «Project Start Date»

§ 2.7 Completion Date: _____ «Completion Date»

- § 2.8 All submittals and shop drawings required by the specifications must be submitted by: «Submittals Due By»
- § 2.9 Provide all clean-up and legal off-site disposal of all debris generated by any work performed by this Contract including general housekeeping of employee generated trash and garbage (i.e. drink cups, food wrappers, bag, etc.).
- § 2.10 The Bid Division Description(s) identify the scope of work, areas of responsibility and specific work to be included in the Contract Amount. If any conflict is found between the architect/engineer specifications and the Bid Division Descriptions regarding the scope of work to be performed, the Bid Division Description(s) shall govern. Further, if a conflict occurs between the Bidding Requirements, the General Requirements, the Specifications, the Bid Division Description(s), the Drawings, or the Addenda(s), the most stringent requirement shall apply.
- § 2.11 Other Special provisions: Article 8.6
- § 2.12 Compliance with EPA AHERA for Asbestos: The Contractor must adhere to all EPA AHERA and Michigan State Asbestos Regulations for Asbestos and other hazardous materials.
- § 2.13 Compliance with Lead-Containing Materials: ALL Contractors, Subcontractors and Sub-Subcontractors shall adhere to the Environmental Protection Agency (EPA) lead-based paint regulation titled the “Renovation, Repair and Paint (RRP) Rule”. Included under this law are “Child Occupied Facilities” (COFs). COFs encompass locations of pre-1978 constructed buildings where children under age six (6) regularly visit, such as kindergarten rooms, 1st grade classrooms, applicable restrooms, pre-school and day care centers. Therefore portions of each pre-1978 constructed school building falls under the RRP Rule. Any contractor working on this project who disturbs painted surfaces in COF spaces shall ensure that they adhere to all aspects of the RRP Rule. This included but is not limited to meeting the requirements for being a Certified Firm, having a Certified Lead Renovator involved and following applicable lead safe work practices. Furthermore, all Contractors shall be responsible to comply with all applicable Federal and Michigan State lead regulations including, but not limited to, 29CFR Part 1926.62 of the OSHA Lead Construction Standards, (Part 603 of the Michigan State Standards). All costs associated with regulatory compliance shall be borne by the Contractor.
- § 2.14 This Contractor is responsible for all safety issues for all work that he has effected until his project is complete.

ARTICLE 3 DATE OF COMMENCEMENT AND DATES OF SUBSTANTIAL COMPLETION

§ 3.1 The date of commencement of the Work shall be:

- 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 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 of the Project or Portions Thereof

§ 3.3.1 Subject to adjustments of the Contract Time as provided in the Contract Documents, the date of Substantial Completion of the Work of all of the Contractors for the Project will be : See Milestone Schedule for details
(Insert the date of Substantial Completion of the Work of all Contractors for the Project.)

«Substantial Completion Date»

§ 3.3.2 The Contractor agrees that time is of the essence and to start work when directed by the Construction Manager and to furnish sufficient materials and a sufficient number of properly skilled works, so as not to delay the work of any other Contractor or completion of the project.

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 one of the following:
(Check the appropriate box.)

- Stipulated Sum, in accordance with Section 4.2 below:
- Cost of the work plus the Contractor’s Fee without a Guaranteed Maximum Price, in accordance with Section 4.3 below:
- Cost of the Work plus the Contractor’s Fee with a Guaranteed Maximum Price, in accordance with Section 4.4 below

(Based on the selection above, complete Section 4.2, 4.3 or 4.4 below.)

§ 4.2 Stipulated Sum

§ 4.2.1 The Stipulated Sum shall be «Contract Amount» Dollars (\$«Contract Amount »), subject to additions and deductions as provided in the Contract Documents.

Contract amount includes: Base Bid \$«Base Bid», PLM Bond Amount \$«Bond Amount», Alternates \$«Alternate» totaling \$«Contract Amount ».

§ 4.2.2 Alternates

§ 4.2.2.1 Alternates, if any, included the Contract Sum:

Item	Price
<u>«Alternate Description»</u>	

§ 4.2.2.2 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
------	-------	---------------------------

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

Item	Price
------	-------

§ 4.2.4 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)
------	-----------------------	-------------------------

ARTICLE 5 PAYMENTS

§ 5.1 Progress Payments

§ 5.1.1 The Construction Manager will provide a Contractor Invoice Form to the Contractor for submitting the Contractor’s request for payment each month. All reference to “Application for Payment” or “Progress Payment Request” shall mean “Contractor Invoice Form”. Based upon Applications for Payment submitted to the Construction Manager by the Contractor and upon certification of the Application for Payment by the Construction Manager and 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:

See Contractor Invoice Form Due Date on Attachment “A”

§ 5.1.3 Provided an Application for Payment is received by the Construction Manager not later than the “Contractor Invoice Form Due Date” found on Attachment “A”, the Owner shall make payment of the amount certified in the Application for Payment to the Contractor for all undisputed amounts not later than forty-five (45) days after the “Owner Approves Invoice” date found on Attachment “A”. If an Application for Payment is received by the Construction Manager after the application date fixed above, payment for all undisputed amounts shall be made by the Owner after the Construction Manager receives the Application for Payment and at the payment date for the Applications for Payment of the following month.

(Federal, state or local laws may require payment within a certain period of time.)

§ 5.1.4 Progress Payments Where the Contract Sum is Based on a Stipulated Sum

§ 5.1.4.1 Each Contractor Invoicing Form and CM prepared Progress Payment Request Form 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 Construction Manager and Architect may require. This approved schedule of values, unless objected to by the Construction Manager, shall be used as a basis for reviewing the Contractor’s Invoicing Form and CM prepared Progress Payment Form.

§ 5.1.4.2 The Contractor Invoicing Form 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.

§ 5.1.4.3 In accordance with AIA Document A232™-2019, General Conditions of the Contract for Construction, Construction Manager as Adviser Edition, and subject to other provisions of the Contract Documents, the amount of each progress payment shall be computed as follows:

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

- .1 Take that portion of the Contract Sum properly allocable to completed Work as determined by multiplying the percentage completion of each portion of the Work by the share of the total Contract Sum allocated to that portion of the Work in the schedule of values, less retainage of ten percent (10%). Pending final determination of cost to the Owner of changes in the Work, amounts not in dispute may be included as provided in Section 7.3.9 of the General Conditions; and
- .2 Add 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, less retainage of ten percent (10%); and
- .3 That portion of Construction Change Directives that the Architect determines, in the Architect’s professional judgment, to be reasonably justified; and
- .4 Add, upon Substantial Completion of the Work, a sum sufficient to increase the total payments to ninety percent (90%) of the Contract Sum, less such amounts as the Construction Manager and Owner recommends and the Architect determines for incomplete Work and unsettled claims; and
- .5 Add, if final completion of the Work is thereafter materially delayed through no fault of the Contractor, any additional amounts payable in accordance with Section 9.10.3 of the General Conditions.

§ 5.1.4.3.2 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 Construction Manager or Architect has previously withheld or nullified a Certificate for Payment as provided in Article 9 of AIA Document A232-2019.
- .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 A232-2019; and

.5 Retainage withheld pursuant to Section 5.1.7.

§ 5.1.4.4 The Contractor shall submit to the Construction Manager an itemized progress payment request by the date required in Section 01045 of the Project Manual. The progress payment request is referred to as the Contractor Invoice Form. After the schedule of values is submitted to and approved by the Construction Manager, the Construction Manager will prepare a Contractor Invoice Form master template in accordance with the approved schedule of values and provide it to the Contractor for use to prepare all progress payment requests. The Contractor shall submit a signed and notarized original Contractor Invoice Form for each monthly progress payment request. It shall be accompanied by such supporting data and documents the Owner, Construction Manager and Architect may require substantiating the Contractor's right to payment.

1. Contractor Invoice Form as defined as: See Section 1045 (Contractors Application for Payment)
2. Cost Control Manual as defined as: See Section 1045 (Contractors Application for Payment)
3. Progress Payment Request as defined as: See Section 1045 (Contractors Application for Payment)

§ 5.1.7 Retainage

§ 5.1.7.1 For each progress payment made prior to when the Work of this Contract is substantially complete, 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.)

Ten percent (10%) retainage

§ 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 when the entire Work of this Contract is substantially complete, including modifications for completion of portions of the Work as provided in Section 3.4.2, insert provisions for such modifications.)

Ten percent (10%) retainage shall be held back until the project is complete.

§ 5.2 Final Payment

§ 5.2.1 Final Payment Where the Contract Sum is Based on a Stipulated Sum

§ 5.2.1.1 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 A232-2019, and to satisfy other requirements, if any, which extend beyond final payment; and
- .2 a final Certificate for Payment or Project Certificate for Payment has been issued by the Architect.

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

§ 5.2.2 The following must be submitted to the Construction Manager before the acceptance and submission of final payment in addition to requirements of other sections:

- .1 All required closeout documents including warranties, guarantees, operation and maintenance documents, and training;
- .2 As-Builts Drawings;
- .3 Itemized lists of all surplus and extra materials required per specifications at which time the Construction Manager will schedule the delivery of such materials to the owner by the Contractor;
- .4 Consent of Surety for Final Payment;
- .5 Submit Releases and Final Unconditional Waivers of Lien from all suppliers and subcontractors;
- .6 Submit certification stating that no materials containing asbestos were incorporated into the Work;
- .7 Submit certification that all punch list items have been completed.

§ 5.3 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.)

Five Percent (5%) per annum % See MCL 438.31

ARTICLE 6 DISPUTE RESOLUTION

§ 6.1 Initial Decision Maker

The Architect will serve as Initial Decision Maker pursuant to Section 15 of AIA Document A232-2019, unless the parties appoint below another individual, not a party to this Agreement, to serve as 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.)

N/A

§ 6.2 Binding Dispute Resolution

For any Claim subject to, but not resolved by, mediation pursuant to Section 15 of AIA Document A232-2019, the method of binding dispute resolution shall be as follows:

(Check the appropriate box.)

- Arbitration pursuant to Section 15 of AIA Document A232-2019
- 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.

§ 6.2.1 In an effort to resolve any conflicts that arise during the construction of the Project or following the completion of the project, the Owner and the Contractor agree that all disputes between them arising out of or relating to this Agreement shall be submitted to non-binding mediation, unless the parties mutually agree otherwise. All parties shall endeavor to settle disputes by mediation in accordance with the Construction Industry Mediation Rules of the American Arbitration Association currently in effect. Demand for mediation shall be filed in writing with the other party of this Agreement and with the American Arbitration Association. A demand for mediation shall be made within a reasonable time after the claim, dispute, or other matter in writing to the other party. In the event non-binding mediation fails to resolve any or all of the disputes or claims, the parties may pursue relief through any other legal and/or equitable means.

§ 6.2.2 The Owner reserves the right in its discretion to require consolidation or joinder of any mediation relating to this Agreement with another mediation involving an independent contractor or consultant engaged by the Owner in connection with the Project. Agreement in the event the Owner believes such consolidation or joinder is necessary in order to resolve a dispute or avoid duplication of time, expense, or effort.

§ 6.2.3 In the event the Owner is involved in a dispute which is not subject to mediation involving a person or entity not a party to this Agreement, the mediation provision of this Article shall be deemed to be void and nonexistent in the event the Owner, in its discretion, determines the Contractor should become a part to that dispute by joinder or otherwise.

§ 6.2.4 The Owner reserves the right to require any mediation to be held near the Owner's principal place of business.

ARTICLE 7 TERMINATION OR SUSPENSION

§ 7.1 Where the Contract Sum is a Stipulated Sum

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§ 7.1.1 The Contract may be terminated by the Owner or the Contractor as provided in Article 14 of AIA Document A232-2019.

§ 7.1.2 The Work may be suspended by the Owner as provided in Article 14 of AIA Document A232-2019.

ARTICLE 8 MISCELLANEOUS PROVISIONS

§ 8.1 Where reference is made in this Agreement to a provision of AIA Document A232-2019 or another Contract Document, the reference refers to that provision as amended or supplemented therein, or as amended or supplemented by other provisions of the Contract Documents.

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

«Owner Name»
«Owner Address»
«Owner CSZ»

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

«Contractor»
«Address»
«CSZ»

§ 8.4 Neither the Owner's nor the Contractor's representative shall be changed without ten days written 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 A132™-2019, Standard Form of Agreement Between Owner and Contractor, Construction Manager as Adviser Edition, and elsewhere in the Contract Documents.

Type of Insurance	Limit of Liability (\$0.00) Per Specifications
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§ 8.5.2 The Contractor shall provide bonds as set forth in Article 11 of AIA Document A132™-2019, and elsewhere in the Contract.

§ 8.6 Other provisions:

§ 8.6.1 Project Team is comprised of the Owner, Construction Manager, Owner's Representative and Architect.

§ 8.6.2 The Bid Division Description(s) outline the work items that the Contractor is responsible to provide for the Project regardless of any customary practices or agreements of that trade.

§ 8.6.3 If a Project Team member has reasonable objection to the actions of or the manner by which work is performed by a person directly employed by the Contractor or by any subcontractor of the Contractor, the Contractor shall propose another to whom the Project Team has no reasonable objection. Any cost associated with the removal and replacement of such a person shall be at the expense of the Contractor.

§ 8.6.4 All Change Orders and Change Directives will be initiated by a Change Event. (Reference Sections 01051, and 01053 of the Project Manual). The Change Event will be the instrument by which the Contractor will submit a detailed and itemized cost proposal for a proposed change for review by the Construction Manager, Owner's Representative and Architect, and the approval by the Owner, before the contract change is issued.

§ 8.6.5 A Change Event shall not alter the Contractor's obligation to comply with the process of filing claims in accordance with other provisions of this agreement.

§ 8.6.6 All Contractors must conform to the provisions of the Michigan Right-To-Know Law, 1986 PA 80.

§ 8.6.7 All Contractors must have available on site a copy of all Safety Data Sheets and in addition provide a copy to the Construction Manager. The Construction Manager will return the copy of the Contractor's Safety Data Sheets at the completion of the project.

§ 8.6.8 The Contractor shall include similar dispute resolution provisions in all agreements with subcontractors, sub-consultants, suppliers, or fabricators so retained, thereby providing for a consistent method of dispute resolution among the parties to those agreements.

§ 8.6.9 In the event of any inconsistency between this agreement and the General Conditions of the Contract for Construction (the "General Conditions"), the terms of this agreement shall govern.

§ 8.6.10 Claims by the Owner arising under this Agreement shall be subject to the limitations provisions defined in Michigan law, except that in no event shall a claim by the Owner be deemed untimely if filed within six (6) years of the final project completion. This provision is acknowledged to apply notwithstanding any other and shorter time frames contractually applicable to claims of the Contractor.

§ 8.6.11 The provisions of the General Conditions related to any waiver of subrogation are hereby deleted from the document and shall be deemed to have no effect. Further, any provision interpreted as the Owner waiving consequential or other indirect damages shall be ineffective and void.

§ 8.6.12 The modifications made to AIA Document A232-2019 Edition by the Owner are hereby incorporated into this Agreement.

§ 8.6.13 All specified insurance certificates and/or insurance policies must be received by the Construction Manager prior to the Contractor commencing work. The Contractor agrees to furnish a performance bond, and labor and materials payment bond for the full amount of this contract, including change orders.

ARTICLE 9 ENUMERATIONS OF CONTRACT DOCUMENTS

§ 9.1 This Agreement is comprised of the following documents:

- .1 AIA Document A132™-2019, Standard Form of Agreement Between Owner and Contractor, Construction Manager as Adviser Edition
- .2
- .3 AIA Document A232™-2019, General Conditions of the Contract for Construction, Construction Manager as Adviser Edition
- .4
- .5 The Drawings are as follows, and are dated «Drawings Dates» unless a different date is show below: See Attachment "C"

Number	Title	Date
--------	-------	------

- .6 The Specifications are those contained in the Project Manual dated «Manual Dated» unless a different date is shown below: See Attachment "B"

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

- .7 The Addenda, if any:

Number	Date	Pages
<u>«Addendum 1»</u>	<u>«Adm Date»</u>	

«Addendum 2» «Adm 2 Date»
«Addendum 3» «Adm 3 Date»

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:

Supplementary and other Conditions of the Contract: Those contained in the Project Manual dated «Manual Dated» unless a different date is shown below: See Attachment “B”

Document	Title	Date	Pages
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.9 Other documents, if any listed below:

(List here any additional documents that are intended to form part of the Contract Documents. AIA Document A232-2019 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.)

Pre Bid Meeting and Agenda, Post Bid Interview Form, and Pre Construction Meeting and Agenda

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

OWNER
«Owner Name»

CONTRACTOR
«Contractor»

(Signature)

(Signature)

«Owner and Title»
(Printed name and title)

(Printed name and title)

(Date)

(Date)

PART 1 – GENERAL

1.01 BID BONDS

- A. Bid Security must be in the form of a Bid Bond, or a certified check made payable to the Owner.
- B. When a Bid Bond is submitted, the Owner shall be listed as obligee.
- C. When a Bid Bond is submitted, the attorney-in-fact that executes the bond on behalf of the Surety shall attach to the Bond a certified, current copy of their Power of Attorney.
- D. **THE BID BOND AND ALL OTHER BONDS MUST BE ISSUED BY A SURETY COMPANY LICENSED AS SUCH TO DO BUSINESS IN THE STATE OF MICHIGAN.**

1.02 LABOR & MATERIAL PAYMENT BONDS AND PERFORMANCE BONDS

- A. The Owner reserves the right to require any successful Bidder to furnish both a Labor and Material Payment Bond, and a Performance Bond, each in the amount of one hundred percent (100%) of their contract amount.
- B. **THE LABOR & MATERIAL PAYMENT BOND AND THE PERFORMANCE BOND MUST BE ISSUED BY A SURETY COMPANY LICENSED AS SUCH TO DO BUSINESS IN THE STATE OF MICHIGAN.**
- C. When required, Labor and Material Payment Bonds and Performance Bonds must be separate. The combined form will not be accepted. Labor & Material Payment Bonds and Performance Bonds must be submitted on AIA Document A312, 2010 edition, without modifications.
- D. When submitted, Labor and Material Payment Bonds and Performance Bonds shall include:
 - 1. Full name and address of Contractor Surety and Owner.
 - 2. The proper Contract Date.
 - 3. The exact amount of the Contract.
 - 4. A description of the contract work / project.
 - 5. The Owner's name and address.
 - 6. An incorporation by reference of the contract terms.
 - 7. Language obligating the Surety, jointly and severally, with the Contract to the Owner
 - 8. The condition for discharge to the Surety.
 - 9. Signature.
 - 10. Corporate Seal, if applicable.
 - 11. Notarization.
 - 12. Power of Attorney.

1.03 SUPPLY BONDS

- A. The Owner reserves the right to require any direct supplier to furnish a Supply Bond in the amount of one hundred percent (100%) of their contract amount.
- B. Supply Bonds shall include all information required above (reference 1.02C above) for Labor and Material Payment Bonds and Performance Bonds.
- C. **ALL SUPPLY BONDS SHALL BE LEGAL AND ENFORCEABLE IN THE STATE OF MICHIGAN.**

1.04 BOND COSTS IN BIDS

- A. Do not include costs for Labor and Material Payment Bond(s), Performance Bond(s), or Supply Bond(s) in Base bid. State the cost of such Bond(s) separately, in the space(s) provided on the Proposal Form (Section 00300).

1.05 SUBMISSION OF BONDS

- A. Bonds shall be submitted to the Construction Manager for delivery to the Owner within fifteen (15) days following the date of issue of the Contract.
- B. Bonds must be submitted prior to contract execution and accepted by the Owner before work may begin on-site.
- C. If the work is commenced prior to contract execution in response to a Notice to Proceed (reference Section 00500), the Contractor shall, prior to commencement of the work, submit evidence satisfactory to the Owner that required bonds will be furnished, and shall deliver the Bonds by the date the Bidder executes the Owner/Contractor Agreement (reference Section 00510).

END OF SECTION 00600

PART 1 – GENERAL

1.01 INSURANCE CERTIFICATES

- A. Each Contractor shall provide, prior to the beginning of Work, a certificate of insurance for delivery to the Owner indicating that all required insurance coverage is in force.
- B. Use standard Insurance Certificate Form. The Accord Form 25 (2016/03) are preferable forms. These forms should be obtained from your Insurance agent.
- C. Issue all certificates to: **Freeland Community Schools**
710 Powley Drive
Freeland, MI 48623
- D. Certificates must show as ‘additional insured’ the Owner, **Freeland Community Schools**, the Architect, **The Collaborative**, and the Construction Manager, **WOLGAST CORPORATION**.
- E. A “Letter of Compliance” must be completed and submitted along with the certificate of insurance. The “Letter of Compliance” form is Page 3 of this section.
- F. **Insurance certificates must be completed as follows: (please refer to corresponding numerals on the sample certificate (following instructions) and also reference the “Section 00700 - General Conditions of the Contract for Construction.”**
1. This blank is to be dated the date the certificate of insurance is issued.
 2. This blank is to provide the complete name and address of the insurance agency issuing the certificate.
 3. This blank is to provide the full name and address of the “prime contractor.”
 4. These blanks are to provide the name (or names) of the insurance company (ies) providing coverage for the specific coverage issued on the certificate.
 5. General Liability
 - a. General Liability – All blanks must be checked in this section and policies must be on an “occurrence” basis.
 - b. Policy Number – A policy number must be listed here.
 - c. Policy “effective” and “expiration” dates must be listed in these two blanks.
 - d. This section must be filled in with dollar amounts (listed in thousands). Please refer to the example on the following page.
 6. Automobile liability
 - a. These blanks must be filled in with either:
Option 1: Any Auto, Hired, and Non-Owned automobiles OR
Option 2: All Owned Autos (Priv. Pass.), All Owned Autos (Other than Priv. Pass.), Hired Autos, and Non-Owned Autos.
 - b. Policy Number – A policy number must be listed here.
 - c. Policy Effective and Expiration dates must be listed in these two blanks.
 - d. This Section must be filled in with dollar amounts (in thousands).
 7. Excess Liability (Provide \$2 million Excess Liability Umbrella policy):
 - a. This blank must be checked with the “Umbrella Form.”
 - b. Policy Number – A policy number must be listed here.
 - c. Policy Effective and Expiration dates must be listed in these blanks.
 - d. If this section is required (see Item 7 above), both of these blanks must be filled in with a minimum of \$2,000,000 and \$2,000,000.

8. Worker's Compensation
 - a. Nothing needs to be checked here.
 - b. Policy Number – A policy number must be listed here.
 - c. Policy Effective and Expiration dates must be listed in these blanks.
 - d. These blanks must be filled in with minimum limits as follows:
 - \$500,000 (each accident)
 - \$500,000 (disease policy limits)
 - \$500,000 (disease each employee)
9. This section need not be completed unless some unique coverage is required for a certain type of job.
10. This section should contain the listing of the additional insured as in 1.01D. The names of the Owner, Architect, and Construction Manager must be listed here.
11. The Owner should be listed here, as this is the actual Certificate Holder. List the Owner as follows:

Freeland Community Schools

12. This blank must show the number thirty (30), indicating that the Owner and all additional insured parties will receive at least thirty (30) days' notice of cancellation of any of the policies listed on the certificate.
13. The certificate must be signed by a licensed insurance agent or representative of the insurance company in order to be valid.

NOTE: Sample Certificate of Liability and Letter of Compliance follows.



CERTIFICATE OF LIABILITY INSURANCE

DATE (MM/DD/YYYY)
(1)

THIS CERTIFICATE IS ISSUED AS A MATTER OF INFORMATION ONLY AND CONFERS NO RIGHTS UPON THE CERTIFICATE HOLDER. THIS CERTIFICATE DOES NOT AFFIRMATIVELY OR NEGATIVELY AMEND, EXTEND OR ALTER THE COVERAGE AFFORDED BY THE POLICIES BELOW. THIS CERTIFICATE OF INSURANCE DOES NOT CONSTITUTE A CONTRACT BETWEEN THE ISSUING INSURER(S), AUTHORIZED REPRESENTATIVE OR PRODUCER, AND THE CERTIFICATE HOLDER.

IMPORTANT: If the certificate holder is an ADDITIONAL INSURED, the policy(ies) must have ADDITIONAL INSURED provisions or be endorsed. If SUBROGATION IS WAIVED, subject to the terms and conditions of the policy, certain policies may require an endorsement. A statement on this certificate does not confer rights to the certificate holder in lieu of such endorsement(s).

PRODUCER (2)	CONTACT NAME:		
	PHONE (A/C, No, Ext):	FAX (A/C, No):	
	E-MAIL ADDRESS:		
	INSURER(S) AFFORDING COVERAGE		NAIC #
INSURED (3)	INSURER A:	(4)	
	INSURER B:		
	INSURER C:		
	INSURER D:		
	INSURER E:		
	INSURER F:		

COVERAGES CERTIFICATE NUMBER: REVISION NUMBER:

THIS IS TO CERTIFY THAT THE POLICIES OF INSURANCE LISTED BELOW HAVE BEEN ISSUED TO THE INSURED NAMED ABOVE FOR THE POLICY PERIOD INDICATED. NOTWITHSTANDING ANY REQUIREMENT, TERM OR CONDITION OF ANY CONTRACT OR OTHER DOCUMENT WITH RESPECT TO WHICH THIS CERTIFICATE MAY BE ISSUED OR MAY PERTAIN, THE INSURANCE AFFORDED BY THE POLICIES DESCRIBED HEREIN IS SUBJECT TO ALL THE TERMS, EXCLUSIONS AND CONDITIONS OF SUCH POLICIES. LIMITS SHOWN MAY HAVE BEEN REDUCED BY PAID CLAIMS.

INSR LTR	TYPE OF INSURANCE	ADDL SUBR INSD WVD	POLICY NUMBER	POLICY EFF (MM/DD/YYYY)	POLICY EXP (MM/DD/YYYY)	LIMITS
X	COMMERCIAL GENERAL LIABILITY (5A) CLAIMS-MADE <input type="checkbox"/> OCCUR <input type="checkbox"/> GEN'L AGGREGATE LIMIT APPLIES PER: POLICY <input type="checkbox"/> PRO-JECT <input type="checkbox"/> LOC <input type="checkbox"/> OTHER:		(5B)	(5C)		EACH OCCURRENCE (5D) \$ 1,000,000.00 DAMAGE TO RENTED PREMISES (Ea occurrence) \$ 100,000.00 MED EXP (Any one person) \$ 5,000.00 PERSONAL & ADV INJURY \$ 1,000,000.00 GENERAL AGGREGATE \$ 1,000,000.00 PRODUCTS - COMP/OP AGG \$ 1,000,000.00 \$
X	AUTOMOBILE LIABILITY (6A) ANY AUTO OWNED AUTOS ONLY <input type="checkbox"/> SCHEDULED AUTOS <input type="checkbox"/> HIRED AUTOS ONLY <input checked="" type="checkbox"/> NON-OWNED AUTOS ONLY <input checked="" type="checkbox"/>		(6B)	(6C)		COMBINED SINGLE LIMIT (Ea accident) (6D) \$ 1,000,000.00 BODILY INJURY (Per person) \$ BODILY INJURY (Per accident) \$ PROPERTY DAMAGE (Per accident) \$ \$
X	UMBRELLA LIAB EXCESS LIAB DED RETENTION \$		(7B)	(7C)		EACH OCCURRENCE (7D) \$ 2,000,000.00 AGGREGATE \$ 2,000,000.00 \$ PER STATUTE <input type="checkbox"/> OTH-ER (8D) <input type="checkbox"/>
	WORKERS COMPENSATION AND EMPLOYERS' LIABILITY (8A) ANY PROPRIETOR/PARTNER/EXECUTIVE OFFICER/MEMBER EXCLUDED? (Mandatory in NH) If yes, describe under DESCRIPTION OF OPERATIONS below	Y/N <input type="checkbox"/> N/A	(8B)	(8C)		E.L. EACH ACCIDENT \$ 500,000.00 E.L. DISEASE - EA EMPLOYEE \$ 500,000.00 E.L. DISEASE - POLICY LIMIT \$ 500,000.00
(9)						

DESCRIPTION OF OPERATIONS / LOCATIONS / VEHICLES (ACORD 101, Additional Remarks Schedule, may be attached if more space is required)

(10) LIST THE OWNER, ARCHITECT AND CONSTRUCTION MANAGER AS ADDITIONAL INSURED

CERTIFICATE HOLDER

(11) INSERT THE OWNER'S NAME HERE

NOTE: PLEASE HAVE YOUR INSURANCE COMPANY MAIL THIS DOCUMENT TO THE CONSTRUCTION MANAGER

CANCELLATION

(12)

SHOULD ANY OF THE ABOVE DESCRIBED POLICIES BE CANCELLED BEFORE THE EXPIRATION DATE THEREOF, NOTICE WILL BE DELIVERED IN ACCORDANCE WITH THE POLICY PROVISIONS.

AUTHORIZED REPRESENTATIVE

(13)

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ACORD 25 (2016/03)

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POLICY NUMBER:

COMMERCIAL GENERAL LIABILITY

THIS ENDORSEMENT CHANGES THE POLICY. PLEASE READ IT CAREFULLY.

ADDITIONAL INSURED - OWNERS, LESSEES OR CONTRACTORS - SCHEDULED PERSON OR ORGANIZATION

This endorsement modifies insurance provided under the following:
COMMERCIAL GENERAL LIABILITY COVERAGE PART

SCHEDULE

Name Of Additional Insured Person(s) Or Organization(s)	Location(s) Of Covered Operations
Information required to complete this Schedule, if not shown above, will be shown in the Declarations.	

A. Section II - Who Is An Insured is amended to include as an additional insured the person(s) or organization(s) shown in the Schedule, but only with respect to liability for "bodily injury", "property damage" or "personal and advertising injury" caused, in whole or in part, by:

1. Your acts or omissions; or
2. The acts or omissions of those acting on your behalf;

in the performance of your ongoing operations for the additional insured(s) at the location(s) designated above.

However:

1. The insurance afforded to such additional insured only applies to the extent permitted by law; and
2. If coverage provided to the additional insured is required by a contract or agreement, the insurance afforded to such additional insured will not be broader than that which you are required by the contract or agreement to provide for such additional insured.

B. With respect to the insurance afforded to these additional insureds, the following additional exclusions apply:

This insurance does not apply to "bodily injury" or "property damage" occurring after:

1. All work, including materials, parts or equipment furnished in connection with such work, on the project (other than service, maintenance or repairs) to be performed by or on behalf of the additional insured(s) at the location of the covered operations has been completed; or

2. That portion of "your work" out of which the injury or damage arises has been put to its intended use by any person or organization other than another contractor or subcontractor engaged in performing operations for a principal as a part of the same project.

C. With respect to the insurance afforded to these additional insureds, the following is added to **Section III - Limits Of Insurance**:

If coverage provided to the additional insured is required by a contract or agreement, the most we will pay on behalf of the additional insured is the amount of insurance:

1. Required by the contract or agreement; or
2. Available under the applicable Limits of Insurance shown in the Declarations;

whichever is less.

This endorsement shall not increase the applicable Limits of Insurance shown in the Declarations.

THIS ENDORSEMENT CHANGES THE POLICY. PLEASE READ IT CAREFULLY.

**ADDITIONAL INSURED - OWNERS, LESSEES OR
CONTRACTORS - AUTOMATIC STATUS WHEN
REQUIRED IN CONSTRUCTION AGREEMENT WITH YOU**

This endorsement modifies insurance provided under the following:

COMMERCIAL GENERAL LIABILITY COVERAGE PART

A. Section II - Who Is An Insured is amended to include as an additional insured any person or organization for whom you are performing operations when you and such person or organization have agreed in writing in a contract or agreement that such person or organization be added as an additional insured on your policy. Such person or organization is an additional insured only with respect to liability for "bodily injury", "property damage" or "personal and advertising injury" caused, in whole or in part, by:

1. Your acts or omissions; or
2. The acts or omissions of those acting on your behalf;

in the performance of your ongoing operations for the additional insured.

However, the insurance afforded to such additional insured:

1. Only applies to the extent permitted by law; and
2. Will not be broader than that which you are required by the contract or agreement to provide for such additional insured.

A person's or organization's status as an additional insured under this endorsement ends when your operations for that additional insured are completed.

B. With respect to the insurance afforded to these additional insureds, the following additional exclusions apply:

This insurance does not apply to:

1. "Bodily injury", "property damage" or "personal and advertising injury" arising out of the rendering of, or the failure to render, any professional architectural, engineering or surveying services, including:

- a. The preparing, approving, or failing to prepare or approve, maps, shop drawings, opinions, reports, surveys, field orders, change orders or drawings and specifications; or
- b. Supervisory, inspection, architectural or engineering activities.

This exclusion applies even if the claims against any insured allege negligence or other wrongdoing in the supervision, hiring, employment, training or monitoring of others by that insured, if the "occurrence" which caused the "bodily injury" or "property damage", or the offense which caused the "personal and advertising injury", involved the rendering of or the failure to render any professional architectural, engineering or surveying services.

2. "Bodily injury" or "property damage" occurring after:

- a. All work, including materials, parts or equipment furnished in connection with such work, on the project (other than service, maintenance or repairs) to be performed by or on behalf of the additional insured(s) at the location of the covered operations has been completed; or
- b. That portion of "your work" out of which the injury or damage arises has been put to its intended use by any person or organization other than another contractor or subcontractor engaged in performing operations for a principal as part of the same project.

C. With respect to the insurance afforded to these additional insureds, the following is added to **Section III - Limits Of Insurance**:

The most we will pay on behalf of the additional insured is the amount of insurance:

1. Required by the contract or agreement you have entered into with the additional insured; or
2. Available under the applicable Limits of Insurance shown in the Declarations;

whichever is less.

This endorsement shall not increase the applicable Limits of Insurance shown in the Declarations.

POLICY NUMBER:

COMMERCIAL GENERAL LIABILITY

THIS ENDORSEMENT CHANGES THE POLICY. PLEASE READ IT CAREFULLY.

**ADDITIONAL INSURED - OWNERS, LESSEES OR
CONTRACTORS - COMPLETED OPERATIONS**

This endorsement modifies insurance provided under the following:

COMMERCIAL GENERAL LIABILITY COVERAGE PART
PRODUCTS/COMPLETED OPERATIONS LIABILITY COVERAGE PART

SCHEDULE

Name Of Additional Insured Person(s) Or Organization(s)	Location(s) And Description Of Covered Operations
Information required to complete this Schedule, if not shown above, will be shown in the Declarations.	

A. Section II - Who Is An Insured is amended to include as an additional insured the person(s) or organization(s) shown in the Schedule, but only with respect to liability for "bodily injury" or "property damage" caused, in whole or in part, by "your work" at the location designated and described in the schedule of this endorsement performed for that additional insured and included in the "products-completed operations hazard".

However:

1. The insurance afforded to such additional insured only applies to the extent permitted by law; and
2. If coverage provided to the additional insured is required by a contract or agreement, the insurance afforded to such additional insured will not be broader than that which you are required by the

contract or agreement to provide for such additional insured.

B. With respect to the insurance afforded to these additional insureds, the following is added to **Section III - Limits Of Insurance**:

If coverage provided to the additional insured is required by a contract or agreement, the most we will pay on behalf of the additional insured is the amount of insurance:

1. Required by the contract or agreement; or
2. Available under the applicable Limits of Insurance shown in the Declarations;

whichever is less.

This endorsement shall not increase the applicable Limits of Insurance shown in the Declarations.

END OF SECTION 00650

PART 1 – GENERAL

1.01 DESCRIPTION

- A. Within fifteen (15) days following the date of the issue of the Notice to Proceed (Section 00500), each Contractor shall submit to the Construction Manager for delivery to the Owner, a Schedule of Values showing accurate costs for the elements of their Work.
- B. The Schedule of Values shall be typed or printed on the Contractor's letterhead, identify the project and work division, and must be dated and signed.
- C. The Schedule of Values shall divide the Work into a sufficient number of individual cost elements to serve as an accurate basis for Contractor's Application for Payment.
- D. Each work element shall be listed identifying labor and material as separate line items. Each work element shall include its prorated share of profit, overhead, and retainage.

1.02 SPECIAL ITEMS

- A. As a part of the schedule of values the Contractor shall designate specific line items and associated values identified as:
 - 1. Performance Bond and Labor & Material Payment Bond (when required by Owner).
Value: Actual Cost of Bonds
 - 2. Daily housekeeping and clean-up inclusive of any special cleaning and preparation required by the specification for delivering the building for the Owners occupancy.
Value: Two percent (2%) of the total Contract Amount
 - 3. Retainage / Punch List
Value: Ten percent (10%) of the total Contract Amount
- B. A request for payment of any special item amount contained in the Contractor's approved Schedule of Values or a portion thereof may be submitted for payment once the work for that item has been completed to the satisfaction of the Owner, Architect and Construction Manager
- C. Upon the completion of the Contractor's work exclusive of any punch list work, a Contractor may submit a separate Application for Payment requesting the Retention / Punch List line item be reduced to (5%). **This** request must be submitted to the Construction Manager along with a Partial Consent of Surety. Once received, the Construction Manager will forward to the Owner for approval and notify the contractor when fully executed. The Owner shall reserve the right to accept or reject all requests for Retention / Punch List reduction.
- D. The Schedule of Values shall be submitted and approved prior to Contract execution and receipt of any payment.
- E. **Absolutely NO CHANGES may be made to an approved Schedule of Values.**
- F. Increases or decreases in the Contract Amount shall be through change orders.
- G. Each Change Order shall be listed as a new line item on the Contractor Invoicing Form.

END OF SECTION 00670

PART 1 – GENERAL

1.01 DESCRIPTION

- A. Within fifteen (15) days following the date of the issue of the Contract, each Contractor shall submit to the Construction Manager for delivery to the Owner, a list of all subcontractors that they intend to utilize in their performance of the Work, and all suppliers who will be providing materials and/or equipment to be incorporated into the Work.
- B. All SUBCONTRACTORS' names, addresses, telephone numbers, and types of Work shall be included on the list.
- C. All SUPPLIERS' names, addresses, telephone number, and items provided shall be included on the list.
- D. All items of material and equipment included in the Work shall be listed. Each item shall be listed with its manufacturer, supplier, and installing subcontractor, if applicable.
- E. Subcontractor / Supplier / Material / Equipment listings shall be submitted prior to contract execution.
- F. Prior to awarding a contract, the Construction Manager will notify the contractor if the Owner has reasonable and substantial objection to any person, organization, material and/or equipment listed by the Contractor. If the Owner has a reasonable and substantial objection, the Contractor shall amend their Proposal by providing an acceptable substitute. The Owner may, at their discretion, accept such a substitute or they may disqualify the Proposal.
- G. **Suppliers, Subcontractors, Material, and Equipment proposed by the Contractor and accepted by the Owner shall be used in the Work for which they are proposed and accepted and shall not be changed except with prior written approval by the Construction Manager and Owner.**

END OF SECTION 00680

PART 1 – GENERAL

1.01 DESCRIPTION

- A. Within fifteen (15) days following the date of issue of a Contract, each Contractor shall submit to the Construction Manager, for delivery to the Owner, a list of all supervisory employees whom the Contractor proposes to employ to accomplish the Work.
- B. This list shall include supervisory employees' names, titles, and duties.
- C. Employee listings shall be submitted prior to contract execution.

1.02 OWNER'S APPROVAL

- A. Contractors are required to establish, to the satisfaction of the Owner, the reliability and responsibility of proposed employees.
- B. Prior to the award of a contract, the Construction Manager will notify the Contractor if the Owner has a reasonable and substantial objection to any person listed by the Contractor. If the Owner has reasonable and substantial objection, the Contractor may amend their Proposal by providing an acceptable substitute. The Owner may, at their discretion, accept such a substitute or they may disqualify the Proposal.
- C. Employees proposed by the Contractor and accepted by the Owner shall be employed on the Work for which they are proposed and accepted and shall not be changed except with written approval of the Owner.

END OF SECTION 00690

**PROJECT
GENERAL CONDITIONS
OF THE CONTRACT FOR
CONSTRUCTION ON
FOLLOWING PAGE(S)**

END OF SECTION 00700

 **AIA[®] Document A232[®] – 2019****General Conditions of the Contract for Construction, Construction Manager as Adviser Edition****for the following PROJECT:***(Name, and location or address)*Freeland Community School District, 2024 School Construction Project – including

- General Funds – Middle School six (6) classroom addition,
- Safety Grant – Middle School secure vestibule addition,
- Food Service Funds – Elementary School kitchen renovations;

All in accordance with approved project scopes, applicable laws, the approved plans and specifications, the Owner's fixed budget, and as otherwise approved by the Owner.**THE CONSTRUCTION MANAGER:***(Name, legal status, and address)*Wolgast Corporation4835 Towne Centre Road, Suite 203Saginaw, Michigan 48604Telephone: (989) 790-9120Facsimile: (989) 790-9063**THE OWNER:***(Name, legal status, and address)*Freeland Community School District710 Powley DriveFreeland, Michigan 48623Telephone: (989) 695-5527Facsimile: (989) 695-5789**THE ARCHITECT:***(Name, legal status, and address)*The Collaborative, Inc.One SeaGate, Park Level 118Toledo, Ohio 43604Telephone: (614) 362-8351Facsimile: Not Applicable

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

This document is intended to be used in conjunction with AIA Documents A132™–2019, Standard Form of Agreement Between Owner and Contractor, Construction Manager as Adviser Edition; B132™–2019, Standard Form of Agreement Between Owner and Architect, Construction Manager as Adviser Edition; and C132™–2019, Standard Form of Agreement Between Owner and Construction Manager as Adviser.

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User Notes:

(1752118123)

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, Agreement as to contractors,~~ the Contract Documents ~~do not also~~ 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, Owner-accepted portions of the Contractor's bid or proposal, or and portions of addenda relating to bidding or proposal requirements, requirements but do not include sample forms. The Architect's execution of the Owner/Architect Agreement and the Construction Manager's execution of the Owner/Construction Manager Agreement shall constitute their acceptance of all terms herein related to the respective parties.

§ 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 the Construction Manager or the Construction Manager's consultants, (3) between the Owner and the Architect or the Architect's consultants, (4) between the Contractor and the Construction Manager or the Construction Manager's consultants, (5) between the Owner and a Subcontractor or Sub-subcontractor (6) between the Construction Manager and the Architect, or (7) between any persons or entities other than the Owner and Contractor. The Construction Manager and Architect shall, however, be entitled to performance and enforcement of obligations under the Contract intended to facilitate performance of their 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. The Contractor acknowledges and agrees that the Contract Documents are sufficient to provide for the completion of the Work and that the Contract Documents include work (whether or not shown or described) which reasonably may be inferred to be required or useful for the completion of the Work in accordance with applicable laws, codes, and customary standards of the construction industry.

§ 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 other Contractors, and by the Owner's own forces and Separate Contractors.

§ 1.1.5 **Contractors.** Contractors are persons or entities, other than the Contractor or Separate Contractors, who perform Work under contracts with the Owner that are administered by the Architect and Construction Manager.

§ 1.1.6 **Separate Contractors.** Separate Contractors are persons or entities who perform construction under separate contracts with the Owner not administered by the Architect and Construction Manager.

§ 1.1.7 **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.

§ 1.1.8 **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.

§ 1.1.9 **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

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consultants under their respective professional services agreements. Instruments of Service may include, without limitation, studies, surveys, models, sketches, drawings, specifications, and other similar materials.

§ 1.1.10 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~~ faith and without negligence.

§ 1.1.11 Products. The term "Product(s)" as used in the Contract Documents refers to the materials, systems, and equipment provided by the Contractor for use in the Work of the Project.

§ 1.1.12 Warranty. The terms "Warranty" and "Guarantee" as used in the Contract Documents shall have the same meaning and shall be defined as "legally enforceable assurance of satisfactory performance or quality of a product or Work".

§ 1.1.13 Materials. Where materials, systems, and equipment items are referred to in the singular, such reference shall not serve to limit the quantity required. The Contractor shall furnish quantities as required by the Contract Documents to complete the Work. Unless specifically limited in the Contract Documents, the words "furnish", "install", and "provide", or any combination thereof mean to furnish and incorporate into the Work, including all necessary labor, materials, and equipment and other items required to perform the Work indicated.

§ 1.1.14 Project Manual. The Project Manual is a volume assembled for the Work which may include the bidding requirements, sample forms, Conditions of the Contract, and Specifications.

§ 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. Where responsibility for particular Work is required of the Contractor, the Contractor shall not be released from that responsibility by reason of the specification or drawing which establishes the responsibility. Thus, the Contractor shall be responsible for all Work required of it, even though that responsibility may be shown only in that portion of the documents typically pertaining to another contractor or 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.

§ 1.2.4 If there should be a conflict between two or more of the Contract Documents then the following order of interpretation shall apply:

- .1 Where requirements specifically set forth in the applicable Agreement are in conflict with other Contract Documents, including but not limited to these General Conditions, the Agreement shall govern.
- .2 In all other instances, the conflict shall be resolved by complying with the provision that is most favorable to the Owner (as determined by the Owner in the Owner's sole discretion).
- .3 When a duplicate of material or equipment occurs in the Drawings, the Specifications or other Contract Documents, each Contractor shall be deemed to have bid on the basis of each furnishing such material or equipment. The Owner, with the assistance of the Architect and Construction Manager, will decide which Subcontractor(s) shall furnish the same.

§ 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 Unless otherwise indicated in the Contract Documents or the Owner/Architect Agreement, 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 unless otherwise indicated in the Contract Documents or the Owner/Architect Agreement, the Architect and respective consultants will 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 national overnight courier, or by electronic transmission if a method for electronic transmission is set forth in the Agreement. Further, any other written notice delivered with a written acknowledgement or receipt shall be deemed duly served, regardless of method.

Wherever the Contract Documents require the Contractor to give "Notice" or "Timely Notice" to the Architect, Public Authority, and/or others, it shall be the Contractor's responsibility to furnish all such notices sufficiently in advance to allow the party receiving the notice reasonable time to react to such notice, including travel time on the job site as necessary, when such notices require the on-site presence of the Architect, Public Authority, their authorized representatives, or others for field observation of inspections, testing or approvals. Reasonable time shall be defined as no less than 24 hours plus normal travel time from the home office of the party being notified to the job site and must also accommodate known, standard, or reasonable processing periods.

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

~~§ 1.8 Building Information Models Use and Reliance~~

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

ARTICLE 2 OWNER

§ 2.1 General

§ 2.1.1 The Owner is the person or entity identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number. The Owner shall designate in writing a representative who shall have express authority to bind the Owner with respect to all matters requiring the Owner's approval or ~~authorization~~ authorization subject to parameters of authority established by Owner's board of education. Except as otherwise provided in Section 4.2.I, the Construction Manager and the Architect do 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 Owner's information is~~ "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~~ including, but not limited to, 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. Unless otherwise provided under the Contract Documents, the Owner, assisted by the Construction Manager, shall secure and pay for the building permit.

~~§ 2.3.2 The Owner shall retain an architect~~ Architect is the person lawfully licensed to practice architecture, or an entity lawfully practicing architecture, in the jurisdiction where the Project ~~is located~~ is located, if licensed architecture is required by law for the Project. That person or entity is identified as the Architect in the Agreement and

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is referred to throughout the Contract Documents as if singular in number. The term "Architect," "Architect/Engineer," "Engineer," or "Design Professional" as used herein means the Architect or the Architect's authorized representative.

§ 2.3.3 ~~The Owner shall retain a~~ construction manager adviser is lawfully practicing construction management in the jurisdiction where the Project is located. That person or entity is identified as the Construction Manager in the Agreement and is referred to throughout the Contract Documents as if singular in number.

§ 2.3.4 If the employment of the Construction Manager or Architect terminates, the Owner shall employ a successor construction manager or architect ~~to whom the Contractor has no reasonable objection and~~ whose status under the Contract Documents shall be that of the Construction Manager or Architect, respectively.

§ 2.3.5 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 Taking into account the Contractor's experience and expertise, and exercise of professional caution, 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. The Contractor shall not be entitled to additional compensation resulting from its failure to confirm the location of the site utilities or existing structures prior to bid opening.

§ 2.3.6 ~~The~~ Upon specific written request of the Contractor, 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. Contracts with other Contractors alone shall not constitute sufficient Owner control for purposes of this section.

§ 2.3.7 Unless otherwise provided in the Contract Documents, the ~~Owner shall furnish to the Contractor~~ Contractor will receive at least one copy of the Contract Documents in pdf format (or another format reasonably approved by the Owner) for purposes of making reproductions pursuant to Section 1.5.2.

§ 2.3.8 The Owner shall endeavor to forward all communications to the Contractor through the Construction Manager. Other communication shall be made as set forth in Section 4.2.6.

§ 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. This right shall be in addition to and not in limitation of the Owner's rights under any provision of the Contract Documents.

§ 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~~ three-day period after receipt of notice from the Owner or the Owner's designee (or immediately in the case of a threat to the safety of persons or property) 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 review by the Construction Manager and prior approval of the Architect, and the Construction Manager or 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~~ including any claim against the Contractor's Performance Bond, correct such default or neglect. In such case, the Owner may deduct from payments then or thereafter due the Contractor the reasonable cost of correcting such deficiencies, including Owner's expenses, including any and all legal expenses incurred to effectuate and enforce this provision and compensation for the Construction Manager's and Architect's and their respective consultants' 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.

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If the Architect, Construction Manager, Owner, or other contractors or consultants are required to provide additional services due to defects or deficiencies in the Contractor's work or by failure of the Contractor to perform under its agreement, the Contractor shall be responsible for all such costs and fees (including attorney fees), which shall promptly be paid to the Owner. The Owner, Contractor, Architect, and Construction Manager acknowledge that the Owner's receipt of such payment from the Contractor is a condition precedent to the Owner's obligation to make payment to those adversely affected.

This Section 2.5 allows the Owner to withhold payments from a non-performing Contractor irrespective of the termination procedure identified in Section 14.2, and the Owner may pursue either remedy, or both.

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.

§ 3.1.1.1 Possession, sale, or consumption of alcoholic beverages on the construction site is strictly prohibited. The unlawful manufacture, distribution, dispensation, possession or use of drugs is prohibited on the construction site.

§ 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 Construction Manager or Architect in their 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 2.3.5, 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 Construction Manager and Architect any errors, inconsistencies or omissions discovered by or made known to the Contractor as a request for information submitted to the Construction Manager in such form as the Construction Manager and 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 Construction Manager and Architect any nonconformity discovered by or made known to the Contractor as a request for information submitted to Construction Manager in such form as the Construction Manager and 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,

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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.

§ 3.2.5 Prior to submitting its bid, the Contractor shall have studied and compared the Contract Documents and shall have reported to the Architect any error, inconsistency, or omission in the Contract Documents related to its work. It will be presumed that the Contractor's bid and the Contract Sum include the cost of correcting any error, inconsistency, or omission, which could have been discovered by the exercise of reasonable diligence. Unless the Contractor establishes that such error, inconsistency, or omission could not have been discovered by the exercise of reasonable diligence, the Contractor will make such corrections without additional compensation so that the Work is fully functional.

§ 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, the Construction Manager, and the Architect, and shall propose alternative means, methods, techniques, sequences, or ~~procedures~~ procedures, specifically including any delays that could impact timely coordination and completion of the Work. The Architect shall evaluate the proposed alternative solely for conformance with the design intent for the completed construction. The Construction Manager shall review the proposed alternative for sequencing, constructability, and coordination impacts on the other Contractors. Unless the Architect or the Construction Manager objects to the Contractor's proposed alternative, the Contractor shall perform the Work using its alternative means, methods, techniques, sequences, or procedures. The Contractor shall immediately notify the Construction Manager of delays of other contractors that could impact timely coordination and completion of the Work.

§ 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 the Project 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. Such provision of labor and materials shall occur in sufficient time to satisfy the existing Project schedule. The Contractor bears the risk of any failure to timely provide such labor and materials for any reason. The Contractor agrees to execute the appropriate UCC forms to effectuate the Owner's ownership of the material and equipment furnished pursuant to this Agreement.

§ 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, in consultation with the Construction Manager, 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.

§ 3.4.4 The Contractor, Construction Manager, and Architect each respectively agree that neither they nor their subcontractors will discriminate against any employee or applicant for employment, to be employed in the performance of this contract, with respect to hire, tenure, conditions or privilege of employment, or any matter directly

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or indirectly related to employment, because of race, age, sex, color, religion, national origin, ancestry or physical disability. Breach of this covenant may be regarded as a material breach of this contract.

§ 3.4.5 Asbestos-Free Product Installation

§ 3.4.5.1 It is hereby understood and agreed that no product and/or material containing asbestos including chrysolite, amosite, crocidolite, tremolite asbestos, anthophyllite asbestos, actinolite asbestos and any combination of these materials that have been chemically treated and/or altered shall be installed or introduced into the Work by the contractor or his employees, agents, subcontractors, or other individuals or entities over whom the Contractor has control. If applicable, the Contractor shall be required to provide a signed certification statement ensuring that all products or materials installed or introduced into the work all be asbestos-free.

§ 3.4.5.2 The Contractor shall also be required to furnish certified statements from the manufacturers of supplied materials used during construction verifying their products to be asbestos-free in accordance with the requirements of Section 3.4.5.1.

§ 3.4.5.3 The Contractor shall complete and submit to the Owner a certification evidencing asbestos-free product installation prior to issuance of the final Certificate for Payment, in a form acceptable to the Owner.

§ 3.5 Warranty

§ 3.5.1 The Contractor warrants to the Owner, Construction Manager, 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.

In addition to any other warranties, guarantees or obligations set forth in the Contract Documents or applicable as a matter of a law and not in limitation of the terms of the Contract Documents, the Contractor warrants and guarantees that:

- .1 The Owner will have good title to the Work and all materials and equipment incorporated into the Work and, unless otherwise expressly provided in the Contract Documents, will be of good quality and new;
2. The Work and all materials and equipment incorporated into the Work will be free from all defects, including any defects in workmanship or materials;
3. The Work and all equipment incorporated into the Work will be fit for the purpose for which they are intended;
4. The Work and all materials and equipment incorporated into the Work will be merchantable; and
5. The Work and all materials and equipment incorporated into the Work will conform in all respects to the Contract Documents.

If required by the Construction Manager or Architect, the Contractor shall furnish satisfactory evidence as to the kind and quality of materials and equipment. 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 Construction Manager or Architect, the Contractor shall furnish satisfactory evidence as to the kind and quality of materials and equipment.

Upon notice of the breach of any of the foregoing warranties or guarantees or any other warranties or guarantees under the Contract Documents, the Contractor, in addition to any other requirements in the Contract Documents, will commence to correct such breach within seventy-two (72) hours after written notice thereof and thereafter will use its best efforts to correct such breach to the satisfaction of the Owner; provided that if such notice is given after final payment hereunder, such seventy-two (72) hour period shall be extended to seven (7) days. The foregoing warranties and obligations of the Contractor shall survive the final payment and/or termination of the Contract.

The Contractor shall, at the time of final completion of the Work and as a condition precedent to final payment to the Contractor, assign to the Owner all manufacturers' warranties related to the materials and labor used in the Work. The Contractor further agrees to perform the Work in such manner as to preserve any and all such manufacturers' warranties and deliver to the Owner the warranties, project manuals, operating procedures, and other materials related to each of the building systems and materials included in the Contractor's Work and as required by the Specifications.

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§ 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 or portions thereof 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. The Contractor shall also pay all state and federal taxes levied on its business, income or property and shall make all contributions for social security and other wage or payroll taxes. The Contractor shall be solely responsible for such payments and shall hold the Owner harmless from same.

§ 3.7 Permits, Fees, Notices, and Compliance with Laws

§ 3.7.1 Unless otherwise provided in the Contract Documents, the Owner, assisted by the Construction Manager, shall secure and pay for the building permit. The Contractor shall secure and pay 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 written and dated notice to the Owner, Construction Manager, and the Architect before conditions are disturbed and in no event later than 14 days after first observance of the conditions. The Architect and Construction Manager will promptly investigate such conditions and, if the Owner and the Architect, in consultation with the Construction Manager, 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, they will recommend that an equitable adjustment be made in the Contract Sum or Contract Time, or both. If the Owner and the Architect, in consultation with the Construction Manager, 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, Construction Manager, and Contractor, stating the reasons. If the ~~Owner or~~ Contractor disputes the Architect's determination or recommendation, ~~either party may the Contractor shall~~ submit a Claim as provided in Article 15. The requirements of Section 2 of 1998 PA 57 (MCL 125.1592), as amended, are hereby incorporated into this document. The Contractor shall be alert to any indication or evidence of existing underground or concealed utilities or structures not shown on the Contract Documents and shall immediately notify the Owner of discovery of such evidence. If the Contractor encounters such utilities or structures, it shall cease operations immediately to minimize damage and shall notify the Owner and Architect. The Contractor shall bear the cost of damage resulting from its failure to exercise reasonable care in its construction activity or from continuing operations without notifying the Owner.

§ 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~~ provide written and dated notification to the Owner, Construction Manager, 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~~ shall be made, as needed as provided in Article 15.

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§ 3.8 Allowances

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

§ 3.8.2 Unless otherwise provided in the Contract Documents:

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

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

§ 3.9 Superintendent

§ 3.9.1 The Contractor shall employ a competent superintendent and necessary assistants who shall be in attendance at the Project site during performance of the Work. The superintendent shall represent the Contractor, and communications given to the superintendent shall be as binding as if given to the Contractor. The superintendent and any other personnel shall be satisfactory to the Owner in all respects, and the Owner shall have the right to require the Contractor to remove any superintendent or any other personnel from the Project whose performance is not satisfactory to the Owner and to replace such superintendent or other personnel with another who is satisfactory to the Owner.

§ 3.9.2 The Contractor, as soon as practicable after award of the Contract, shall notify the Owner and Architect, through the Construction Manager, of the name and qualifications of a proposed superintendent. ~~Within The Owner and/or the Construction Manager may reply within 14 days of receipt of the information, the Construction Manager may notify the Contractor, stating whether the Owner, the Construction Manager, or the Architect (1) has reasonable objection to the proposed superintendent or (2) require additional time for review. Failure of the Construction Manager 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, Construction Manager, 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.~~ consent.

§ 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, and the Construction Manager's use in developing the Project schedule, 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. In no event shall the Contractor's Construction Schedule be extended due to action or inaction of the Contractor, except with prior written approval of the Owner within the Owner's sole discretion. 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. The Contractor shall cooperate with the Construction Manager in scheduling and performing the Contractor's Work to avoid conflict with, and as to cause no delay in, the work or activities of other Contractors, or the construction or operations of the Owner's own forces or Separate Contractors.

§ 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 ~~Owner's, Construction Manager's and Architect's approval. The Architect and Construction Manager's approval which~~ 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 Construction Manager and Architect reasonable time to review ~~submittals-submittals,~~ and (3) provide for expeditious and practical execution of the Work. If the Contractor fails to submit a submittal schedule, or fails to

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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 participate with other Contractors, the Construction Manager, and the Owner in reviewing and coordinating all schedules for incorporation into the Project schedule that is prepared by the Construction Manager. The Contractor shall make revisions to the construction schedule and submittal schedule as deemed necessary by the Construction Manager to conform to the Project schedule.

§ 3.10.4 The Contractor shall perform the Work in ~~general accordance with the most recent schedules submitted to the Owner, Construction Manager, and Architect, and incorporated into the approved Project schedule.~~ accordance with the most recent approved project schedule and the most recent work schedule.

§ 3.10.5 The Contractor shall cooperate with the Construction Manager in scheduling and performing its Work to avoid conflict or interference with the Work of others, and the Contractor shall be responsible for any conflict or interferences that it causes. The Construction Manager and the Contractor acknowledge and understand that the work schedule will be modified from time-to-time with the Owner's approval to coordinate with the work of others and that such schedule changes do not give rise to a claim for damages or additional compensation by the Contractor for delay or otherwise. The Contractor shall be required to conform to the most recent Owner-approved schedule and acknowledges that fact was taken into account when it agreed to the Contract Sum and entered into this Contract.

§ 3.10.6 The Contractor shall cooperate with the Construction Manager in working out and following the proper sequence of operations between the Work of the Contractor and that of other trades on the site.

§ 3.10.7 The Contractor shall prosecute the Work undertaken in a prompt and diligent manner whenever the Work (or a part thereof) becomes available, or at such other time as the Owner and/or Construction Manager may direct so as to promote the general progress of the entire construction. The Contractor shall not, by delay or otherwise, interfere with or hinder the Work of the Construction Manager or any other Contractor. Any materials that are to be furnished by the Contractor shall be furnished in sufficient time to enable the Contractor to perform and complete its Work within the time or times provided in the schedule. If the Contractor shall, through its action or inactions, including the actions or inactions of its' subcontractors or suppliers, fall behind in furnishing necessary labor and/or materials to meet the construction needs in accordance with the established schedule, then it shall increase its forces or work such overtime as may be required, at its own expense, to bring its part of the work up to the proper schedule. In the event that the Contractor does not take such action necessary to bring its part of the work up to schedule, as determined by the Construction Manager, then the Owner may supplement the Contractor's forces or take other action permitted under Section 2.4 or Section 2.5. The Contractor shall be responsible for any and all costs of performing or completing the Work and shall pay any such sums within ten (10) days of an invoice. If not paid within ten (10) days, the amount will be withheld from the Contractor's next payment and paid to the relevant parties. If the amounts withheld from payments then or thereafter due Contractor are insufficient to cover such costs, the Owner may bill these costs to the Contractor, and the Contractor shall pay any such sums within ten (10) days of an invoice. Exercise of such rights shall in no way limit or jeopardize the Owner's right to any other remedy, including but not limited to a claim against the Performance Bond of the Contractor.

§ 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 Construction Manager, Architect, and Owner, and delivered to the Construction Manager 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 for submittal to and review by the Architect to illustrate materials or

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equipment for some portion of the Work. All Work shall be furnished and installed in accordance with the Drawings, Specifications and as additionally required by the manufacturer's printed instructions. The Contractor shall review the manufacturer's instructions, and where conflict occurs between the Drawings or Specifications and the manufacturer's instructions, the Contractor shall request clarification from the Architect prior to commencing 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 and Construction Manager is subject to the limitations of Sections 4.2.10 through 4.2.12. Informational submittals upon which the Construction Manager and Architect are 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 Construction Manager or Architect without action.

§ 3.12.5 The Contractor shall review for compliance with the Contract Documents, approve, and submit to the Construction Manager, Shop Drawings, Product Data, Samples, and similar submittals required by the Contract Documents, in accordance with the Project submittal schedule approved by the Construction Manager and Architect or, in the absence of an approved Project submittal schedule, with reasonable promptness and in such sequence as to cause no delay in the Work or in the activities of other Contractors, Separate Contractors, or the Owner's own forces. The Contractor shall cooperate with the Construction Manager in the coordination of the Contractor's Shop Drawings, Product Data, Samples, and similar submittals with related documents submitted by other Contractors.

§ 3.12.6 By submitting Shop Drawings, Product Data, Samples, and similar submittals, the Contractor represents to the Owner, Construction Manager, 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 reviewed and 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 review and approval of Shop Drawings, Product Data, Samples, or similar submittals, unless the Contractor has specifically notified the Construction Manager and Architect in a detail writing 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 Construction Manager and 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 reasonably rely upon the adequacy and accuracy of the performance and design criteria provided in the Contract

~~Documents.~~ Documents subject to its experience and expertise. 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, the Architect, and the Owner shall be entitled to rely upon the adequacy and accuracy of the services, certifications, and approvals performed or provided by such design professionals. The Architect and Construction Manager shall be entitled to reasonably 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, subject to their professional judgment, experience, and expertise.~~ 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. The Construction Manager shall review submittals for sequencing, constructability, and coordination impacts on other Contractors.

§ 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 Construction Manager and Architect at the time and in the form specified by the Architect.

§ 3.13 Use of Site

§ 3.13.1 The Contractor shall confine operations at the site to areas permitted by applicable laws, statutes, ordinances, codes, permits, rules and regulations, lawful orders of public authorities, and the Contract Documents and shall not unreasonably encumber the site with materials or equipment. Only materials and equipment which are to be used for the Project or to carry out the Work shall be stored at the Project site(s). Protection of such materials and equipment shall be the sole responsibility of the Contractor.

§ 3.13.2 The Contractor shall coordinate the Contractor's operations with, and secure the approval of, the Construction Manager before using any portion of the site.

§ 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, Separate Contractors, or of other Contractors by cutting, patching, or otherwise altering such construction, or by excavation. The Contractor shall not cut or otherwise alter construction by the Owner, Separate Contractors, or by other Contractors except with written consent of the Construction Manager, Owner, and such other Contractors or Separate Contractors. Consent shall not be unreasonably withheld. The Contractor shall not unreasonably withhold, from the Separate Contractors, other Contractors, or the Owner, its consent to cutting or otherwise altering the Work.

§ 3.15 Cleaning Up

§ 3.15.1 The Contractor and its Subcontractors 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, or Construction Manager with the Owner's approval, may do so and the Owner shall be entitled to reimbursement from the Contractor.

§ 3.15.3 Any areas and/or concurrently occupied space both occupied by the Owner and used in the progress of the Work, whether within the limits of the construction site or the adjacent areas leading to it, shall be maintained in a clean and safe condition and open to travel. Failure by the Contractor to maintain said areas will result in the Owner's cleaning of same, at the expense of the Contractor.

§ 3.16 Access to Work

The Contractor shall provide the Owner, Construction Manager, 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 indemnify and hold harmless the Owner, Construction Manager, and Architect harmless from from any and all cost, damage, and loss on account thereof, including, but not limited to actual attorneys' fees, 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, Architect, or Construction Manager. 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 through the Construction Manager. The review by the Owner of any method of construction, invention, appliance, process, article, device or materials of any kind shall be for its adequacy as integrated into the Work and shall not be an approval for the use thereof by the Contractor in violation of any patent or other rights of any third person.

§ 3.18 Indemnification

§ 3.18.1 To the fullest extent permitted by law, the Contractor shall indemnify and hold harmless the Owner, Construction Manager, Architect, Construction Manager's and 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 in any way related to performance of the Work, or the duties or obligations of this Agreement or the failure of the Contractor or the Work to conform with the Contract Documents, caused in whole or in part by any acts or omissions of the Contractor, a Subcontractor, or 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. them or anyone for whose acts of any of them may be liable. The Contractor shall not be obligated to indemnify a party for that party's sole negligence but shall remain liable to the fullest extent of its fault or the fault of a person for whom the Contractor is responsible (e.g., a Subcontractor). The Contractor shall be responsible to the Owner, Construction Manager, Architect, Architect's consultants and agents and employees of any of them from and against all amounts such parties may be required to pay in attorney fees in order to pursue enforcement of this provision against the Contractor or otherwise obtain indemnification from the Contractor provided under the terms of this Section 3.18 or any other applicable Contract Document. Such obligation shall not be construed to negate, abridge, abridge or reduce any other rights or obligations of indemnity that would otherwise exist as to a party or person described in this Section 3.18, which would otherwise exist as to any party or person set forth in this section. To the fullest extent permitted by law, the Contractor shall indemnify the Owner and save the Owner harmless against all loss by fines, penalties or corrective measures resulting from negligent or wrongful acts or omissions by the Contractor, its Subcontractors, agents, employees or assigns, with respect to the violation of safety requirements of this Contract, including reasonable attorney fees.

§ 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. addition to and not in limitation of the Contractor's other indemnity obligations, the Contractor hereby accepts and assumes exclusive liability for and shall indemnify and save harmless the Owner, Construction Manager and Architect from and against the payment of the following:

All contributions, taxes, or premiums (including interest and penalties thereon) which may be payable under the unemployment insurance law of any state, the federal Social Security Act, federal, state, county and/or municipal tax withholding laws, or any other law, measured upon the payroll of or required to be withheld from employees by whomsoever employed, engaged in the Work to be performed and furnished under the Contract Documents.

All sales, use, personal property and other taxes (including interest and penalties thereon) required by any federal, state, county, municipal or other law to be paid or collected by the Contractor or any of its Subcontractors or vendors or any other person or persons acting for, through or under it or any of them, by reason of the performance of the Work

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or the acquisition, ownership, furnishing, or use of any materials, equipment, supplies, labor, services or other items for or in connection with the Work;

All pension, welfare, vacation, annuity and other benefit contributions payable under or in connection with respect to all persons by whomsoever employed, engaged in the Work to be performed and furnished under the Contract Documents.

The Contractor shall indemnify and hold the Owner harmless from any claim, damage, loss or expense, including but not limited to actual attorney fees, incurred by the Owner related to any hazardous material or waste, toxic substance, pollution or contamination brought into the Project site or caused by the Contractor or used, handles, transported, stored, removed, remediated, disturbed or dispersed of by Contractor.

§ 3.18.3 In the event that any claim is made or asserted, or lawsuit filed for damages or injury arising out of or resulting from the performance of the Work, whether or not the Owner is named as a party, the Contractor shall immediately advise the Owner, in writing, of such claim or lawsuit and shall provide a full and complete copy of any documents or pleadings thereto, as well as a full and accurate report of the facts involved.

ARTICLE 4 ARCHITECT AND CONSTRUCTION MANAGER

§ 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. The term "Architect," "Architect/Engineer," "Engineer," or "Design Professional" as used herein means the Architect or the Architect's authorized representative.

§ 4.1.2 The Construction Manager is the person or entity retained by the Owner pursuant to Section 2.3.3 and identified as such in the Agreement.

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

§ 4.2 Administration of the Contract

§ 4.2.1 The Construction Manager and Architect will provide administration of the Contract as described in the Contract Documents and will be the Owner's representatives during construction until the date the Architect issues the final Certificate for ~~Payment.~~ Payment and with the Owner's written concurrence during the correction period. The Construction Manager and 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 more frequently, as otherwise agreed with the Owner, Owner or as required by law, 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, Subject to the Owner/Architect Agreement,~~ the Architect will not be required to make exhaustive or continuous on-site inspections to check the quality or quantity of the Work. On the basis of the site visits, the Architect will keep the Owner and the Construction Manager reasonably informed about the progress and quality of the portion of the Work completed, will guard the Owner against defects and deficiencies in the work, and promptly report to the Owner and Construction Manager known deviations from the Contract Documents- Documents, the Project schedule and defects and deficiencies observed in the Work.

§ 4.2.3 The Construction Manager shall provide one or more representatives who shall be in attendance at the Project site whenever the Work is being performed. The Construction Manager will determine in general if the Work observed is being performed in accordance with the Contract Documents, will keep the Owner and Architect reasonably informed of the progress of the Work, and will promptly report to the Owner and Architect known deviations from the Contract Documents and the most recent Project schedule, and defects and deficiencies observed in the Work.

§ 4.2.4 The Construction Manager will schedule and coordinate the activities of the Contractor and other Contractors in accordance with the latest approved Project ~~schedule~~-schedule and shall supervise construction as required by 1937 PA 306 (MCL 388.851 et seq.).

§ 4.2.5 The Construction ~~Manager, Manager and Architect~~, except to the extent required by Section 4.2.4, and ~~Architect 4.2.4 or by 1937 PA 306 and/or 1980 PA 299, as applicable~~, will not have control over, charge of, or responsibility for, the construction means, methods, techniques, sequences or procedures, or for the Contractor's safety precautions and programs in connection with the Work, since these are solely the Contractor's rights and responsibilities under the Contract Documents, and Documents. Except as required by their respective agreements with the Owner, neither will be responsible for the Contractor's failure to perform the Work in accordance with the requirements of the Contract Documents. Neither the Construction Manager nor the Architect Documents and neither will have control over or charge of, or be responsible for acts or omissions of, the Contractor, Subcontractors, or their agents or employees, or of any other persons or entities performing portions of the Work. The Construction Manager will schedule and coordinate the work of all Contractors on the Project, including the Contractors' use of the site. The Construction Manager will keep the Contractors informed of the Project Construction Schedule to enable the Contractors to plan and perform the Work in a timely manner.

§ 4.2.6 **Communications.** The Owner shall endeavor to communicate with the Contractor and the Construction Manager's consultants through the Construction Manager about matters arising out of or relating to the Contract Documents. The Owner and Construction Manager shall endeavor to include the Architect in all communications that relate to or affect the Architect's services or professional responsibilities. The Owner shall endeavor to promptly notify the Architect of the substance of any direct communications between the Owner and the Construction Manager 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~~may be through the Contractor. Communications by and with other Contractors shall be through the Construction Manager. Communications by and with the Owner's own forces and Separate Contractors shall be through the Owner. The Contract Documents may specify other communication protocols.

§ 4.2.7 The Construction Manager and Architect will review and certify all Applications for Payment by the Contractor, in accordance with the provisions of Article 9.

§ 4.2.8 The Architect and Construction Manager have authority to reject Work that does not conform to the Contract Documents, and will notify each other about the rejection. Whenever the Construction Manager considers it necessary or advisable, the Construction Manager will have authority to require inspection or testing of the Work in accordance with Sections 13.4.2 and 13.4.3, upon written authorization of the Owner, whether or not the Work is fabricated, installed or completed. The foregoing authority of the Construction Manager will be subject to the provisions of Sections 4.2.18 through 4.2.20 inclusive, with respect to interpretations and decisions of the Architect. However, neither the Architect's nor the Construction Manager's authority to act under this Section 4.2.8 nor a decision made by either of them in good faith either to exercise or not to exercise such authority shall give rise to a duty or responsibility of the Architect or the Construction Manager to the Contractor, Subcontractors, suppliers, their agents or employees, or other persons performing any of the Work.

§ 4.2.9 Utilizing the submittal schedule provided by the Contractor, the Construction Manager shall prepare, and revise as necessary, a Project submittal schedule incorporating information from other Contractors, the Owner, Owner's consultants, Owner's Separate Contractors and vendors, governmental agencies, and participants in the Project under the management of the Construction Manager. The Project submittal schedule and any revisions shall be submitted to the Architect for approval.

§ 4.2.10 The Construction Manager will receive and promptly review for conformance with the submittal requirements of the Contract Documents, all submittals from the Contractor such as Shop Drawings, Product Data, and Samples. Where there are other Contractors, the Construction Manager will also check and coordinate the information contained within each submittal received from the Contractor and other Contractors, and transmit to the Architect those recommended for approval. By submitting Shop Drawings, Product Data, Samples, and similar submittals, the Construction Manager represents to the Owner and Architect that the Construction Manager has reviewed and recommended them for approval. The Construction Manager's actions will be taken in accordance with the Project submittal schedule approved by the Architect or, in the absence of an approved Project submittal schedule, with reasonable promptness while allowing sufficient time to permit adequate review by the Architect.

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§ 4.2.11 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. Upon the Architect's completed review, the Architect shall transmit its submittal review to the Construction Manager.

§ 4.2.12 Review of the Contractor's submittals by the Construction Manager and Architect 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 Construction Manager and 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 Construction Manager and 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. However, should the Construction Manager or Architect discover during the course of such review any inaccuracies, incompleteness, or other irregularities, they shall immediately notify the Owner of the same to determine an appropriate corrective course of action or notify the Contractor of the same to correct the irregularities.

§ 4.2.13 The Construction Manager will prepare Change Orders and Construction Change Directives.

§ 4.2.14 The Construction Manager and the Architect will take appropriate action on Change Orders or Construction Change Directives in accordance with Article 7, and the Architect will have authority to order minor changes in the Work as provided in Section 7.4. The Architect, in consultation with the Construction Manager, will investigate and make determinations and recommendations regarding concealed and unknown conditions as provided in Section 3.7.4.

~~§ 4.2.15 Utilizing the documents provided by the Contractor, the~~ The Construction Manager will maintain at the site for the Owner one copy of all Contract Documents, approved Shop Drawings, Product Data, Samples, and similar required submittals, in good order and marked currently to record all changes and selections made during construction. These will be available to the Architect and the Contractor, and will be delivered to the Owner in good condition and reasonably organized upon completion of the Project.

§ 4.2.16 The Construction Manager will assist the Architect in conducting inspections to determine the date or dates of Substantial Completion and the date of final completion; issue Certificates of Substantial Completion in conjunction with the Architect pursuant to Section 9.8; and receive and forward to the Owner written warranties and related documents required by the Contract and assembled by the Contractor pursuant to Section 9.10. The Construction Manager will forward to the Architect a final Application and Certificate for Payment or final Project Application and Project Certificate for Payment upon the Contractor's compliance with the requirements of the Contract Documents.

~~§ 4.2.17 If the Owner and Architect agree, the~~ 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 Construction Manager of any change in the duties, responsibilities and limitations of authority of the Project representatives.

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

~~§ 4.2.19 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,~~ interpretations, 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 so rendered in good ~~faith,~~ faith and without negligence.

§ 4.2.20 The Architect's ~~decisions~~ interpretations on matters relating to aesthetic effect will be final if consistent with the intent expressed in the Contract ~~Documents~~ Documents and acceptable to the Owner.

§ 4.2.21 The Construction Manager will receive and review requests for information from the Contractor, and forward each request for information to the Architect, with the Construction Manager's recommendation. The Architect will review and respond in writing, through the Construction Manager, to requests for information about the Contract Documents. The Construction Manager's recommendation and the Architect's response to each request will be made in writing within any time limits agreed upon or otherwise with reasonable ~~promptness~~ promptness given the particular circumstances. 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 other Contractors or Separate Contractors or the subcontractors of other Contractors or Separate Contractors. The term "Subcontractor" shall also include material and equipment suppliers.

§ 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 Construction Manager, for review by the Owner, Construction Manager and Architect, of the persons or entities proposed for each principal portion of the Work, including those who are to furnish supplies, materials or equipment ~~equipment~~, including those fabricated to a special design. Within 14 days of receipt of the information, the Construction Manager ~~may~~ will notify the Contractor whether the Owner, the Construction Manager or the Architect (1) has reasonable objection to any such proposed person or entity or, (2) requires additional time for review. ~~Failure of the Construction Manager to provide notice within the 14 day period shall constitute notice of no reasonable objection.~~ The Contractor shall remain, in all instances, jointly and severally liable to the Owner for all acts or omissions of its Subcontractor. All contractual agreements with additional persons or entities serving as a subcontractor shall incorporate the Contract Documents, expressly identify the Owner as a third-party beneficiary, give the Owner all rights against the Subcontractor that it would have against the Contractor and state that the Owner shall enjoy all third-party beneficiary rights not prohibited by law.

§ 5.2.2 The Contractor shall not contract with a proposed person or entity to whom the Owner, Construction Manager 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, Construction Manager or Architect has reasonable objection to a person or entity proposed by the Contractor, the Contractor shall propose another to whom the Owner, Construction Manager 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, Construction Manager or Architect makes reasonable objection to such substitution. The Contractor shall notify the Owner, the Architect, and the Construction Manager of any proposed subcontractor substitution a minimum of 10 days prior to such proposed change.

§ 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, Construction Manager and Architect. Each subcontract agreement shall preserve and protect the rights of the Owner, Construction Manager 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~~ may be equitably adjusted as negotiated by the parties.

§ 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 with Own Forces and to Award Other Contracts

§ 6.1.1 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- insurance~~. The Construction Manager and Contractor shall be responsible for coordinating the Work with the work of other Contractors, including the Owner's own forces or Separate Contractors so as to complete the Work in accordance with the Project schedule.

§ 6.1.2 When the Owner performs construction or operations with the Owner's own forces or Separate Contractors, the Owner shall provide for coordination of such forces and Separate Contractors with the Work of the Contractor, who shall cooperate with them.

~~§ 6.1.3 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's own forces, Separate Contractors, Construction Manager and other Contractors reasonable opportunity for introduction and storage of their materials and equipment and performance of

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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's own forces, Separate Contractors or other Contractors, the Contractor shall, prior to proceeding with that portion of the Work, promptly notify the Construction Manager and Architect of apparent discrepancies or defects in the construction or operations by the Owner or Separate Contractor or other Contractors that would render it unsuitable for proper execution and results of the Contractor's Work. Failure of the Contractor to notify the Construction Manager and 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 or other Contractors' 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 Contractors or other Contractors that are not apparent.

§ 6.2.3 The Contractor shall reimburse the Owner for costs the Owner incurs, including costs that are payable to a Separate Contractors or to other Contractors, 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 delays, improperly timed activities, damage to the Work or defective construction by the Owner's own forces, Separate Contractors, or other Contractors.~~

§ 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, ~~Construction Manager~~, Separate Contractors, or other Contractors as provided in Section 10.2.5. Should a claim be made that the Contractor wrongfully delayed or caused damage to the Work or property of another contractor (including the Owner's own forces, other Contractors, or Separate Contractors), the Contractor shall promptly settle the dispute with such other contractor. If such other contractor sues the Owner on account of any delay or damage alleged to have been caused by the Contractor, the Construction Manager will notify the Contractor who shall defend such proceedings at the Contractor's sole expense. If any judgment or award against the Owner arises therefrom, the Contractor shall pay or satisfy it and shall reimburse the Owner for all costs, including attorneys' fees and court costs, which the Owner may have incurred.

§ 6.2.5 The Owner, Separate Contractors, and other Contractors 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, other 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 Construction Manager, with notice to the Architect,~~ will allocate the cost among those responsible. The Owner's right to clean up shall in no event be deemed a duty, and should the Owner choose not to pursue this remedy, the Contractor necessitating such action shall remain fully responsible for the same.

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, only by Change Order, Construction Change Directive-Directive, written contract amendment, 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, Construction Manager, Architect and Contractor. A Construction Change Directive requires agreement by the Owner, Construction Manager 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

A Change Order is a written instrument prepared by the Construction Manager and signed by the Owner, Construction Manager, Architect, and Contractor, 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.

§ 7.2.3 The Contractor's agreement on any Change Order shall constitute its final settlement of all matters relating to the direct and indirect costs associated with such change and any and all related adjustments to the Contract Sum and the Contract Time.

§ 7.3 Construction Change Directives

§ 7.3.1 A Construction Change Directive is a written order prepared by the Construction Manager and signed by the Owner, Construction Manager 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 or more 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 Construction Manager shall ~~determine~~ determine, with the Owner's approval, 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 Construction Manager 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 a reasonable amount of 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 Construction Manager and 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 Construction Manager 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. Contractor agreements to a Construction Change Directive shall require a follow-up writing or signature as contemplated in Section 7.3.7.

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§ 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 Construction Manager and 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 undisputed Work completed under the Construction Change Directive in Applications for Payment. ~~The~~ For those undisputed portions, the Construction Manager and Architect will make an interim determination for purposes of monthly certification for payment for those costs and certify for payment the amount that the Construction Manager and Architect determine to be reasonably justified. The interim determination of ~~cost~~ cost, if agreed to by the Owner in writing, 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 in writing with a determination made by the Construction Manager and Architect concerning the adjustments in the Contract Sum and Contract Time, or otherwise reach agreement upon the ~~adjustments~~, adjustments in writing, such agreement shall be effective immediately and the Construction Manager shall 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 Owner and Construction Manager 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 Owner and Construction Manager 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 obtaining all supplies, materials, tools and equipment necessary to perform the Work and for properly 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. All work shall be completed in sufficient time to allow for clean-up and preparation for Owner move-in prior to the date of Substantial Completion.

§ 8.3 Delays and Extensions of Time

§ 8.3.1 ~~If~~ Provided the Contractor submits a written request for an extension not more than fourteen days after the occurrence that gives rise to the delay, 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, Architect, Construction Manager, or an employee of any of them, or of the Owner's own forces, Separate Contractors, or other Contractors; (2) by changes ordered in the Work; (3) by labor disputes, fire, unusual delay in deliveries, fire, government-declared emergencies, 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; litigation, mediation, or arbitration, as applicable; or (5) by other causes that the Contractor asserts and the Architect, based on the recommendation of the Construction Manager, determines justify delay, then the Contract Time shall be extended for such reasonable time as the Architect may determine may be extended by Change Order. Failure of the Contractor to submit a timely request for an extension shall irrevocably waive the Contractor's right to such an extension of time. If the contract time is subject to extension pursuant to this subparagraph, such extension shall be the exclusive remedy of the Contractor and the Contractor shall not be entitled to recover damages from the Owner. Further, minor modifications in Contract time resulting from adjustments in the Project construction schedule shall not be deemed a sufficient cause for an extension of time under this Section.

§ 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.~~

§ 8.4 Delay Damage Claims

§ 8.4.1 If the Contractor fails to complete its Work on time resulting in loss or damage to the Owner, the Owner shall be entitled to recover any damages caused by the Contractor's breach, including overhead, profit, extended general conditions, actual attorney fees, etc.

§ 8.4.2 In the event the Contractor is delayed or hindered in the commencement or progress of the Work, including but not limited to those delays caused by the Work or lack of Work of another contractor or subcontractor on the Project, and the Contractor claims monetary damages as a direct and proximate consequences thereof (including, but not limited to, extended general conditions, overhead, profit, overtime, interest, supervisions or other costs or profits whatsoever), then the Contractor shall not assert such claims against the Architect, Construction Manager or Owner and, as to the Architect, Construction Manager and Owner, the Contractor's claims of such delay damages are hereby waived. The Contractor's sole and exclusive remedy regarding claims for monetary delay damages shall be to pursue such claims directly against any contractor(s) and/or subcontractors on the job which may have caused the delay, and with regard to such claims asserted against the Contractor by any other contractor(s) and/or subcontractors, the Contractor hereby waives the defense of absence of contractual privity and hereby assumes liability to other contractor(s) and/or subcontractors arising out of the Contractor's actions or inactions resulting in such delay and claim.

§ 8.4.3 For any delay claims raised against the Owner, the Contractor's sole and exclusive remedy is an extension of time to perform the Work not to exceed the time frame of any proven delay. Under no circumstances is the Contractor entitled to monetary delay damages from the Owner.

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-adjusted, unless the Contractor provided such unit prices as a part of a competitive bid.

§ 9.2 Schedule of Values

~~Where the Contract is based on a stipulated sum or Guaranteed Maximum Price, Before the first Application for Payment, the Contractor shall submit a schedule of values to the Construction Manager, 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 Construction Manager and the Architect. This schedule, unless objected to by the Owner, Construction Manager or Architect, shall be used as a basis for reviewing the Contractor's Applications for Payment. The Construction Manager shall forward to the Owner and Architect the Contractor's schedule of values. Any changes to the schedule of values shall be submitted to the Construction Manager and supported by such data to substantiate its accuracy as the Construction Manager and the Architect may require, and unless objected to by the Construction Manager or 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 fifteen days before the date established for each progress payment, the Contractor shall submit to the Construction Manager an itemized Application for Payment prepared in accordance with the schedule of values, if required under Section 9.2, values 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, Construction Manager or Architect require, such as copies of requisitions, and releases of waivers of lien 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 Construction Manager and Architect, but not yet included in Change Orders. A Contractor's request for payment of sums related to work regarding Construction Change Directive shall, unless qualified in writing at the time of request, constitute full and complete consent to the Construction Change Directive(s) and to the issuance of a Change Order.~~

~~§ 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.~~

~~§ 9.3.1.3 The Contractor shall submit with each monthly Application for Payment (1) an Affidavit that payrolls, bills for materials and equipment, and other indebtedness connected with the Work for which the previous application was submitted and the Owner might in any way be responsible have been paid or otherwise satisfied, and (2) a release or waiver of liens rising out of the Contract from each Contractor and/or Subcontractor, materialman, supplier and laborer or the Contractor addressing all previous Applications for Payment submitted for the Project.~~

~~§ 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. Payment to Contractor for materials stored off site is discouraged. When circumstances indicate that the Owner's best interest is served by off-site storage, the Contractor shall make written request to the Owner and Construction Manager for approval to include such material costs in its next progress payment. The Contractor's request shall include the following information:~~

- ~~.1 A list of the fabricated materials consigned to the Project (which shall be clearly identified, giving the place of storage, together with copies of invoices and reasons why materials cannot be delivered to the site.~~
- ~~.2 Certification that items have been tagged for delivery to the Project and that they will not be used for another purpose.~~
- ~~.3 A letter from the Contractor's Surety indicating agreement to the arrangements and that payment to the Contractor shall not relieve either party of their responsibility to complete the Work.~~
- ~~.4 Evidence of adequate insurance covering the material in storage, which shall name the Owner as additionally insured.~~
- ~~.5 Costs incurred by the Owner, Construction Manager and Architect to inspect material in off-site storage shall be paid by the Contractor.~~

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.6 Subsequent pay requests shall itemize the materials and their cost which were approved on previous pay requests and remain in off-site storage.

.7 When a partial payment is allowed on account of material delivered on the site of the Work or in the vicinity thereof or under possession and control of the Contractor, but not yet incorporated therein, such material shall become the property of the Owner, but if such material is stolen, destroyed or damaged by casualty before being used, the Contractor will be required to replace it at its own expense.

§ 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 Where there is only one Contractor, the Construction Manager will, within seven days after the Construction Manager's receipt of the Contractor's Application for Payment, review the Application, certify the amount the Construction Manager determines is due the Contractor, and forward the Contractor's Application and Certificate for Payment to the Architect. Within seven days after the Architect receives the Contractor's Application for Payment from the Construction Manager, the Architect will either (1) issue to the Owner a Certificate for Payment, in the full amount of the Application for Payment, with a copy to the Construction Manager; or (2) issue to the Owner a Certificate for Payment for such amount as the Architect determines is properly due, and notify the Construction Manager 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 Construction Manager and Owner of the Architect's reason for withholding certification in whole as provided in Section 9.5.1. The Construction Manager will promptly forward to the Contractor the Architect's notice of withholding certification.

§ 9.4.2 Where there is more than one Contractor performing portions of the Project, the Construction Manager will, within seven days after the Construction Manager receives all of the Contractors' Applications for Payment: (1) review the Applications and certify the amount the Construction Manager determines is due each of the Contractors; (2) prepare a Summary of Contractors' Applications for Payment by combining information from each Contractor's application with information from similar applications for progress payments from the other Contractors; (3) prepare a Project Application and Certificate for Payment; (4) certify the amount the Construction Manager determines is due all Contractors; and (5) forward the Summary of Contractors' Applications for Payment and Project Application and Certificate for Payment to the Architect.

§ 9.4.2.1 Within seven days after the Architect receives the Project Application and Project Certificate for Payment and the Summary of Contractors' Applications for Payment from the Construction Manager, the Architect will either (1) issue to the Owner a Project Certificate for Payment, with a copy to the Construction Manager; or (2) issue to the Owner a Project Certificate for Payment for such amount as the Architect determines is properly due, and notify the Construction Manager 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 Project Application for Payment, and notify the Construction Manager and Owner of the Architect's reason for withholding certification in whole as provided in Section 9.5.1. The Construction Manager will promptly forward the Architect's notice of withholding certification to the Contractors. As between the Owner and the Contractor, the failure of the Architect or Construction Manager to notify the Contractor or the Owner of a withheld certification does not render such withholding ineffective, and the Owner shall have no obligation to pay a Contractor for uncertified amounts or amounts for which no Certificate for Payment has been issued. If the Contractor does not receive notice of a withheld certification, it shall proceed as provided in Section 9.7.

§ 9.4.3 The Construction Manager's certification of an Application for Payment or, in the case of more than one Contractor, a Project Application and Certificate for Payment, shall be based upon the Construction Manager's evaluation of the Work and the data in the Application or Applications for Payment. The Construction Manager's certification will constitute a representation that, to the best of the Construction Manager'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, or Contractors are, entitled to payment in the amount certified.

§ 9.4.4 The Architect's issuance of a Certificate for Payment or, in the case of more than one Contractor, Project Application and Certificate for Payment, shall be based upon the Architect's evaluation of the Work, the recommendation of the Construction Manager, and data in the Application for Payment or Project Application for Payment. The Architect's certification will constitute a representation 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, or Contractors are, entitled to payment in the amount certified.

§ 9.4.5 The representations made pursuant to Sections 9.4.3 and 9.4.4 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 Construction Manager or ~~Architect~~ Architect, in writing, together with the Certification which the qualification pertains.

§ 9.4.6 The issuance of a Certificate for Payment or a Project Certificate for Payment will not be a representation that the Construction Manager or Architect ~~has~~ has, unless otherwise required by contract or law, (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 Construction Manager or Architect may withhold a Certificate for Payment or Project Certificate for Payment in whole or in part, to the extent reasonably necessary to protect the Owner, if in the Construction Manager's or Architect's opinion the representations to the Owner required by Section 9.4.3 and 9.4.4 cannot be made. If the Construction Manager or Architect is unable to certify payment in the amount of the Application, the Construction Manager will notify the Contractor and Owner as provided in Section 9.4.1 and 9.4.2. If the Contractor, Construction Manager and Architect cannot agree on a revised amount, the Architect will promptly issue a Certificate for Payment or a Project Certificate for Payment for the amount for which the Architect is able to make such representations to the Owner. The Construction Manager or 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 or Project Certificate for Payment previously issued, to such extent as may be necessary in the Construction Manager's or Architect's opinion to protect the Owner from loss for which the Contractor is responsible, including loss resulting from the acts and omissions described in Section 3.3.2 because of

- .1 defective Work not ~~remedied~~; remedied or the Contractor is in breach of the Agreement;
- .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 or other 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.
- .8 the Work not having progressed to the extent set forth in the Application for payment; or
- .9 representations of the Contractor are untrue.

§ 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 or Construction Manager withholds certification for payment under Section 9.5.1, 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 Construction Manager, and both will reflect such payment on the next Certificate for Payment.

§ 9.5.5 If the Contractor disputes any determination by the Owner, Architect, or Construction Manager with regard to any Certificate for Payment, the Contractor shall nevertheless continue to expeditiously perform the Work and such dispute shall provide no basis for any manner of suspension of the Contractor's performance of the Work.

§ 9.6 Progress Payments

§ 9.6.1 After the Architect has issued a Certificate for Payment or Project 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 Construction Manager and Architect.

§ 9.6.1.1 The Owner may, in its sole discretion, choose to make payments to Contractors through the Construction Manager. More particularly, the Owner may distribute funds to the Construction Manager for the Construction Manager to then provide payment to each respective and applicable Contractor. The Owner may discontinue this practice at any time in its sole discretion.

§ 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 Construction Manager 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 Owner, Construction Manager and Architect 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, Construction Manager 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. Owner may, in its sole discretion, after providing Contractor with ten (10) days prior written notice, make direct payments to the Contractor's Subcontractors, material men, laborers or claimants relating to labor or material provided to the Contractor in the event the Subcontractors, material men, laborers or claimants threaten to or actually cease providing labor and/or materials for the Project due to nonpayment such that, in the Owner's determination, progress of the Project and the Project's schedule are jeopardized. All payments made pursuant to this section shall be considered the same as if paid directly to the Contractor and shall constitute partial payment of the Contract Sum. In the event the Contractor disagrees with the amount proposed to be paid to one or more Subcontractors, material men, laborers or claimants, the Contractor shall provide a bond in the amount the Contractor believes the Owner will overpay, within ten (10) days of receipt of notice, or be barred from making any claim that the amount of the direct payment was incorrect. Payment under this provision shall not jeopardize any other remedy available to the Owner.

§ 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.

§ 9.6.9 Subject to applicable law, if a petition in bankruptcy or any other arrangement or proceeding regarding insolvency, assignment for the benefit of creditors, trust, chattel mortgage, or similar state or federal proceeding, whether voluntary or involuntary, shall be filed with respect to the Contractor, the Owner may withhold the final balance, or any other payments, whether or not an application for progress payment has been properly filed, until expiration of the period of any guarantees or warranties required for the Contractor, and the Owner may pay out such funds the amount necessary to satisfy any claims or costs that otherwise would have been covered by such guarantees or warranties.

§ 9.7 Failure of Payment

If the Construction Manager and Architect do not issue a Certificate for Payment or a Project Certificate for Payment, through no fault of the Contractor, ~~Contractor and without justifiable basis under the Contract Documents,~~ within fourteen days after the Construction Manager's 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 Construction Manager and Architect or awarded by binding dispute resolution, ~~then the Contractor may, upon seven~~ unless the Owner, in good faith, disputes the amount certified, ~~then the Contractor may, upon twenty-one~~ additional days' notice to the Owner, Construction Manager and Architect, stop the Work until ~~payment of the amount owing has been received. (1) the Contractor receives payment of the amount owing, or (2) the Contractor receives notice from the Architect, Construction Manager, or Owner or a full or partial withheld certification as provided herein.~~ 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. The Owner shall have no obligation to pay the Contractor unless it receives a Certificate for Payment for the amount certified. The Owner may withhold payment from a non-performing Contractor irrespective of the issuance of a Certificate for Payment.

§ 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 and when all required occupancy permits, if any, have been issued, so 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 notify the Construction Manager, and the Contractor and Construction Manager shall jointly 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 list, the Architect, assisted by the Construction Manager, 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 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, immediately.~~ In such case, the Contractor shall then submit a request for another inspection by the Architect, assisted by the Construction Manager, to determine Substantial Completion.

§ 9.8.4 When the Architect, assisted by the Construction Manager, determines that the Work of all of the Contractors, or designated portion thereof, is substantially complete, the Construction Manager will prepare, and the Construction Manager and Architect shall execute, 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.

§ 9.8.6 Notwithstanding Sections 9.8.1 and 9.8.2, as a condition precedent to establishing the date of Substantial Completion, the Contractor shall prepare and submit to the Architect and Construction Manager a comprehensive list of items to be completed or corrected (a "punch list"). The Contractor shall respond immediately to correct Work deficiencies and/or punch list items. Should the Contractor fail to make corrections in a timely fashion, but not later than thirty (30) calendar days from the date of Substantial Completion or notification of the required corrections, whichever is earlier, such Work may be corrected by the Owner at the Contractor's sole expense, and the Contract Sum may be adjusted accordingly.

§ 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 and Construction Manager shall jointly 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 after consultation with the Construction Manager complete. The Contractor shall proceed with the work in such a manner as reasonably directed and shall cooperate with the Owner to limit interruptions.~~

§ 9.9.2 Immediately prior to such partial occupancy or use, the Owner, Construction Manager, 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 completion of the Work, the Contractor shall forward to the Construction Manager a notice that the Work is ready for final inspection and acceptance, and shall also forward to the Construction Manager a final Contractor's Application for Payment. Upon receipt, the Construction Manager shall perform an inspection to confirm the completion of Work of the Contractor. The Construction Manager shall make recommendations to the Architect when the Work of all of the Contractors is ready for final inspection, and shall then forward the Contractors' notices and Application for Payment or Project Application for Payment, to the Architect, who will promptly make such inspection. When the Architect finds the Work acceptable under the Contract Documents and the Contract fully performed, the Construction Manager and Architect will promptly issue a final Certificate for Payment or Project Certificate for Payment stating that to the best of their knowledge, information and belief, and on the basis of their 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 Construction Manager's and Architect's final Certificate for Payment or Project 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 through the Construction Manager (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

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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~~ payment, (5) an affidavit that states the Work is fully completed and performed in accordance with the Contract Documents and is satisfactory to the Architect and the Owner, (6) in the event of Contractor bankruptcy, at the Owner's option, an order entered by the court having jurisdiction of the Contractor's insolvency proceeding authorizing such payment, (7) a general release executed by the Contractor on a form provided by the Construction Manager, (8) all close-out documents and warranties have been provided in a reasonable and acceptable manner, (9) documentation of any special warranties, such as manufacturers' warranties or specific Subcontractor warranties, and ~~(6), (10)~~, 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~~ actual 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 Construction Manager and Architect so confirm, the Owner shall, upon application by the Contractor and certification by the Construction Manager and 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 through the Construction Manager 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.~~ not constitute a waiver of any Claims by the Owner.

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

§ 9.10.6 All architectural costs incurred after the specified Final Completion date resulting from the Contractor's failure to complete the Work as agreed shall be paid by the Contractor to the Owner prior to the authorization of final payment. Charges to the Contractor shall be made at such times and in such amounts as the Architect invoices the Owner under the current rate schedule in effect at the time of service, for services provided in connection with the Work. The architectural costs incurred after the final completion date will be deducted from the Contractor's progress payment or final payment as applicable.

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. The Contractor shall submit the Contractor's safety program to the Construction Manager for review and coordination with the safety programs of other Contractors. The Construction Manager's responsibilities for review and coordination of safety programs shall not extend to direct control over or charge of the acts or omissions of the Contractors, Subcontractors, agents or employees of the Contractors or Subcontractors, or any other persons performing portions of the Work and not directly employed by the Construction Manager.

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§ 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;
- .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; and
- .4 construction or operations by the Owner, Separate Contractors, or other Contractors.

§ 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. The Contractor shall take all reasonable safety precautions with respect to its Work and the work of others, shall comply with all standard industry safety measures and shall comply with all applicable laws, ordinances, rules, regulations and orders of any public authority and all other requirements of the Contract Documents, including those applicable to the safety of persons or property. The Contractor shall be responsible for the safety of all of the Contractor's employees and the safety of all of the Contractor's Subcontractors, suppliers, and their employees. The Contractor shall report in writing to the Construction Manager any injury to any of Contractor's or its Subcontractors' employees at the site within one (1) day after the occurrence of such injury. The Contractor acknowledges receiving, or having access to an opportunity to review, health and safety information about the Project site(s), including any applicable asbestos management plan and any other environmental information it deems necessary to perform the work.

§ 10.2.3 The Contractor shall implement, erect, and maintain, as required by existing conditions and performance of the Contract, ~~reasonable~~ reasonable, necessary, and appropriate 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. The Contractor shall be solely and fully responsible for any and all damage claims and for defense of all actions against the Owner relating to such explosives, hazardous materials and/or unusual methods.

§ 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, 10.2.1.3 and 10.2.1.4 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, 10.2.1.3 and 10.2.1.4. 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, Construction Manager or Architect or anyone directly or indirectly employed by any of them, or by anyone for whose acts any 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, Construction Manager 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 the Contractor suffers injury or damage to person or property because of an act or omission of the other party, Owner, or of others for whose acts such party the Owner is legally responsible, notice of the injury or damage, whether or not insured, shall be given to the other party Owner 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. Owner to~~

investigate the matter. The Contractor's failure to do so shall be an irrevocable waiver of any claim against the Owner arising out of such injury or damage. Injury or damage to persons or property suffered by the Owner because of an act or omission of the Contractor or others for whose acts the Contractor is legally responsible shall be subject to the limitations provisions established by Michigan law.

§ 10.2.8.1 The Contractor causing damage to the Work of another Contractor shall be responsible for the repair and replacement of such damaged Work. Back charges may be made against the Contract sum of the damaging Contractor when corrections are not made promptly.

§ 10.2.8.2 The Owner reserves the right to pay the Contractor suffering damage from monies due the Contractor who is responsible for the Work required by same and shall deduct it from the Contract amount due the said responsible Contractor.

§ 10.2.9 If the Contractor or any Subcontractor chooses to use any systems, equipment, facilities, or services which have been incorporated in the Project as a permanent part thereof by any other, the Contractor shall assume full responsibility for damages caused to said systems, equipment, facilities or services, and have damages repaired as required, so that in no case will the performance of the used systems, equipment, facilities or services be diminished from the specified criteria as a result of such use.

§ 10.2.10 The Contractor acknowledges that the safety of the Owner's students, employees and guests is of the utmost importance. The Contractor will take no action which would jeopardize the safety of the Owner's students, employees and guests and, without the Owner's written approval, shall take no action which would interfere with the Owner's activities. Without limiting the foregoing provisions, the Contractor shall comply with all laws applicable to students and/or school safety.

§ 10.3 Hazardous Materials

§ 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, Construction Manager and Architect of the condition.

§ 10.3.2 Upon receipt of the Contractor's notice, the Owner in its discretion 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~~ shall, as a courtesy, furnish in writing to the Contractor, Construction Manager 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, the Construction Manager and the Architect will promptly reply to the Owner in writing stating whether or not any of them has reasonable objection to the persons or entities proposed by the Owner. If the Contractor, Construction Manager or Architect has an objection to a person or entity proposed by the Owner, the Owner shall propose another to whom the Contractor, the Construction Manager 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 to address 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, Construction Manager, Architect, their 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

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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.~~ site. To the extent the Contract requires the removal, transport and disposal of hazardous materials, the Contractor agrees that it assumes responsibility or said tasks as a part of the Agreement.

§ 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 reasonable 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. Nothing in this section will be construed as relieving Contractor from the cost and responsibilities for emergencies covered hereby.

§ 10.5 Notification of Utility Companies

§ 10.5.1 At least five (5) working days prior to the start of work in areas which may involve existing utility lines, the Contractor shall notify the MISS DIG notification system of the planned work.

§ 10.5.2 The utility company should, upon receipt of notice, stake, mark or otherwise designate the location (and depth) of their lines, or temporarily move the line(s).

§ 10.5.3 The Contractor shall immediately report to the respective utility company any break or leak in its lines, or any dent, gouge, groove or other damage to the utility line or to its coating or cathodic protection made or discovered in the course of the Work.

§ 10.5.4 The Contractor shall immediately alert the Owner, Construction Manager, Architect and occupants of nearby premises of any and all emergencies caused or discovered in the utility lines(s) in the course of the Work.

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.~~ Agreement, as described elsewhere in the Contract Documents, as required by law, or as reasonably required by the Owner in light of the nature of services performed and insurance obligations of its other contractors and consultants. 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, Construction Manager and Construction Manager's consultants, and the 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. On all insurance contracts under which the Contractor is obligated to have its insurance company name the Owner as additional insured, the Contractor shall require such insurance company to add to the policy the following clause: "The insurance afforded to the Additional Insured is primary insurance. If the Additional Insureds have other insurance which is applicable to the loss on an excess or contingent basis, the amount of the insurance company's liability under this policy shall not be reduced by the existence of such other insurance." Certificates of insurance acceptable to the Owner shall be submitted by Contractor to the Owner and Construction

Manager prior to commencement of Work and thereafter upon renewal or replacement of each required policy of insurance.

§ 11.1.2 The Contractor shall provide bonds covering faithful performance of 100% of the Contract and payment of 100% of the obligations arising thereunder as stipulated in bidding requirements or specifically required by the Contract Documents or as by law on the date of the Contract. The Contractor shall provide such additional 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, located and that are reasonably acceptable to the Owner. The Construction Manager shall obtain copies of the Performance Bond and Payment Bond required by the Agreement from the Contractor prior to Contractor beginning performance pursuant to the Agreement. The Contractor's obligation to provide such bonds shall not be waived in any fashion, including any failure to secure such bonds prior to Contractor beginning performance pursuant to the Agreement.

§ 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 directly to the Owner, and separately to the Construction Manager, 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 both the Contractor and the Construction Manager, separately and 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.~~

§ 11.2.2.1 The Contractor shall at the Contractor's own expense provide insurance coverage for materials stored off the site after written approval of the Owner at the value established in the approval, and also for portions of the Work in transit until such materials are permanently attached to the Work.

§ 11.2.2.2 The insurance required by Section 11.2 is not intended to cover machinery, tools or equipment owned or rented by the Contractor that are utilized in the performance of the Work, but not incorporated into permanent improvements. The Contractor shall, at the Contractor's own expense, provide insurance for owned or rented machinery, tools or equipment.

§ 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

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insurance required by the Contract Documents, the Owner shall provide notice directly to the Contractor, and separately to the Construction Manager, 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; ~~and (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.~~ may be adjusted negotiation between the parties. 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 Construction Manager and Construction Manager's consultants; (3) the Architect and Architect's consultants; (4) other Contractors and any of their subcontractors, sub-subcontractors, agents, and employees; and (5) 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 Construction Manager, Construction Manager's consultants, Architect, Architect's consultants, other Contractors, 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 is not waiving any rights its insurer(s) may have to subrogation. To the extent any terms in the General Conditions or any other Contract Documents are contrary to the aforementioned, such terms shall be deemed void and unenforceable.~~

~~§ 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, Architect, and Construction Manager 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 Construction Manager, Architect and Contractor their just shares of insurance proceeds received by the Owner, and by appropriate agreements the Construction Manager, Architect and Contractor shall make payments to their consultants and Subcontractors in similar manner insureds. The Owner shall use its best efforts, with consultation of the Construction Manager, to reach a quick and fair settlement for all interested parties, with the insurance companies after a loss.~~

~~§ 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~~

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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 Construction Manager's or Architect's request or to requirements specifically expressed in the Contract Documents, it must, if requested in writing by either, be uncovered for their examination and be replaced at the Contractor's expense without change in the Contract ~~Time~~ Time or Contract Sum.

§ 12.1.2 If a portion of the Work has been covered that the Construction Manager or Architect has not specifically requested to examine prior to its being covered, the Construction Manager or Architect may ~~request~~ request, with the Owner's consent, 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~~ Owner shall reasonably adjust the Contract Sum and Contract Time as may be appropriate. At the time, Owner's consent is sought as described herein, the Architect and/or Construction Manager shall notify the Owner that additional costs may apply if the Work is in accordance with the Contract Documents. 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 Construction Manager or 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 Construction Manager's and Architect's services and expenses made necessary thereby, shall be at the Contractor's expense. If any portion of the Work is determined by the Owner, Construction Manager or Architect, either during performance of the Work or during any applicable warranty period, to be defective or not in compliance with the contract requirements, the Construction Manager or Owner shall notify the Contractor in writing that such Work is rejected. Thereupon, the Contractor shall immediately replace and/or correct such Work by making the same comply strictly with all the requirements therefor. The Contractor shall bear all costs of correcting such rejected Work, including work of other subcontractors and including compensation for the Architect's and Construction Manager's additional services and any delay or related damage to the Owner made necessary thereby. The Construction Manager shall have the right to charge the Contractor for any compensation payable for the Architect's or Construction Manager's additional services required by the Contractor's rejected Work and deduct the payment from the next payment due the Contractor.

§ 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 or Construction Manager to do so, unless the Owner has previously given the Contractor a written acceptance of such condition. The Owner or Construction Manager 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, Construction Manager or Architect, the Owner may correct it in accordance with Section 2.5.

§ 12.2.2 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.

§ 12.2.3 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, Separate Contractors, or other 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.

§ 12.2.6 The Contractor shall respond immediately to correct Work deficiencies and/or punch list items. Failure to correct Work deficiencies and/or punch list items in a timely fashion shall be a substantial breach, and the Owner may terminate the Contract immediately without following the procedure identified in Section 14.2. As used in this Section 12.2.6, "timely" means the Contractor shall begin correction within three days of receiving the punch list or notice of work deficiency, and correction will be completed in a commercially reasonable time in accordance with the direction of the Construction Manager. Whether or not the Contract is terminated, if the Contractor fails to make corrections in a timely fashion, such Work may be corrected by the Owner, in its sole discretion, at the Contractor's expense and the Contract Sum may be adjusted by backcharge accordingly. The Contractor shall promptly notify the Construction Manager, in writing, when the Work deficiencies and/or punch list items are completed. Upon the review of the Work by the Construction Manager after such notification by the Contractor, if Work deficiencies and/or punch list items shall continue to exist, the Contractor shall reimburse any cost incurred by the Owner, including the Construction Manager's and Architect's fees for reinspections of the Work. Failure to pay such costs within ten (10) days of receipt of a demand regarding the same shall permit the Owner to withhold such amounts from the unpaid portion of the Contractor's contract.

§ 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. The acceptance of nonconforming Work by the Owner shall be by written Change Order, specifically referencing that it addresses nonconforming work, acceptable to the Owner's authorized representative, and signed by all parties. Acceptance of nonconforming Work may only occur pursuant to such written Change Order.

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.State of Michigan in all respects, except that claims and causes of action brought by the Owner shall not be deemed untimely if filed within six (6) years of substantial completion of the entire (and all) Project(s).~~

§ 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.

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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, Construction Manager, 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 Construction Manager and Architect timely notice of when and where tests and inspections are to be made so that the Construction Manager and 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 Construction Manager, 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 Construction Manager and 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 Construction Manager and Architect of when and where tests and inspections are to be made so that the Construction Manager and 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 Construction Manager's and 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 Construction Manager for transmittal to the Architect.

§ 13.4.5 If the Construction Manager or Architect is to observe tests, inspections, or approvals required by the Contract Documents, the Construction Manager or 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.

§ 13.6 The Contractor agrees that time is of the essence and to start work when directed by the Construction Manager and to furnish sufficient materials and a sufficient number of properly skilled workers, so as not to delay the work of any other Contractor or completion of the Project.

§ 13.7 Notwithstanding any provisions within the Contract Documents, nothing shall be deemed a waiver of any immunity granted to Owner by law or statute, including but not necessarily limited to, governmental immunity under MCL 691.1407.

§ 13.8 The Owner, being a governmental unit, is protected by the Michigan Void Construction Contracts Act, MCL 691.991.

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 for reasons within the Owner's control 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 Construction Manager has not certified or 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, or because the Owner has not made payment on a Certificate for Payment within the time stated in the Contract Documents, subject to justifiable withholding of payment as described herein or 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, Construction Manager and Architect, terminate the Contract and recover from the Owner payment for Work executed, as well as reasonable overhead and ~~profit~~ direct costs 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~~ days, for reasons within the Owner's control and through no act or fault of the Contractor, a Subcontractor, a Sub-subcontractor, or their agents or employees, or any other persons 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, Construction Manager and Architect, terminate the Contract and recover from the Owner as provided in Section 14.1.3. The Contractor may not terminate the Contract unless it has submitted claims for the delays and sought an extension of time for each delay.

§ 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; materials to the point of negatively impacting the Project and/or the related schedule;
- .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~~ Documents; Or

- .5 fails to prosecute the Work or any part thereof with promptness and diligence or fails to perform any provisions of this Contract, or goes into bankruptcy, liquidation, makes an assignment for the benefit of creditors, enters into a composition with its creditors, or becomes insolvent.

§ 14.2.2 When any of the reasons described in Section 14.2.1 exist, after consultation with the Construction Manager, 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: three days' notice, terminate the Contractor's right to proceed with the Work, or such part of the Work as to which such defaults have occurred, and may take any one or more of the following actions;

- .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.

The notice required by this Section 14.2.2 shall not give the Contractor a right to cure defective Work or to cure other grounds for termination under Section 14.2.1. Further, the Owner's failure to strictly comply with the formal requirements of termination (e.g., by providing less than three days' notice of termination) shall not be a substantial breach by the Owner. The Owner may terminate the Contractor immediately if the Contractor endangers persons or property or has breached Project safety requirements).

In the event, the Contractor's surety bond requires notice of intent to declare a default of the Contractor and if such bond notice is provided by the Owner, such notice shall be adequate to satisfy the three (3) day written notice described above in this section.

§ 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 Construction Manager's and Architect's services and expenses made necessary thereby, and other damages incurred by the Owner in pursuing termination and completion of the Work, including actual attorney and legal fees and costs, 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, upon application, be certified by the Initial Decision Maker after consultation with the Construction Manager, 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 the 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 this 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.~~termination.

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.~~Contract, including but not limited to additional sums, additional time for performance, or damages for delay. 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. The Contractor shall not knowingly (as "knowingly" is defined in the Federal False Claims Act, 31 USC 3729, et seq.) present or cause to be presented a false or fraudulent Claim. As a condition precedent to making a Claim by the Contractor, the Claim shall be accompanied by an affidavit sworn to before a notary public or other person authorized to administer oaths in the State of Michigan and executed by an authorized representative of the Contractor, which states that: "The Claim which is submitted herewith complies with subparagraph 15.1.1 of the General Conditions, as amended, which provides that the Contractor shall not knowingly present or cause to be presented a false or fraudulent claim." Claims of the Owner shall be governed by the relevant Michigan statutory limitations period.

§ 15.1.2.1 Regardless of any provisions to the contrary, the statute of limitations with respect to any defective or nonconforming Work which is not discovered by the Owner shall not commence until the discovery of such defective or nonconforming Work by the Owner. See also Section 13.1.

§ 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, accordance with Section 13.1 and Section 15.1.21.1, regardless of any other time frames identified in this Agreement. The Contractor shall commence all claims and causes of action in accordance with Section 15.1 and, if shorter, any other provisions of this Agreement and Michigan law.~~

§ 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 written notice to the other party Owner and to the Initial Decision Maker with a copy sent to the Construction Manager and Architect, if the Architect is not serving as the Initial Decision Maker. Claims by either party The Contractor 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 Contractor first recognizes the condition giving rise to the Claim, whichever is later. Failure to timely and properly initiate a claim shall be an irrevocable waiver of such claim. Claims by the Owner shall be governed by the applicable statute of limitations period, except as such time frame may be longer in accordance with Section 13.1 and Section 15.1.2.1.~~

§ 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 written notice to the other party. In such event, no decision by the Initial Decision Maker is required. Claims by the Contractor under this Section 15.1.3.2 shall be initiated within 21 days after occurrence of the event giving rise to such Claim or within 21 days after the Contractor first recognizes the condition giving rise to the Claim, whichever is later. Failure to timely and properly initiate a claim shall be an irrevocable waiver of such claim. Claims by the Owner shall be governed by the applicable statute of limitations period, except as such time frame may be longer in accordance with Section 13.1 and Section 15.1.2.1.~~

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§ 15.1.4 Continuing Contract Performance

§ 15.1.4.1 Pending final resolution of a Claim, including by mediation and/or litigation, as applicable, 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 undisputed 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.~~ may be adjusted as mutually agreed by the Owner and Contractor. 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. Failure to provide such notice shall serve as an absolute bar against a claim for such an increase in the Contract Sum. Prior notice is not required for Claims relating to an emergency endangering life or property arising under Section 10.4. A Project delay shall not be a basis for a Claim for additional cost. Delay claims against the Owner may be remedied only through an extension of time per Section 8.4.2 and Section 8.4.3.

§ 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, additional notice as provided in Section 15.1.3 shall be ~~given~~ given in addition to the general requirements for filing a claim. The Contractor's Claim shall include an estimate of cost and of probable effect of delay on progress of ~~the Work, the Work due to the increase in Contract Time sought.~~ 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~~ waives Claims against the Owner 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 the Owner's termination of the Contractor~~ in accordance with Article 14. Nothing contained in this Section 15.1.7 shall be deemed to preclude assessment of liquidated ~~damages, damages in favor of the Owner,~~ 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-interpretation.~~ The Architect will serve as the Initial Decision Maker, ~~unless otherwise indicated in the Agreement-Maker.~~ Except for those Claims excluded by this Section 15.2.1, an ~~initial decision-interpretation~~ shall be required as a condition precedent to mediation ~~of any Claim. If an initial decision or litigation of any Claim brought by the Contractor against the Owner. If an initial interpretation 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-an interpretation having been rendered. Unless the Initial Decision Maker and all affected parties agree, the Initial Decision Maker will not decide-interpret~~ 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,~~ interpret the Claim. Within ten (10) days of a written request, the Contractor shall make available to the Owner or its representative all of its books, records, or other documents in its possession or to which it has access relating to a Claim and shall require its subcontractors, regardless of tier, and materialmen to do the same.

§ 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 will, based on its interpretation,~~ either reject or approve the Claim in whole or in part.

§ 15.2.5 The Initial Decision Maker will render an initial ~~decision-interpretation~~ approving or rejecting the Claim, or indicating that the Initial Decision Maker is unable to resolve the Claim. This initial ~~decision-interpretation~~ shall (1) be in writing; (2) state the reasons therefor; and (3) notify the parties, the Construction Manager, 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.~~ interpretation shall be subject to the parties' agreed upon binding dispute resolution process.

§ 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. Regardless of any other time frames identified herein, claims and causes of action brought by the Owner shall be governed in accordance with the statute of limitations periods under Michigan law, except for such longer periods of time as may be permitted in Section 13.1 and Section 15.1.2.1.~~

~~§ 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 of 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.~~ **SURETY NOTICE AND PRIOR APPROVAL**

Except where otherwise expressly required by the terms of the Agreement, the Contract Documents or the General Conditions, exercise by the Owner of any contractual or legal right or remedy without prior notice to or approval by the Contractor's surety shall in no way bar or prohibit the Owner's ability to pursue such right or remedy. Further, pursuit of such a right or remedy without prior notice to or approval of surety shall in no way compromise, limit or bar any claim by the Owner against a surety bond of the Contractor. The Owner's claims against a Contractor's surety bond shall be governed by Section 13.1 with respect to any limitations periods.

~~§ 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, Except as otherwise agreed in writing by the parties, 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 commencement of the parties' agreed upon~~ 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. ~~The Owner, at its sole discretion, may consolidate mediation conducted under this Agreement with any other arbitration mediation to which it is a party provided that (1) the arbitration mediation agreement governing the other arbitration mediation permits consolidation, (2) the arbitrations mediations to be consolidated substantially involve common questions of law or fact, and (3) the arbitrations mediations employ materially similar procedural rules and methods for selecting arbitrator(s) mediator(s).~~

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~~§ 15.4.4.2 Subject to the rules of the American Arbitration Association or other applicable arbitration rules, either party-~~ The Owner, at its sole discretion, 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, in mediation, provided that the party sought to be joined consents in writing to such joinder. Consent to arbitration-mediation 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. Contractor further agrees to include similar dispute resolution provisions in all agreements with the independent contractors and consultants retained for the Project and to require all independent contractors and consultants also to include similar dispute resolution provisions in all agreements with subcontractors, all subconsultants, suppliers or fabricators so retained, thereby providing for a consistent method of dispute resolution between the parties to those agreements. Subject to the other limitations periods identified in these General Conditions which are understood to govern over this sentence, no demand for mediation shall be made after the date when the applicable statutes of limitations would bar legal or equitable proceedings. During the pendency of any mediation, all applicable limitations periods shall be tolled until the conclusion of that process.~~

The Owner reserves the right in its discretion to require consolidation or joinder of any mediation arising out of or relating to this Agreement with another mediation involving a person or entity not a party to this Agreement in any event the Owner believes such consolidation or joinder is necessary in order to resolve a dispute or avoid duplication of time, expense or effort. In the event the Owner is involved in a dispute which is not subject to mediation involving a person or entity not a party to this Agreement, the mediation provisions applicable to the parties shall be deemed to be void and nonexistent in the event Owner, in its discretion, determines the Contractor should become a party to that dispute by joinder or otherwise. Any mediation hearing shall be held in the general location where the Project is located unless another location is mutually agreed upon.

PART 1 – GENERAL

1.01 DESCRIPTION

- A. Addenda are written or graphic instruments issued prior to execution of construction contracts which add to, delete from, clarify, or correct the Bidding Documents and/or the Contract Documents.
- B. Addenda may be included in the Bidding Documents and may be included in the Contract Documents.
- C. Addenda may be issued by either the Architect or the Construction Manager as deemed necessary to facilitate the building and construction of the Project.

1.01 BIDDERS' AND CONTRACTORS' RESPONSIBILITIES

- A. Each Bidder shall be responsible for taking the provisions of all Addenda issued prior to the Bid Date into account during the presentation of his Proposal.
- B. Each Bidder shall be responsible for obtaining all Addenda, and for ascertaining that all Addenda issued prior to the Bid Date have been considered in preparing his Proposal.
- C. Each Contractor shall perform his work in accordance with all Addendums issued.

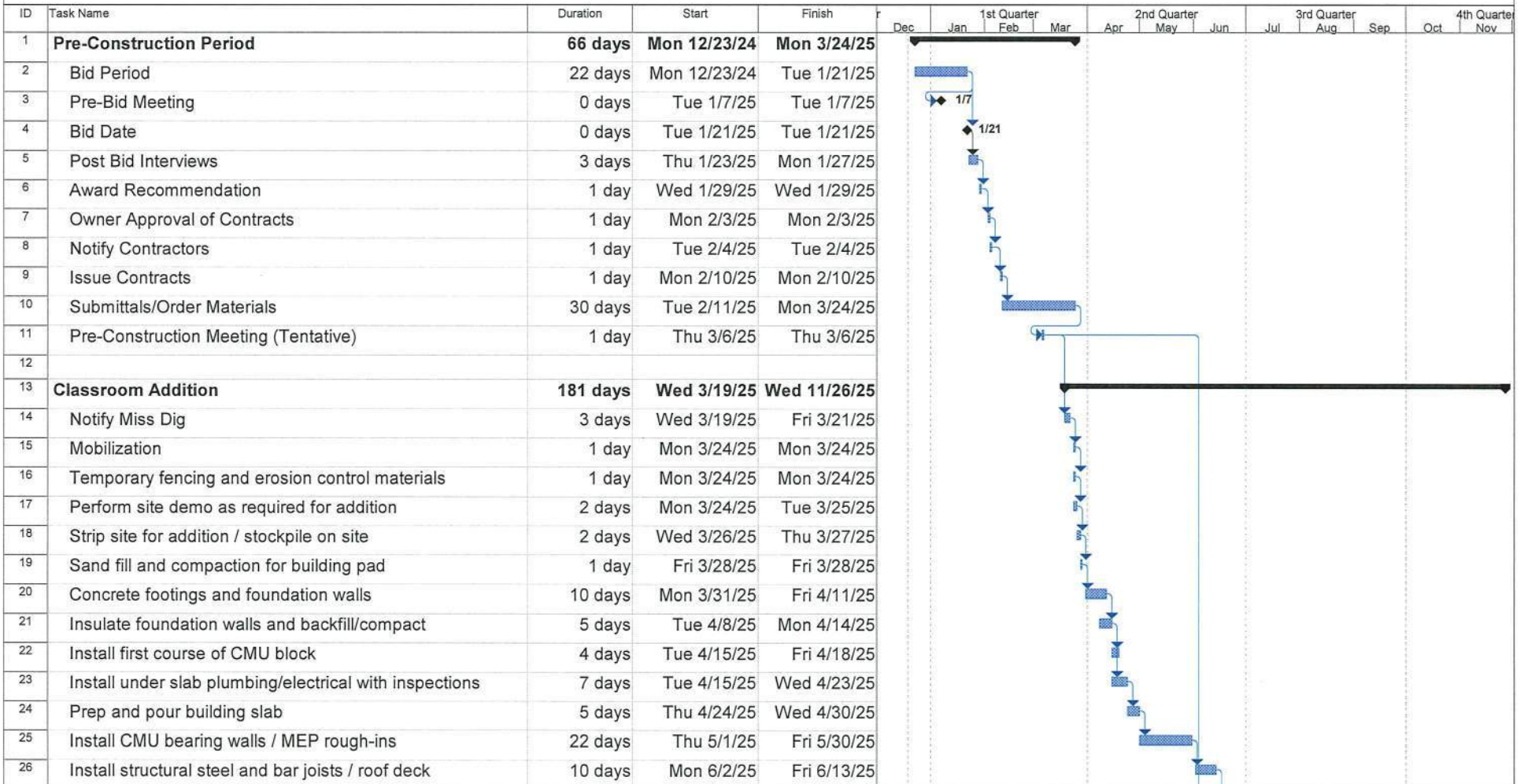
END OF SECTION 00900

**MILESTONE
SCHEDULE
ON
FOLLOWING
PAGE(S)**

END OF SECTION 00999



Freeland Community School District Middle School Classroom / Secure Vestibule Additions Milestone Schedule (12/20/2024)



CCS MS Classroom Addition
Date: Thu 12/19/24

Task		External Tasks		Inactive Summary		Start-only		Deadline	
Split		External Milestone		Manual Task		Finish-only			
Milestone		Inactive Task		Duration-only		External Tasks			
Summary		Inactive Milestone		Manual Summary Rollup		External Milestone			
Project Summary		Inactive Milestone		Manual Summary		Progress			

Wolgast Corporation reserves the right to make changes to this construction schedule as the project progress warrants.



Freeland Community School District

Middle School Classroom / Secure Vestibule Additions

Milestone Schedule (12/20/2024)



ID	Task Name	Duration	Start	Finish	Timeline												
					Dec	Jan	1st Quarter		2nd Quarter		3rd Quarter			4th Quarter			
							Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	
27	Install masonry veneer / cavity wall insulation	18 days	Mon 6/9/25	Wed 7/2/25													
28	Install roof drains and piping	5 days	Mon 6/9/25	Fri 6/13/25													
29	Install roofing system	12 days	Mon 6/16/25	Tue 7/1/25													
30	Run new electrical and hydronic lines in existing corridors	10 days	Mon 6/16/25	Fri 6/27/25													
31	Install rigid insulation/ metal stud framing / metal wall panel	18 days	Fri 6/20/25	Tue 7/15/25													
32	Install interior CMU walls / MEP rough-ins / set door frames	20 days	Thu 6/26/25	Wed 7/23/25													
33	Install RTU	4 days	Wed 7/2/25	Mon 7/7/25													
34	Install roof edge metal trim	8 days	Mon 7/7/25	Wed 7/16/25													
35	MEP overhead rough-ins w/ inspections	25 days	Mon 7/7/25	Fri 8/8/25													
36	Paint exposed masonry walls	12 days	Mon 7/21/25	Tue 8/5/25													
37	Interior metal stud framing	8 days	Thu 7/24/25	Mon 8/4/25													
38	Install exterior windows & doors	10 days	Wed 7/30/25	Tue 8/12/25													
39	Interior drywall hang & finish	9 days	Thu 7/31/25	Tue 8/12/25													
40	Paint exposed ductwork / roof structure and deck	5 days	Wed 8/6/25	Tue 8/12/25													
41	Install ceiling grid	12 days	Mon 8/11/25	Tue 8/26/25													
42	Paint drywall ceilings / bulkheads	5 days	Wed 8/13/25	Tue 8/19/25													
43	Install casework	14 days	Fri 8/15/25	Wed 9/3/25													
44	Install wall tile	8 days	Wed 8/27/25	Fri 9/5/25													
45	Install lockers	10 days	Wed 8/27/25	Tue 9/9/25													
46	Install light fixtures	10 days	Wed 8/27/25	Tue 9/9/25													
47	Install acoustical baffles and logo decals	3 days	Fri 9/5/25	Tue 9/9/25													
48	Install epoxy flooring and base	7 days	Mon 9/8/25	Tue 9/16/25													
49	Install plumbing fixtures and finish work	6 days	Wed 9/17/25	Wed 9/24/25													
50	Install interior doors and hardware	5 days	Wed 9/17/25	Tue 9/23/25													
51	Install bathroom partitions and specialties	5 days	Thu 9/25/25	Wed 10/1/25													
52	Install LVT flooring and base	16 days	Thu 9/25/25	Thu 10/16/25													

CCS MS Classroom Addition Date: Thu 12/19/24	Task		External Tasks		Inactive Summary		Start-only		Deadline	
	Split		External Milestone		Manual Task		Finish-only			
	Milestone		Inactive Task		Duration-only		External Tasks			
	Summary		Inactive Milestone		Manual Summary Rollup		External Milestone			
	Project Summary		Inactive Milestone		Manual Summary		Progress			

Wolgast Corporation reserves the right to make changes to this construction schedule as the project progress warrants.



Freeland Community School District

Middle School Classroom / Secure Vestibule Additions

Milestone Schedule (12/20/2024)



ID	Task Name	Duration	Start	Finish	Dec	1st Quarter			2nd Quarter			3rd Quarter			4th Quarter	
					Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	
53	Final inspections	3 days	Fri 10/17/25	Tue 10/21/25												
54	Install ceiling tile	6 days	Mon 10/20/25	Mon 10/27/25												
55	Final cleaning	6 days	Tue 10/28/25	Tue 11/4/25												
56	Punch list by Architect/Engineers	3 days	Wed 10/22/25	Fri 10/24/25												
57	Owner move in furniture	5 days	Mon 10/27/25	Fri 10/31/25												
58	Punch List Work by All Contractors	20 days	Wed 10/29/25	Tue 11/25/25												
59	Staff move-in	1 day	Wed 11/26/25	Wed 11/26/25												
60																
61	Secure Vestibule Addition	60 days	Wed 6/4/25	Tue 8/26/25												
62	Notify Miss Dig	3 days	Wed 6/4/25	Fri 6/6/25												
63	Mobilization	1 day	Mon 6/9/25	Mon 6/9/25												
64	Temporary fencing and erosion control materials	1 day	Mon 6/9/25	Mon 6/9/25												
65	Perform site demo as required for addition	2 days	Tue 6/10/25	Wed 6/11/25												
66	Sand fill and compaction for building pad	1 day	Thu 6/12/25	Thu 6/12/25												
67	Concrete footings and foundation walls	3 days	Fri 6/13/25	Tue 6/17/25												
68	Insulate foundation walls and backfill/compact	1 day	Wed 6/18/25	Wed 6/18/25												
69	Install under slab plumbing/electrical with inspections	1 day	Thu 6/19/25	Thu 6/19/25												
70	Prep and pour building slab and exterior concrete	3 days	Fri 6/20/25	Tue 6/24/25												
71	Demo walls, flooring and ceiling at existing office area	2 days	Wed 6/25/25	Thu 6/26/25												
72	Demo windows and door opening / protect openings	2 days	Fri 6/27/25	Mon 6/30/25												
73	Infill masonry at existing window openings	2 days	Mon 6/30/25	Tue 7/1/25												
74	Install structural steel and roof deck	3 days	Wed 7/2/25	Fri 7/4/25												
75	Demo / patch existing masonry for install new roof flashing	3 days	Mon 7/7/25	Wed 7/9/25												
76	Install roof drains and piping	3 days	Wed 7/9/25	Fri 7/11/25												
77	Install roofing system	2 days	Mon 7/14/25	Tue 7/15/25												
78	Install metal wall framing with elect rough-ins / inspections	2 days	Wed 7/16/25	Thu 7/17/25												

CCS MS Classroom Addition Date: Thu 12/19/24	Task		External Tasks		Inactive Summary		Start-only		Deadline	
	Split		External Milestone		Manual Task		Finish-only			
	Milestone		Inactive Task		Duration-only		External Tasks			
	Summary		Inactive Milestone		Manual Summary Rollup		External Milestone			
	Project Summary		Inactive Milestone		Manual Summary		Progress			

Wolgast Corporation reserves the right to make changes to this construction schedule as the project progress warrants.



Freeland Community School District

Middle School Classroom / Secure Vestibule Additions

Milestone Schedule (12/20/2024)



ID	Task Name	Duration	Start	Finish	Timeline											
					Dec	Jan	1st Quarter		2nd Quarter			3rd Quarter			4th Quarter	
							Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov
79	Install curtainwall system	3 days	Fri 7/18/25	Tue 7/22/25												
80	Install roof edge metal trim	2 days	Tue 7/22/25	Wed 7/23/25												
81	Interior drywall hang & finish	5 days	Wed 7/23/25	Tue 7/29/25												
82	Install new interior office door frame	2 days	Thu 7/24/25	Fri 7/25/25												
83	Install metal panels in curtainwall system	2 days	Thu 7/24/25	Fri 7/25/25												
84	Install exterior lettering	2 days	Thu 7/24/25	Fri 7/25/25												
85	Paint drywall	2 days	Wed 7/30/25	Thu 7/31/25												
86	Install ceiling grid	3 days	Fri 8/1/25	Tue 8/5/25												
87	Install light fixtures	2 days	Wed 8/6/25	Thu 8/7/25												
88	Install aluminum doors and hardware	2 days	Fri 8/8/25	Mon 8/11/25												
89	Install flooring and base	3 days	Mon 8/11/25	Wed 8/13/25												
90	Final inspections	1 day	Thu 8/14/25	Thu 8/14/25												
91	Install ceiling tile	1 day	Fri 8/15/25	Fri 8/15/25												
92	Final cleaning	1 day	Mon 8/18/25	Mon 8/18/25												
93	Punch list by Architect/Engineers	1 day	Tue 8/19/25	Tue 8/19/25												
94	Staff move-in	1 day	Wed 8/20/25	Wed 8/20/25												
95	Punch List Work by All Contractors	3 days	Fri 8/22/25	Tue 8/26/25												
96																
97	Site Work at Classroom Addition	117 days	Thu 3/16/23	Fri 8/25/23												
98	Perform storm and sanitary work scope	8 days	Wed 7/9/25	Fri 7/18/25												
99	Prep and pour exterior concrete	3 days	Fri 7/18/25	Tue 7/22/25												
100	Place topsoil and fine grade	3 days	Wed 7/23/25	Fri 7/25/25												
101	Prep and install grass hydroseed	3 days	Mon 7/28/25	Wed 7/30/25												
102	Water new lawn areas until grass is established	20 days	Thu 7/31/25	Wed 8/27/25												
103	Punch list by Architect / Engineer	1 day	Thu 8/28/25	Thu 8/28/25												
104	Punch List Work by All Contractors (If needed)	5 days	Fri 8/29/25	Thu 9/4/25												

CCS MS Classroom Addition Date: Thu 12/19/24	Task		External Tasks		Inactive Summary		Start-only		Deadline	
	Split		External Milestone		Manual Task		Finish-only			
	Milestone		Inactive Task		Duration-only		External Tasks			
	Summary		Inactive Milestone		Manual Summary Rollup		External Milestone			
	Project Summary		Inactive Milestone		Manual Summary		Progress			

Wolgast Corporation reserves the right to make changes to this construction schedule as the project progress warrants.

PART 1 – GENERAL

1.01 PROJECT DESCRIPTION

A. Freeland Community Schools – BP 1 2024 Classroom/Secure Vestibule

1.02 CONTRACTORS USE OF PREMISES

- A. Contractors shall limit their use of the Project site for Work and for storage, to allow for:
1. Work by other Contractors.
- B. Contractors shall coordinate their use of the Project site under the direction of the Construction Manager.
- C. Contractors shall assume full responsibility for the protection and safekeeping of materials and equipment stored on the site. No security will be employed.
- D. Each Contractor shall move any stored material or equipment under their control if it interferes with the operations of the Owner or other Contractors, as directed by the Construction Manager.
- E. Contractors shall obtain and pay for additional storage or work areas needed for operations not allowed on the site.

1.03 OWNER OCCUPANCY

- A. The owner intends to occupy the Project by [Refer to Milestone Schedule](#). All contractors must comply with this requirement.

1.04 OWNER FURNISHED PRODUCTS

- A. Products furnished and paid for by the Owner are described in the Specifications and in the Bid Division List (Section 00309).
- B. Owner's Responsibilities Regarding Owner-Furnished Products:
1. Arrange for and deliver necessary shop drawings, product data and samples to the installing contractor,
 2. Arrange and pay for product delivery to the site, in concert with the Short-Term Construction Activities Plan,
 3. Arrange for the suppliers to submit bills of materials to Contractors,
 4. Inspect deliveries jointly with Contractors,
 5. Submit claims for transportation damage,
 6. Arrange for replacement of damaged, defective, or missing items,
 7. Arrange for manufacturer's warranties, bonds, service, and inspections, as required.

- C. Contractor's Responsibilities Regarding Owner-Furnished Products:
1. Designate needed delivery dates for each product in the Short-Term Construction Activities Plan,
 2. Review shop drawings, product data and samples,
 3. Review and return Owner-Furnished shop drawings, data, and samples with notification of any discrepancies or problems anticipated in use of the product, within 2 weeks,
 4. Promptly inspect products jointly with the Owner, and record shortages, damaged items, and defective items,
 5. Handle products at the site, including uncrating and storage,
 6. Protect products from exposure to elements, and other forms of damage,
 7. Assemble, install, connect, adjust, and finish products as stipulated in the Specification,
 8. Repair or replace items damaged by Contractor,
 9. Dispose of all crating, wrapping, and trash related to the material.

END OF SECTION 01010

PART 1 – GENERAL

1.01 NORMAL WORK HOURS

A. 7 a.m. to 5 p.m., Monday through Friday.

1.02 EXCEPTIONS

- A. Necessary variations of normal work hours shall only occur with the express approval of the Construction Manager on the Owner's behalf.
- B. As a condition to the contract, the Contractor agrees that no premium-time, over-time or other special rate shall be charged for the scheduled completion of the project for any reason or cause.
- C. It will be the responsibility of each Contractor to provide an adequate work force to assure the timely completion of all Work.
- D. The Contractor will work whatever hours required (overtime, weekends, holidays) to complete their work and allow for the completion of all other work to achieve final completion in the time frames required by the Owner.

END OF SECTION 01030

PART 1 – GENERAL

1.01 CONSTRUCTION MANAGEMENT

- A. This is a Construction Management project. There is no General Contractor. All Contractors on this Project are Prime Contractors. The Owner will award contracts for all Bid Divisions involved in the Project. The Project will be controlled and administered by a Construction Manager.

1.02 WORK ASSIGNMENTS

- A. Nothing contained on the Contract Documents, and especially in the work scope of any Bid Division, shall be construed as a Work assignment to any construction trade industry. Each Contractor is responsible for their own decisions on Work assignments and shall make them in accord with the prevailing practice in the areas of the Project, and in such a way that neither their progress nor the progress of others will be adversely affected.
- B. Disputes that may arise over improper assignments or over assignments claimed by more than one Contractor shall be settled immediately by the Contractors and shall in no case result in a slowdown or stoppage of Work of any Contractor.

1.03 RETAINAGE ON OWNER PURCHASED ITEMS

- A. The Owner may retain an amount of Five Thousand (\$5,000.00) or ten percent (10%); whichever is the larger amount, on material and/or equipment purchased from suppliers for inclusion in the Work, until such time as it is satisfactorily installed. The purpose of this provision is to ensure proper conformance to the Contract Documents.

1.04 PERFORMANCE OF WORK

- A. All Contractors shall provide weekly input to aid in the preparation of the Look Ahead Schedule by which the Project will be built. Consequently, it is the responsibility and obligation of each Contractor to utilize their manpower and resources according to the commitments made under the Look Ahead Schedule.

1.05 PROMPTNESS OF EXECUTION

- A. It is the intention of the Owner to complete the Project in the fastest practical time frame. Whereas varying conditions inherent in the construction process will affect the progress of the Work, it is the intent of each construction contract that the Contractor maintain the progress pace set forth in the CAP schedule.

1.06 PROGRESS PAYMENTS

- A. It is the intention of the Owner to recognize timely performance prescribed in the CAP. Contractors who maintain specified progress will be eligible for 100% Progress Payments.
- B. Contractors who fail to maintain specified progress may be subject to retainage up to 100% of Progress Payments, at such times as those Contractors are judged by the Construction Manager, and/or the Project Architect, to be behind schedule.

1.07 PAYMENT FOR STORED MATERIALS

- A. As a means of eliminating cost escalation on available items of material and equipment, and in the interest of obtaining competitive Bids, the Owner will provide payment for contract items purchased early and stored on site, and in specific pre-approved instances, off the Project site as well. In order to qualify for such payment, the material or equipment must be safely stored, protected, and insured against loss or damage, inspected and dedicated to this Project only. Any extra cost of off-site storage is to be included as part of the Bid Proposal.

- B. Materials stored on the site shall be in the area designated by the Construction Manager. Materials or equipment lost through theft, or mishandling, shall be replaced by the Contractor, without cost to the Owner. The Contractor receiving materials shall provide and maintain protection of stored materials at no additional cost to the Owner. The contractor shall retain responsibility for any loss, damage, or replacement costs of any and all stored materials.
- C. Requests for payment for materials delivered and stored at the site must have acceptable itemized bills attached and available at the time of delivery.

1.08 SCHEDULE OF VALUES

- A. The Schedule of Values (Section 00670) shall include the following mandatory items for any Contractor who provides on-site labor as a part of their Contract:

- 1. Labor for each portion of the work to be performed.
- 2. Materials for each portion of the work to be performed.
- 3. Performance Bond and Labor & Material Payment Bond (when required by Owner).
Value: Actual Cost of Bonds
- 4. Daily housekeeping and clean-up inclusive of any special cleaning and preparation required by the specifications for delivering the building for the Owners occupancy.
Value: Two percent (2%) of the total Contract Amount
- 5. Retainage / Punch List
Value: Ten percent (10%) of the total Contract Amount

- B. Monthly allocations shall be made to each item as appropriate and as directed by the Construction Manager.
- C. The value of the Housekeeping/Final Clean-Up item shall be two percent (2%) of the Contract value, or as described by the Construction Manager.

1.09 MATERIAL AND EQUIPMENT EXPEDITING

- A. The Construction Manager will initiate and coordinate an expediting program on the Owner's behalf in cooperation with each Contractor, incorporating all critical items of material and/or equipment provided under the various Bid Division contracts.
- B. Each Contractor shall provide the Construction Manager with a completed Material and Equipment Purchase/Delivery list and as a part of the Bid Division Descriptions. The Contractor's purchase order issue date, supplier name and phone number and the delivery date for each material and equipment item required for the project must be provided.
- C. Each Contractor shall further cooperate by keeping the Construction Manager informed of all changes in the commitments previously indicated in the Material and Equipment Purchase/Delivery list and when deemed necessary by the Construction Manager, provide source contacts for direct expediting by the Construction Manager.
- D. The Contractor must require all suppliers to notify the Contractor's office a minimum of twenty-four (24) hours prior to the delivery of any materials or equipment so the Contractor is present to receive and unload the delivery.
- E. If a Contractor is not present on the job site to receive and unload the Contractor's material or equipment the Construction Manager may have the owner authorize others to perform the work. All costs associated with such actions will be deducted from the payments due the Contractor.

1.10 PROTECTION OF THE WORK OF OTHERS

- A. Contractors shall consider protection of finished Work of prime importance. Care shall be taken by Contractors not to damage completed Work of other Contractors, and to provide adequate protection to their own completed Work. Contractors who damage the work of others or existing finishes shall be back charged all costs associated with repairing or replacing the damaged work.
- B. When moving laborers and/or materials across floors, grades, roofs, other vulnerable surfaces, or through occupied areas, the Contractor shall provide adequate surface protection to prevent damage to surfaces.

1.11 MANDATORY ATTENDANCE AT MEETINGS

- A. Each Contractor shall provide a representative of the Contractor authorized and empowered to enact decisions regarding schedule compliance, manpower commitments and cost changes at all Project and Progress Meetings.

1.12 PRE-ON-SITE ACTIVITY MEETING

- A. Each Contractor is required to meet on the site with the Field Construction Manager prior to beginning their Work. The purpose of this meeting is to review the intent of the Contract Documents as they pertain to the Contractor's Work, and to integrate the Contractor's schedule into the Short-Term Construction Activities Plan for the Project.

1.13 RETURN ACTIVITIES

- A. Each Contractor is required to report to the Field Construction Manager prior to resuming Work on the Project after an absence from the site of one or more working days. The purpose of reporting is to make the Field Construction Manager aware of the Contractor's re-involvement with the Project, and to provide an update regarding any conditions that could affect the continuing Work of the Contractor.

1.14 CUTTING AND PATCHING

- A. Each Contractor shall make arrangements with the Construction Manager for fitting their Work into the Project and shall coordinate all fitting with other Contractors. Whenever any contractor has been given sufficient information as to required openings prior to beginning their Work, they shall pay the cost for cutting and/or restoring if they fail to provide proper required openings.
- B. Each Contractor shall be responsible for any cutting, fitting, and patching that may be required to complete their Work if they have failed to properly notify the Construction Manager and preceding Contractors of any openings required. Contractors shall not endanger the Work of any other Contractor by cutting, excavating, or otherwise altering any Work, and shall not cut or alter the Work of any other contractor except with the consent of the Construction Manager. Any costs caused by defective or ill-timed Work shall be borne by the party responsible for such Work.
- C. Cutting or restoring performed by any Contractor, for work that is rejected by the Architect shall be corrected under the direction of the Construction Manager, as instructed by the Architect. The Contractor responsible for the defective restoration shall incur the cost of such Work.
- D. Openings over six inches in diameter must be formed by the concrete contractor(s).
- E. Cutting and patching of concrete floors and decks shall be performed in a neat and workman like manner, using a coring machine. After coring, each Contractor shall pack and grout openings around sleeves or other Work penetrating floors and decks.

- F. No Contractor shall do any cutting that may impair the strength of any building or its components. No holes, except for small screws or bolts, may be drilled in beams or other structural members for the purpose of supporting or attaching Mechanical Work, without prior approval from the Architect.
- G. Each Contractor shall be responsible for the cutting and patching of holes and openings through existing walls, partitions, floors, ceilings, and roofs necessary for the installation of their work. If the location for a hole or opening is through an existing joist, beam, or column, the Contractor shall notify the Construction Manager who, after consultation with the Architect, will instruct the Contractor how to proceed.
- H. Each Contractor shall be responsible for the closing and patching of holes and openings through existing walls, partitions, floors, ceilings, and roofs created by demolition work they are shown to complete unless noted otherwise.
- I. Temporary removal and replacement of all ceilings not scheduled to be replaced shall be the responsibility of the Contractor requiring access.
- J. The Contractor responsible for patching shall provide both the rough (substrate) and finish surfaces. They shall employ only qualified tradesmen to assure that all work is done in a neat and workmanlike manner. All patching shall match adjacent surfaces.

1.15 BLOCKING, BACKING AND GROUNDS

- A. Each Contractor shall be responsible for providing the blocking, backing and grounds necessary for the installation of their work unless specifically noted on the drawings in which case said blocking, backing, and grounds shall be provided by the Bid Division supplying shown backing material.

1.16 ACCESS PANELS

- A. Each Contractor shall be responsible for furnishing the necessary access panels for items of work installed under their contract.
- B. Installation of all access panels shall be the responsibility of the contractor erecting the wall or ceiling system.
- C. If not specified, these access panels shall be approved by the Architect prior to installation.

END OF SECTION 01040

PART 1 – GENERAL

1.01 DESCRIPTION

- A. All Applications for Payment must be submitted on a “Contractor Invoice Form.”
- B. Contractor Invoice Form(s) will be sent to contractors each month by the Construction Manager. The Contractor Invoice Form must be returned to the Construction Manager by the due date (located in the upper left-hand corner of the form) in order to be included in the current month’s Cost Control Manual to be submitted to the Owner. The due date can also be found on **“Attachment A”** of the Owner-Contractor contract.
- C. Any completed Contractors Invoice Form received by the Construction Manager **later** than the contract established due date **will not** be accepted and **will need to be re-billed the following month.**

1.02 SWORN STATEMENTS AND WAIVERS

- A. All Applications for Payment must be accompanied by a Sworn Statement and applicable waivers.
- B. For complete instructions on preparing Sworn Statements and Waivers, please reference Section 01050 – Sworn Statements and Lien Waivers.
- C. Final Sworn Statement and Full Unconditional Lien Waivers must be provided prior to the release of the final payment or exchanged for final payment by presenting them in person.

1.03 SCHEDULE OF VALUES

- A. All billings are processed based on approved Schedules of Values. Absolutely NO CHANGES may be made to approved Schedule of Values.

1.04 CHANGE ORDERS

- A. Increases or decreases in the Contract Amount shall be through change orders.
- B. Each Change Order shall be listed as a new line item on the Contractor Invoice Form. This is the only way a change order will be processed for payment.

1.05 APPROVAL OR REJECTION OF APPLICATION FOR PAYMENT

- A. Approved Applications for Payment will be included in the current month Cost Control Manual submitted to the Owner for their approval and payment. Following approval, the Owner will process payments and forward them to the Construction Manager for accompaniment of appropriate waiver(s), and payment will be sent on to Contractor.
- B. Contractors with Applications for Payment that were adjusted or rejected will be contacted by Wolgast for an explanation.
- C. No payment will be issued through the Owner for any progress payment when the substantiating sworn statement and lien waiver(s) from the previous payment have not been received by the Construction Manager.

END OF SECTION 01045

PART 1 – GENERAL

1.01 DESCRIPTION

- A. Sworn Statement shall be included with each Application for Payment.
- B. A sample Sworn Statement follows as Pages 2 and 3 of this Section.
- C. Page 1 of the Sworn Statement shall contain all necessary Project information, including
 - 1. Date of Sworn Statement.
 - 2. County in which the deponent is at the time of the completion of the Sworn Statement.
 - 3. Deponent name.
 - 4. Contractor name on whose behalf the deponent is making statement.
 - 5. County in which the Project is situated.
 - 6. Project name and site location.
 - 7. Deponent signature and typewritten name.
 - 8. Notary name, signature, and commission expiration date.
- D. Page 2 of the Sworn Statement shall contain all necessary Project information, including:
 - 1. Project name and site location.
 - 2. Subcontractor/Supplier listings as submitted for approval at the beginning of the Project.
 - 3. Description of work to be completed by each subcontractor/supplier.
 - 4. Total contract amount for each subcontractor/supplier.
 - 5. Listings of amounts paid, amounts owing, retentions held, and balances to complete.

1.02 WAIVERS

- A. All Applications for Payment must be accompanied by a Sworn Statement and applicable waivers.
- B. Sample “partial” and “full” waivers follow as Pages 4 and 5 of this Section.

1.03 APPLICATION AND CERTIFICATE FOR PAYMENT

- A. No payment will be issued through the Owner for any progress payment when the substantiating sworn statement and lien waiver(s) from the previous payment have not been received by the Construction Manager.
- B. For additional information and instructions on the Application and Certificate for Payment, please reference Section 01045.

Sample Sworn Statement

STATE OF MICHIGAN
COUNTY OF _____

_____ Being duly sworn, deposes and says that
_____ Is the Contractor for an improvement to the following described real property situated in
_____ COUNTY, MICHIGAN, known as _____. That the following is a statement of each subcontractor and
supplier and laborer, for which laborer the payment of wages for fringe benefits and withholdings is due but unpaid, with whom the contractor has
subcontracted for performance under the contract with the owner or lessee thereof, and that the amounts due to the persons as of the date hereof
are correctly and fully set forth opposite their names, as follows on Page 2.

That the contractor has not procured materials from, or subcontracted with, any other person other than those set forth and owes no money for the
improvement other than the sums set forth.

Deponent further says that he or she makes the foregoing statement as the contractor for the purpose of representing to the owner or lessee of the
above described premises and his or her agents that the above described property is free from claims of construction liens, or the possibility of
construction liens, except as specifically set forth and except for claims of Construction Lien Act, Act No. 497 of the Public Acts of 1980, as amended,
being Section 570.1109 of the Michigan Compiled Laws.

Deponent Signature

Deponent Name – Typewritten

Subscribed and sworn before me this _____ day of _____, 19 _____.

Notary Public Signature

Notary Public Name – Typewritten

My commission expires: _____

Warning to the owner; an owner or lessee of the above described property may not rely on this sworn statement to avoid the claim of a
subcontractor, supplier, or laborer who has provided a notice of furnishing or a laborer who may provide a notice of furnishing pursuant to Section
109 of the Construction Lien Act to the designee or the owner of lessee if the designee is not named or has died.

Warning to the deponent; a person, who with intent to defraud, gives a false sworn statement is subject to criminal penalties as provided in Section
110 of the Construction Lien Act, Act No. 497 of the Public Acts of 1980, as amended, being Section 50.1110 of the Michigan Compiled Laws.

Page 2 – Sworn Statement Sample

Project Name:

Site Location:

SUB/SUPPLIER	DESCRIPTION	TOTAL CONTRACT	AMOUNT PAID	AMOUNT OWING	RETENTION HELD	BALANCE TO COMPLETE

**PARTIAL UNCONDITIONAL WAIVER OF LIEN
Subcontractor/Supplier**

Check No. _____

Amount: \$ _____

Invoice#: _____

I/we have a contract with **Freeland Community Schools – BP 1 2024 Classroom/Secure Vestibule** to provide

_____ For the improvement of the property described as **Freeland Community Schools**, and hereby waive my/our construction lien to the amount of \$ _____ for labor/materials provided through _____.

This waiver, together with all previous waivers, if any, (circle one) DOES / DOES NOT cover all amounts due to me/us for contract improvement through the date shown above.

(Name of Lien Claimant)

By: _____ Signed on: _____
(Signature of lien claimant or authorized officer or agent of lien claimant) (Date)

Address: _____

Telephone: _____

**FULL UNCONDITIONAL WAIVER OF LIEN
Subcontractor/Supplier**

Check No. _____

Amount: \$ _____

Invoice#: _____

My/our contract with **Freeland Community Schools – BP 1 2024 Classroom/Secure Vestibule** to provide
_____ For the improvement of the property described as **Freeland
Community Schools**, having been fully paid and satisfied, all my/our construction lien rights against such property and
hereby waived and released.

(Name of Lien Claimant)

By: _____ Signed on: _____
(Signature of lien claimant or authorized officer or agent of lien claimant) (Date)

Address: _____

Telephone: _____

END OF SECTION 01050

PART 1 – GENERAL

1.01 DESCRIPTION

- A. The Change Event Form will be used to document any request for a change in the scope of the Work throughout the construction process, and establish owner and architect approval prior to preparing a change order or having work performed.
- B. The Change Event Form will only be used when it IS NOT NECESSARY for work to be performed immediately.

1.02 PROCESSING OF CHANGE EVENT FORMS

- A. The Owner, Architect, Engineer, Construction Manager or Contractor may initiate a request for change during the Project in the form of a bulletin/proposal request, construction change directive, request for information, or value engineering proposal. Requests for changes shall be submitted to the Construction Manager for preparation and distribution of the Change Event Form.
- B. The Change Event will be accompanied by a copy of all related sketches, drawings, specifications, instructions, etc.
- C. The Construction Manager will forward the Change Event to the Contractor for the purposes of obtaining an itemized quote (including labor, material, equipment, units, rates, and subtotals) for the changes requested.
- D. The Contractor will complete and return the Change Event Form within five (5) days, or less, to the Construction Manager.
- E. The Construction Manager will review all Change Events and itemized detail for accuracy and validity within 48 hours of receiving said information.
- F. If the Construction Manager approves the costs or deductions submitted by the Contractor in the Change Event, the Construction Manager will:
 - 1. Forward one (1) copy of the Change Event with itemized detail to the Architect for review and endorsement, stipulating the date by the endorsed Change Event is to be returned.
 - 2. Discuss the Change Event and costs or deductions with the Architect to secure their endorsement.
 - 3. Forward one (1) copy of the Change Event with itemized detail to the Owner for approval and signature.
- G. After receiving the endorsed Change Event(s) timely from the Architect and Owner, the Construction Manager will prepare a Change Order for Contractor signature. The Contractor will sign the Change Order, acknowledging notice to proceed with change, and return a copy back to the Construction Manager.
- H. Only Change Events with the Architect's and Owner's signature of approval and acceptance will be processed into Change Orders.

1.03 PRICING GUIDELINES FOR CHANGE EVENTS

- A. Pricing Guidelines for Change Events that will be considered for Change Orders shall be fully detailed and itemized showing each of the following:
 - 1. Labor: All field labor indicating worker name, date, and hours worked and hourly rate; hourly rate shall be based on straight time only and shall include the labor classification.

2. Fringes: All established payroll taxes, assessments, and fringe benefits on the labor in 7.3.2.1; this may include, but is not limited to, FICA, Federal and State unemployment, Health and Welfare and Workers Compensation; each of the fringes is to be a separate line item.
3. Material: All material purchased by the Contractor and incorporated into the changed Work, showing quantities, unit costs and costs of each item as appropriate; material costs will only be allowed at the Contractor's actual cost including all discounts, rebates or related credits. Only one third (33 percent) of the cost of reusable materials for each use, such as formwork lumber, shoring or temporary enclosures will be allowed.
4. Equipment: Rental Equipment – charges for certain non-owned, heavy, or specialized equipment up to 100 percent of the documented rental costs; no rental charges will be allowed for hand tools, minor equipment, simple scaffolds, etc.; downtime due to Contractor caused delays, repairs, maintenance, late fees and weather will not be allowed. Owned Equipment – charges for certain owned, heavy or specialized equipment up to 100 percent of the cost listed by the Associated Equipment Dealers Blue Book; no charges will be allowed for hand tools, minor equipment, simple scaffolds, etc.; only the actual time the equipment is necessary to be in use to perform the work will be allowed; downtime due to Contractor caused delays, repairs, maintenance and weather will not be allowed.
5. A total amount of ten (10) percent of the total of all labor, materials and equipment performed by the Contractor's own forces shall be allowed for the Contractor's combined overhead and profit.
6. A total amount of ten (10) percent of the total of all extra work performed by the Contractor's Subcontractor(s) shall be allowed for the Contractor's combined overhead and profit.
7. For work deleted, that would have been completed by the Contractor or the Contractor's Subcontractor(s) an amount equaling the cost of the Work plus an amount equaling five (5) percent of the work shall be credited to the owner.

1.04 TIME LIMIT

- A. Contractor must return the Change Event and respective price quotations within five (5) working days, unless noted otherwise on the Construction Management issued Change Event.
- B. Failure to return the completed Change Event within the predefined time period will indicate the contractor shall have no charge for the associated work within their bid division per the Change Event at no additional cost to the Owner, Construction Manager and Architect.

END OF SECTION 01051

PART 1 – GENERAL

1.01 DESCRIPTION

- A. The Change Order Document is the legal instrument used to modify the Contract Documents.
- B. Change Orders will be prepared, as necessary, following the acceptance of the Change Event amount by the Owner (Section 01051).
- C. A sample Change Order follows as page 2 of this Section.

1.02 PROCESSING OF CHANGE ORDERS

- A. All changes and potential changes to the Project shall be documented by using the Change Event Form (Section 01051).
- B. Complete and approved Change Events will be converted into Change Orders as necessary.
- C. One (1) original Change Order shall be prepared by the Construction Manager and forwarded to the Contractor for signature. Signatory parties shall include: the Contractor only on Change Order.

1.02 PRICING GUIDELINES

- A. Pricing Guidelines for Change Events that will be considered for Change Orders shall be fully detailed and itemized showing each of the following:
 - 1. Labor: All field labor indicating worker name, date, and hours worked and hourly rate; hourly rate shall be based on straight time only and shall include the labor classification.
 - 2. Fringes: All established payroll taxes, assessments and fringe benefits on the labor in 7.3.2.1; this may include, but is not limited to, FICA, Federal and State unemployment, Health and Welfare and Workers Compensation; each of the fringes is to be a separate line item.
 - 3. Material: All material purchased by the Contractor and incorporated into the changed Work, showing quantities, unit costs and costs of each item as appropriate; material costs will only be allowed at the Contractor's actual cost including any and all discounts, rebates or related credits. Only one third (33 percent) of the cost of reusable materials for each use, such as formwork lumber, shoring or temporary enclosures will be allowed.
 - 4. Equipment: Rental Equipment – charges for certain non-owned, heavy or specialized equipment up to 100 percent of the documented rental costs; no rental charges will be allowed for hand tools, minor equipment, simple scaffolds, etc.; downtime due to Contractor caused delays, repairs, maintenance, late fees and weather will not be allowed. Owned Equipment – charges for certain owned, heavy or specialized equipment up to 100 percent of the cost listed by the Associated Equipment Dealers Blue Book; no charges will be allowed for hand tools, minor equipment, simple scaffolds, etc.; only the actual time the equipment is necessary to be in use to perform the work will be allowed; downtime due to Contractor caused delays, repairs, maintenance and weather will not be allowed.
 - 5. A total amount of ten (10) percent of the total of all labor, materials and equipment performed by the Contractor's own forces shall be allowed for the Contractor's combined overhead and profit.

6. A total amount of ten (10) percent of the total of all extra work performed by the Contractor's Subcontractor(s) shall be allowed for the Contractor's combined overhead and profit.
7. For work deleted, that would have been completed by the Contractor or the Contractor's Subcontractor(s) an amount equaling the cost of the Work plus an amount equaling five (5) percent of the work shall be credited to the owner.

CHANGE ORDER

PROJECT:

PROJECT NO:

CHANGE ORDER NO.:

CHANGE ORDER DATE:

CONTRACT DATE:

CONTRACT NO.:

CONTRACTOR:

ARCHITECT:

OWNER:

It is hereby agreed to make the following changes to the Contract:

- 1. QR#
- 2. N/A
- 3. N/A
- 4. N/A
- 5. N/A

This work described by this Change Order becomes a part of and is to be performed by the same terms as the existing Contract. This Change Order must be signed by the Owner, Architect, and Contractor to be valid.

The Original Contract Sum.....	\$
Net change by previously authorized Change Orders.....	\$
The Contract Sum prior to this Change order.....	\$
The Contract Sum will be <input type="checkbox"/> increased / <input type="checkbox"/> decreased by this Change Order.....	
The new Contract Sum including this Change Order is.....	\$

Contractor _____ Architect _____ Owner _____

By: _____ By: _____ By: _____

Date: _____ Date: _____ Date: _____

DISTRIBUTION - FULLY EXECUTED CHANGE ORDERS ARE COPIED AND DISTRIBUTED AS FOLLOWS:
White (original) – Owner; Blue – Construction Manager; Green – Contractor; Yellow – Architect

END OF SECTION 01053

PART 1 – GENERAL

1.01 LAYOUT AND MEASUREMENTS

- A. The responsibility for accurate layout and measurement of the Work of each Contractor is their own. In addition, each Contractor shall verify the dimensional accuracy of the Work upon which their own Work relies before they begin their Work. They shall report all inaccuracies to the Construction Manager and shall not proceed until all corrections are made. If a Contractor proceeds with their Work on dimensionally inaccurate Work of another Contractor, they shall be liable for the cost of corrections to their own Work when the error is corrected and shall cooperate in the correction as directed by the Construction Manager.
- B. The Owner, through the Construction Manager, will provide a bench mark and baseline for all Contractors' reference.
- C. If the Construction Manager performs layout work or must arrange for others to perform layout work that is the responsibility of the Contractor, those costs will be charged to the Contractor. The costs will be submitted to the Owner and the Owner will deduct those costs from the Contractor's contract payment.

END OF SECTION 01055

1.01 PREVAILING WAGE

- A. There is no prevailing wage on this project.

END OF SECTION 01060

PART 1 – GENERAL

1.01 DESCRIPTION

A. Work included:

1. Throughout the Contract Documents, reference is made to codes and standards which establish qualities and type of workmanship and materials, and which establish methods for testing and reporting on the pertinent characteristics.
2. Where materials or workmanship are required by these Contract Documents to meet or exceed the specifically named code or standard, it is the Contractor's responsibility to provide materials and workmanship that meet or exceed the specifically names code or standard.
3. It is also the Contractor's responsibility, when so required by the Contract Documents or by written request from the Owner, to deliver to the Owner all required proof that the materials or workmanship, or both, meet or exceed the requirements of the specifically named code or standard. Such proof shall be in the form requested in writing by the Owner, and generally will be required to be copies of a certified report of tests conducted by a testing agency approved for that purpose by the Owner.

B. Related Work Described Elsewhere:

1. Specific naming of codes or standards occurs on the Drawings and other Sections of these specifications.

1.02 QUALITY ASSURANCE

A. Familiarity with Pertinent Codes and Standards.

1. In procuring all items used in this Work, it is the Contractor's responsibility to verify the detailed requirements of the specifically named codes and standards and to verify that the items procured for use in this Work meet or exceed the specified requirements.

B. Rejection of Non-Complying Items.

1. The Owner reserves the right to reject items incorporated into the Work which fail to meet the specified minimum requirements.
2. The Owner further reserves the right and without prejudice to other recourse the Owner may take, to accept non-complying items subject to an adjustment in the Contract Amount as approved by the Owner.

C. Applicable standards listed in these Specifications include, but are not necessarily limited to, standards promulgated by the following agencies and organizations:

1. AASHTO – American Association of State Highway and Transportation Officials, 341 National Press Building, Washington, D.C. 20004.

ACI – American Concrete Institute, Box 19150, Redford Station, Detroit, Michigan 48219

AISC – American Institute of Steel Construction, Inc., 1221 Avenue of the Americans, New York, New York, 10020.

ANSI – American National Standards Institute (successor to USASI and ASAO), 1430 Broadway, New York, New York 10018.

ASTM – American Society for Testing Materials, 1916 Race Street, Philadelphia, Pennsylvania 19103.

AWS – American Welding Society, Inc., 2501 N.W. 7th Street, Miami, Florida 33125.

AWWA – American Water Works Association, Inc., 6666 West Quincy Avenue, Denver, Colorado 80235.

BOCA – Building Officials Code Administrators International, Inc. 17926 South Halsted Street, Homewood, Illinois 60460.

CRSI – Concrete Reinforcing Steel Institute, 228 North LaSalle Street, Chicago, Illinois 60610.

CS – Commercial Standard of NBS, U.S. Department of Commerce, Government Printing Office, Washington, D.C. 20402.

FGMA – Flat Glass Marketing Association, 3310 Harrison, Topeka, Kansas 66611.

State of Michigan Fire Marshall Bulletin 412.0.

NAAMM – The National Association of Architectural Metal Manufacturers, 1033 South Boulevard, Oak Park, Illinois 60302.

NEC – National Electric Code (see NFPA).

NEMA – National Electrical Manufacturer’s Association, 155 East 44th Street, New York, New York 10017.

NFPA – National Fire Protection Association, 470 Atlantic Avenue, Boston, Massachusetts 02210.

SDI – Steel Deck Institute, 135 Addison Avenue, Elmhurst, Illinois 60125.

SSPC – Steel Structures Painting Council, 4400 Fifty Avenue, Pittsburgh, Pennsylvania 15213.

TCA – Tile Council of America, Inc., P.O. Box 326, Princeton, New Jersey 08540.

UL – Underwriters’ Laboratories, Inc., 207 East Ohio Street, Chicago, Illinois 60611.

Fed. Specs, and Fed. Standards: Specifications Sales (3FRI), Building 197, Washington Navy Yard, General Service Administration, Washington, D.C. 20407.

UBC – Uniform Building Code, International Conference of Building Officials, 5360 South Workman Mill Road, Whittier, California 90601.

END OF SECTION 01085

PART 1 – GENERAL

1.01 ALTERNATES

- A. This section identifies each alternate by number and describes the basic changes to be incorporated into the work, only when that alternate is made a part of the Work by specific provisions in the Owner-Contractor Agreement.
- B. Related Requirements in other parts of the Project Manual:
 - 2. Method of quotation of the cost of each alternate, and the basis of the Owner’s acceptance of alternates: Bidding Documents
 - 3. Incorporation of alternates into the Work: Owner-Contractor Agreement.
- C. Related Requirements Specified in Other Sections:
 - 1. Part 1.01: Description of Work
 - 2. Sections of the Specifications as listed under the respective Alternates.
- D. Referenced sections of specifications stipulate pertinent requirements for products and methods to achieve the work stipulated under each Alternate.
- E. Coordinate pertinent related work and modify surrounding work as required to properly integrate the work under each Alternate and to provide the complete construction required by the Contract Documents.
- F. The Owner reserves the right to accept the proposed amount for any alternate at any time during the active construction of the project. If the Owner elects to accept an alternate after the Owner-Contractor contract has been issued, the work shall be added to the contract by change order.

1.02 DESCRIPTION OF ALTERNATES

See proposal Form

END OF SECTION 01100

PART 1 – GENERAL

1.01 PRE-CONSTRUCTION MEETINGS

- A. Prior to the initiation of on-site activity, a meeting will be held with all Bid Division Contractors for the purpose of planning, scheduling, and coordinating an orderly initiation of on-site construction activity. Attendance at this meeting is required of all Contractors. The Construction Manager will advise all Contractors of the time and location of this meeting.
- B. A representative of the contractor authorized to enact decisions regarding schedule, manpower commitments and costs must attend the pre-construction meeting.

1.02 PRE-CONSTRUCTION CONFERENCES

- A. Each Contractor is required to meet on the site with the Construction Manager prior to beginning their Work. The purpose of this meeting is to review the intent of the Contract Documents as they pertain to the Contractor's Work, and to integrate the initiation of that Work with the Work already in progress on the site.

1.03 PROGRESS AND PROJECT MEETINGS

- A. Contractors active on-site shall be required to attend Progress and Project Meetings when called by the Construction Manager. These meetings are for the purpose of planning and assessing construction progress and for discussing problems of mutual concern.
- B. It is mandatory that any contractor actively engaged in work on site shall be required to have a representative of the contractor authorized and empowered to enact decisions regarding schedule, manpower commitments and costs and their superintendent attend these meetings, or the Owner may withhold the Contractor's payment.
- C. All decisions, instructions, and interpretations given by the Owner or their designated representatives at these meetings shall be conclusive and shall be binding on the Contractors.
- D. The proceedings of such meetings will be recorded and posted. Copies will be forwarded to Contractors.

END OF SECTION 01200

PART 1 – GENERAL

1.01

- A. Contractor shall be solely responsible to submit all shop drawings, product data, and samples, or other items required by the Construction Documents hereinafter referred to as submittals to the Construction Manager for processing and forwarding to the Architect for their review.
- B. Submittals shall be delivered to the Construction Manager's office in accordance with the procedures and dates required by the Construction Documents and/or this section, Section 01300, of the project manual (specifications) whichever is more stringent in its requirement. All submittals shall be provided to the Construction Manager within 30 calendar days of receipt of the signed contract or Notice to Proceed unless specified otherwise in the Construction Documents.

1.02 SUBMITTALS - SHOP DRAWINGS, PRODUCT DATA AND SAMPLES

- A. The Contractor shall submit to the Construction Manager individual submittals either via Procore or email. All files must include the specification number, item number and name as indicated in the submittal log.
- B. Contractor shall provide electronic copies of submittals. The submittals shall be in PDF format only. COLOR SAMPLES MUST BE SUBMITTED AS PHYSICAL SAMPLES.
- C. In submitting shop drawings, product data and samples, each Contractor represents that they have checked and coordinated the information contained within such submittals with the requirements of the Work and of the Contract Documents. All submittals must be stamped or signed by the contractor responsible for submitting, to attest to their review.

ALL SUBMITTALS MUST BE ACCOMPANIED BY THE WOLGAST CORPORATION SHOP DRAWING / SUBMITTAL FORM (see Page 2 of this section).

- D. Any submittal not accompanied by the Wolgast Corporation Shop Drawing / Submittal Form will be returned to the contractor for resubmittal.
- E. The Submittal Log provided as part of the Bid Division Descriptions shall be a guideline only and is not to be a representation of every or all submittals required for the completion of the Project. The Contractor shall be required to provide all items and perform all work in complete compliance with the Contract Documents.
- F. The Contractor shall not be relieved of the responsibility for any deviation in the work required by the Contract Documents, or any errors and omissions contained in shop drawings, product data; samples, or other submittal data reviewed and returned to the Contractor by the Architect. Any work performed prior to the Architect's review shall be subject to removal and replacement at the Contractor's expense.
- G. No portion of the Work requiring submission of shop drawings, product data or samples shall commence until the submission has been reviewed by the Architect. If any work is performed prior to the Architect's review of the required submittal(s), the work shall be subject to removal and replacement at the Contractor's expense if that work does not comply with the requirements of the contract documents.

1.03 START-UP DOCUMENTS (CONTRACT-AWARD SUBMITTALS)

- A. (Refer to Sections 00100, 00600, 00650, 00670, 00680, 00690.)

1.04 CONTRACT CLOSEOUT DOCUMENTS (CLOSE-OUT SUBMITTALS)

- A. (Refer to Sections 01700, 01720, 01730, and 01740.)

END OF SECTION 01300

TRANSMITTAL FORM FOR WOLGAST CORPORATION SHOP DRAWINGS / SUBMITTAL FORM

CONTRACTOR: _____ _____ _____ _____	PROJECT TITLE AND LOCATION _____ _____ _____ _____	WOLGAST PROJECT NO. _____ DATE SUBMITTED: _____ From Contractor _____ To Architect _____ From Architect _____ To Contractor _____
---	--	--

Pkg. NO.	Pkg. Name	Item No.	CSI Code No.	CSI Code Name	Item Ref. No.	Item Description	Item Type	No. of each	Subcontractors/MFR

The undersigned certifies that the above submitted items have been reviewed in detail and are correct and in strict conformance with the contract documents except as otherwise noted. NOTE: Approval of items submitted does not relieve contractor from complying with all requirements of the contract documents.

CONTRACTOR'S COMMENTS:

CONTRACTOR'S NAME

SIGNATURE

PART 1 – GENERAL

1.01 CONSTRUCTION SCHEDULES

- A. A Milestone Schedule is provided as part of the bidding documents to indicate dates by which certain critical tasks and/or portions of the project must be completed. The Milestone schedule also indicates the date by which the Project must be 100% complete, receipt of final inspections, occupancy allowed by all governing authorities, and owner move-in.
- B. Based on the Milestone Schedule each Contractor shall submit to the Construction Manager, at or prior to the Pre-Construction Meeting, two (2) copies of the proposed progress schedule for their Work identifying the critical tasks that they must complete to achieve the Milestone Schedule completion dates.
- C. The Construction Manager will utilize the scheduling input from the Contractors for incorporation into the Project Construction Schedule. The Project Construction Schedule will be compiled and distributed to all contractors.
- D. By signing the Owner-Contractor Agreement the Contractor agrees to cooperate with all the other multiple contractors and to coordinate all construction activities to allow the work of that contractor and all other contractors to meet the completion date(s) established in the Milestone Schedule. The Contractor also agrees that the Project Construction Schedule shall be followed to achieve or improve upon the completion dates for the various tasks in order to attain the final completion of the project by the scheduled completion date.
- E. The Construction Manager will, at times, issue a weekly Look-Ahead Schedule as part of the weekly Contractor Coordination Meetings. The Look-Ahead Schedule will support the Project Construction Schedule and provide specific scheduling information for the Contractor to assure the scheduled completion dates are achieved. The Contractor agrees to comply with the required work identified in the Look-Ahead Schedules.

END OF SECTION 01350

PART 1 – GENERAL

1.01 QUALITY CONTROL BY PROJECT ARCHITECT AND CONSTRUCTION MANAGER

- A. Each Contractor shall comply with the quality control provisions of the Contract Documents.
- B. The quality and completeness of the Work shall be maintained on a day-to-day basis. Inaccurate, faulty, incomplete, and defective Work shall be corrected by the Contractor without continuous prodding by the Construction Manager. Failure to cooperate in this continuous punch list effort may reduce Progress Payments.

1.02 CONTRACTOR QUALITY CONTROL

- A. Each Contractor shall be responsible for providing a quality workmanship consistent with the requirements of the Contract Documents. All Work will be of good quality and free from faults and defects. Every care shall be exercised to ensure that the quality specified is the quality provided.
- A. If at any time a Contractor is of the opinion that the quality of their Work is, or will be, jeopardized as a result of rescheduling or coordination of the Project, or for any other reason known to them, they shall stop work immediately and shall inform the Construction Manager of their action and the reasons thereof. The Contractor shall immediately provide a written explanation to the Field Construction Manager and Project Manager for the record, and shall mail a copy to the Architect. Upon investigation by the Construction Manager, a decision will be made on the note of jeopardy, in order to resolve the problem.
- C. Any Contractor who compounds a mistake by installing their product on another Contractor's obviously faulty work will assume responsibility for repair of said work.

END OF SECTION 01400

PART 1 – GENERAL

1.01 DESCRIPTION

- A. The Owner may employ and pay for the services of an independent testing laboratory to perform specified testing as identified in the Bid Division Descriptions.
- B. Contractors shall cooperate with the Laboratory to facilitate the execution of this service.
- C. Employment of the Laboratory shall in no way relieve the Contractor's obligation to maintain the quality of their work.

1.02 CONTRACTOR'S RESPONSIBILITIES

- A. Contractors shall cooperate with Laboratory personnel, and shall provide access to Work, and to manufacturers' operations.
- B. Contractors shall provide the Laboratory samples of proposed materials, which require testing.
- C. Contractors shall provide to the Laboratory the preliminary design mix proposed to be used for concrete and other materials, which require control, by the Laboratory.
- D. Contractors shall furnish all test results and coordinate testing with the Construction Manager.
- E. Contractors shall furnish incidental labor and facilities necessary:
 - 1. To provide access to Work to be tested.
 - 2. To obtain and handle samples at the Project site or at the source of the project to be tested.
 - 3. To facilitate inspections and tests.
- F. Contractors shall notify the Laboratory sufficiently in advance of operations to allow for Laboratory assignment of personnel and scheduling of tests.
- G. Contractors shall make arrangements with the Laboratory and pay for additional samples and tests required for the Contractor's convenience.
- H. Contractors shall comply with the Project Team's instructions regarding testing.

END OF SECTION 01410

PART 1 - GENERAL

1.01 DESCRIPTION

- A. The Owner will allow each Contractor to use power and water, where available, for use in construction. All usage will be arranged for by the Construction Manager.

1.02 REQUIREMENTS OF REGULATORY AGENCIES

- A. Comply with the National Electric Code.
- B. Comply with federal, state and local codes and regulations and with utility company requirements.

1.03 MATERIALS, GENERAL

- A. Cords, connectors, etc. may be new or used, but must be adequate in capacity for the required usage, must not create unsafe conditions, and must not violate requirements of applicable codes and standards.

1.04 TEMPORARY ELECTRICITY AND LIGHTING

- A. The Electrical Contractor shall furnish, install and maintain a complete and adequate temporary electrical service and distribution system for use by the Construction Manager and all Contractors during the construction period.
- B. The Electrical Contractor shall obtain, provide, and pay for all temporary electrical power service installation from the local power company or the existing building if the capacity is available.
- C. The cost of electrical power consumption shall be paid for by the Owner.
- D. Prior to the start of construction, the Electrical Contractor shall provide temporary power at each construction area and at the office of the Construction Manager. Each temporary service will be sufficient in size to provide continuous power for: twelve (12) ground fault protected, 20 amp, duplex receptables; two (2) 220v, 3 phase 40 amp receptable; 20 amp, 120v grounded temporary lighting circuits to provide for a minimum of one (1) lamp holder for each 200 square feet or a minimum of one (1) per room. Each lamp holder will be provided with one (1) 150 watt lamp and guard with no more than twelve (12) lamps per circuit. The Electrical Contractor shall be responsible for replacing all lamps as required.
- E. All wire and cable shall be sized to hold voltage drop at all outlets to a maximum of 5% total from transformer.
- F. Portions of the permanent electrical system may, at the option of the Electrical Contractor, be used for temporary power and lighting. The Electrical Contractor shall replace all burned out lamps, damaged wiring devices, and plates prior to acceptance of building by Owner. When any part of the permanent electrical system is used for temporary power or lighting, the Electrical Contractor will maintain the system until the final acceptance by the Owner and begin all warranties and guarantees upon the date of substantial completion.
- G. Overtime work requiring standby electricians shall be at the expense of the Contractor requiring the same.
- H. Installation of temporary electrical power and lighting shall be as scheduled by the Construction Manager.
- I. All temporary electrical installations shall be in compliance with the latest National Electrical Code (N.E.C.), MIOSHA or OSHA, whichever is more stringent. Compliance with N.E.C Section 210-8(b) shall be the responsibility of the Electrical Contractor. Assured grounding systems as defined in Exception Number 2 of N.E.C. Section 210-8(b) shall not be used in place of ground fault protection 9.

The Electrical Contractor shall completely remove the temporary electrical service and distribution system when directed to do so by the Construction Manager. The contractors responsible for the installation of all ceilings and partitions shall patch their work as necessary after removal of the temporary electrical system at no additional cost to the Construction Manager or Owner.

- J. The Owner shall pay for all electrical energy consumed during the construction period except for energy consumed to provide power or lighting in excess to those listed in this Article.
- K. Any electrical requirements for power or lighting beyond those listed in this Section (including energy charges) shall be the responsibility of the Contractor requiring them.

1.05 TELEPHONE SERVICE

- A. A telephone, if located at the Construction Manager's Field Office, may be provided for all Contractors' use in making local or long-distance calls.

1.06 WATER

- A. A temporary water distribution center will be provided in a nearby convenient location. The Contractor shall supply all hoses, etc. beyond that point.

1.07 SANITARY FACILITIES

- A. The Construction Manager will arrange for temporary sanitary facilities. Contractors shall not use permanent facilities at the site.

1.08 TEMPORARY HEAT

- A. When identified and required by the H.V.A.C. Contractor's Bid Division Description, the H.V.A.C. contractor shall install a heating system (permanent or temporary) in readiness for furnishing temporary heat in the new structure.
- B. When the H.V.A.C. Contractor is required to provide a temporary heating system, the H.V.A.C. Contractor shall operate and maintain the temporary heating system. The temporary heating system shall maintain a minimum temperature at all times of 40 degrees during rough-ins and 60 degrees during finishing operations. The H.V.A.C. contractor shall be responsible for the costs of all temporary electrical work relating to the temporary heating system if the permanent system is not used.
- C. In the event that temporary gas fired or open flame heating devices are used, they shall be of the heat exchanger type properly vented to the outdoors, and shall comply with local and state laws, codes, and ordinances.
- D. Portions of the new heating system may, at the option of the H.V.A.C. contractor, be used for temporary heat providing that all parts of the system are cleaned and restored to prime condition prior to acceptance. The H.V.A.C. contractor shall remove any filters used during the temporary heating period and replace with new filters. In addition, the H.V.A.C. subcontractor shall pay the cost of extending warranty and guarantee periods on any permanent equipment used prior to Substantial Completion. The H.V.A.C. contractor shall completely remove the temporary heating system when directed to do so by the Construction Manager.
- E. When identified and required by the H.V.A.C. Contractor's Bid Division Description, all or portions of the new (permanent) H.V.A.C. system shall be used for temporary heat. When the new/permanent system is used for temporary heat, the H.V.A.C. Contractor shall:

1. Maintain the system throughout its use.
2. At the end of the system's use as a temporary system, the H.V.A.C. Contractor shall replace all filters with new filters.
3. Cover openings in permanent return air ductwork with filter media. Maintain and replace filter media as required so air flow is not restricted.
4. Clean and restore all parts of the system to prime condition immediately prior to final acceptance by the Owner.
5. Provide the full warranty and guarantee of the entire system with the warranty/ guarantee period beginning at the time of final acceptance by the Owner.

F. All fuel costs for Temporary Heat shall be paid fo by the Owner.

1.09 EXECUTION

A. Each Contractor shall maintain and operate systems to assure continuous service, and avoid disruption of service.

1.10 REMOVAL

- A. Each Contractor shall promptly remove their own temporary materials and equipment when their use is no longer required.
- B. Each Contractor shall clean and repair damage they have caused by temporary installations or use of temporary facilities.
- C. Each Contractor shall restore existing facilities they have used for temporary services to their specified or original condition.

END OF SECTION 01510

PART 1 – GENERAL

1.01 DESCRIPTION

- A. Each Contractor shall furnish, install, and maintain construction aids required for the performance of their own Work, and shall move or remove them when they are no longer needed for the Work.
- B. Certain construction aids will be provided for and maintained by the Owner as indicated in later paragraphs in this Section.

PART 2 – PRODUCTS

2.01 MATERIALS, GENERAL

- A. Materials may be new or used, shall be suitable for their intended purposes, and shall not violate the requirements of applicable codes and standards.

2.02 CONSTRUCTION AIDS

- A. Each Contractor shall provide all required construction aids and equipment to facilitate the execution of the Work, including scaffolds, staging, ladders, and other such facilities and equipment.
- B. Contractors shall maintain all facilities and equipment in a first-class condition.

2.03 TEMPORARY ENCLOSURES

- A. The Construction Manager will arrange for temporary enclosures except those required by section 01900 – 2.01 to separate work areas from the areas of existing buildings occupied by the Owner to prevent penetration of dust or moisture into occupied areas, to prevent damage to existing equipment, and to protect the Owner’s employees, customers, and operations from construction work.

PART 3 – EXECUTION

3.01 PREPARATION

- A. Consult with the Owner, Construction Manager, and other Consultants and review the site conditions and other factors, which could affect construction procedures and construction aids, including adjacent properties and public facilities which may be affected by execution of the project.

3.02 GENERAL

- A. Comply with applicable requirements of the Specifications.
- B. Relocate construction aids as required by the progress of construction, by storage requirements, and to accommodate requirements of the Owner and other Contractors employed at the site.

3.03 REMOVAL

- A. Completely remove temporary materials, equipment, and services:
 - 1. When construction needs can be met by the use of permanent construction.
 - 2. At the completion of the Project.
- B. Clean and repair damage to the permanent facilities caused by installation or by use of temporary facilities.
- C. Restore existing facilities used for temporary purposes to specified or original condition.

END OF SECTION 01520

PART 1 – GENERAL

1.01 DESCRIPTION

- A. Safety is the responsibility of each individual Contractor. Each Contractor shall comply with all local safety ordinances and MIOSHA regulations and requirements while performing the Work.
- B. Each Contractor is required to submit Safety Data Sheets (SDS) to the Construction Manager via Procore or email, to be used for reference only, prior to transporting the material/chemical on site. In addition, it is the responsibility of each Contractor to maintain an accessible SDS file for their employees, subcontractors, sub-subcontractors, and suppliers that are on site.
- C. Each Contractor shall submit evidence of an Employer Safety Program that complies with current MIOSHA regulations and requirements prior to beginning any contract Work.
- D. Each Contractor and their Subcontractor(s), Sub-subcontractor(s), and Suppliers shall take all necessary precautions to ensure the safety of the public and/or workers on the job, and to prevent accidents or injury to any persons, on, about, or adjacent to the premises where the Work is being performed. The Contractor and their Subcontractor(s), Sub-subcontractor(s), and Supplier(s) shall comply with Federal or State OSHA regulations and all other laws, codes, ordinances, and regulations relative to safety and the prevention of accidents.
- E. The Contractor shall designate a responsible representative at the jobsite as Safety Representative who shall be responsible for the promotion of safety and prevention of accidents, and shall enforce all applicable laws, ordinances, codes, rules, regulations, and standards pertaining to safety and prevention of accidents.

END OF SECTION 01530

PART 1 – GENERAL

1.01 SECURITY

- A. Each Contractor shall bear full responsibility for protecting equipment, materials, and tools from damage, loss and vandalism.

END OF SECTION 01540

PART 1 – GENERAL

1.01 PROJECT ACCESS

- A. All employees of the Contractor(s), employees of the subcontractor(s) of the Contractor, any and all other persons having any related activity to the Contractor including suppliers & sales representatives, Inspectors, Architect/Engineer Representatives and all other Visitors must report to the Construction Manager Field Supervisor in the CM Site Office before being permitted into the project.
- B. Each worker must register at the site office prior to entering the work area each day that worker is engaged in the required tasks for the construction of the project. The worker shall register by signing their name and issued ID number, identifying the company they represent. The supervising foreman for each Contractor shall be responsible for registering all employees or tier subcontractor employees of that Contractor each day and providing that registration to the CM Field Supervisor.
- C. If Owner requested, all workers will be issued a photo identification badge and corresponding number by the Construction Manager allowing them access to the project. The ID badge shall be worn at all times. Any person failing to wear the photo ID badge will be required to leave the project immediately.
- D. Only workers performing required tasks for the construction of the project will be permitted access to the project site. Workers not actively engaged in performing required tasks will not be permitted on the project.
- E. Suppliers, sales representatives, and any other person having legitimate business with the Contractor or a subcontractor of any tier to the Contractor must remain at the Site Office until the on-site supervisor for that Contractor or tier subcontractor meets with that person at the CM Site Office.
- F. Any visitor to the project must register at the CM Site Office, request permission from the CM Site Supervisor for access to the project, have their own personal protection equipment as required by the CM Site Supervisor, and be issued a "Visitor" identification badge allowing access to the project.
- G. The CM Site Supervisor may deny any person access to the project for any reason the supervisor may see fit.
- H. The Contractor agrees to adhere to this Project Access policy regardless of all other agreements.

1.02 ACCESS ROADS

- A. Contractors' access to the Project site and arrangements for periodic, temporary access for specific construction shall be made through the Construction Manager with the Owner's approval.

1.03 DELIVERY

- A. Contractors receiving deliveries to site shall request a 24-hour notice to delivery from suppliers. Contractors receiving deliveries shall ensure that their personnel are at the site to receive deliveries, and properly store them.
- B. Bidders of Divisions for supply only should give 48 hours' notice to the Field Construction Manager so proper arrangements can be made for unloading.
- C. Any Contractors or Bid Division suppliers not giving notice shall reimburse Contractors at the site or be back charged accordingly for unloading and storage of said materials.
- D. Since site space is limited, delivery of materials shall not be made to the jobsite before progress of the job schedule calls for it, unless approved by the Construction Manager.

1.04 PARKING

- A. Contractor parking will be in an area designated by the Construction Manager on site.

1.05 SITE PLAN

- A. Refer to the Contractors use of premises (Section 01010) for further information on the use of the site.

END OF SECTION 01550

PART 1 – GENERAL

1.01 CONTROLS

- A. Control of elements such as noise, dust, water, pests, rodents, debris, pollution, and erosion are the responsibility of the Contractor(s). The Architect and Construction Manager will identify the Contractor(s) responsible for these controls in the event such controls have not been implemented. The Contractor(s) agrees to abide by the assignment of responsibility by the Architect and Construction Manager regarding such controls when required. The Contractor(s) shall be responsible for performing the control measures in strict conformance to all governing codes and restrictions.

END OF SECTION 01560

PART 1 – GENERAL

1.01 TRAFFIC REGULATIONS

- A. Contractors shall abide by all governmental and Owner-established traffic regulations.
- B. Contractors shall use the route designated by the Owner/Construction Manager and shall comply with the requirements of Section 01550 – Access and Deliveries.

END OF SECTION 01570

PART 1 – GENERAL

1.01 DESCRIPTION

- A. No signs shall be displayed by any Contractor.

END OF SECTION 01580

PART 1 – GENERAL

1.01 DESCRIPTION

- A. The Project Field Office will be located on-site adjacent to the location of the temporary power.
- B. The Project Field Office will be used by the Owner, Construction Manager, and Architect.
- C. Project meetings and progress meetings will be held in the Project Field Office, or at another location selected by the Construction Manager when deemed necessary.

1.02 TRAILERS, ETC.

- A. Trailers to be used as Contractors' site office and storage will be permitted. Approval must be obtained from the Field Construction Manager prior to moving on-site and will be located as directed by the Construction Manager. All trailers must meet federal, state, and local electrical and fire codes.

END OF SECTION 01590

PART 1 – GENERAL

1.01 NEW MATERIAL AND EQUIPMENT

- A. Material and equipment incorporated into the Work shall:
1. Conform to applicable specification and standards,
 2. Comply with sizes, makes, types, and qualities specified or as specifically approved in writing by the Architect or Owner.
- B. Manufactured and Fabricated Products:
1. Design, fabricate and assemble in accord with the best engineering and shop practices.
 2. Manufacture like parts of duplicate units to standard sizes and gauges, to be interchangeable.
 3. Two or more items of the same kind shall be identical, by the same manufacturer.
 4. Products shall be suitable for service conditions.
 5. Equipment capacities, sizes, and dimensions shown or specified shall be adhered to, unless variations are specifically approved in writing by the Project Architect.
- C. Do not use material or equipment for any purpose other than that for which it is designed or is specified.

1.02 MANUFACTURERS INSTRUCTIONS

- A. When the Contract Documents require that installation comply with manufacturers' printed instructions, obtain and distribute copies of such instructions to parties involved in the installation, including two (2) copies to the Project Architect.
- B. Maintain one set of complete instructions at the site during installation, until project completion.
- C. Handle, install, connect, clean, condition and adjust products in strict accord with such instructions and in conformity with specified requirements.
1. Should job conditions or specified requirements conflict with manufacturers' instructions, consult with the Project Team for further instructions.
- D. Perform Work in accord with manufacturers' instructions. Do not omit any preparatory step or installation procedure unless specifically modified or exempted by the Contract Documents.

1.03 TRANSPORTATION AND HANDLING

- A. Arrange deliveries of products in accordance with the Short-Term Construction Activities Plan. Coordinate to avoid conflict with Work and conditions at the site.
1. Deliver products in undamaged condition, in manufacturers' original containers or packaging, and with identifying labels intact and legible.
 2. Immediately upon delivery, inspect shipments to assure compliance with the requirements of the Contract Documents and approved submittals, and to ensure that products are properly protected and undamaged.
- B. Provide equipment and personnel to handle products by methods which will prevent soiling or damage to products or packaging.

1.04 STORAGE AND PROTECTION

- A. Store products in accord with manufacturers' instructions, with seals and labels intact and legible.
 - 1. Store products subject to damage by the elements in weather tight enclosures.
 - 2. Maintain temperature and humidity within the ranges required by Manufacturers' instructions.
- B. Arrange storage in a manner to provide easy access for inspection. Make periodic inspections of stored products to assure that the products are maintained under specific conditions and are free from damage or deterioration.
- C. Protection after Installation:
 - 1. Provide substantial coverings as necessary to protect installed products from damage, traffic, and subsequent construction operations. Remove the coverings when they are no longer needed.

1.05 SUBSTITUTIONS AND PRODUCT OPTIONS

- A. Products List:
 - 1. Before commencing Work, submit to the Construction Manager a complete list of major products proposed to be used, with manufacturers and suppliers' names, product names, model numbers, and where applicable, names of installing subcontractors. (Refer to Section 00680.)
- B. Contractor's Options:
 - 1. For products specified only by reference standard, select any product meeting that standard.
 - 2. For products specified by naming several products or manufacturers, select any one of the products or manufacturers named, which complies with the specifications.
 - 3. For products specified by naming one or more products or manufacturer and "or equal," Contractors must submit requests for substitutions for any product or manufacturer not specifically names.
 - 4. For products specified by naming only one product and manufacturer, there is no option.
- C. Substitutions:
 - 1. The Project Team will consider written requests from Contractors for substitution of products.
 - 2. Submit a separate request for each product, supported with complete data, with drawings and samples, as appropriate, including:
 - a. Comparison of the qualities of the proposed substitution with that specified,
 - b. Changes required in other elements of the Work because of the substitution,
 - c. Effect on the construction schedule,
 - d. Cost data comparing the proposed substitution with the product specified,
 - e. Any required license fees or royalties,
 - f. Availability of maintenance service, and source of replacement materials.
 - 3. Architect will be the judge of the acceptability of all proposed substitutions.
 - 4. Any request for a substitution constitutes a representation that the Contractor:
 - a. Has investigated the proposed product and determined that it is equal to or superior in all respects to that specified,
 - b. Will provide the same warranties or bonds for the substitution as for the product specified,
 - c. Will coordinate the installation of accepted substitutions into the Work, and make such other Changes as may be required to make the Work complete in all respects,
 - d. Waivers all claims for additional costs which may subsequently become apparent.
 - 5. The Construction Manager will review requests for substitutions and the Architect's determination of acceptability with reasonable promptness and will notify Contractors in writing of his decisions regarding requested substitutions.

END OF SECTION 01600

PART 1 – GENERAL

1.01 DESCRIPTION

- A. Each Contractor shall comply with requirements stated in the General Conditions and in the Specifications for procedures in closing out the Work.

1.02 SUBSTANTIAL COMPLETION AND FINAL INSPECTION PROCEDURE

- A. When a Contractor's work is 98% complete, and in compliance with Section 10 "Completion" of the Contract, the Contractor will be provided with a Certificate of Substantial Completion, after proper certification by the Construction Manager and Architect. A list of Work in need of correction and a list of incomplete Work will be forwarded to the Contractor. Both the Construction Manager and the Architect will have input to each list.
- B. Each Contractor will be allowed two weeks to complete the items on both lists beginning from the date stipulated on the Certification of Substantial Completion. The Contractor shall begin completion and correction activities within seven (7) days of receipt of the lists and complete all activities within the two-week period specified. Contractors failing to perform in accord with these time parameters will be subject to the provisions of the Additional Conditions, and the Owner will have the right to carry out the corrective Work and/or complete the Work. The cost of correction or completion will be deducted from the Contractor's contract amount.
- C. By the act of submitting the Certificate of Substantial Completion for execution by the Construction Manager and the Architect, the Contractor represents that they have:
1. Reviewed the Contract Documents.
 2. Inspected their Work for compliance with the Contract Documents.
 3. Completed their Work in accord with the Contract Documents and all pertinent submittals.
- D. They further represent that:
1. Equipment and systems have been tested in the presence of the Owner's representative and are operational.
 2. Their Work is completed and ready for final inspection.

1.03 CONTRACTOR'S CLOSEOUT DOCUMENTS

- A. Upon Substantial Completion, the Contractor shall submit the following:
1. Evidence of compliance with requirements of governing authorities, including Certificates of Inspection.
 2. Operating and Maintenance Data, Product Data and Instructions to the Owner's personnel.
 3. Warranties and Bonds
 4. Spare Parts and Maintenance Materials
 5. Evidence of Payment and Release of Liens
 6. Certification of Substantial Completion.
 7. As Built Drawings
 8. Contractor Hazardous Materials Compliance Affidavit
 9. Asbestos Free Affidavit
 10. Letter from Contractor's Insurance carrier that a Certificate of Insurance shall be sent to the Construction Manager at renewal time for a two (2) year period after substantial completion.
- B. One (1) hard copy set along with one (1) electronic set of closeout documents shall be submitted to the Construction Manager upon Substantial Completion.

- C. All Close Out documents must be turned in within two weeks of substantial completion. Final payment to the contractor will not be released until all closeout documents have been received and approved and/or punch list items have been completed and signed off.

1.04 FINAL APPLICATION FOR PAYMENT

- A. Each Contractor shall submit the final Application for Payment in accord with the procedures and requirements stated in the General Conditions of the Contract for Construction.
- B. Refer to Sections 01720, 01730, and 01740 for further information regarding submittals.

END OF SECTION 01700

PART 1 – GENERAL

1.01 DESCRIPTION

- A. Each Contractor shall execute cleaning during the progress of the Work, and at completion of the Work, as required by the Additional Conditions and the Specifications.

1.02 DISPOSAL REQUIREMENTS

- A. Conduct cleaning and disposal operation to comply with codes, ordinances, regulations, and anti-pollution law.

PART 2 – PRODUCTS AND EQUIPMENT

2.01 MATERIALS

- A. Use only those cleaning materials which will not create hazards to health or property, and which will not damage surfaces.
- B. Use only those cleaning materials and methods recommended by the manufacturer of the surface material to be cleaned.
- C. Use cleaning materials only on surfaces recommended by the cleaning material manufacturer.
- D. Each Contractor shall provide his/her own cleaning equipment.
- E. Each Contractor shall cooperate with the Owner and the Construction Manager regarding clean up.

PART 3 – EXECUTION

3.01 HOUSEKEEPING AND CLEAN-UP

- A. Each Contractor shall execute daily housekeeping to keep their Work, the site, and adjacent properties free from accumulations of waste materials, rubbish, and windblown debris resulting from construction operations.
- B. Each Contractor is financially responsible for his/her clean-up operations. Clean up must be timely as well as thorough in order to meet safety regulations and permit other Contractors to perform without hindrance from dirt and debris. The Construction Manager will coordinate Project housekeeping and take appropriate steps to maintain clean, safe working conditions. **Contractors failing to meet housekeeping requirements will be charged for services arranged by the Construction Manager.**

3.02 DUST CONTROL

- A. Clean interior spaces prior to the start of finish painting and continue cleaning on an as-needed basis until painting is finished.
- B. Schedule operations so that dust and other contaminants resulting from the cleaning process will not fall on wet or newly coated surfaces.
- C. Clean up must be performed after each task is done.
- D. Each Contractor is responsible for developing a plan for dust control and debris removal for each task prior to starting.

3.03 FINAL CLEANING

- A. Each Contractor shall employ qualified people for cleaning.
- B. Installing Contractors shall remove grease, mastic adhesives, dust, dirt, stains, finger-paints, labels, and other foreign materials from exposed interior and exterior surfaces, for acceptance by the Construction Manager, prior to leaving the site.
- C. Prior to final completion or Owner occupancy, each Contractor shall conduct an inspection of exposed interior and exterior surfaces and all work areas, to verify that the entire Project is clean.

END OF SECTION 01710

PART 1 – GENERAL

1.01 DESCRIPTION

- A. The Construction Manager will make available a set of Record Documents of the following:
1. Drawings.
 2. Specifications.
 3. Addenda.
 4. Change Orders and other Modifications to the Contracts.
 5. Written Instructions.
 6. Approved Shop Drawings, Product Data and Samples.
 7. Field Test Records.
 8. Construction Photographs.

1.02 RECORD DRAWINGS

- A. As a condition of final payment, each Contractor shall mark any and all installation information that differs in location, size, dimension or type from that shown on the Construction Documents on a single set of Construction Documents. Location of items of work such as electrical conduits, junction boxes, fire alarm cable, data cable, etc., that are not specifically shown on the Construction Documents shall be included in the Record Drawings. Locations of all work installed under concrete slabs shall be noted with accurate dimensions and the depth below finish floor indicated.

1.03 SUBMITTAL

- A. At Contract Closeout, each Contractor shall deliver one (1) hard set along with (1) electronic set of Record Documents, as indicated in 01700.1.03B to the Construction Manager, for delivery to the Owner.
- B. Each Contractor shall accompany their Record Document submittal with a transmittal letter in duplicate, containing:
1. Date.
 2. Project and Phase Designation.
 3. Contractor's name and address.
 4. Bid Division name and number.
 5. Title and number of each Record Document.
 6. Signature of Contractor of his authorized representative.
- D. The receipt of such Record Documents by the Construction Manager or the Owner shall not be a waiver of any deviations from the Contract Documents.

END OF SECTION 01720

PART 1 – GENERAL

1.01 DESCRIPTION

- A. Each Contractor shall compile product, data, and related information appropriate to the Owner’s maintenance and operation of products furnished under their contract.
- B. Each Contractor shall instruct the Owner’s personnel in the maintenance of products and in the operation of equipment and systems.

1.02 MAINTENANCE AND OPERATING MANUALS

- A. Prior to Substantial Completion, each Contractor shall submit to the Construction Manager one (1) hard set along with one (1) electronic set of all comprehensive maintenance and operating materials, presenting complete directions and recommendations for the proper care and maintenance of all visible surfaces, as well as maintenance and operating instructions for all equipment items which the Contractor has provided or installed.
- B. Operating instructions shall include all necessary printed directions for correct operation, adjustment, servicing, and maintenance of movable parts. Also included shall be suitable parts lists and diagrams showing parts location and assembly.

1.03 INSTRUCTION OF OWNER’S PERSONNEL

- A. Prior to final inspection or acceptance, each Contractor shall fully instruct the Owner’s designated operating and maintenance personnel in the operation, adjustment, and maintenance of all products, equipment, and systems.
- B. Manufacturer’s operating and maintenance manuals shall constitute the basis of instruction. Each Contractor shall review the contents of such manuals with the Owner’s personnel in full detail to explain all aspects of operation and maintenance.

END OF SECTION 01730

PART 1 – GENERAL

1.01 DESCRIPTION

- A. The Contractor shall provide a written Guarantee for all labor, material, equipment, and workmanship for a minimum period of two (2) years from the date of Substantial Completion of the project (or longer period of time if stipulated in the specifications) covering the work of their entire Bid Division(s).
- B. The Contractor shall also provide a written Warranty covering all work of their entire Bid Division(s) for a minimum period of two (2) years from the date of final project completion (or longer period of time if stipulated in the specifications).
- C. The Contractor shall further provide all suppliers, manufacturer, subcontractor and other written guaranties and warranties covering the work of the entire Bid Division(s) as required by the project specifications.

1.02 REQUIREMENTS

- A. The Contractor shall provide one (1) hard copy along with one (1) electronic copy of all written Guaranties and Warranties.
- B. The Contractor shall review all guaranties and warranties to assure of their compliance with all conditions of the contract.
- C. The Contractor shall assemble all guaranties and warranties, fully executed by each respective contractor, supplier, manufacturer and subcontractor and submit to the construction manager within two weeks of the date of Substantial Completion of the project.
- D. If the Owner elects to permit equipment and component parts of equipment into service during the progress of construction and has issues such permission in writing, all such guaranties and warranties must be submitted to the construction manager within two weeks after inspection and acceptance.
- E. For items of work where acceptance is delayed materially beyond the Date of Substantial Completion, the Contractor shall provide revised guaranties and warranties listing the acceptance date as the start of the guaranty or warranty period.

END OF SECTION 01740

PART 1 – GENERAL

1.01 DESCRIPTION

- A. It shall be the Contractor's responsibility to ensure that the Owner is notified of any hazardous materials brought to the site.
- B. In compliance with Michigan State Law there is to be no smoking anywhere on the project site or owner's property or use of any tobacco product at any time.
- C. The Contractor agrees to disallow any known carcinogens to be brought onto the jobsite at any time.
- D. The Contractor will not permit any employee to be in possession of any firearm or ammunition when on school property either on the worker's person or in the worker's vehicle. It is illegal to possess firearms or ammunition on your person or in a vehicle on school property at any time.

1.02 REQUIREMENTS

- A. The Contractor shall provide:
 - 1. One (1) hard copy of each Safety Data Sheet (SDS) for each of the hazardous materials used on the site.
 - 2. Certification that the Contractor (and their subcontractors) has instructed the persons using the hazardous materials in their proper use.
 - 3. For removal of any unused hazardous materials in their proper use.
 - 4. Certification that no asbestos containing materials are being used or brought onto the site by signing and notarizing the asbestos free certificate, which follows as page 3 of this Section.
- B. The Contractor shall utilize employee(s) that have been trained and certified for Hazardous Material Awareness specifically for asbestos and lead awareness.
- C. The Contractor has the responsibility to make themselves, their employees, and their subcontractors aware of any hazardous materials in the area of their specified work.
- D. The above requirements must be fulfilled, in writing, at or prior to a pre-construction meeting by filling out the Contractor Hazardous Materials Compliance Form, which is page 2 of this section.
- E. Standard safety practices and regulations as supplied by all governmental agencies will be in effect.
- F. A list of district SDS sheets is available on request.
- G. The Contractor shall submit a completed Contractor Hazardous Materials Compliance Affidavit and Asbestos-Free Affidavit certifying that no hazardous material has been incorporated into the Project as part of the documentation for Contract Close-Out.

2.01 COMPLIANCE

- A. Compliance with EPA AHERA for Asbestos.
 - 1. The Contractor must adhere to all EPA AHERA and Michigan State Asbestos Regulations for asbestos and other hazardous materials.

B. Compliance with Lead-Containing Materials.

1. All Contractors, Subcontractors and Sub-subcontractors shall adhere to the Environmental Protection Agency (EPA) lead-based paint regulation titled the “Renovation, Repair and Painting (RRP) Rule”. Included under this law are “Child Occupied Facilities” (COFs). COFs encompass locations of a pre-1978 constructed buildings where children under age of six (6) regularly visit, such as kindergarten rooms, 1st grade classrooms, applicable restrooms, preschools and day care centers. Therefore portions of each pre-1978 constructed school building falls under the RRP Rule.
2. Any contractor working on this project who disturbs painted surfaces in COF spaces shall ensure that they adhere to all aspects of the RRP Rule. This includes but is not limited to meeting the requirements for being a Certified Firm, having a Certified Lead Renovator involved and following applicable lead safe work practices.
3. Furthermore, all Contractors shall be responsible to comply with all applicable Federal and Michigan State lead regulations including, but not limited to, 29 CFR Part 1926.62 of the OSHA Lead Construction Standard, (Part 603 of the Michigan State Standards). All costs associated with regulatory compliance shall be borne by the Contractor.

CONTRACTOR HAZARDOUS MATERIALS COMPLIANCE AFFIDAVIT

PROJECT NAME: _____

TITLE: _____

Contractor: _____

Address: _____

Contractor's Representative: _____

Phone: _____ Fax: _____

Job Location: _____

This document certifies that the Contractor and any subsequent Contractors have complied with the terms set forth in the requirements for **Freeland Community Schools** as they pertain to hazardous materials.

The SDS's are attached for all hazardous materials which will be brought to **Freeland Community Schools**.

There are _____ SDS's attached.

The Contractor's employees (including subcontractors) have received appropriate instructions pertaining to the use and handling of hazardous materials.

The Contractor has been informed of hazardous materials in the area of the specified work.

Signature of Contractor's Representative

Date: _____

Received by: _____

Date: _____

ASBESTOS FREE AFFIDAVIT

Contractor: _____

Company Name: _____

Street: _____ City: _____ State: _____ Zip: _____

Project: _____

Bid Division: _____

Name of Building(s) in which work was performed:

Certificate Statement:

I _____, representing and having authority for
_____, hereby certify that any and all products/materials
that will be or have been installed/introduced in the above mentioned buildings, are asbestos free or less
that one percent (1%) asbestos by weight.

Name (printed): _____ Position: _____

Signature: _____

Date: _____

Notary Public: _____

My Commission Expires: _____

END OF SECTION 01800

PART 1 – GENERAL

1.01 NOTICE

- A. This notice is to formally advise you, per AHERA Requirements, that all buildings may have asbestos containing materials present. All areas testing positive for asbestos are documented in booklets located in the **Freeland Community Schools**.

1.02 DESCRIPTION

- A. All thermal insulation such as pipe wrap, especially joints, should be assumed to contain asbestos. Contractors are cautioned not to attempt removal of these materials without first notifying the Owner.

AHERA Notification and Contractor Compliance Affidavit

Project Name: Freeland Community Schools – BP 1 2024 Classroom/Secure Vestibule
Project #:
Owner: Freeland Community Schools
Address: 710 Powley Drive, Freeland, MI 48623

This notice is to formally advise you, per AHERA Requirements, that all buildings may have existing asbestos containing materials. All areas testing positive for asbestos have been documented in the owner’s asbestos inspection report available for inspection at the owner’s main office. All areas currently testing positive for asbestos are documented in the attached Three-Year Re-Inspection Asbestos plan report that has been provided by: Freeland Community Schools.

All thermal insulation such as pipe wrap, especially joints, should be assumed to contain asbestos. Contractors are cautioned not to attempt removal of these materials without first notifying the Owner.

I / We _____ doing business as _____ acknowledge receipt of the Three Year Re-Inspection Asbestos plan for the above mentioned project(s) as provided by Freeland Community Schools and certify that all employees of this contractor shall have been trained in the MIOSHA Two-Hour Asbestos Awareness program. It is this Contractor’s responsibility to inform any subcontractors or suppliers of this information and assume all responsibility for such notification.

Company

State of _____ County of _____

Name

Subscribed and sworn to before me this _____

day of _____

Title

Notary Public: _____

Address

My Commission Expires: _____

City, State, Zip

Seal

END OF SECTION 01805

PART 1 – GENERAL

1.01 CODES

- A. All work shall comply with the applicable requirements of the local building code and accident and fire prevention regulations.

1.02 SCOPE

- A. The Work covered by this section of Specifications includes, but is not limited to, the following:
1. Demolish and remove existing materials as shown on the plan and noted in the Description of Work.
 2. Cover holes and other hazardous openings with approved materials and barriers.
 3. Remove all demolition materials and debris from the construction site and dispose of in a legal manner.
 4. Protect adequately the construction site, adjoining property, and utility services as work proceeds through all stages.

1.03 QUALITY ASSURANCE

- A. The contractor's staff responsible for demolition shall be experienced in this type of work. Equipment is to be of suitable type, in good working condition, and operated by skilled mechanics.

PART 2 – PRODUCTS

2.01 TEMPORARY ENCLOSURES

- A. Provide temporary enclosures to prevent dust from entering other parts of the facility during demolition. Furnish, install, and remove when directed, temporary weathertight enclosures in all exterior openings created during demolition by the contractor.

PART 3 – EXECUTION

3.01 GENERAL INSTRUCTIONS

- A. All work shall be done in a safe and cautious manner in order to avoid accidents and property damage.
- B. Protect the work scheduled to remain, and if damaged, repair to match existing work.
- C. All salvaged material unless otherwise noted on plans or in the Description of Work shall become the property of the Contractor and shall be evaluated in the Contractor's bid price. Promptly remove salvaged material from the construction site as the work proceeds.
- D. Carefully dismantle and store on site all material scheduled to remain the Property of the Owner. Protect until removed by the Owner or until end of Contract.
- E. Protect from damage and clean materials scheduled to be reused.
- F. Protect parts of the existing Work scheduled to remain. Cut away carefully the parts to be demolished to reduce the amount of necessary repairs.
- G. Support existing structure as needed during cutting of new openings or replacement of structural members.
- H. Prevent accumulation of debris and overloading of any part of the structure.
- I. Prevent access of unauthorized persons to partly demolished areas.
- J. Remove all demolition materials, debris, and rubbish from the site as soon as practicable. Do not permit any accumulation on the site. Transport all demolition materials without spillage on the streets.

END OF SECTION 001900

HS/MS Addition & Secure Vestibule

For:

Freeland Schools

Freeland, MI

Specifications

Issued For:

Bidding & Permit
12/12/2024

Prepared by:

THE COLLABORATIVE

One SeaGate, Park Level 118
Toledo, Ohio 43604
Phone: 419-242-7405
Fax: 419-242-7400

Project No. 107270



MICHAEL MUSE, 1301048954
EXPIRATION DATE: 05.06.2025

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SECTION 003100 - AVAILABLE PROJECT INFORMATION

PART 1 GENERAL

1.1 EXISTING CONDITIONS

- A. Certain information relating to existing surface and subsurface conditions and structures is available to bidders but will not be part of Contract Documents, as follows:
- B. Geotechnical Report:
 - 1. A copy is available from the Owner.
 - 2. Contractor is urged to examine data provided.
 - 3. Contractor should visit the site and become acquainted with existing conditions.
 - 4. This report identifies properties of below grade conditions and offers recommendations for the design of foundations, prepared primarily for the use of Architect.
 - 5. This report, by its nature, cannot reveal all conditions that exist on the site. Should subsurface conditions be found to vary substantially from this report, changes in the design and construction of foundations will be made, with resulting credits or expenditures to the Contract Sum accruing to Owner.
 - 6. Interpretation: This report is provided only for information and convenience. Owner and Architect disclaim responsibility for accuracy, true location and extent of soil conditions that have been evaluated by others. Owner and Architect further disclaim responsibility for interpretation of the report data by the Contractor; including but not limited to projecting soil bearing values, rock profiles, soil stability, and presence, level, and extent of underground water.
 - 7. Applicable Requirements: Specific and variable recommendations contained in this document are subject to acceptance by Owner for incorporation in the Contract Documents prepared by Architect. Comply with requirements specified in the Contract Documents for earthwork, paving systems, and other applicable work scope items.
- C. The contractor should review hazardous material testing reports with the owner and any found instances prior to demolition work taking place. No report has been provided or is included within these documents.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

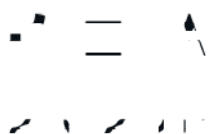
A. END OF SECTION

- **Geotechnical Investigation**
- Proposed Freeland High/Middle School
- Building Addition

8250 Webster Road
Freeland, Michigan

Mr. Dave Serra
The Collaborative
One SeaGate Park Level 118
Toledo, Ohio 43604

PEA Group Project No. 2024-1779



PEA GROUP



1849 Pond Run
Auburn Hills, MI 48326

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December 6, 2024
Project No.: 24-1779

Dave Serra
The Collaborative
One SeaGate, Park Level 118
Toledo, OH 43604

**RE: Geotechnical Investigation
Freeland High/Middle School Building Addition
8250 Webster Road
Freeland, Saginaw County, MI**

Dear Mr. Serra:

PEA Group has performed a geotechnical investigation for the proposed addition to their high/middle school on the property located in Freeland, Michigan. The purpose of our investigation was to determine the general subsurface conditions at the proposed building addition location in order to provide foundation and related site preparation recommendations.

Based on our investigation, the site soils generally consist of *topsoil overlaying silty and sandy clay fill*. These in turn overlie layers of *native silty and sandy clay*. Fill was encountered at two (2) test boring locations and extended to approximate depths in the order of 3.5 to 8.5 feet below the existing ground surface (bgs). Groundwater was encountered in two (2) of the soil test borings during drilling activities at approximate depths ranging from 3.5 to 13.5 feet bgs. The water was typically encountered in sand layers or seams. We believe this water to be perched in the fill and a sand seam at the deeper elevation due to the fact that the boreholes were dry upon the completion of drilling activities. We do not expect any significant groundwater to be encountered during construction or utility installation. The subsurface condition encountered at the test boring locations are feasible for the proposed development.

It is expected that the building addition will be at or near the elevation of the existing building. We anticipate a minimal amount of cut and fill will be needed to achieve final design grades. We anticipate cuts and fills of up to 3 feet. However, due to the 8 feet of fill at TB-2, certain areas may need more cut and fill than others. Following successful completion of earthwork operations, we recommend that the proposed building addition be supported by shallow foundations bearing on engineered fill or on the native soils. We recommend that earthwork be performed in the dry season. We caution that if site conditioning and earthwork operations are during wet or cold weather (i.e. any time other than late spring to early fall) significant difficulty should be anticipated.

The data obtained during this investigation along with our evaluations, analysis and recommendations are presented in the subsequent portions of this report.

SITE CONDITIONS AND PROPOSED CONSTRUCTION

The site for the proposed building addition is located at 8250 Webster Road, Freeland, Michigan. The proposed site is bordered to the north by farm fields; and to the south, east and west by residential properties.

Underground utilities, such as storm and sanitary sewers, water mains and gas lines currently exist throughout the site. The ground surface generally appears to slope down towards the south.

Refer to the Test Boring Location Plan for the existing site features.

Based on information provided, we understand that the present plans include constructing a single-story slab-on-grade structure with no basements.

Although no specific loading information was available for the proposed building addition, we anticipate slab-on-grade construction and loads not exceeding 150 kips for interior columns and 3,000 pounds per linear foot for walls. It is understood at this time that the proposed finish floor elevation for the structure will be near the existing grade.

We anticipate minimal cuts and fills to achieve design grades for the area where the proposed building will be constructed. We also understand that any existing underground utilities would be reused, if applicable.

REGIONAL GEOLOGY AND SEISMIC ACTIVITY

A review of available sources indicates that several ice sheets (i.e. glaciers) advanced and retreated over the site with the most recent being during the late Wisconsin period. Based on the Michigan Department of Environment, Great Lakes, and Energy (EGLE) Quaternary Geology Map, the site soils were generally deposited as end moraines of fine-textured till. According to the 1981 Hydrogeology Atlas Map of Michigan, the top of rock is at about elevation 400 or about 250 feet below the surface. Any sand and gravel strata are generally attributed to a succession of gradually receding lakes creating beach ridges.

Southern Michigan and Freeland are considered to have a relatively low seismic risk. The appropriate geotechnical design considerations for seismic conditions should be applied based on the Michigan Building Code. Based on our interpretation of the test borings and understanding of the soil conditions below the depth of exploration, we recommend the site be classified as a Class D Site.

FIELD INVESTIGATION

We investigated subsurface conditions at the site by drilling four (4) test borings, designated TB-1 to TB-4. DLZ Drilling Company drilled the test borings on November 19, 2024. The test borings were drilled within the proposed building addition and parking locations. The test borings were located in the field by measuring from existing surface features. The locations are shown on the Test Boring Location Plan. Ground surface elevations were estimated from the topographic survey of the site completed by PEA Group dated October 14, 2024.

The borings were advanced with 3 ¼ inch inside-diameter hollow stem augers. Soil samples were taken at intervals of generally 2.5 feet within the upper 15 feet and at 5-foot intervals below 15 feet. These test boring samples were taken by the Standard Penetration Test method (ASTM D-1586) utilizing an automatic hammer.

The soil samples obtained with the split-barrel sampler were sealed in containers and transported to our laboratory for further classification and testing. We will retain these soil samples for 60 days after the date of this report. At that time, we will dispose of the samples unless otherwise instructed.

PRESENTATION OF DATA

We evaluated the soil and groundwater conditions encountered in the test borings and have presented these conditions in the form of individual Logs of Test Borings on Figures 1 through 4. The nomenclature used on the boring logs and elsewhere are presented on the Soil Terminology sheet, Figure 5. The stratification shown on the test boring logs represents the soil conditions at the actual boring locations. Variations may occur between the borings. The stratigraphic lines represent the approximate boundary between the soil types, however, the transition may be more gradual than what is shown.

LABORATORY TESTING

The soil samples obtained from the test borings were also classified in our laboratory. Selected samples were tested to determine natural moisture contents. Testing was performed in accordance with current ASTM standards. The results of these tests are presented on the individual Logs of Test Borings.

In addition to the laboratory testing, pocket penetrometer measurements of the unconfined compressive strengths of cohesive soils were determined in the field. The strength values determined by the penetrometer are also presented on the test boring logs.

SOIL CONDITIONS AND EVALUATIONS

From the information obtained during this investigation, subsoil conditions are generally similar throughout the site. Topsoil was encountered at the ground surface followed by fill consisting of sandy clay and clayey sand, and underlain by native soils consisting of hard silty clay with various amounts of sand and gravel.

Topsoil was encountered at the ground surface at all the test boring locations. The topsoil generally consists of dark brown clayey sand and ranges between 5 to 6 inches thick at the test boring locations. We do not consider the topsoil suitable for the support of the building foundations, floor slabs, pavements or for use as engineered fill material. However, this material can be reused for landscaping.

Fill was encountered below the topsoil at the test boring location TB-1 and TB-2, and extended to approximate depths of 3.5 and 8.5 ft bgs, respectively. The fill consists of very stiff brown and gray sandy clay, and clayey sand. The fill is fairly uniform in composition. The existing fill is considered suitable to support floor slabs and pavement or to be reused as engineered fill providing the earthwork recommendations in the Site Preparation section of this report are followed. The existing fill is not suitable for foundation support or for the support of engineered fill for foundation supports. Reuse of the fill as common fill below pavements is acceptable if some potential settlement of the pavement surface is acceptable. Due to the previous development on the site, there is potential for additional fill to be encountered. These fills should be evaluated prior to use onsite.

Underlying the topsoil, pavement section, and/or the existing fill, the soils consist of very stiff to hard silty and sandy clays that extended to the test boring termination depths. The native clays are consistent in unconfined compressive strength as measured in the field by pocket penetrometer. The native soils are considered suitable for the direct support of foundations, floor slabs, pavement, and for reuse as compacted fill.

SITE PREPARATION

We recommend that all earthwork operations be performed under adequate specifications and be properly monitored in the field. We expect the earthwork to consist of minimal cuts and fills to bring the site to grade preparing for floor slabs and pavement. We recommend the following earthwork operations be performed.

- Any surface vegetation should be cleared. Topsoil or any other organic soils, if encountered, should be removed in their entirety from the building and parking areas.
- Abandoned utilities inside the proposed building should be removed in their entirety. Outside the building area, the abandoned utilities should either be removed or plugged.
- Where cohesive soils are present prior to fill placement in fill areas, and after rough grade has been achieved in cut areas, the cohesive subgrade should be thoroughly proof-rolled. A heavy rubber-tired vehicle such as a loaded dump truck should be used for proof-rolling.
- We expect that some areas of the site will not proof-roll satisfactorily. Any areas that exhibit excessive pumping and yielding during proof-rolling and compaction should be stabilized by aeration, drying, and compaction if weather conditions are favorable, or removal and replacement with engineered fill (undercutting).
- Undercutting can include the use of geotextiles and geogrids. Removing wet pumping soils to find suitable stable soil may not work on this site. Thus, in order to backfill an undercut excavation, 1-1/2 inch by 3-inch concrete or a geogrid is recommended to stabilize the bottom before the refilling process begins.
- Following proof rolling and repair of unsuitable subgrade areas, the upper foot of the subgrade should be compacted to 95 percent of the maximum dry density as determined by the Modified Proctor Compaction Test, (ASTM D-1557) prior to placement of engineered fill.

We recommend materials meeting the following criteria be used for backfill or engineered fill to achieve design grades:

- The material should be non-organic and free of debris.
- Frozen material should not be used as fill nor should fill be placed on a frozen subgrade.
- The on-site soils may be used for engineered fill provided that they are approximately at the optimum moisture content. The silty and sandy clay soils may require aeration and drying before they can be properly compacted.
- Some of the granular deposits on the site may meet the requirements for granular fill, and may be re-used accordingly.
- Free-draining granular soils should be used for trench backfill and in confined spaces.
- Pea gravel is not recommended as engineered fill. Although pea gravel can easily be compacted, since it is rounded and very narrowly graded, it is unstable under wheel loads. In order to support loads, it must be confined laterally.
- Common Fill: The on-site soils may be used for common fill material. Common fill should be used in large areas that can be compacted by large earth moving equipment.
- Granular Fill: Granular fill should be used in confined areas such as trenches and backfill around

foundations. Granular fill should meet the following gradation:

<u>Sieve Size</u>	<u>Percent Passing</u>
6 inch	100
3 inch	95-100
Loss by Wash	0-15

MDOT Class III meets the requirements for Granular Fill.

Alternately the following also can be used:

<u>Sieve Size</u>	<u>Percent Passing</u>
3 inch	100
1 inch	60-100
No. 30	0-30
Loss by Wash	0-10

MDOT Class II meets the requirements for Granular Fill. Some restrictions apply to some applications

- **Sand-Gravel Fill:** Sand-gravel fill should be used where free-draining material is required. Free-draining material is recommended for underfloor fill and retaining wall backfill. Sand and gravel fill should meet the following gradation:

<u>Sieve Size</u>	<u>Percent Passing</u>
2 inch	100
1/2 inch	45-85
No. 4	20-85
No. 30	5-30
Loss by Wash	0-5

MDOT Class I material meets the requirements for sand and gravel.

- **Crushed Stone Fill:** Crushed stone fill should be used for aggregate base and for any over-excavated foundations. Crushed stone should meet the following gradations:

<u>Sieve Size</u>	<u>Percent Passing</u>
1-1/2 inch	100
1 inch	85-100
1/2 inch	50-75
No. 8	20-45
Loss by Wash	0-10

MDOT 21AA meets the gradation.

The fill should be placed in uniform horizontal layers. The thickness of each layer should be in accordance with the following:

<u>Compaction Method</u>	<u>Maximum Loose Lift Thickness</u>
Hand-operated vibratory plate or light roller	

In confined areas	4 inches
Hand-operated vibratory roller weighing at Least 1,000 pounds	6 inches
Vibratory roller drum roller, minimum dynamic Force, 2,000 pounds	9 inches
Vibratory drum roller, minimum dynamic force, 30,000 pounds	12 inches
Sheeps-foot roller	8 inches

The vibrating roller thicknesses indicated are for compacting granular soils. The lift thicknesses may be increased if field compaction testing demonstrates the specified compaction is achieved throughout the lift.

The fill should be compacted to achieve the specified compaction percentage of the maximum dry density as determined by the Modified Proctor compaction test (ASTM D-1557). The specified compaction for fill placed in various area should be as follows:

<u>Area</u>	<u>Percent Compaction</u>
Within building	95
Below foundations	95
Pavement base	95
Within one foot of pavement subgrade	95
Below one foot of pavement subgrade	92
Landscaped area	88

Trench backfill shall also be compacted to the above standards. The subgrade preparation under the proposed building should extend 10 feet beyond the foundations of the structure. The subgrade preparation under the pavement should extend 5 feet beyond the edge plus a one-on-one slope to the original grade.

The site conditioning procedures discussed above are expected to result in fairly stable subgrade conditions throughout most of the site. However, the on-site silty cohesive soils are sensitive to softening when wet or disturbed by construction traffic. Depending on weather conditions and the type of equipment and construction procedures used, surface instability may develop in parts of the site. If this occurs, additional corrective procedures may be required, such as in-place stabilization or undercutting. Surface instability for pavement preparation commonly results from poor surface water management as the building is constructed, underground utilities are installed, and when sensitive subgrades are not protected from excessive construction traffic. Corrective procedures can be limited by careful attention to water management and construction traffic.

If site conditioning and earthwork operations are to be performed during wet or cold weather (i.e. any time other than late spring to early fall), significant difficulty should be anticipated in drying or stabilizing the on-site silty cohesive clay soils. Under such circumstances, it may become necessary to undercut the wet soils and backfill with clean granular soils to achieve proper stabilization.

If site preparation operations are performed during dry summer months, it may be possible to stabilize wet soils in place and to use cohesive soils as fill with proper conditioning and moisture control in the field. However, using on-site cohesive soils that require moisture conditioning as engineered fill may not be cost effective.

FOUNDATION RECOMMENDATIONS

Based on an evaluation of the subsurface data obtained and successful completion of the earthwork procedures previously outlined, we recommend that the proposed building addition be supported on shallow spread and/or strip footings. Foundation excavations adjacent to utilities, streets, driveways, and sidewalks require caution, and care shall be given. Care must be exercised when making excavations adjacent to the existing structure to minimize lateral soil movements and the potential undermining of existing foundations. In addition, the new and existing building sections should be structurally separate to allow for independent movements.

Exterior footings should be founded at a depth of at least 3.5 feet below the exposed finished grade for protection against frost penetration. Interior footings not exposed to frost penetration during or after construction can be installed at shallower depths provided that suitable bearing soils are present. To help mitigate frost heave, the sides of all footings should be vertical, and not be allowed to be larger at the top.

Adjacent spread footings at different levels should be designed and constructed so that the least lateral distance between them is equivalent to or more than the difference in their bearing levels. To achieve a change in the level of a strip footing, the footing should be gradually stepped at a grade no steeper than two units horizontal to one unit vertical.

We recommend a uniform net allowable soil bearing pressure of 3,000 pounds per square foot (psf) be used for the design of footings bearing on undisturbed native soil and engineered fill. In using a net allowable soil pressure, the weight of the footing, backfill over the footing, or floor slabs need not be included in the structural loads for sizing footings. For both the vertical load and the horizontal load, the allowable bearing may be increased by one third for transient loads resulting from wind or seismic loads. However, strip footings should be at least 12 inches in width, and isolated spread footings should be at least 18 inches in their dimension, regardless of the resulting bearing pressure. All foundation excavations should be observed and tested to verify that adequate in-situ bearing pressures, compatible with the design value, are achieved.

If the recommendations outlined in this report are adhered to, total and differential settlements for the completed structure should be within approximately 1 inch and 1/2 inches, respectively. We recommend that all strip footings be suitably reinforced to minimize the effects of differential settlements associated with local variations in subsoil conditions.

GROUNDWATER CONDITIONS AND CONTROL

Groundwater was encountered in two (2) of the soil borings during drilling activities at approximate depths of 3.5 and 13.5 feet bgs. The water was typically encountered in sand layers or seams. We believe this water to be perched in the fill and a sand seam at the deeper elevation due to the fact that the boreholes were dry upon the completion of drilling activities. We do not expect any significant groundwater to be encountered during construction or utility installation.

Groundwater observations during drilling operations in predominantly cohesive soils are not necessarily indicative of the static groundwater level due to the low permeability of such soils and the tendency of drilling operations to seal off the natural paths of groundwater flow. Considering the predominantly cohesive character of the subsoils and groundwater levels about 10 feet below the ground surface, no significant

groundwater accumulations are anticipated in construction excavations. We expect that accumulations of groundwater or surface runoff water in such excavations should be controllable with normal pumping from properly constructed sumps.

FLOOR SLABS

The subgrade resulting from the satisfactory completion of site preparation operations can be used for the support of concrete floor slabs. Based on the proposed / anticipated finish floor grade, the slab may be supported by existing fill, engineered fill, and or native soils. A modulus of subgrade reaction, k, of 130 pounds per cubic inch may be used for design. We recommend that all concrete floor slabs be suitably reinforced and separated from the foundation system to allow for independent movement. If floor settlement is to be virtually eliminated, the existing fill deposits would have to be removed in their entirety and replaced with engineered backfill.

We recommend a porous granular blanket consisting of MDOT Class I sand or MDOT 21AA aggregate at least 4 inches thick under the floor slab. We also recommend a vapor barrier for floor covering materials affected by moisture from the subgrade, such as us typically found in office areas. Where warranted, the slab designer and contractor should refer to American Concrete Institute (ACI) 302 and 360 for guidance in use and placement.

PAVEMENT CONSIDERATIONS

The subgrade resulting from the satisfactory completion of site preparation operations can also be used for the support of pavements. The cohesive subgrade soils consist of low plasticity silty and sandy clays which can be classified as CL or CL-ML, according to the Unified Soil Classification System (USCS). Soils of these types tend to have poor drainage characteristics, are frost susceptible, and are generally unstable under repeated loading. Although sand was encountered in some areas of the site, the clay soils control the design of the pavement. Based on the results of our investigation and the anticipated frost and moisture conditions, these soils may be assigned an estimated California Bearing Ratio (CBR) value of 3 for the design of pavements.

Criteria for an engineered design has not been furnished. In addition to traffic loads, criteria also includes the design life, reliability and defining the condition at the end of the design period. We anticipate that both a light and heavy duty conventional pavement section consisting of asphalt with aggregate base will be used. In addition, a concrete pavement may be used for parking and truck traffic areas.

Conventional Asphalt on Aggregate Base

Parking:	1.5 inches of Asphalt Surface Course 2.5 inches of Asphalt Leveling Course 8 inches of Aggregate Base
Heavy Duty Drive Areas:	1.5 inches of Asphalt Surface Course 1.5 inches of Asphalt Leveling Course 2 inches of Asphalt Base Course 10 inches of Aggregate Base

Portland Cement Concrete on Aggregate Base

Parking:	6 inches of Portland Cement Concrete 4 inches of Aggregate Base
----------	--

Heavy Duty Drive Areas: 8 inches of Portland Cement Concrete
 4 inches of Aggregate Base

Acceptable asphalt pavement mixes should be sourced from a registered and approved Michigan Department of Transportation (MDOT) supplier and meet the specifications for MDOT Low Volume Super Pave mixes. The aggregate base should meet criteria for MDOT 21AA.

The above aggregate base thicknesses are based on using natural aggregate as discussed in the Site Preparation Section. At present the readily available natural aggregate is limestone. If crushed concrete is used, it should meet all the MDOT requirements for gradation that includes the loss by wash and percent building material. **We recommend increasing the aggregate layer thickness by 20% when using crushed concrete instead of natural stone.**

For pavements, we recommend that “stub” or “finger” drains be provided around catch basins and other low parts of the site to minimize the accumulation of water above and within the frost susceptible subgrade soils. We also recommend edge drains along parking perimeters where upgrade surface water can flow onto or under pavement. Consideration should also be given to providing subdrains around the perimeter of any proposed landscaped islands within the parking area since they can become a source of water infiltration into the pavement. Such subdrains could be connected to nearby catch basins. The pavement should be properly sloped to promote effective surface drainage and prevent water ponding.

The pavement recommendations provided in this report are intended to provide serviceable pavement for about 20 years. However, all pavements require regular maintenance and occasional repairs. The need for such maintenance is not necessarily indicative of premature pavement failure. If such activities are not performed in a timely manner, the service life of the pavement can be substantially reduced. Most pavements require preservation treatments about 5 years into their life from environmental causes.

In truck loading zones, truck trailer parking areas, and trash dumpster pick-up areas within the asphalt pavement areas, heavy concentrated wheel loads will be subjected upon the pavement. This type of activity frequently results in rutting of asphalt pavement and ultimately can lead to premature failure. Therefore, we recommend that suitably reinforced concrete pavement at least 8 inches in thickness be given consideration in these areas. Asphalt pavement in truck unloading areas may also experience rutting due to forklift traffic and/or truck turning movements. We recommend that concrete pavement also be placed in such areas.

FIELD MONITORING

Soil conditions at the site could vary from those generalized on the basis of test borings made at specific locations. We recommend that a qualified geotechnical engineer be retained to provide soil engineering services during the site preparation, excavation, and foundation phases of the proposed project. This is to observe compliance with the design concepts, specifications, and recommendations. Also, this allows modifications to be made in the event that subsurface conditions differ from those anticipated prior to the start of construction. Additionally, material testing should be done prior to and during subgrade preparation and utility construction (i.e. materials suitability assessment of on-site and imported fill, compaction testing, asphalt and concrete testing, etc.).

The foundation installations should also be monitored and evaluated by a qualified engineer or soils technician to ensure that the bearing material is consistent with the design bearing intended by the geotechnical report engineer. The on-site review of the condition of the bearing soils as the foundations are constructed is an integral part of the geotechnical design function.

LIMITATIONS OF THE REPORT

This report is intended solely for the use of The Collaborative and other parties explicitly identified in this report. It is prohibited for others to use this report without the explicit written consent of PEA. Any unauthorized reuse, redistribution of or reliance on this report shall be at The Collaborative and recipient's sole risk without liability to PEA. The Collaborative shall defend, indemnify and hold PEA Group harmless from any liability arising from or related to The Collaborative's unauthorized distribution of the report. No portion of this report may be used as a separate entity; it is to be read in its entirety and shall include all supporting drawings and attachments.

The recommendations made in this report are in accordance with our present understanding of the project and the current site use, conditions and ground surface elevations. Our recommendations are based on the work scope approved by The Collaborative and described in this report. The services were performed in a manner consistent with the level of analysis typically exercised by geotechnical engineering professionals currently practicing under similar conditions in the same locality. No other representations and no warranties or representations of any kind, either expressed or implied, are made. Any use which a third party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of such third parties.

By issuing this report, PEA Group is the geotechnical engineer of record. It is recommended that PEA Group be retained during construction and earthwork operations to confirm the conditions of the subsoil are actually similar to those observed during construction and our interpolations were correct. The intent of this requirement is to verify that conditions encountered during construction are consistent with the findings in the report and that inherent knowledge developed as part of our study is correctly carried forward to the construction phases.

It is important to emphasize that a subsurface investigation is a random sampling of the site and the comments included in this report are based on the results obtained at the test locations only. The subsurface conditions may vary at other locations than what was observed in our soil borings. The subsurface conditions can be significantly altered due to construction activities or by exposing the soils to humidity, dry periods or frost. Soil and groundwater conditions between and beyond the soil boring locations may differ both horizontally and vertically from those encountered at the soil borings; these conditions may become apparent during construction which could not be detected or anticipated at the time of our investigation. Should any conditions at the site encountered during construction differ than those encountered during this investigation, we request that we be notified immediately in order to reassess our recommendations. If changed conditions are encountered during construction, no matter how minor, the recommendations in this report shall be considered invalid until a sufficient review is completed by PEA Group and is documented in a written form.

GENERAL COMMENTS

We have formulated the evaluations and recommendations presented in this report, relative to site preparation and building foundations, on the basis of data provided to us relating to the location of the proposed building. Any significant change to this data should be brought to our attention for review and evaluation with respect to the prevailing subsurface conditions.

The scope of the present investigation was limited to evaluation of subsurface conditions for the support of building foundations, pavements, and other related aspects of development. No chemical, environmental, or hydrogeological testing or analysis was included in the scope of this investigation.

If you have any questions regarding this report, or if we may be of further assistance to you in any respect, please feel free to contact us. We appreciate the opportunity to have been of service to you.

Sincerely,

PEA Group

A handwritten signature in black ink, appearing to read 'Brendon Junge', with a long, sweeping flourish extending upwards and to the right.

Brendon Junge, PE
Geotechnical Project Engineer

A handwritten signature in black ink, appearing to read 'D. Jack Sattelmeier', with a large, circular flourish at the end.

D. Jack Sattelmeier, PE
Director of Geotechnical Engineering

Attachments: Log of Test Boring
 Soil Terminology
 Location Plan

PROJECT NAME: *Freeland High/Middle School Building Addition*
LOCATION: *8250 Webster Road*
Freeland, Saginaw County, Michigan

PEA Job No.: *2024-1779*
Reviewed by: *DJS*

SUBSURFACE PROFILE		SOIL SAMPLE DATA							
GROUND SURFACE ELEVATION	652	DEPTH FEET	SAMPLE	BLOWS /6"	SPT "N"	Moisture Content (%)	Dry Density (pcf)	Unconf. Comp. Str. (psf)	Failure Strain (%)
		0							
	TOPSOIL: Black Clayey Sand	0.6							
650	Very Stiff Brown SANDY CLAY, Trace Gravel, Some Silt	3.5	1-S	4 6 4	10	9		*6000	
		5	2-S	3 4 6	10	14		*9000	
645	Hard Brown and Gray SILTY CLAY, Trace Gravel, Occasional Sand and Silt Seams		3-S	4 8 9	17	12		*9000	
		10	4-S	4 7 8	15	12		*9000	
640									
		13.5	5-S	2 3 4	7	9		*3500	
635	Stiff Gray SANDY CLAY, Trace Gravel, Some Silt, Occasional Sand Seams	15							
		18.5	6-S	3 5 5	10	11		*4000	
630	Stiff to Very Stiff Gray SILTY CLAY, Trace Gravel, Some Sand	20							
		25	7-S	2 5 5	10	14		*4000	
625									
		30	8-S	2 4 5	9	12		*2500	
	End of Boring	30							
620		35							

Total Depth: 30
Drilling Method: 3-1/4" Hollow Stem Augers
Drilling Date: 11/19/24
Inspector: SGA
Contractor: DLZ Drilling Company
Plugging procedure: Soil Cuttings

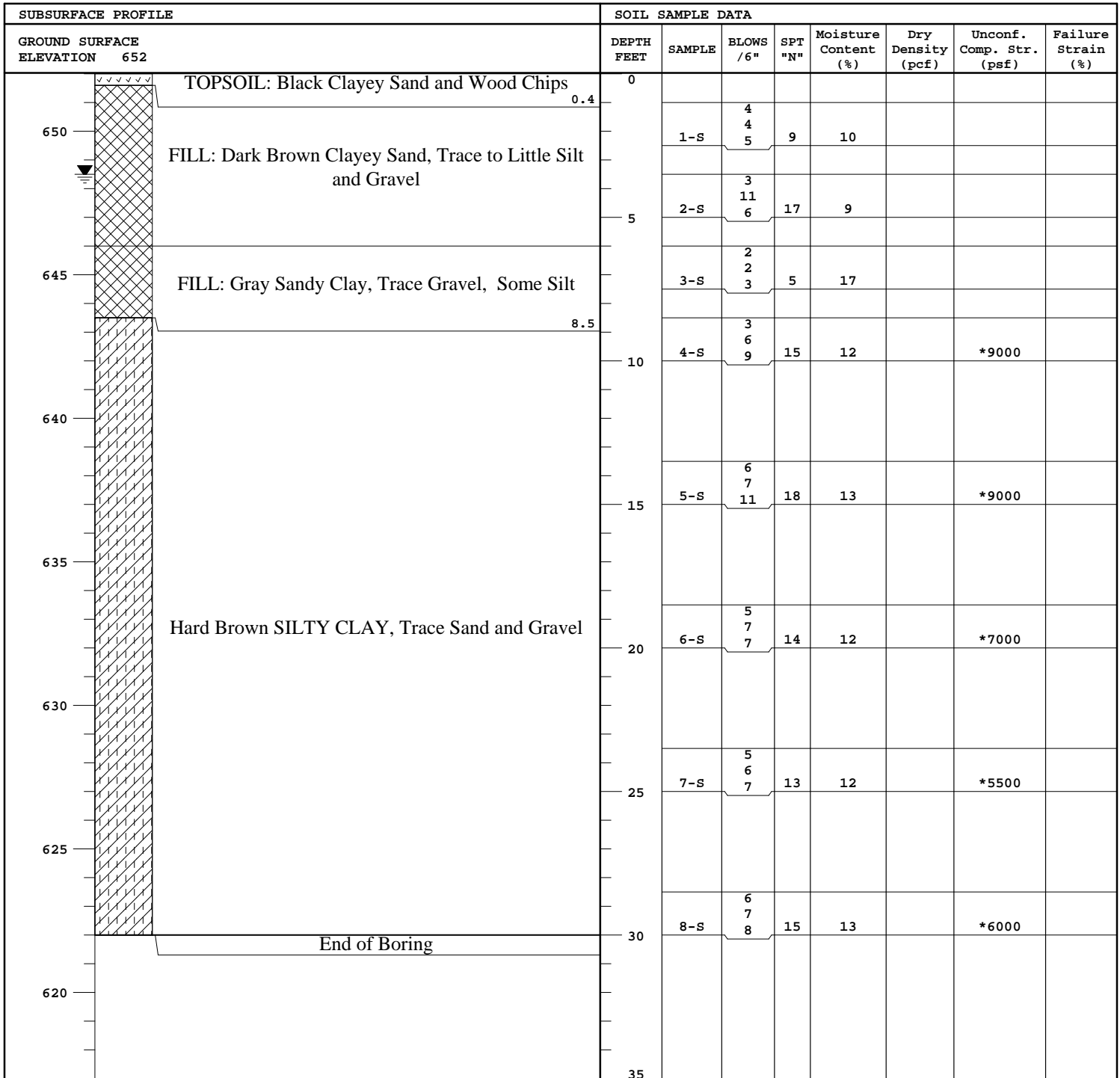
Water Level Observations:
During drilling: 13.5 ft.
After drilling: Dry Upon Completion
Notes: *Pocket Penetrometer



LOG OF TEST BORING NO. TB-2

PROJECT NAME: *Freeland High/Middle School Building Addition*
LOCATION: *8250 Webster Road*
Freeland, Saginaw County, Michigan

PEA Job No.: *2024-1779*
Reviewed by: *DJS*



Total Depth: 30
Drilling Method: 3-1/4" Hollow Stem Augers
Drilling Date: 11/19/24
Inspector: SGA
Plugging procedure: Soil Cuttings
Contractor: DLZ Drilling Company

Water Level Observations:
During drilling: 3.5 ft.
After drilling: Dry Upon Completion
Notes: *Pocket Penetrometer



LOG OF TEST BORING NO. TB-3

PROJECT NAME: *Freeland High/Middle School Building Addition*
LOCATION: *8250 Webster Road*
Freeland, Saginaw County, Michigan

PEA Job No.: *2024-1779*
Reviewed by: *DJS*

SUBSURFACE PROFILE		SOIL SAMPLE DATA							
GROUND SURFACE ELEVATION 652		DEPTH FEET	SAMPLE	BLOWS /6"	SPT "N"	Moisture Content (%)	Dry Density (pcf)	Unconf. Comp. Str. (psf)	Failure Strain (%)
TOPSOIL: Black Clayey Sand		0							
650	0.7		1-S	2 3 5	8	16		*5000	
		5	2-S	6 10 11	21	11		*9000	
645			3-S	5 8 11	19	13		*9000	
		10	4-S	5 7 10	17	12		*9000	
640			5-S	2 4 5	9	11		*4000	
635			6-S	3 5 5	10	11		*4000	
630			7-S	3 4 5	9	11		*4000	
625			8-S	3 5 5	10	11		*5000	
620		30							
End of Boring		35							

Total Depth: 30
Drilling Method: 3-1/4" Hollow Stem Augers
Drilling Date: 11/19/24
Inspector: SGA
Plugging procedure: Soil Cuttings
Contractor: DLZ Drilling Company

Water Level Observations:
During drilling: Did Not Encounter
After drilling: Dry Upon Completion
Notes: *Pocket Penetrometer



LOG OF TEST BORING NO. TB-4

PROJECT NAME: *Freeland High/Middle School Building Addition*
LOCATION: *8250 Webster Road*
Freeland, Saginaw County, Michigan

PEA Job No.: *2024-1779*
Reviewed by: *DJS*

SUBSURFACE PROFILE		SOIL SAMPLE DATA							
GROUND SURFACE ELEVATION 652		DEPTH FEET	SAMPLE	BLOWS /6"	SPT "N"	Moisture Content (%)	Dry Density (pcf)	Unconf. Comp. Str. (psf)	Failure Strain (%)
TOPSOIL: Black Clayey Sand		0							
650	0.7		1-S	4 14 14	28	9		*9000	
		5	2-S	12 14 17	31	11		*9000	
645			3-S	6 7 11	18	13		*9000	
		10	4-S	9 8 10	18	13		*9000	
640	Very Stiff to Hard Brown SILTY CLAY, Trace Sand and Gravel								
		15	5-S	5 6 7	13	14		*7500	
635									
		20	6-S	4 4 5	9	12		*5500	
630									
	Very Stiff Gray SILTY CLAY, Trace Gravel, Some Sand	25	7-S	2 5 5	10	14		*4000	
625									
	Very Stiff Gray SANDY CLAY, race Gravel, Some Silt	28.5							
	End of Boring	30	8-S	2 3 4	7	15		*4500	
620		35							

Total Depth: 30
Drilling Method: 3-1/4" Hollow Stem Augers
Drilling Date: 11/19/24
Inspector: SGA
Contractor: DLZ Drilling Company
Plugging procedure: Soil Cuttings

Water Level Observations:
During drilling: Did Not Encounter
After drilling: Dry Upon Completion
Notes: *Pocket Penetrometer

PEA GROUP

SOIL TERMINOLOGY

Unless otherwise noted, all terms utilized herein refer to the Standard Definitions presented in ASTM D-653.

PARTICLE SIZES	CLASSIFICATION
Boulders - Greater than 12 inches (305 mm)	The major soil constituent is the principal noun (i.e., clay, silt, sand, gravel). The minor constituents are reported as follows:
Cobbles - 3 inches (76.2 mm) to 12 inches (305 mm)	
Gravel:	Modifiers to Main Constituent (Percent by Weight)
<ul style="list-style-type: none"> • Coarse - 3/4 inches (9.05 mm) to 3 inches (76.2 mm) • Fine - No. 4 (4.75 mm) to 3/4 inches (19.05 mm) 	
Sand:	Trace - 1 to 10%
<ul style="list-style-type: none"> • Coarse - No. 10 (2.00 mm) to No. 4 (4.74 mm) • Medium - No. 40 (0.425 mm) to No. 10 (2.00 mm) • Fine - No. 200 (0.074 mm) to No. 40 (0.425 mm) 	Little - 10 to 20%
Silt - 0.005 mm to 0.074 mm	Some - 20 to 30%
Clay - Less than 0.005 mm	Adjective - Over 30%

COHESIVE SOILS

If clay content is sufficient so that clay dominates soil properties, clay becomes the principal noun with the other major soil constituent as modifier (i.e., silty clay). Other minor soil constituents may be included in accordance with the classification breakdown for cohesionless soils (i.e., silty clay, trace of sand, little gravel).

<u>Consistency</u>	<u>Unconfined Compressive Strength (PSF)</u>	<u>Approximate Range of N</u>
Very Soft	Below 500	0 to 2
Soft	500 to 1,000	3 to 4
Medium	1,000 to 2,000	5 to 8
Stiff	2,000 to 4,000	9 to 15
Very Stiff	4,000 to 8,000	16 to 30
Hard	8,000 to 16,000	31 to 50
Very Hard	Over 16,000	Over 50

Consistency of cohesive soils is based upon an evaluation of the observed resistance to deformation under load and not upon the Standard Penetration Resistance (N).

COHESIONLESS SOILS

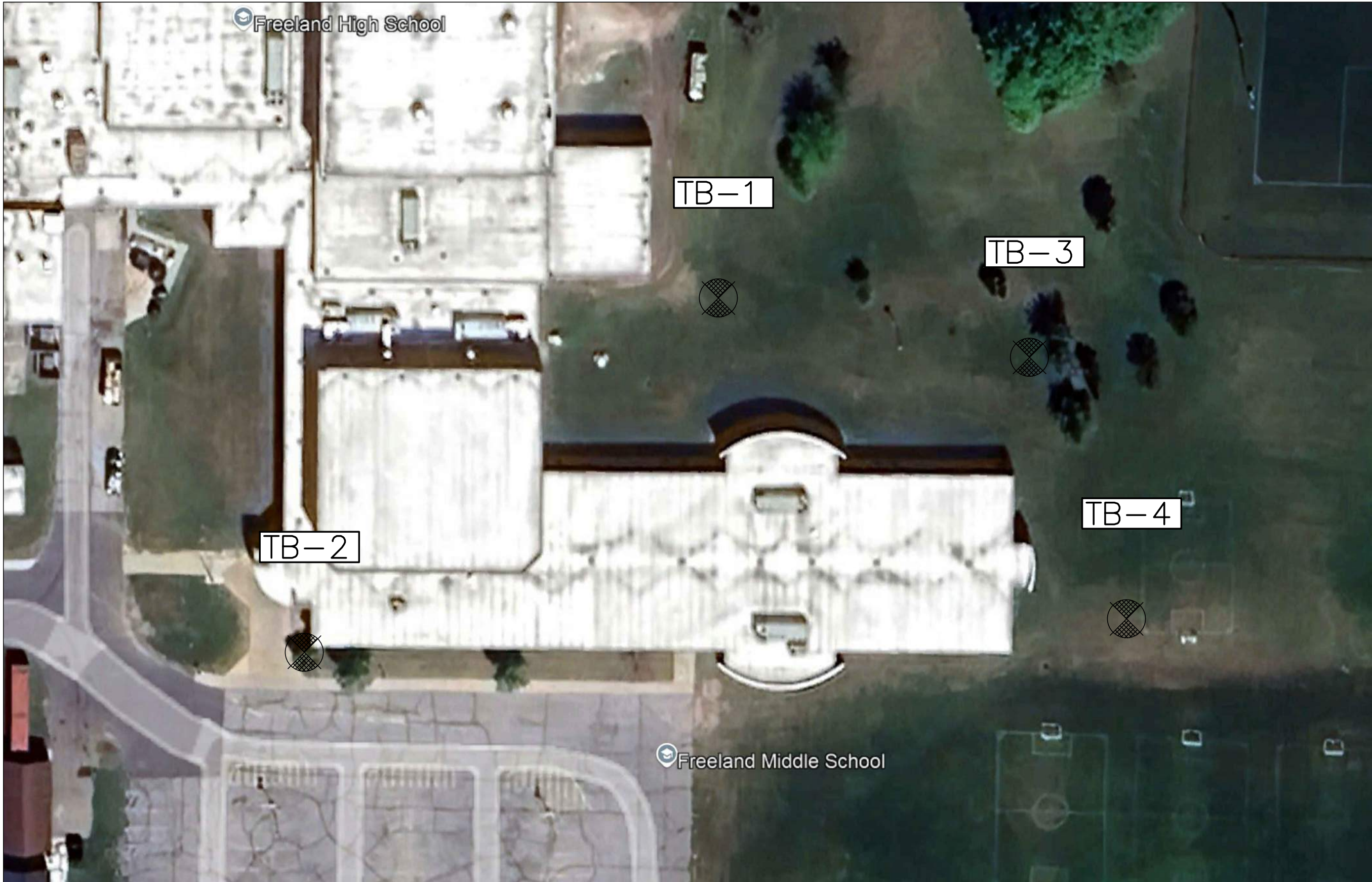
<u>Density Classification</u>	<u>Relative Density %</u>	<u>Approximate Range of N</u>
Very Loose	0 to 15	0 to 4
Loose	16 to 35	5 to 10
Medium Compact	36 to 65	11 to 30
Compact	66 to 85	31 to 50
Very Compact	86 to 100	Over 50

Relative Density of Cohesionless Soils is based upon the evaluation of the Standard Penetration Resistance (N), modified as required for depth effects, sampling effects, etc.

SAMPLE DESIGNATIONS

- C - Core
- D - Directly from Auger Flight or Miscellaneous Sample
- S - Split Spoon Sample - ASTM D-1586
- LS - S - Sample with liner insert
- ST - Shelby Tube Sample - 3-inch diameter unless otherwise noted
- PS - Piston Sample - 3-inch diameter unless otherwise noted
- RC - Rock Core - NX core unless otherwise noted

STANDARD PENETRATION TEST (ASTM D-1586) - a 2.0-inch outside diameter, 1-3/8-inch inside diameter split barrel sampler is driven into undisturbed soil by means of a 140-pound weight falling freely.



Freeland High School

TB-1

TB-3

TB-2

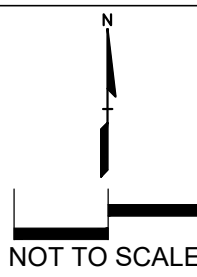
TB-4

Freeland Middle School



TROY ■ WASHINGTON TWP
BRIGHTON ■ DETROIT
t: 844.813.2949

www.peagroup.com



CAUTION!!
THE LOCATIONS AND ELEVATIONS OF EXISTING UNDERGROUND UTILITIES AS SHOWN ON THIS DRAWING ARE ONLY APPROXIMATE. NO GUARANTEE IS EITHER EXPRESSED OR IMPLIED AS TO THE COMPLETENESS OR ACCURACY THEREOF. THE CONTRACTOR SHALL BE EXCLUSIVELY RESPONSIBLE FOR DETERMINING THE EXACT UTILITY LOCATIONS AND ELEVATIONS PRIOR TO THE START OF CONSTRUCTION.

CLIENT
THE COLLABORATIVE
ONE SEAGATE, PARK LEVEL 118
TOLEDO, OHIO 43604

PROJECT TITLE
FREELAND HIGH SCHOOL BUILDING ADDITION
1024 WEBSTER ROAD
FREELAND, SAGINAW COUNTY, MICHIGAN

REVISIONS	

ORIGINAL ISSUE DATE:
DECEMBER 4, 2024

DRAWING TITLE
TEST BORING LOCATION MAP

PEA JOB NO. 2024-1779

P.M. XXX

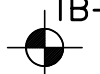
DN. XXX

DES. XXX

DRAWING NUMBER:

TBM 1

BORING LEGEND

 **TB-1** TEST BORING BY PERFORMED BY DLZ DRILLING ON NOVEMBER 18, 2024 UNDER TECHNICAL SUPERVISION OF PEA.

SECTION 011000 - SUMMARY

PART 1 GENERAL

1.1 PROJECT

- A. Project Name: Middle School Classroom and Secure Vestibule Additions
- B. Owner's Name: Freeland Community School District
- C. Architect's Name: The Collaborative Inc.
- D. The Project consists of a six classroom addition and separate secure vestibule addition to the existing Middle School as well as associated renovations adjacent to the areas of work.

1.2 CONTRACT DESCRIPTION

- A. Contract Type: A single prime contract based on a Stipulated Price as described in Document 005200 - Agreement Form.

1.3 WORK BY OWNER

- A. Owner will supply and install items as noted within the contract documents.
- B. Owner will supply items as noted within the contract documents for installation by the Contractor.

1.4 OWNER OCCUPANCY

- A. Owner intends to continue to occupy adjacent portions of the existing building as indicated through the Construction Managers logistics planning.
- B. Owner intends to occupy portions of the Project at times indicated through the Construction Managers logistics planning.
- C. Cooperate with Owner to minimize conflict and to facilitate Owner's operations.
- D. Schedule the Work to accommodate Owner occupancy.

1.5 CONTRACTOR USE OF SITE AND PREMISES

- A. Construction Operations: Limited to areas noted on Drawings.

1. Locate and conduct construction activities in ways that will limit disturbance to site.
 2. Refer to the Construction Managers logistics planning for limitations on areas of construction operations during different construction phases.
- B. Material Deliveries: Coordinate schedule and locations for all on-site deliveries with Owner.
1. Deliveries are prohibited during student drop-off, pick-up, and bussing times.
 - a. Prohibited hours for deliveries, unless approved in writing by Owner in advance:
 - 1) 7:30 AM to 8:30 AM, verify with owner
 - 2) 2:30 PM to 3:30 PM, verify with owner
- C. Arrange use of site and premises to allow:
1. Owner occupancy in areas unaffected by renovation.
- D. Provide access to and from site as required by law and by Owner:
1. Emergency Building Exits During Construction: Keep all exits required by code open during construction period; provide temporary exit signs if exit routes are temporarily altered.
 2. Do not obstruct roadways, sidewalks, or other public ways without permit.
- E. Existing building spaces may not be used for storage.
- F. Time Restrictions:
1. Limit conduct of especially noisy exterior work to the hours of 8 am to 5 pm, and days when school is not in session.
- G. Utility Outages and Shutdown:
1. Limit disruption of utility services to hours the building is unoccupied.
 2. Do not disrupt or shut down life safety systems, including but not limited to fire sprinklers and fire alarm system, without 7 days notice to Owner and authorities having jurisdiction.
 3. Prevent accidental disruption of utility services to other facilities.

1.6 WORK SEQUENCE

- A. Refer to drawings for additional scope and milestone information for each phase.
- B. Milestone dates for each phase are essential to the Project. Contractor is responsible for completing phases by dates provided.
1. Owner is not responsible for additional overtime or off-shift labor costs, **or winter conditions costs** incurred by Contractor to maintain the project schedule, defined by the complete project schedule approved by Contractor, Owner, and Architect in accordance with Section 013216 - Construction Progress Schedule.
 2. Refer to Instructions to Bidders for additional information.
- C. Coordinate construction schedule and operations with Owner.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 012100 - ALLOWANCES

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Cash allowances.

1.2 CASH ALLOWANCES

- A. Costs Included in Cash Allowances: Cost of product to Contractor or subcontractor, less applicable trade discounts.
- B. Architect Responsibilities:
 - 1. Select products in consultation with Owner and transmit decision to Contractor.
- C. Contractor Responsibilities:
 - 1. Assist Architect in selection of products, and installers.
 - 2. Obtain proposals from suppliers and installers and offer recommendations.
 - 3. On notification of which products have been selected, execute purchase agreement with designated supplier and installer.
 - 4. Arrange for and process shop drawings, product data, and samples. Arrange for delivery.
 - 5. Promptly inspect products upon delivery for completeness, damage, and defects. Submit claims for transportation damage.
- D. Differences in costs will be adjusted by Change Order whether it be in addition to the stated amount or if less than or none of the amount is used throughout construction. Any and all dollars not utilized through construction need be returned to the Owner for the full amount not utilized with no additional mark-up associated by the contractor.

1.3 ALLOWANCES SCHEDULE

- A. The contractor is to hold an allowance in the amount of Fifteen Thousand dollars (\$15,000.00) for additional patching requirements throughout the areas of work. If a portion or all of the funds are not used the remaining amount should be returned to the owner at actual cost and with no associated mark-ups.
- B. The contractor is to hold an allowance in the amount of Fifteen Thousand dollars (\$15,000.00) for additional existing utility clean-up throughout the areas of work. If a portion or all of the funds are not used the remaining amount should be returned to the owner at actual cost and with no associated mark-ups.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 012300 - ALTERNATES

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Description of Alternates.
- B. Procedures for pricing Alternates.

1.2 ACCEPTANCE OF ALTERNATES

- A. Alternates quoted on Bid Forms will be reviewed and accepted or rejected at Owner's option. Accepted Alternates will be identified in the Owner-Contractor Agreement.
- B. Coordinate related work and modify surrounding work to integrate the Work of each Alternate.

1.3 SCHEDULE OF ALTERNATES

- A. Alternate No. A-1: Access Control for Classroom Door Hardware
 - 1. Base Bid Item: utilize door hardware as noted on the door schedule and associated door hardware specification.
 - 2. Alternate Item: utilize denoted hardware sets A-1 within the door hardware specification understanding these are intended to allow for access control at the associated classroom doors which includes necessary conduit routing with rough-in.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

A. END OF SECTION

SECTION 012500 - SUBSTITUTION PROCEDURES

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Procedural requirements for proposed substitutions.

1.2 RELATED REQUIREMENTS

- A. Section 002113 - Instructions to Bidders: Restrictions on timing of substitution requests.
- B. Section 012100 - Allowances, for cash allowances affecting this section.
- C. Section 012300 - Alternates, for product alternatives affecting this section.
- D. Section 013000 - Administrative Requirements: Submittal procedures, coordination.
- E. Section 016000 - Product Requirements: Fundamental product requirements, product options, delivery, storage, and handling.
- F. Section 016116 - Volatile Organic Compound (VOC) Content Restrictions: Restrictions on emissions of indoor substitute products.

1.3 DEFINITIONS

- A. Substitutions: Changes from Contract Documents requirements proposed by Contractor to materials, products, assemblies, and equipment.
 - 1. Substitutions for Cause: Proposed due to changed Project circumstances beyond Contractor's control.
 - 2. Substitutions for Convenience: Proposed due to possibility of offering substantial advantage to the Project.

1.4 REFERENCE STANDARDS

- A. CSI/CSC Form 1.5C - Substitution Request (During the Bidding/Negotiating Stage) Current Edition.
- B. CSI/CSC Form 13.1A - Substitution Request (After the Bidding/Negotiating Phase) Current Edition.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.1 GENERAL REQUIREMENTS

- A. A Substitution Request for products, assemblies, materials, and equipment constitutes a representation that the submitter:
 - 1. Has investigated proposed product and determined that it meets or exceeds the quality level of the specified product, equipment, assembly, or system.
 - 2. Agrees to provide the same warranty for the substitution as for the specified product.
 - 3. Agrees to provide same or equivalent maintenance service and source of replacement parts, as applicable.
 - 4. Agrees to coordinate installation and make changes to other work that may be required for the work to be complete, with no additional cost to Owner.
 - 5. Waives claims for additional costs or time extension that may subsequently become apparent.
- B. Document each request with complete data substantiating compliance of proposed substitution with Contract Documents. Burden of proof is on proposer.
 - 1. Note explicitly any non-compliant characteristics.
- C. Content: Include information necessary for tracking the status of each Substitution Request, and information necessary to provide an actionable response.
 - 1. Forms indicated in the Project Manual are adequate for this purpose, and must be used.
- D. Limit each request to a single proposed substitution item.
 - 1. Submit an electronic document, combining the request form with supporting data into single document.

3.2 SUBSTITUTION PROCEDURES DURING PROCUREMENT

- A. Instructions to Bidders specifies time restrictions for submitting requests for substitutions during the bidding period, and the documents required.
- B. Submittal Form (before award of contract):
 - 1. Submit substitution requests by completing CSI/CSC Form 1.5C - Substitution Request (During the Bidding/Negotiating Stage). See this form for additional information and instructions. Use only this form; other forms of submission are unacceptable.

3.3 SUBSTITUTION PROCEDURES DURING CONSTRUCTION

- A. Submittal Form (after award of contract):

1. Submit substitution requests by completing CSI/CSC Form 13.1A - Substitution Request. See this form for additional information and instructions. Use only this form; other forms of submission are unacceptable.
- B. Submit request for Substitution for Cause within 14 days of discovery of need for substitution, but not later than 14 days prior to time required for review and approval by Architect, in order to stay on approved project schedule.
- C. Substitutions will not be considered under one or more of the following circumstances:
 1. When they are indicated or implied on shop drawing or product data submittals, without having received prior approval.
 2. Without a separate written request.
 3. When acceptance will require revisions to Contract Documents.

3.4 RESOLUTION

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

3.5 ACCEPTANCE

- A. Accepted substitutions change the work of the Project. They will be documented and incorporated into work of the project by Change Order, Construction Change Directive, Architectural Supplementary Instructions, or similar instruments provided for in the Conditions of the Contract.

END OF SECTION

SECTION 013135 - ARCHITECT'S CADD FILES

PART 1 GENERAL

1.1 SUMMARY

- A. This Section includes administrative and procedural requirements for the Contractor's use of the Architect's CADD files.

1.2 SUBMITTAL PROCEDURES

- A. General: Electronic copies of CADD Drawings of the Contract Drawings will be provided by Architect for Contractor's use in preparing submittals on limited basis as indicated.

1.3 CONTRACTOR'S USE OF ARCHITECT'S CADD FILES

- A. General: At Contractor's written request, copies of Architect's CADD files will be provided to Contractor for Contractor's use in connection with Project, subject to the following conditions:
 - 1. Review procedures as listed in the "Collaborative CADD File Transfer" form, found at the end of this section.
 - 2. Submit completed form to the Architect.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

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THE COLLABORATIVE INC. CADD FILE TRANSFER

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END OF SECTION

SECTION 016000 - PRODUCT REQUIREMENTS

PART 1 GENERAL

1.1 SECTION INCLUDES

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

1.2 RELATED REQUIREMENTS

- A. Section 011000 - Summary: Identification of Owner-supplied products.
- B. Section 012500 - Substitution Procedures: Substitutions made during procurement and/or construction phases.
- C. Section 016116 - Volatile Organic Compound (VOC) Content Restrictions: Requirements for VOC-restricted product categories.
- D. Section 017419 - Construction Waste Management and Disposal: Waste disposal requirements potentially affecting product selection, packaging and substitutions.

1.3 REFERENCE STANDARDS

- A. EN 15804 - Sustainability of construction works - Environmental product declarations - Core rules for the product category of construction products 2014.
- B. GreenScreen (LIST) - GreenScreen for Safer Chemicals List Translator; Clean Production Action Current Edition.
- C. GreenScreen (METH) - GreenScreen for Safer Chemicals Method v1.2; Clean Production Action Current Edition.
- D. ISO 14025 - Environmental labels and declarations -- Type III environmental declarations -- Principles and procedures 2006.

- E. ISO 14040 - Environmental management - Life cycle assessment - Principles and framework 2006 (Amended 2020).
- F. ISO 14044 - Environmental management - Life cycle assessment - Requirements and guidelines 2006 (Amended 2020).
- G. ISO 21930 - Sustainability in buildings and civil engineering works -- Core rules for environmental product declarations of construction products and services 2017.

1.4 SUBMITTALS

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

1.5 QUALITY ASSURANCE

- A. Environmental Product Declaration (EPD): Publicly available, critically reviewed life cycle analysis having at least a cradle-to-gate scope.
 - 1. Good: Product-specific; compliant with ISO 14044.
 - 2. Better: Industry-wide, generic; compliant with ISO 21930, or with ISO 14044, ISO 14040, ISO 14025, and EN 15804; Type III third-party certification with external verification, in which the manufacturer is recognized as the program operator.
 - 3. Best: Commercial-product-specific; compliant with ISO 21930, or with ISO 14044, ISO 14040, ISO 14025, and EN 15804; Type III third-party certification with external verification, in which the manufacturer is recognized as the program operator.
 - 4. Where demonstration of impact reduction below industry average is required, submit both industry-wide and commercial-product-specific declarations; or submit at least 5 declarations for products of the same type by other manufacturers in the same industry.
- B. GreenScreen Chemical Hazard Analysis: Ingredients of 100 parts-per-million or greater evaluated using GreenScreen (METH).
 - 1. Good: GreenScreen (LIST) evaluation to identify Benchmark 1 hazards; a Health Product Declaration includes this information.
 - 2. Better: GreenScreen Full Assessment.
 - 3. Best: GreenScreen Full Assessment by GreenScreen Licensed Profiler.

- 4. Acceptable Evidence: GreenScreen report.
- C. Health Product Declarations (HPD): Complete, published declaration with full disclosure of known hazards, prepared using one of the HPDC (HPD-OLT) online tools.
- D. Regional Materials: Materials that are extracted, harvested, recovered, and manufactured within a radius of 100 miles from the Project site.

PART 2 PRODUCTS

2.1 EXISTING PRODUCTS

- A. Do not use materials and equipment removed from existing premises unless specifically required or permitted by Contract Documents.
- B. Unforeseen historic items encountered remain the property of the Owner; notify Owner promptly upon discovery; protect, remove, handle, and store as directed by Owner.
- C. Existing materials and equipment indicated to be removed, but not to be re-used, relocated, reinstalled, delivered to the Owner, or otherwise indicated as to remain the property of the Owner, become the property of the Contractor; remove from site.

2.2 NEW PRODUCTS

- A. Provide new products unless specifically required or permitted by Contract Documents.
- B. Use of products having any of the following characteristics is not permitted:
 - 1. Made using or containing CFC's or HCFC's.
 - 2. Made of wood from newly cut old growth timber.
 - 3. Containing lead, cadmium, or asbestos.
- C. Where other criteria are met, Contractor shall give preference to products that:
 - 1. If used on interior, have lower emissions, as defined in Section 016116.
 - 2. If wet-applied, have lower VOC content, as defined in Section 016116.
 - 3. Are extracted, harvested, and/or manufactured closer to the location of the project.
 - 4. Have longer documented life span under normal use.
 - 5. Have a published Environmental Product Declaration (EPD).
 - 6. Have a published Health Product Declaration (HPD).
 - 7. Have a published GreenScreen Chemical Hazard Analysis.
 - 8. Have a published Manufacturer's Inventory of Chemical Content.

2.3 PRODUCT OPTIONS

- A. Products Specified by Reference Standards or by Description Only: Use any product meeting those standards or description.

- B. Products Specified by Naming One or More Manufacturers: Use a product of one of the manufacturers named and meeting specifications, no options or substitutions allowed.
- C. Products Specified by Naming One or More Manufacturers with a Provision for Substitutions: Submit a request for substitution for any manufacturer not named.
- D. Products with a Basis of Design listed either in the specifications or in the Drawings: Use the Basis of Design product, or submit a request for substitution for a comparable product meeting the product requirements. Substitutions may be permitted from a list of named manufacturers, or by other manufacturers, depending on the specified product.

2.4 MAINTENANCE MATERIALS

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

PART 3 EXECUTION

3.1 SUBSTITUTION LIMITATIONS

- A. See Section 012500 - Substitution Procedures.

3.2 OWNER-SUPPLIED PRODUCTS

- A. Owner's Responsibilities:
 - 1. Arrange for and deliver Owner reviewed shop drawings, product data, and samples, to Contractor.
 - 2. Arrange and pay for product delivery to site.
 - 3. On delivery, inspect products jointly with Contractor.
 - 4. Submit claims for transportation damage and replace damaged, defective, or deficient items.
 - 5. Arrange for manufacturers' warranties, inspections, and service.
- B. Contractor's Responsibilities:
 - 1. Review Owner reviewed shop drawings, product data, and samples.
 - 2. Receive and unload products at site; inspect for completeness or damage jointly with Owner.
 - 3. Handle, store, install and finish products.
 - 4. Repair or replace items damaged after receipt.

3.3 TRANSPORTATION AND HANDLING

- A. Package products for shipment in manner to prevent damage; for equipment, package to avoid loss of factory calibration.
- B. If special precautions are required, attach instructions prominently and legibly on outside of packaging.
- C. Coordinate schedule of product delivery to designated prepared areas in order to minimize site storage time and potential damage to stored materials.
- D. Transport and handle products in accordance with manufacturer's instructions.
- E. Transport materials in covered trucks to prevent contamination of product and littering of surrounding areas.
- F. Promptly inspect shipments to ensure that products comply with requirements, quantities are correct, and products are undamaged.
- G. Provide equipment and personnel to handle products by methods to prevent soiling, disfigurement, or damage, and to minimize handling.
- H. Arrange for the return of packing materials, such as wood pallets, where economically feasible.

3.4 STORAGE AND PROTECTION

- A. Provide protection of stored materials and products against theft, casualty, or deterioration.
- B. Designate receiving/storage areas for incoming products so that they are delivered according to installation schedule and placed convenient to work area in order to minimize waste due to excessive materials handling and misapplication. See Section 017419.
 - 1. Structural Loading Limitations: Handle and store products and materials so as not to exceed static and dynamic load-bearing capacities of project floor and roof areas.
- C. Store and protect products in accordance with manufacturers' instructions.
- D. Store with seals and labels intact and legible.
- E. Arrange storage of materials and products to allow for visual inspection for the purpose of determination of quantities, amounts, and unit counts.
- F. Store sensitive products in weathertight, climate-controlled enclosures in an environment favorable to product.
- G. For exterior storage of fabricated products, place on sloped supports above ground.

- H. Provide off-site storage and protection when site does not permit on-site storage or protection.
- I. Protect products from damage or deterioration due to construction operations, weather, precipitation, humidity, temperature, sunlight and ultraviolet light, dirt, dust, and other contaminants.
- J. Comply with manufacturer's warranty conditions, if any.
- K. Do not store products directly on the ground.
- L. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to prevent condensation and degradation of products.
- M. Store loose granular materials on solid flat surfaces in a well-drained area. Prevent mixing with foreign matter.
- N. Prevent contact with material that may cause corrosion, discoloration, or staining.
- O. Provide equipment and personnel to store products by methods to prevent soiling, disfigurement, or damage.
- P. Arrange storage of products to permit access for inspection. Periodically inspect to verify products are undamaged and are maintained in acceptable condition.

END OF SECTION

SECTION 016116 - VOLATILE ORGANIC COMPOUND (VOC) CONTENT RESTRICTIONS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Requirements for VOC-Content-Restricted products.

1.2 RELATED REQUIREMENTS

- A. Section 013000 - Administrative Requirements: Submittal procedures.

1.3 DEFINITIONS

- A. VOC-Content-Restricted Products: All products in the following product categories, whether specified or not:
 - 1. Interior paints and coatings applied on site.
 - 2. Interior adhesives and sealants applied on site, including flooring adhesives.
- B. Interior of Building: Anywhere inside the exterior weather barrier.
- C. Adhesives: All gunnable, trowelable, liquid-applied, and aerosol adhesives, whether specified or not; including flooring adhesives, resilient base adhesives, and pipe jointing adhesives.
- D. Sealants: All gunnable, trowelable, and liquid-applied joint sealants and sealant primers, whether specified or not; including firestopping sealants and duct joint sealers.
- E. Inherently Non-Emitting Materials: Products composed wholly of minerals or metals, unless they include organic-based surface coatings, binders, or sealants; and specifically the following:
 - 1. Stone.
 - 2. Concrete.
 - 3. Clay brick.
 - 4. Metals that are plated, anodized, or powder-coated.
 - 5. Glass.
 - 6. Ceramics.
 - 7. Solid wood flooring that is unfinished and untreated.

1.4 REFERENCE STANDARDS

- A. 40 CFR 59, Subpart D - National Volatile Organic Compound Emission Standards for Architectural Coatings; U.S. Environmental Protection Agency current edition.

- B. ASTM D3960 - Standard Practice for Determining Volatile Organic Compound (VOC) Content of Paints and Related Coatings 2005 (Reapproved 2018).
- C. CARB (SCM) - Suggested Control Measure for Architectural Coatings; California Air Resources Board 2007.
- D. SCAQMD 1113 - Architectural Coatings 1977 (Amended 2016).
- E. SCAQMD 1168 - Adhesive and Sealant Applications 1989 (Amended 2017).

1.5 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data: For each VOC-restricted product used in the project, submit evidence of compliance.

1.6 QUALITY ASSURANCE

- A. VOC Content Test Method: 40 CFR 59, Subpart D (EPA Method 24), or ASTM D3960, unless otherwise indicated.
 - 1. Evidence of Compliance: Acceptable types of evidence are:
 - a. Report of laboratory testing performed in accordance with requirements.
 - b. Published product data showing compliance with requirements.
 - c. Certification by manufacturer that product complies with requirements.
- B. Testing Agency Qualifications: Independent firm specializing in performing testing and inspections of the type specified in this section.

PART 2 PRODUCTS

2.1 MATERIALS

- A. All Products: Comply with the most stringent of federal, State, and local requirements, or these specifications.
- B. VOC-Content-Restricted Products: VOC content not greater than required by the following:
 - 1. Adhesives, Including Flooring Adhesives: SCAQMD 1168 Rule.
 - 2. Joint Sealants: SCAQMD 1168 Rule.
 - 3. Paints and Coatings: Each color; most stringent of the following:
 - a. 40 CFR 59, Subpart D.
 - b. SCAQMD 1113 Rule.
 - c. CARB (SCM).

PART 3 EXECUTION

3.1 FIELD QUALITY CONTROL

- A. Owner reserves the right to reject non-compliant products, whether installed or not, and require their removal and replacement with compliant products at no extra cost to Owner.
- B. Additional costs to restore indoor air quality due to installation of non-compliant products will be borne by Contractor.

END OF SECTION

SECTION 024119 - SELECTIVE DEMOLITION

PART 1 GENERAL

1.1 SECTION INCLUDES

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

1.2 DEFINITIONS

- A. Demolition (Demo): Dismantle, raze, destroy or wreck any building or structure or any part thereof.
- B. Remove: Detach or dismantle items from existing construction and dispose of them off site, unless items are indicated to be salvaged or reinstalled.
- C. Remove and Salvage: Detach or dismantle items from existing construction in a manner to prevent damage. Clean, package, label and deliver salvaged items to Owner in ready-for-reuse condition.
- D. Remove and Reinstall: Detach or dismantle items from existing construction in a manner to prevent damage. Clean and prepare for reuse and reinstall where indicated.
- E. Existing to Remain: Designation for existing items that are not to be removed and that are not otherwise indicated to be salvaged or reinstalled.

1.3 REFERENCE STANDARDS

- A. 29 CFR 1926 - Safety and Health Regulations for Construction.
- B. NFPA 241 - Standard for Safeguarding Construction, Alteration, and Demolition Operations.

1.4 ADMINISTRATIVE REQUIREMENTS

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

1.5 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Demolition Plan: Submit demolition plan as required by OSHA and local AHJs.
 - 1. Indicate extent of demolition, removal sequencing, bracing and shoring, and location and construction of barricades and fences.
 - 2. Demolition firm qualifications.

- C. Project Record Documents: Accurately record actual locations of capped and active utilities and subsurface construction.

1.6 QUALITY ASSURANCE

- A. Demolition Firm Qualifications: Company specializing in the type of work required.
 - 1. Minimum of five years of documented experience.

PART 2 PRODUCTS -- NOT USED

PART 3 EXECUTION

3.1 DEMOLITION

- A. Remove portions of existing buildings as indicated on Drawings.
- B. Remove paving and curbs required to accomplish new work.
- C. Within area of new construction, remove existing foundation elements completely.
- D. Outside area of new construction, remove foundation walls and footings to minimum 2 feet below finished grade.
- E. Remove other items as specifically indicated on Drawings.
- F. Remove items specifically indicated for salvage, relocation, and recycling.
- G. Fill excavations, open pits, and holes in ground areas generated as result of removals, using compacted fill as specified.

3.2 GENERAL PROCEDURES AND PROJECT CONDITIONS

- A. Comply with applicable codes and regulations for demolition operations and safety of adjacent structures and the public.
 - 1. Obtain required permits.
 - 2. Comply with applicable requirements of NFPA 241.
 - 3. Use of explosives is not permitted.
 - 4. Take precautions to prevent catastrophic or uncontrolled collapse of structures to be removed; do not allow worker or public access within range of potential collapse of unstable structures.
 - 5. Provide, erect, and maintain temporary barriers and security devices.
 - 6. Use physical barriers to prevent access to areas that could be hazardous to workers or the public.

7. Conduct operations to minimize effects on and interference with adjacent structures and occupants.
 8. Do not close or obstruct roadways or sidewalks without permits from authority having jurisdiction.
 9. Conduct operations to minimize obstruction of public and private entrances and exits. Do not obstruct required exits at any time. Protect persons using entrances and exits from removal operations.
 10. Obtain written permission from owners of adjacent properties when demolition equipment will traverse, infringe upon, or limit access to their property.
- B. Do not begin removal until receipt of notification to proceed from Owner.
- C. Do not begin removal until existing elements to be salvaged or relocated have been removed.
- D. Do not begin removal until vegetation to be relocated has been removed and vegetation to remain has been protected from damage.
- E. Protect existing structures and other elements to remain in place and not removed.
1. Provide bracing and shoring.
 2. Prevent movement or settlement of adjacent structures.
 3. Stop work immediately if adjacent structures appear to be in danger.
- F. Minimize production of dust due to demolition operations. Do not use water if that will result in ice, flooding, sedimentation of public waterways or storm sewers, or other pollution.
- G. Hazardous Materials:
1. If hazardous materials are discovered during removal operations, stop work and notify Architect and Owner; hazardous materials include regulated asbestos containing materials, lead, PCBs, and mercury.

3.3 EXISTING UTILITIES

- A. Protect existing utilities to remain from damage.
- B. Do not disrupt public utilities without permit from authority having jurisdiction.
- C. Do not close, shut off, or disrupt existing life safety systems that are in use without at least 7 days prior written notification to Owner.
- D. Do not close, shut off, or disrupt existing utility branches or take-offs that are in use without at least 3 days prior written notification to Owner.

- E. Locate and mark utilities to remain; mark using highly visible tags or flags, with identification of utility type; protect from damage due to subsequent construction, using substantial barricades if necessary.
- F. Remove exposed piping, valves, meters, equipment, supports, and foundations of disconnected and abandoned utilities.
- G. Prepare building demolition areas by disconnecting and capping utilities outside the demolition zone. Identify and mark, in same manner as other utilities to remain, utilities to be reconnected.

3.4 SELECTIVE DEMOLITION FOR ALTERATIONS

- A. Existing construction and utilities indicated on drawings are based on casual field observation and existing record documents only.
 - 1. Verify construction and utility arrangements are as indicated.
 - 2. Report discrepancies to Architect before disturbing existing installation.
 - 3. Beginning of demolition work constitutes acceptance of existing conditions that would be apparent upon examination prior to starting demolition.
- B. Separate areas in which demolition is being conducted from areas that remain occupied.
 - 1. Provide, erect, and maintain temporary dustproof partitions of construction.
 - 2. Provide sound retardant partitions of construction and in locations indicated on drawings.
- C. Maintain weatherproof exterior building enclosure, except for interruptions required for replacement or modifications; prevent water and humidity damage.
- D. Maintain building security; take care to prevent unauthorized entry.
- E. Remove existing work as indicated and required to accomplish new work.
 - 1. Remove rotted wood, corroded metals, and deteriorated masonry and concrete; replace with new construction indicated.
 - 2. Remove items indicated on drawings.
 - 3. Core Drilling: Core drill slabs as required to install new items as detailed on Drawings. If required based on existing slab conditions, employ methods of detecting existing tensioned and un-tensioned reinforcing, and other embedded items, so as not to damage existing facilities and equipment.

4. Powder-Actuated Fasteners and Post-installed Anchors: Verify existing slab conditions employing methods of detection specified for core drilling; locate fasteners and anchors to avoid structural damage to existing slabs and existing tensioned reinforcing.
- F. Services (Including but not limited to HVAC, Plumbing, Fire Protection, Electrical, and Telecommunications): Remove existing systems and equipment as indicated.
1. Maintain existing active systems to remain in operation, and maintain access to equipment and operational components.
 2. Where existing active systems serve occupied facilities but are to be replaced with new services, maintain existing systems in service until new systems are complete and ready for service.
 3. See Section 011000 - Summary for limitations on outages and required notifications.
 4. Verify that abandoned services serve only abandoned facilities before removal.
 5. Remove abandoned pipe, ducts, conduits, and equipment, including those above accessible ceilings. Remove back to source of supply where possible, otherwise cap stub and tag with identification.
- G. Protect existing work to remain.
1. Prevent movement of structure. Provide shoring and bracing as required.
 2. Perform cutting to accomplish removal work neatly and as specified for cutting new work.
 3. Repair adjacent construction and finishes damaged during removal work.
 4. Patch to match new work.

3.5 DEBRIS AND WASTE REMOVAL

- A. Remove debris, junk, and trash from site.
- B. Remove from site all materials not to be reused on site; do not burn or bury.
- C. Leave site in clean condition, ready for subsequent work.
- D. Clean up spillage and wind-blown debris from public and private lands.

END OF SECTION 024119

SECTION 031000 - CONCRETE FORMING AND ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Form-facing material for cast-in-place concrete walls.

1.2 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Not required for this project.

1.3 ACTION SUBMITTALS

A. Product Data: For each of the following:

1. Concealed surface form-facing material, if used
2. Form-release agent, if used.

- B. Shop Drawings: Not required for any form-facing or form materials on this job.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Concrete Formwork: Design, erect, shore, brace, and maintain formwork, shores, and reshores in accordance with ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads, so that resulting concrete conforms to the required shapes, lines, and dimensions.

1. Design wood panel forms in accordance with APA's "Concrete Forming Design/Construction Guide."
2. Design formwork to limit deflection of form-facing material to 1/240 of center-to-center spacing of supports.

2.2 FORM-FACING MATERIALS

- A. Concealed Surface Form-Facing Material: Lumber, plywood, metal, plastic, or another approved material.

1. Provide lumber dressed on at least two edges and one side for tight fit.

2.3 RELATED MATERIALS

- A. Chamfer Strips: Wood, metal, PVC, or rubber strips, 3/4 by 3/4 inch, minimum.
- B. Form-Release Agent: Commercially formulated form-release agent that does not bond with, stain, or adversely affect concrete surfaces and does not impair subsequent treatments of concrete surfaces.
 - 1. Formulate form-release agent with rust inhibitor for steel form-facing materials.
 - 2. Form release agent for form liners shall be acceptable to form liner manufacturer.
- C. Form Ties: Factory-fabricated, removable or snap-off, glass-fiber-reinforced plastic or metal form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.
 - 1. Furnish ties that, when removed, leave holes no larger than 1 inch in diameter in concrete surface.
 - 2. It is the Engineer's preference that below-grade walls be formed and poured without the use of form ties.

PART 3 - EXECUTION

3.1 INSTALLATION OF FORMWORK

- A. Comply with ACI 301.
- B. Construct formwork, so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117 and to comply with the Surface Finish designations specified in Section 033000 "Cast-In-Place Concrete" for as-cast finishes.
- C. Limit concrete surface irregularities as follows:
 - 1. Surface Finish-1.0: ACI 117 Class D, 1 inch.
- D. Construct forms tight enough to prevent loss of concrete mortar.
 - 1. Minimize joints.
 - 2. Exposed Concrete: Symmetrically align joints in forms.
- E. Construct removable forms for easy removal without hammering or prying against concrete surfaces.
 - 1. Provide crush or wrecking plates where stripping may damage cast-concrete surfaces.
 - 2. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical.
 - 3. Install keyways, reglets, recesses, and other accessories, for easy removal.
- F. Do not use rust-stained, steel, form-facing material.

- G. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces.
 - 1. Provide and secure units to support screed strips.
 - 2. Use strike-off templates or compacting-type screeds.
- H. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible.
 - 1. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar.
 - 2. Locate temporary openings in forms at inconspicuous locations.
- I. Chamfer exterior corners and edges of permanently exposed concrete.
- J. At construction joints, overlap forms onto previously placed concrete not less than 12 inches.
- K. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work.
 - 1. Determine sizes and locations from trades providing such items.
 - 2. Obtain written approval of Architect prior to forming openings not indicated on Drawings.
- L. Construction and Movement Joints:
 - 1. Construct joints true to line with faces perpendicular to surface plane of concrete.
 - 2. Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.
 - 3. Place joints perpendicular to main reinforcement.
 - 4. Locate joints for beams, slabs, joists, and girders in the middle third of spans.
 - a. Offset joints in girders a minimum distance of twice the beam width from a beam-girder intersection.
 - 5. Locate horizontal joints in walls and columns at underside of floors, slabs, beams, and girders and at the top of footings or floor slabs.
 - 6. Space vertical joints in walls as necessary dictated by the Contractor's sequencing.
 - a. Locate joints beside piers integral with walls, near corners, and in concealed locations where possible.
- M. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.
- N. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.

- O. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

3.2 FIELD QUALITY CONTROL

- A. Special Inspections: Owner will engage a special inspector and qualified testing and inspecting agency to perform field tests and inspections and prepare test reports.
- B. Inspections:
 - 1. Inspect formwork for shape, location, and dimensions of the concrete member being formed.

END OF SECTION 031000

SECTION 032000 - CONCRETE REINFORCING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
1. Steel reinforcement bars.
 2. Welded-wire reinforcement.

1.2 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Not required for this project.

1.3 ACTION SUBMITTALS

- A. Product Data: For the following:
1. Each type of steel reinforcement including mill certificates.
- B. Shop Drawings: Comply with ACI SP-066:
1. Include placing drawings that detail fabrication, bending, and placement.
 2. Include bar sizes, lengths, materials, grades, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, location of splices, lengths of lap splices, tie spacing, hoop spacing, and supports for concrete reinforcement.
- C. Construction Joint Layout: Indicate proposed construction joints required to build the structure.
1. Location of construction joints is subject to approval of Architect and Engineer.

PART 2 - PRODUCTS

2.1 STEEL REINFORCEMENT

- A. Reinforcing Bars: ASTM A615 Grade 60, deformed.
- B. Deformed-Steel Welded-Wire Reinforcement: ASTM A1064, flat sheet.

2.2 REINFORCEMENT ACCESSORIES

- A. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded-wire reinforcement in place.
 - 1. Manufacture bar supports from steel wire, plastic, or precast concrete in accordance with CRSI's "Manual of Standard Practice," of greater compressive strength than concrete and as follows:
 - a. For concrete surfaces exposed to view, where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected steel wire, all-plastic bar supports, or CRSI Class 2 stainless steel bar supports.
- B. Steel Tie Wire: ASTM A1064, annealed steel, not less than 0.0508 inch in diameter.

2.3 FABRICATING REINFORCEMENT

- A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

PART 3 - EXECUTION

3.1 PREPARATION

- A. Protection of In-Place Conditions:
 - 1. Do not cut or puncture vapor retarder.
 - 2. Repair damage and reseal vapor retarder before placing concrete.
- B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that reduce bond to concrete.

3.2 INSTALLATION OF STEEL REINFORCEMENT

- A. Comply with CRSI's "Manual of Standard Practice" for placing and supporting reinforcement.
- B. Accurately position, support, and secure reinforcement against displacement.
 - 1. Locate and support reinforcement with bar supports to maintain minimum concrete cover.
 - 2. Do not tack weld crossing reinforcing bars.
- C. Preserve clearance between bars of not less than 1 inch, not less than one bar diameter, or not less than 1-1/3 times size of large aggregate, whichever is greater.
- D. Provide concrete coverage in accordance with ACI 318.
- E. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.

- F. Splices: Lap splices as indicated on Drawings.
 - 1. Bars indicated to be continuous, and all vertical bars to be lapped not less than 36 bar diameters at splices, or 24 inches, whichever is greater.
 - 2. Stagger splices in accordance with ACI 318.
- G. Install welded-wire reinforcement in longest practicable lengths.
 - 1. Support welded-wire reinforcement in accordance with CRSI "Manual of Standard Practice."
 - a. For reinforcement less than W4.0 or D4.0, continuous support spacing to not exceed 12 inches.
 - 2. Lap edges and ends of adjoining sheets at least one wire spacing plus 8 inches for deformed wire.
 - 3. Offset laps of adjoining sheet widths to prevent continuous laps in either direction.
 - 4. Lace overlaps with wire.

3.3 JOINTS

- A. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by the Engineer.
 - 1. Place joints perpendicular to main reinforcement.
 - 2. Continue reinforcement across construction joints unless otherwise indicated.
 - 3. Do not continue reinforcement through sides of strip placements of floors and slabs.

3.4 INSTALLATION TOLERANCES

- A. Comply with ACI 117.

3.5 FIELD QUALITY CONTROL

- A. Special Inspections: Owner will engage a special inspector and qualified testing and inspecting agency to perform field tests and inspections and prepare test reports.
- B. Inspections:
 - 1. Steel-reinforcement placement.

END OF SECTION 032000

SECTION 033000 - CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Cast-in-place concrete, including concrete materials, mixture design, placement procedures, and finishes.

B. Related Requirements:

1. Section 031000 "Concrete Forming and Accessories" for form-facing materials
2. Section 032000 "Concrete Reinforcing" for steel reinforcing bars and welded-wire reinforcement.

1.2 DEFINITIONS

- A. Cementitious Materials: Portland cement alone or in combination with one or more of the following: blended hydraulic cement, fly ash, slag cement, and other pozzolans materials subject to compliance with requirements.

- B. Water/Cement Ratio (w/cm): The ratio by weight of water to cementitious materials.

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Not required for this project.

1.4 ACTION SUBMITTALS

- A. Product Data: For each of the following.

1. Portland cement.
2. Fly ash.
3. Slag cement.
4. Blended hydraulic cement.
5. Aggregates.
6. Admixtures:

- a. Include limitations of use, including restrictions on cementitious materials, supplementary cementitious materials, air entrainment, aggregates, temperature at time of concrete placement, relative humidity at time of concrete placement, curing conditions, and use of other admixtures.

7. Vapor retarders.

8. Liquid floor treatments.
9. Curing materials.
10. Joint fillers.

B. Design Mixtures: For each concrete mixture, include the following:

1. Mixture identification.
2. Minimum 28-day compressive strength.
3. Durability exposure class.
4. Maximum w/cm.
5. Calculated equilibrium unit weight, for lightweight concrete.
6. Slump limit.
7. Air content.
8. Nominal maximum aggregate size.
9. Intended placement method if pumping is expected.
10. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.

1.5 INFORMATIONAL SUBMITTALS

A. Material Certificates: For each of the following, signed by manufacturers:

1. Cementitious materials.
2. Admixtures.
3. Curing compounds.
4. Vapor retarders.
5. Joint-filler strips.

B. Material Test Reports: For the following, from a qualified testing agency:

1. Portland cement.
2. Fly ash.
3. Slag cement.
4. Admixtures:

C. Preconstruction Test Reports: For each mix design.

D. Field quality-control reports.

1.6 QUALITY ASSURANCE

- A. Ready-Mixed Concrete Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products that complies with ASTM C94 requirements for production facilities and equipment.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Comply with ASTM C94 and ACI 301.

1.8 FIELD CONDITIONS

- A. Cold-Weather Placement: Comply with ACI 301 and ACI 306.1.
- B. Hot-Weather Placement: Comply with ACI 301 and ACI 305.1.

PART 2 - PRODUCTS

2.1 CONCRETE, GENERAL

- A. ACI Publications: Comply with ACI 301

2.2 CONCRETE MATERIALS

A. Cementitious Materials:

- 1. Portland Cement: ASTM C150, Type I.
- 2. Fly Ash: ASTM C618, Class C or F.
- 3. Slag Cement: ASTM C989, Grade 100 or 120.
- 4. Blended Hydraulic Cement: ASTM C595, Type II, portland-limestone cement, if desired

B. Normal-Weight Aggregates: ASTM C33, coarse aggregate or better, graded. Provide aggregates from a single source.

- 1. Maximum Coarse-Aggregate Size: See structural notes, nominal.
- 2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.

C. Air-Entraining Admixture: ASTM C260.

D. Chemical Admixtures: Certified by manufacturer to be compatible with other admixtures that do not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.

- 1. Water-Reducing Admixture: ASTM C494, Type A.
- 2. Retarding Admixture: ASTM C494, Type B.
- 3. Water-Reducing and -Retarding Admixture: ASTM C494, Type D.
- 4. High-Range, Water-Reducing Admixture: ASTM C494, Type F.
- 5. High-Range, Water-Reducing and -Retarding Admixture: ASTM C494, Type G.
- 6. Plasticizing and Retarding Admixture: ASTM C1017, Type II.

E. Water and Water Used to Make Ice: ASTM C94, potable

2.3 VAPOR RETARDERS

- A. Sheet Vapor Retarder, Class A: ASTM E1745, Class A, thickness noted on the drawings. Include manufacturer's recommended adhesive or pressure-sensitive tape.

2.4 LIQUID FLOOR TREATMENTS

- A. Penetrating Liquid Floor Treatment: Clear, chemically reactive, waterborne solution of inorganic silicate or silicate materials and proprietary components; odorless; that penetrates, hardens, and densifies concrete surfaces. This can be a dissipating cure and seal product for floors to receive coverings per architectural finish schedule, or a permanent cure and seal product for exposed concrete floors.
 - 1. Euclid Chemical, Euco-Diamond Hard
 - 2. Prosoco, LS/CS
 - 3. Ashford Formula
 - 4. Other equivalent products, as submitted, and reviewed by the Architect.
 - 5. For dissipating agent: Euclid Chemical, Dr. Vox

2.5 CURING MATERIALS

- A. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. when dry.
- B. Moisture-Retaining Cover: ASTM C171, polyethylene film burlap-polyethylene sheet.
 - 1. Color:
 - a. Ambient Temperature Below 50 deg F: Black.
 - b. Ambient Temperature between 50 deg F and 85 deg F: Any color.
 - c. Ambient Temperature Above 85 deg F: White.
- C. Curing Paper: 8-foot-wide paper, consisting of two layers of fibered kraft paper laminated with double coating of asphalt.
- D. Water: Potable or complying with ASTM C1602.

2.6 RELATED MATERIALS

- A. Expansion- and Isolation-Joint-Filler Strips: Sika Backer Rod or equal.

2.7 CONCRETE MIXTURES, GENERAL

- A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, in accordance with ACI 301.
 - 1. Use a qualified testing agency for preparing and reporting proposed mixture designs, based on laboratory trial mixtures.
- B. Admixtures: Use admixtures in accordance with manufacturer's written instructions.

2.8 CONCRETE MIXTURES

1. Refer to the structural notes and drawings for information on required mix designs. Please also refer to the civil-site drawings for exterior pavement mix designs not inclusive to the structural drawings.

2.9 CONCRETE MIXING

- A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete in accordance with ASTM C94, and furnish batch ticket information.

PART 3 - EXECUTION

3.1 INSTALLATION OF EMBEDDED ITEMS

- A. Place and secure anchorage devices and other embedded items required for adjoining Work that is attached to or supported by cast-in-place concrete.
 1. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 2. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of ANSI/AISC 303.

3.2 INSTALLATION OF VAPOR RETARDER

- A. Sheet Vapor Retarders: Place, protect, and repair sheet vapor retarder in accordance with ASTM E1643 and manufacturer's written instructions.
 1. Install vapor retarder with longest dimension parallel with direction of concrete pour.
 2. Face laps away from exposed direction of concrete pour.
 3. Lap vapor retarder over footings and grade beams not less than 6 inches, sealing vapor retarder to concrete.
 4. Lap joints 6 inches and seal with manufacturer's recommended tape.
 5. Terminate vapor retarder at the top of floor slabs, grade beams, and pile caps, sealing entire perimeter to floor slabs, grade beams, foundation walls, or pile caps.
 6. Seal penetrations in accordance with vapor retarder manufacturer's instructions.
 7. Protect vapor retarder during placement of reinforcement and concrete.
 - a. Repair damaged areas by patching with vapor retarder material, overlapping damages area by 6 inches on all sides, and sealing to vapor retarder.

3.3 JOINTS

- A. Construct joints true to line, with faces perpendicular to surface plane of concrete.

- B. Construction Joints: Coordinate with floor slab pattern and concrete placement sequence.
 - 1. Install so strength and appearance of concrete are not impaired, at locations indicated on Drawings or as approved by Architect.
 - 2. Place joints perpendicular to main reinforcement.
 - a. Continue reinforcement across construction joints unless otherwise indicated.
 - b. Do not continue reinforcement through sides of strip placements of floors and slabs.
 - c. Provide Sika Speed Plate dowel at construction joints, 1/4" thickness, 18" O.C., or other approved equal.
 - 3. Space vertical joints in walls as indicated on Drawings. Unless otherwise indicated on Drawings, locate vertical joints beside piers integral with walls, near corners, and in concealed locations where possible.
- C. Control Joints in Slabs-on-Ground: Form weakened-plane control joints, sectioning concrete into areas as indicated. Construct control joints per the drawings.
 - 1. Sawed Joints: Form control joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch-wide joints into concrete when cutting action does not tear, abrade, or otherwise damage surface and before concrete develops random cracks.
- D. Isolation Joints in Slabs-on-Ground: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.
 - 1. Terminate full-width joint-filler strips not less than 1/2 inch or more than 1 inch below finished concrete surface, where joint sealants are indicated.
 - 2. Install joint-filler strips in lengths as long as practicable. Where more than one length is required, lace or clip sections together.

3.4 CONCRETE PLACEMENT

- A. Before placing concrete, verify that installation of formwork, reinforcement, embedded items, and vapor retarder is complete and that required inspections are completed.
 - 1. Immediately prior to concrete placement, inspect vapor retarder for damage and deficient installation, and repair defective areas.
 - 2. Provide continuous inspection of vapor retarder during concrete placement and make necessary repairs to damaged areas as Work progresses.
- B. Notify Architect and testing and inspection agencies 24 hours prior to commencement of concrete placement.
- C. Do not add water to concrete during delivery, at Project site, or during placement.
- D. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete is placed on concrete that has hardened enough to cause seams or planes of weakness.

1. If a section cannot be placed continuously, provide construction joints as indicated.
 2. Deposit concrete to avoid segregation.
 3. Deposit concrete in horizontal layers of depth not to exceed formwork design pressures and in a manner to avoid inclined construction joints.
 4. Consolidate placed concrete with mechanical vibrating equipment in accordance with ACI 301.
 - a. Do not use vibrators to transport concrete inside forms.
 - b. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches into preceding layer.
 - c. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity.
 - d. At each insertion, limit duration of vibration to time necessary to consolidate concrete, and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.
- E. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.
1. Do not place concrete floors and slabs in a checkerboard sequence.
 2. Consolidate concrete during placement operations, so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
 3. Maintain reinforcement in position on chairs during concrete placement.
 4. Screed slab surfaces with a straightedge and strike off to correct elevations.
 5. Level concrete, cut high areas, and fill low areas.
 6. Slope surfaces uniformly to drains where required.
 7. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess bleedwater appears on the surface.
 8. Do not further disturb slab surfaces before starting finishing operations.

3.5 FINISHING FORMED SURFACES

A. As-Cast Surface Finishes:

1. ACI 301 Surface Finish SF-1.0: As-cast concrete texture imparted by form-facing material.
 - a. Patch voids larger than 1-1/2 inches wide or 1/2 inch deep.
 - b. Remove projections larger than 1 inch.
 - c. Tie holes do not require patching.
 - d. Surface Tolerance: ACI 117 Class D.
 - e. Apply to concrete surfaces not part of slabs

B. Related Unformed Surfaces:

1. At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a color and texture matching adjacent formed surfaces.

2. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces unless otherwise indicated.

3.6 FINISHING FLOORS AND SLABS

- A. Comply with ACI 302.1R recommendations for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.
- B. Trowel Finish:
 1. After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel.
 2. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance.
 3. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.
 4. Do not add water to concrete surface.
 5. Do not apply hard-troweled finish to concrete, which has a total air content greater than 3 percent.
 6. Apply a trowel finish to surfaces exposed to view or to be covered with resilient flooring, carpet, ceramic or quarry tile set over a cleavage membrane, paint, or another thin-film-finish coating system.
 7. Finish and measure surface, so gap at any point between concrete surface and an unlevelled, freestanding, 10-ft.-long straightedge resting on two high spots and placed anywhere on the surface does not exceed 1/8 inch.
- C. Broom Finish: Apply a broom finish to exterior concrete platforms, steps, ramps, and locations indicated on Drawings.
 1. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route.
 2. Coordinate required final finish with Architect before application.

3.7 INSTALLATION OF MISCELLANEOUS CONCRETE ITEMS

- A. Filling In:
 1. Fill in holes and openings left in concrete structures after Work of other trades is in place unless otherwise indicated.
 2. Mix, place, and cure concrete, as specified, to blend with in-place construction.
 3. Provide other miscellaneous concrete filling indicated or required to complete the Work.
- B. Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and by steel-troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.
- C. Equipment Bases and Foundations:

1. Coordinate sizes and locations of concrete bases with actual equipment provided.
2. Construct concrete bases as indicated on Drawings.
3. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete substrate.
4. Prior to pouring concrete, place and secure anchorage devices.
 - a. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 - b. Cast anchor-bolt insert into bases.
 - c. Install anchor bolts to elevations required for proper attachment to supported equipment.

3.8 CONCRETE CURING

- A. Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.
 1. Comply with ACI 301 and ACI 306.1 for cold weather protection during curing.
 2. Comply with ACI 301 and ACI 305.1 for hot-weather protection during curing.
- B. Curing Formed Surfaces: Comply with ACI 308.1 as follows:
 1. Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces.
 2. Cure concrete containing color pigments in accordance with color pigment manufacturer's instructions.
 3. If forms remain during curing period, moist cure after loosening forms.
 4. If removing forms before end of curing period, continue curing for remainder of curing period, as follows:
 - a. Continuous Fogging: Maintain standing water on concrete surface until final setting of concrete.
 - b. Continuous Sprinkling: Maintain concrete surface continuously wet.
 - c. Absorptive Cover: Pre-dampen absorptive material before application; apply additional water to absorptive material to maintain concrete surface continuously wet.
 - d. Water-Retention Sheeting Materials: Cover exposed concrete surfaces with sheeting material, taping, or lapping seams.
 - e. Membrane-Forming Curing Compound: Apply uniformly in continuous operation by power spray or roller in accordance with manufacturer's written instructions.
 - 1) Recoat areas subject to heavy rainfall within three hours after initial application.
 - 2) Maintain continuity of coating and repair damage during curing period.
- C. Curing Unformed Surfaces: Comply with ACI 308.1 as follows:

1. Begin curing immediately after finishing concrete.
2. Interior Concrete Floors:
 - a. Floors to Receive Floor Coverings Specified in Other Sections: Contractor has option of the following:
 - 1) Absorptive Cover: As soon as concrete has sufficient set to permit application without marring concrete surface, install prewetted absorptive cover over entire area of floor.
 - a) Lap edges and ends of absorptive cover not less than 12 inches.
 - b) Maintain absorptive cover water saturated, and in place, for duration of curing period, but not less than seven days.
 - 2) Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive.
 - a) Immediately repair any holes or tears during curing period, using cover material and waterproof tape.
 - b) Cure for not less than seven days.
 - 3) Ponding or Continuous Sprinkling of Water: Maintain concrete surfaces continuously wet for not less than seven days, utilizing one, or a combination of, the following:
 - a) Water.
 - b) Continuous water-fog spray.
 - b. Floors to Receive Curing Compound:
 - 1) Apply uniformly in continuous operation by power spray or roller in accordance with manufacturer's written instructions.
 - 2) Recoat areas subjected to heavy rainfall within three hours after initial application.
 - 3) Maintain continuity of coating, and repair damage during curing period.
 - c. Floors to Receive Curing and Sealing Compound:
 - 1) Apply uniformly to floors and slabs indicated in a continuous operation by power spray or roller in accordance with manufacturer's written instructions.
 - 2) Recoat areas subjected to heavy rainfall within three hours after initial application.
 - 3) Repeat process 24 hours later, and apply a second coat. Maintain continuity of coating, and repair damage during curing period.

3.9 TOLERANCES

- A. Conform to ACI 117.

3.10 APPLICATION OF LIQUID FLOOR TREATMENTS

- A. Penetrating Liquid Floor Treatment: Prepare, apply, and finish penetrating liquid floor treatment in accordance with manufacturer's written instructions.
 - 1. Remove curing compounds, sealers, oil, dirt, laitance, and other contaminants and complete surface repairs.
 - 2. Do not apply to concrete that is less than three days' old.
 - 3. Apply liquid until surface is saturated, scrubbing into surface until a gel forms; rewet; and repeat brooming or scrubbing.
 - 4. Rinse with water; remove excess material until surface is dry.
 - 5. Apply a second coat in a similar manner if surface is rough or porous.

3.11 FIELD QUALITY CONTROL

- A. Special Inspections: Owner will engage a special inspector to perform field tests and inspections and prepare testing and inspection reports.
- B. Testing Agency: Owner will engage a qualified testing and inspecting agency to perform tests and inspections and to submit reports.
 - 1. Testing agency to be responsible for providing curing container for composite samples on Site and verifying that field-cured composite samples are cured in accordance with ASTM C31.
 - 2. Testing agency to immediately report to Architect, Contractor, and concrete manufacturer any failure of Work to comply with Contract Documents.
 - 3. Testing agency shall report results of tests and inspections, in writing, to Owner, Architect, Contractor, and concrete manufacturer within 48 hours of inspections and tests.
 - a. Test reports to include reporting requirements of ASTM C31, ASTM C39/, and ACI 301, including the following as applicable to each test and inspection:
 - 1) Project name.
 - 2) Name of testing agency.
 - 3) Names and certification numbers of field and laboratory technicians performing inspections and testing.
 - 4) Name of concrete manufacturer.
 - 5) Date and time of inspection, sampling, and field testing.
 - 6) Date and time of concrete placement.
 - 7) Location in Work of concrete represented by samples.
 - 8) Date and time sample was obtained.
 - 9) Truck and batch ticket numbers.
 - 10) Design compressive strength at 28 days.

- 11) Concrete mixture designation, proportions, and materials.
 - 12) Field test results.
 - 13) Information on storage and curing of samples before testing, including curing method and maximum and minimum temperatures during initial curing period.
 - 14) Type of fracture and compressive break strengths at seven days and 28 days.
- C. Batch Tickets: For each load delivered, submit three copies of batch delivery ticket to testing agency, indicating quantity, mix identification, admixtures, design strength, aggregate size, design air content, design slump at time of batching, and amount of water that can be added at Project site.
- D. Inspections:
1. Headed bolts and studs.
 2. Verification of use of required design mixture.
 3. Concrete placement, including conveying and depositing.
 4. Curing procedures and maintenance of curing temperature.
- E. Concrete Tests: Testing of composite samples of fresh concrete obtained in accordance with ASTM C 172 shall be performed in accordance with the following requirements:
1. Testing Frequency: Obtain one composite sample for each day's pour of each concrete mixture exceeding 5 cu. yd., but less than 25 cu. yd., plus one set for each additional 50 cu. yd. or fraction thereof.
 - a. When frequency of testing provides fewer than five compressive-strength tests for each concrete mixture, testing to be conducted from at least five randomly selected batches or from each batch if fewer than five are used.
 2. Slump: ASTM C143:
 - a. One test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture.
 - b. Perform additional tests when concrete consistency appears to change.
 3. Air Content: ASTM C231 pressure method, for normal-weight concrete;
 - a. One test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
 4. Concrete Temperature: ASTM C1064:
 - a. One test hourly when air temperature is 40 deg F and below or 80 deg F and above, and one test for each composite sample.
 5. Compression Test Specimens: ASTM C31:

- a. Cast and laboratory cure two sets of two 6-inch by 12-inch or 4-inch by 8-inch cylinder specimens for each composite sample.
 6. Compressive-Strength Tests: ASTM C39.
 - a. Test one cylinder at 7 days and two cylinders at 28 days. If the test cylinders at 28-days meet strength averages, test the final cylinder. If not, hold the final cylinder for a 56-day test.
 7. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
 8. Correct deficiencies in the Work that test reports and inspections indicate do not comply with the Contract Documents.
- F. Measure floor and slab flatness and levelness in accordance with ASTM E1155 within 72 hours of completion of floor finishing and promptly report test results to Architect.

3.12 PROTECTION

A. Protect concrete surfaces as follows:

1. Protect from petroleum stains.
2. Diaper hydraulic equipment used over concrete surfaces.
3. Prohibit vehicles from interior concrete slabs.
4. Prohibit use of pipe-cutting machinery over concrete surfaces.
5. Prohibit placement of steel items on concrete surfaces.
6. Prohibit use of acids or acidic detergents over concrete surfaces.
7. Protect liquid floor treatment from damage and wear during the remainder of construction period. Use protective methods and materials, including temporary covering, recommended in writing by liquid floor treatments installer.

END OF SECTION 033000

SECTION 042000 - UNIT MASONRY

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Concrete block.
- B. Cast stone accent units.
- C. Mortar and grout.
- D. Reinforcement and anchorage.
- E. Flashings.
- F. Lintels.
- G. Accessories.

1.2 RELATED REQUIREMENTS

- A. Section 055000 - Metal Fabrications: Loose steel lintels.
- B. Section 072100 - Thermal Insulation: Insulation for cavity spaces.
- C. Section 079200 - Joint Sealants: Sealing control and expansion joints.

1.3 REFERENCE STANDARDS

- A. ACI 315 - Details and Detailing of Concrete Reinforcement.
- B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
- C. ASTM A240/A240M - Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications.
- D. 16 CFR 1201 - Safety Standard for Architectural Glazing Materials.
- E. ACI 318 - Building Code Requirements for Structural Concrete.
- F. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.
- G. ASTM A951/A951M - Standard Specification for Steel Wire for Masonry Joint Reinforcement.
- H. ASTM A1064/A1064M - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete.

- I. ASTM C55 - Standard Specification for Concrete Building Brick.
- J. ASTM C90 - Standard Specification for Loadbearing Concrete Masonry Units.
- K. ASTM C91/C91M - Standard Specification for Masonry Cement.
- L. ASTM C129 - Standard Specification for Nonloadbearing Concrete Masonry Units.
- M. ASTM C144 - Standard Specification for Aggregate for Masonry Mortar.
- N. ASTM C150/C150M - Standard Specification for Portland Cement.
- O. ASTM C207 - Standard Specification for Hydrated Lime for Masonry Purposes.
- P. ASTM C270 - Standard Specification for Mortar for Unit Masonry.
- Q. ASTM C404 - Standard Specification for Aggregates for Masonry Grout.
- R. ASTM C476 - Standard Specification for Grout for Masonry.
- S. ASTM C780 - Standard Test Methods for Preconstruction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry.
- T. ASTM C979/C979M - Standard Specification for Pigments for Integrally Colored Concrete.
- U. ASTM C1364 - Standard Specification for Architectural Cast Stone.
- V. ASTM C1714/C1714M - Standard Specification for Preblended Dry Mortar Mix for Unit Masonry.
- W. ASTM D226/D226M - Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing.
- X. BIA Technical Notes No. 7 - Water Penetration Resistance – Design and Detailing.
- Y. BIA Technical Notes No. 13 - Ceramic Glazed Brick Exterior Walls.
- Z. BIA Technical Notes No. 28B - Brick Veneer/Steel Stud Walls.
- AA. BIA Technical Notes No. 46 - Maintenance of Brick Masonry.
- BB. TMS 402/602 - Building Code Requirements and Specification for Masonry Structures.
- CC. UL (FRD) - Fire Resistance Directory.

1.4 ADMINISTRATIVE REQUIREMENTS

- A. Coordination: Coordinate placement of backing and substrates specified under other Sections for attachment of anchors.

- B. Preinstallation Meeting: Convene a preinstallation meeting one week before starting work of this section; require attendance by all relevant installers.
 - 1. Require attendance by Contractor, Superintendent, all relevant installers, and parties directly affecting the work of this Section.
 - 2. Review locations of control joints and expansion joints.
 - 3. Review materials, conditions of installation, installation procedures, and coordination with related work.

1.5 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide data for masonry units, fabricated wire reinforcement, mortar, and masonry accessories.
- C. Shop Drawings: Submit drawings indicating steel reinforcing in compliance with ACI 315.
 - 1. Indicate bar sizes, spacing, locations, and quantities of reinforcing steel, bending and cutting schedules, and supporting and spacing devices.
- D. Samples: Submit two samples of facing brick and pigmented mortar units to illustrate color, texture, and extremes of color range.
- E. Samples: Submit samples of all masonry accessories.
- F. Manufacturer's Certificates: Certify that masonry units meet or exceed specified requirements.
 - 1. Include material test reports substantiating compliance with requirements.
 - 2. For brick, include size-variation data verifying that actual range of sizes falls within specified tolerances.
 - 3. For exposed brick, include test report for efflorescence according to ASTM C 67.
 - 4. For masonry units, include data and calculations establishing average net-area compressive strength of units.
- G. Mix Designs: For each type of mortar and grout. Include description of type and proportions of ingredients.
 - 1. Include test reports for mortar mixes required to comply with property specification. Test according to ASTM C109 for compressive strength, ASTM C1506 for water retention, and ASTM C91 for air content.

2. Include test reports, according to ASTM C 1019 for grout mixes required to comply with compressive strength requirement.
- H. Statement of Compressive Strength of Masonry: For each combination of masonry unit type and mortar type, provide statement of average net-area compressive strength of masonry units, mortar type, and resulting net-area compressive strength of masonry determined according to TMS 602/ACI 530.1/ASCE 6.
- I. Cold and Hot Weather Procedures: Detailed descriptions of methods, materials, and equipment to be used to comply with requirements.
- J. Manufacturer's Qualification Statement.
- K. Installer's Qualification Statement.
- L. Masonry Material Cleaning Plan: Include products and techniques for each masonry product of assembly and combined masonry assembly. Submit signed and approved by Masonry Unit Manufacturers.

1.6 QUALITY ASSURANCE

- A. Conform to TMS 602 for masonry inspection and testing requirements.
- B. Comply with provisions of TMS 402/602, except where exceeded by requirements of Contract Documents.
 1. Maintain one copy of each document on project site.
- C. Fire Rated Assemblies: Comply with applicable code for specified requirements for fire rated masonry construction.
- D. Designer Qualifications: Perform design under direct supervision of a Professional Engineer experienced in design of this type of work and licensed in the State in which the Project is located.
- E. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section with minimum three years of documented experience.
- F. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience.

1.7 MOCK-UPS

- A. Comply with general mock-up requirements specified in Section 014000.

- B. Integrated Exterior Mock-up: Construct an exterior wall demonstrating aesthetics and workmanship with cladding systems stepped back so that each detail is visible for inspection. Include masonry veneer, mortar, anchors and accessories, structural backup, wall opening, flashings (with lap joint, corner, and end dam), wall insulation, and air barrier assembly in mock-up.
 - 1. Minimum Size: 8 by 8 foot.
 - 2. Locate As directed by Architect.
 - 3. Mock-up may remain as part of work.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, handle, and store masonry units by means that will prevent mechanical damage and contamination by other materials.
- B. Store materials on elevated platforms, under cover, and in a dry location. Do not install damp materials.

1.9 FIELD CONDITIONS

- A. Protection of Masonry: During construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.
 - 1. Extend cover a minimum of 24 inches down both sides of walls and hold securely in place.
- B. Do not apply uniform floor or roof loads for at least 12 hours and concentrated loads for at least three days after constructing masonry walls or columns.
- C. Hot- and Cold-Weather Requirements: Comply with construction requirements contained in ACI 530.1/ASCE 6/TMS 602.

PART 2 PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer to design wide cavity wall veneer masonry anchors.
 - 1. Where total cavity dimension exceeds the prescriptive limits, or when other requirements of TMS 402 Section 6.2.2 are not met, veneer anchor(s) shall be designed by a Delegated Design Engineer using the provisions of TMS 402-11, Section 6.2.1. Veneer anchors shall be designed to resist appropriate combinations of loads including but not limited to dead, wind and seismic as indicated in the project documents or in keeping with ASCE 7-10.

2.2 CONCRETE MASONRY UNITS (CMU)

- A. Concrete Block: Comply with referenced standards and as follows:
1. Size: Standard units with nominal face dimensions of 16 by 8 inches and nominal depths as indicated on the Drawings for specific locations.
 2. Special Shapes: Provide nonstandard blocks configured for corners, lintels, headers, control joint edges, and other detailed conditions.
 - a. Provide bullnose units for outside corners of interior units.
 - b. Provide special shapes for lintels, corners, jambs, sashes, movement joints, bond beams, and other special conditions indicated on drawings.
 3. Load-Bearing Units: ASTM C90, normal weight.
 - a. Both hollow and solid block, as indicated.
 - b. Unit Compressive Strength: 2,000 psi, average net area, minimum.
 - c. Fire Ratings: Fire rated concrete masonry units shall be in compliance when the masonry has been certified through the equivalent thickness method contained in Chapter 3 of ACI 216.1 for concrete masonry and Chapter 5 for effects of finish materials.
 4. Nonloadbearing Units: ASTM C129.
 - a. Both hollow and solid block, as indicated.
- B. Concrete Veneer:
1. Size: To match existing.
 2. Exposed Faces: Fluted and burnished types, color and texture to match existing.

2.3 CAST STONE UNITS

- A. Cast Stone: Architectural concrete product manufactured to simulate appearance of natural stone, complying with ASTM C1364.
1. Compressive Strength: As specified in ASTM C1364; calculate strength of pieces to be field cut at 80 percent of uncut piece.
 2. Freeze-Thaw Resistance: Demonstrated by laboratory testing in accordance with ASTM C1364.
 3. Surface Texture: Fine grained texture, with no bugholes, air voids, or other surface blemishes visible from distance of 20 feet.

4. Reinforcement: Provide reinforcement as required to withstand handling and structural stresses; comply with ACI 318.
 - a. Pieces More than 24 inches in Any Dimension: Provide full length two-way reinforcement of cross-sectional area not less than 0.25 percent of unit cross-sectional area.
5. Fabrication:
 - a. Slope exposed top surfaces of stone and horizontal sill surfaces for natural wash.
 - b. Where corner detail is not indicated, form external corners to quirk joint profile.
 - c. Cut drip slot in bottom surface of work projecting more than 1/2 inch over wall surfaces. Size slot not less than 3/8 inch wide and 1/4 inch deep; full width of projection.
6. Color: As selected by Architect.

2.4 MORTAR AND GROUT MATERIALS

- A. Masonry Cement: ASTM C91/C91M.
 1. Colored Mortar: Premixed cement as required to match Architect's color sample.
- B. Mortar Cement: ASTM C1329.
 1. Colored Mortar: Premixed cement as required to match Architect's color sample.
- C. Portland Cement: ASTM C150/C150M, Type I or Type II, except Type III may be used for cold-weather construction; color as required to produce approved color sample.
 1. Not more than 0.60 percent alkali.
- D. Hydrated Lime: ASTM C207, Type S.
- E. Mortar Aggregate: ASTM C144.
- F. Grout Aggregate: ASTM C404.
- G. Pigments for Colored Mortar: Pure, concentrated mineral pigments specifically intended for mixing into mortar and complying with ASTM C979/C979M.
 1. Color(s): As selected by Architect from manufacturer's full range.
 2. Acceptable Manufacturers:

- a. Davis Colors, a division of Venator Materials PLC:
www.daviscolors.com/#sle.
 - b. Lambert Corporation: www.lambertusa.com/#sle.
 - c. Solomon Colors, Inc: www.solomoncolors.com/#sle.
 - d. Substitutions: See Section 016000 - Product Requirements.
- H. Water: Clean and potable.
- I. Admixtures: Not permitted unless specified, or requested by Contractor in writing and approved in writing by Architect.
- J. Packaged Dry Material for Mortar for Unit Masonry: Premixed Portland cement, hydrated lime, and sand; complying with ASTM C1714/C1714M and capable of producing mortar of the specified strength in accordance with ASTM C270 with the addition of water only.
- 1. Color: Mineral pigments added as required to produce approved color sample.
- K. Packaged Dry Material for Grout for Masonry: Premixed cementitious materials and dried aggregates; capable of producing grout of the specified strength in accordance with ASTM C476 with the addition of water only.
- 1. Type: Fine.

2.5 REINFORCEMENT AND ANCHORAGE

- A. Acceptable Manufacturers:
- 1. Blok-Lok Limited: www.blok-lok.com.
 - 2. Hohmann & Barnard, Inc.: www.h-b.com/sle.
 - 3. WIRE-BOND www.wirebond.com/#sle.
 - 4. Substitutions: See Section 016000 - Product Requirements.
- B. Wide Cavity Veneer Anchors: For cavity spaces exceeding the allowable limits of TMS 402, provide engineered (delegated design) wide cavity wall adjustable veneer anchors.
- C. Reinforcing Steel: ASTM A615/A615M, Grade 60 (60,000 psi), deformed billet bars; uncoated.
- D. Single Wythe Joint Reinforcement: ASTM A951/A951M.
- 1. Type: Ladder.

2. Material:
 - a. Interior Walls: ASTM A1064/A1064M steel wire, mill galvanized to 16 CFR 1201 Class 3.
 - b. Exterior Walls: ASTM A1064/A1064M steel wire, hot dip galvanized after fabrication to 16 CFR 1201 Class B.
 3. Size: 0.1483 inch side rods with 0.1483 inch cross rods; width as required to provide not less than 5/8 inch of mortar coverage on each exposure.
- E. Ties and Anchors, General: Provide hot dip galvanized ties and anchors as specified, except use Type 304 stainless steel ties and anchors in swimming pool, seating area, locker room, chemical storage rooms, and rooms subject to high humidity and wetting.
- F. Flexible Anchors for Connecting to Structure: 2-piece anchors that permit differential movement between masonry and building frame, sized to provide not less than 5/8 inch of mortar coverage from masonry face.
1. Concrete Frame: Dovetail anchors of bent steel strap, nominal 1 inch width x 0.024 in thick, with triangle wire ties 0.1875 inch thick, hot dip galvanized to ASTM A153/A153M Class B.
 2. Steel Frame: Crimped wire anchors for welding to frame, 0.25 inch thick, with trapezoidal wire ties 0.1875 inch thick, hot dip galvanized to ASTM A153/A153M Class B.
- G. Masonry Veneer Anchors - CMU Back-Up with Continuous Insulation: 2-piece anchors that permit differential movement between masonry veneer and structural backup, hot dip galvanized to ASTM A153/A153M, Class B.
1. Anchor Plates: Not less than 0.075 inch thick, designed for fastening to structural backup.
 2. Vertical Adjustment: Not less than 1-1/4 inches.
 3. Acceptable Products:
 - a. Hohmann & Barnard; HB-5213.
 - b. Blok Lok; BL-407 with insulation washers.
 - c. Wirebond; 2407 with insulation washers.
 - d. Wirebond RJ-711.
 - e. Substitutions: See Section 01 6000 - Product Requirements.

- H. Anchors and Other Components in Contact with Stone: Stainless steel, ASTM A666, Type 304.
 - 1. Sizes and Configurations: As required for vertical and horizontal support of stone and applicable loads.
- I. Setting Buttons and Shims: Plastic type.

2.6 FLASHINGS

- A. Combination Non-Asphaltic Flashing Materials - Stainless Steel:
 - 1. Stainless Steel Flashing - Self-adhering: ASTM A240/A240M; 2 mil type 304 stainless steel sheet with 8 mil of butyl adhesive and a removable release liner.
 - a. Acceptable Manufacturers:
 - 1) STS Coatings, Inc; Wall Guardian Self Adhering Stainless Steel Flashing: www.stscoatings.com/#sle.
 - 2) VaproShield, LLC; VAPRO-SS FLASHING: www.vaproshield.com/#sle.
 - 3) WIRE-BOND: www.wirebond.com/#sle.
 - 4) York Manufacturing, Inc; York 304 SA: www.yorkmfg.com/#sle.
 - 5) Hohmann & Barnard, Inc.; Mighty-Flash SA Stainless Flashing: www.h-b.com.
 - 6) Substitutions: See Section 016000 - Product Requirements.
- B. Flashing Sealant/Adhesives: Non-curing butyl, silicone, polyurethane, or silyl-terminated polyether/polyurethane or other type required or recommended by flashing manufacturer; type adhesively and chemically compatible with type of flashing used.
- C. Termination Bars: Stainless steel; compatible with membrane and adhesives. Provide flanged type for continuous sealant along top edge.
- D. Drip Edge: Stainless steel; angled or flat drip with hemmed edge; compatible with membrane and adhesives.
 - 1. Type: Unless otherwise indicated, extend drip edge at least 3 inches horizontally into masonry and 3/4 inch out from exterior face of masonry with outer edge bent down 45 degrees and hemmed.
 - 2. Type at Grade Adjacent to Walking Surfaces: Extend flat hemmed drip edge at least 3 inches horizontally into masonry with outer edge hemmed and flush with face of masonry. Metal should be continuously visible after joints are tooled.

3. Sealant Between Layers of Sheet Metal: One-part, non-skinning butyl sealant.

E. Lap Sealants and Tapes: As recommended by flashing manufacturer; compatible with membrane and adhesives.

2.7 ACCESSORIES

A. Preformed Control Joints: Rubber material. Provide with corner and tee accessories, fused joints.

B. Joint Filler: Closed cell neoprene or urethane; oversized 50 percent to joint width; self expanding; in maximum lengths available.

1. Complying with ASTM D 1056, Grade 2A1.

2. Acceptable Manufacturers:

a. Hohmann & Barnard, Inc.: www.h-b.com/sle.

b. WIRE-BOND: www.wirebond.com/#sle.

c. Substitutions: See Section 016000 - Product Requirements.

C. Cavity Mortar Control: Semi-rigid polyethylene or polyester mesh panels, sized to thickness of wall cavity, and designed to prevent mortar droppings from clogging weeps and cavity vents and allow proper cavity drainage.

1. Mortar Diverter: Semi-rigid mesh designed for installation at flashing locations.

a. Acceptable Manufacturers:

1) Advanced Building Products Inc.; Mortar Break DT:
www.advancedbuildingproducts.com/sle.

2) Mortar Net Solutions; MortarNet: www.mortarnet.com/#sle.

3) York Manufacturing, Inc; Weep-Net: www.yorkmfg.com/#sle.

4) Hohmann & Barnard, Inc.; Mortar Trap: www.h-b.com.

5) Substitutions: See Section 016000 - Product Requirements.

D. Building Paper: ASTM D226/D226M, Type I ("No.15") asphalt felt.

E. Weeps: Molded PVC grilles, insect resistant.

1. Width: Match specified mortar joint thickness.

2. Color(s): As selected by Architect from manufacturer's full range.

3. Acceptable Manufacturers:

- a. Advanced Building Products, Inc; Mortar Maze Cell Vent: www.advancedbuildingproducts.com/#sle.
 - b. Blok-Lok Limited; CELLVENT: www.blok-lok.com/#sle.
 - c. Hohmann & Barnard, Inc.; QV Quadro-Vent: www.h-b.com.
 - d. Mortar Net Solutions; CellVent: www.mortarnet.com/#sle.
 - e. WIRE-BOND; Cell Vent: www.wirebond.com/#sle.
 - f. Substitutions: See Section 016000 - Product Requirements.
- F. Sealants: Types required by flashing manufacturer to suit indicated installation and service conditions.
- G. Cleaning Solution: Non-acidic, not harmful to masonry work or adjacent materials.

2.8 LINTELS

- A. Steel Lintels: Specified in Section 055000.
- B. Masonry Lintels: Prefabricated or built-in-place masonry lintels made from bond beam CMU matching adjacent CMU in color, texture, and density classification, with reinforcing bars placed as indicated and filled with coarse grout. Cure lintels before handling and installing. Temporarily support build-in-place lintels until cured.
1. Use masonry lintels in concrete masonry unit walls where lintel is exposed, and as specified in Structural Drawings.

2.9 MORTAR AND GROUT MIXING

- A. Mortar for Unit Masonry: ASTM C270, using the Proportion Specification.
1. Masonry Below Grade in Contact With Earth: Type M.
 2. Exterior Loadbearing Masonry: Type S.
 3. Exterior Non-loadbearing Masonry: Type S.
 4. Masonry Veneers: Type N
 5. Interior Loadbearing Masonry: Type S.
 6. Interior Non-loadbearing Masonry: Type N.
- B. Colored Mortar: Proportion selected pigments and other ingredients to match Architect's sample, without exceeding manufacturer's recommended pigment-to-cement ratio.

- C. Grout: ASTM C476; consistency required to fill completely volumes indicated for grouting; fine grout for spaces with smallest horizontal dimension of 2 inches or less; coarse grout for spaces with smallest horizontal dimension greater than 2 inches.
- D. Admixtures: Add to mixture at manufacturer's recommended rate and in accordance with manufacturer's instructions; mix uniformly.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that field conditions are acceptable and are ready to receive masonry.
- B. Verify that related items provided under other Sections are properly sized and located.
- C. Verify that built-in items are in proper location, and ready for roughing into masonry work.

3.2 PREPARATION

- A. Provide temporary bracing during installation of masonry work. Maintain in place until building structure provides permanent bracing.

3.3 COLD AND HOT WEATHER REQUIREMENTS

- A. Comply with requirements of TMS 402/602 or applicable building code, whichever is more stringent.

3.4 COURSING

- A. Establish lines, levels, and coursing indicated. Protect from displacement.
- B. Maintain masonry courses to uniform dimension. Form vertical and horizontal joints of uniform thickness.
- C. Concrete Masonry Units:
 - 1. Bond: Running.
 - 2. Coursing: One unit and one mortar joint to equal 8 inches.
 - 3. Mortar Joints: Concave unless otherwise required for work in other Sections.

3.5 PLACING AND BONDING

- A. Lay hollow masonry units with face shell bedding on head and bed joints.
- B. Buttering corners of joints or excessive furrowing of mortar joints is not permitted.
- C. Remove excess mortar and mortar smears as work progresses.

- D. Remove excess mortar with water repellent admixture promptly. Do not use acids, sandblasting or high pressure cleaning methods.
- E. Interlock intersections and external corners.
- F. Do not shift or tap masonry units after mortar has achieved initial set. Where adjustment must be made, remove mortar and replace.
- G. Perform job site cutting of masonry units with proper tools to provide straight, clean, unchipped edges. Prevent broken masonry unit corners or edges.
- H. Cut mortar joints flush where wall tile is scheduled or resilient base is scheduled.
- I. Isolate masonry partitions from vertical structural framing members with a control joint as indicated.
- J. Isolate top joint of masonry partitions from horizontal structural framing members and slabs or decks with compressible joint filler.

3.6 WEEPS/CAVITY VENTS

- A. Install weeps in veneer and cavity walls at maximum 24 inches on center horizontally above through-wall flashing, above shelf angles and lintels, at bottom of walls, and at rowlock/belt courses where indicated.

3.7 CAVITY MORTAR CONTROL

- A. Do not permit mortar to drop or accumulate into cavity air space or to plug weep/cavity vents.
- B. For cavity walls, build inner wythe ahead of outer wythe to accommodate accessories.
- C. Install cavity mortar diverter at base of cavity and at other flashing locations as recommended by manufacturer to prevent mortar droppings from blocking weep/cavity vents.

3.8 REINFORCEMENT AND ANCHORAGE - GENERAL

- A. Unless otherwise indicated on Drawings or specified under specific wall type, install horizontal joint reinforcement 16 inches on center.
- B. Place masonry joint reinforcement in first and second horizontal joints above and below openings. Extend minimum 16 inches each side of opening.
- C. Place continuous joint reinforcement in first and second joint below top of walls.
- D. Place continuous reinforcement around corners.
- E. Embed longitudinal wires of joint reinforcement in mortar joint with at least 5/8 inch mortar cover on each side.

- F. Lap joint reinforcement ends minimum 12 inches.
- G. Reinforce stack bonded unit joint corners and intersections with strap anchors 16 inches on center.
- H. Fasten anchors to structural framing and embed in masonry joints as masonry is laid. Unless otherwise indicated on Drawings or closer spacing is indicated under specific wall type, space anchors at maximum of 16 inches horizontally and 16 inches vertically.
- I. Embed ties and anchors in mortar joint and extend into masonry unit a minimum of 1-1/2 inches with at least 5/8 inch mortar cover to the outside face of the anchor.

3.9 REINFORCEMENT AND ANCHORAGE - MASONRY VENEER

- A. At concrete masonry veneers, install horizontal joint reinforcement 16 inches on center and in compliance with NCMA TEK 10-04.
- B. At horizontal changes between clay and cementitious masonry (CMU, concrete brick, cast stone, etc.), provide horizontal joint reinforcement complying with NCMA TEK 05-02A, unless otherwise detailed with bond break material, slip plane, or thru-wall flashing.
- C. Secure veneer anchors to back-up substrates and embed into masonry veneer at maximum 16 inches on center vertically and 24 inches on center horizontally.

3.10 MASONRY FLASHINGS

- A. Whether or not specifically indicated, install masonry flashing to divert water to exterior at all locations where downward flow of water will be interrupted.
 - 1. Extend flashings full width at such interruptions and at least 6 inches, minimum, into adjacent masonry or turn up flashing ends at least 1 inch, minimum, to form watertight pan at nonmasonry construction.
 - 2. Remove or cover protrusions or sharp edges that could puncture flashings.
 - 3. Seal lapped ends and penetrations of flashing before covering with mortar.
- B. Terminate flashing up 8 inches minimum on vertical surface of backing and extending minimum 6 inches above top of cavity drainage material:
 - 1. Install vertical leg of flashing over air and water-resistive barriers per manufacturer's directions.
 - 2. Anchor vertical leg of flashing into backing with a termination bar and continout sealant along top edge.

- C. Install flashing in accordance with manufacturer's instructions and BIA Technical Notes No. 7.
- D. Lap end joints of flexible flashings at least 6 inches, minimum, and seal watertight.
- E. Where dowels, reinforcing bars and fastening devices penetrate flashing, seal penetration with sealing compound.

3.11 LINTELS

- A. Install loose steel lintels over openings where indicated.
- B. Install reinforced unit masonry lintels over openings where steel or precast concrete lintels are not scheduled.
 - 1. Reinforced Lintels: Place reinforcing as indicated on Drawings.
- C. Maintain minimum 8 inch bearing on each side of opening.

3.12 GROUTED COMPONENTS

- A. Reinforce bond beams as indicated on Drawings.
- B. Grout solid all hollow concrete unit masonry located below grade, at bond beams, and at other locations indicated.
- C. At bearing locations, fill masonry cores with grout for a minimum 8 inches both sides of opening unless otherwise indicated in drawings.

3.13 CONTROL AND EXPANSION JOINTS

- A. Size control joints as indicated on Drawings; if not shown, 3/8 inch wide.
- B. Do not continue horizontal joint reinforcement through control or expansion joints.
- C. Install preformed control joint device in continuous lengths. Seal butt and corner joints in accordance with manufacturer's instructions.
- D. If control joint locations are not indicated on drawings, locate control joints in CMU walls complying with the NCMA TEK note recommendations and at wall height changes; within ten feet of corners; at wall thickness changes; at bond beam breaks; at abutments of columns and walls; at abutment of cold garages to warm basements or walls; at openings in walls such as doors and windows; and at intervals in continuous walls not exceeding 20 feet in length, unless more restrictive spacing is recommended in the NCMA TEK notes.
- E. Locate expansion joints in masonry veneers as indicated on drawings and in compliance with the Brick Industry Association Technical Notes.
 - 1. If expansion joints are not indicated on drawings, request Architect clarification.

3.14 BUILT-IN WORK

- A. As work progresses, install built-in metal door frames, fabricated metal frames, anchor bolts, and plates and other items to be built into the work and furnished under other Sections.
- B. Install built-in items plumb, level, and true to line.
- C. Bed anchors of metal door and glazed frames in adjacent mortar joints. Fill frame voids solid with grout.
 - 1. Fill adjacent masonry cores with grout minimum 12 inches from framed openings.
- D. Do not build into masonry construction organic materials that are subject to deterioration.

3.15 TOLERANCES

- A. Install masonry within the site tolerances found in TMS 402/602.
- B. Maximum Variation from Alignment of Columns: 1/4 inch.
- C. Maximum Variation From Unit to Adjacent Unit: 1/16 inch.
- D. Maximum Variation from Plane of Wall: 1/4 inch in 10 ft and 1/2 inch in 20 ft or more.
- E. Maximum Variation from Plumb: 1/4 inch per story non-cumulative; 1/2 inch in two stories or more.
- F. Maximum Variation from Level Coursing: 1/8 inch in 3 ft and 1/4 inch in 10 ft; 1/2 inch in 30 ft.
- G. Maximum Variation of Mortar Joint Thickness: Head joint, minus 1/8 inch, plus 1/8 inch.
- H. Maximum Variation from Cross Sectional Thickness of Walls: 1/4 inch.

3.16 CUTTING AND FITTING

- A. Cut and fit for chases, pipes, conduit, sleeves, and grounds. Coordinate with other Sections of work to provide correct size, shape, and location.
- B. Obtain approval prior to cutting or fitting masonry work not indicated or where appearance or strength of masonry work may be impaired.

3.17 FIELD QUALITY CONTROL

- A. An independent testing agency will perform field quality control tests, as specified in Section 014000 - Quality Requirements.

1. See Structural Drawings for additional requirements.
- B. Concrete Masonry Unit Tests: Test each variety of concrete unit masonry in accordance with ASTM C140/C140M for conformance to requirements of this specification.
- C. Mortar Tests: Test each type of mortar in accordance with ASTM C780, testing with same frequency as masonry samples.

3.18 CLEANING

- A. Remove excess mortar and mortar droppings.
- B. Replace defective mortar. Match adjacent work.
- C. Clean soiled surfaces with specified cleaning solution, at low pressure or by hand methods only; do not introduce excessive moisture into masonry wall surfaces during cleaning operations.
- D. Use non-metallic tools and stiff brushes in cleaning operations.

3.19 PROTECTION

- A. Without damaging completed work, provide protective boards at exposed external corners that are subject to damage by construction activities.
 1. Install required protection of installed work at the end of each work day.

END OF SECTION 042000

SECTION 042200 - CONCRETE UNIT MASONRY

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Concrete masonry units.
 - 2. Steel reinforcing bars.

1.2 DEFINITIONS

- A. CMU(s): Concrete masonry units.
- B. Reinforced Masonry: Masonry containing reinforcing steel in grouted cells.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product and block.
- B. Shop Drawings: Masonry steel placement drawings.

1.4 INFORMATIONAL SUBMITTALS

- A. Material Certificates: For each type and size of product. For masonry units, include data on material properties and material test reports substantiating compliance with requirements including compressive strength and fire ratings.
- B. Mix Designs: For each type of mortar and grout. Include description of type and proportions of ingredients.
 - 1. Include product data for mortar mixes required to comply with property specification.
 - 2. Include product data for grout mixes required to comply with compressive strength requirement.

1.5 FIELD CONDITIONS

- A. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace unit masonry damaged by frost or by freezing conditions. Comply with cold-weather construction requirements contained in TMS 602/ACI 530.1/ASCE 6.

- B. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in TMS 602/ACI 530.1/ASCE 6.

PART 2 - PRODUCTS

2.1 UNIT MASONRY, GENERAL

- A. Masonry Standard: Comply with TMS 602/ACI 530.1/ASCE 6, except as modified by requirements in the Contract Documents.
- B. Defective Units: Referenced masonry unit standards may allow a certain percentage of units to contain chips, cracks, or other defects exceeding limits stated. Do not use units where such defects are exposed in the completed Work.

2.2 CONCRETE MASONRY UNITS

- A. Shapes: Provide shapes indicated and as follows, with exposed surfaces matching exposed faces of adjacent units unless otherwise indicated.
 - 1. Provide special shapes for lintels, corners, jambs, sashes, movement joints, headers, bonding, and other special conditions.
- B. Integral Water Repellent: Provide units made with integral water repellent.
- C. CMUs: ASTM C90.
 - 1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 3250 psi
 - 2. Density Classification: Normal weight.
- D. Concrete Building Brick: ASTM C55.

2.3 STEEL LINTELS

- A. Steel Lintels: Provide galvanized loose angle and wide flange lintels per the structural drawings located per the architectural elevations.

2.4 MORTAR AND GROUT MATERIALS

- A. Portland Cement: ASTM C150, Type I or II, except Type III may be used for cold-weather construction. Provide natural color or white cement as required to produce mortar color indicated.
- B. Hydrated Lime: ASTM C207, Type S.
- C. Masonry Cement: ASTM C91.

- D. Aggregate for Mortar: ASTM C144.
 - 1. White-Mortar Aggregates: Natural white sand or crushed white stone.
 - 2. Colored-Mortar Aggregates: Natural sand or crushed stone of color necessary to produce required mortar color.
- E. Aggregate for Grout: ASTM C404.
- F. Cold-Weather Admixture: Nonchloride, noncorrosive, accelerating admixture complying with ASTM C494, Type C, and recommended by manufacturer for use in masonry mortar of composition indicated.
- G. Water-Repellent Admixture: Liquid water-repellent mortar admixture intended for use with CMUs containing integral water repellent from same manufacturer.
- H. Water: Potable.

2.5 REINFORCEMENT

- A. Uncoated-Steel Reinforcing Bars: ASTM A615 Grade 60.
- B. Reinforcing Bar Positioners: Wire units designed to fit into mortar bed joints spanning masonry unit cells and to hold reinforcing bars in center of cells. Units are formed from 0.148-inch steel wire, hot-dip galvanized after fabrication. Provide units designed for number of bars indicated. Bar positioners are only required if the contractor deems necessary.
- C. Masonry-Joint Reinforcement, General: ASTM A951.
 - 1. Exterior Walls: Hot-dip galvanized carbon steel.
 - 2. Wire Size for Side Rods: 9 ga
 - 3. Wire Size for Cross Rods: 9 ga
 - 4. Spacing of Cross Rods: Not more than 16 inches o.c.
 - 5. Provide in lengths of not less than 10 feet, with prefabricated corner and tee units.

2.6 TIES AND ANCHORS

- A. Materials: Provide ties and anchors specified in this article that are made from materials that comply with the following unless otherwise indicated:
 - 1. Hot-Dip Galvanized, Carbon-Steel Wire: ASTM A82, with ASTM A153, Class B-2 coating.
 - 2. Steel Plates, Shapes, and Bars: ASTM A36.

2.7 EMBEDDED FLASHING MATERIALS

- A. Not required for below-grade masonry walls. Refer to the architectural drawings for any flashing requirements for brick veneers and thru-wall details not covered on the structural drawings.

2.8 MISCELLANEOUS MASONRY ACCESSORIES

- A. Compressible Filler: Premolded filler strips complying with ASTM D1056, Grade 2A1; compressible up to 35 percent; of width and thickness indicated; formulated from neoprene.
- B. Preformed Control-Joint Gaskets: Made from styrene-butadiene-rubber compound, complying with ASTM D2000, Designation M2AA-805 and designed to fit standard sash block and to maintain lateral stability in masonry wall; size and configuration as indicated.
- C. Bond-Breaker Strips: Asphalt-saturated felt complying with ASTM D226, Type I (No. 15 asphalt felt).

2.9 MORTAR AND GROUT MIXES

- A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures unless otherwise indicated.
 - 1. Do not use calcium chloride in mortar or grout.
 - 2. Use masonry cement mortar unless otherwise indicated.
 - 3. Add cold-weather admixture (if used) at same rate for all mortar that will be exposed to view, regardless of weather conditions, to ensure that mortar color is consistent.
- B. Preblended, Dry Mortar Mix: Furnish dry mortar ingredients in form of a preblended mix. Measure quantities by weight to ensure accurate proportions, and thoroughly blend ingredients before delivering to Project site.
- C. Mortar for Unit Masonry: Comply with ASTM C270. Provide the following types of mortar for applications stated unless another type is indicated.
 - 1. For masonry below grade or in contact with earth, use Type S.
- D. Grout for Unit Masonry: Comply with ASTM C476.
 - 1. Use grout of type indicated or, if not otherwise indicated, of type (fine or coarse) that will comply with TMS 602/ACI 530.1/ASCE 6 for dimensions of grout spaces and pour height.
 - 2. Proportion grout in accordance with ASTM C476, paragraph 4.2.2 for specified 28-day compressive strength indicated, but not less than 2000 psi.
 - 3. Provide grout with a slump of 8 to 11 inches as measured in accordance with ASTM C143.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Use full-size units without cutting if possible. If cutting is required to provide a continuous pattern or to fit adjoining construction, cut units with motor-driven saws; provide clean, sharp, unchipped edges. Allow units to dry before laying unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.

3.2 TOLERANCES

A. Dimensions and Locations of Elements:

1. For dimensions in cross section or elevation, do not vary by more than plus 1/2 inch or minus 1/4 inch.
2. For location of elements in plan, do not vary from that indicated by more than plus or minus 1/2 inch.
3. For location of elements in elevation, do not vary from that indicated by more than plus or minus 1/4 inch in a story height or 1/2 inch total.

B. Lines and Levels:

1. For bed joints and top surfaces of bearing walls, do not vary from level by more than 1/4 inch in 10 feet, or 1/2-inch maximum.
2. For conspicuous horizontal lines, such as lintels, sills, parapets, and reveals, do not vary from level by more than 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2-inch maximum.
3. For vertical lines and surfaces, do not vary from plumb by more than 1/4 inch in 10 feet, 3/8 inch in 20 feet, or 1/2-inch maximum.
4. For conspicuous vertical lines, such as external corners, door jambs, reveals, and expansion and control joints, do not vary from plumb by more than 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2-inch maximum.
5. For lines and surfaces, do not vary from straight by more than 1/4 inch in 10 feet, 3/8 inch in 20 feet, or 1/2-inch maximum.

C. Joints:

1. For bed joints, do not vary from thickness indicated by more than plus or minus 1/8 inch, with a maximum thickness limited to 1/2 inch.
2. For head and collar joints, do not vary from thickness indicated by more than plus 3/8 inch or minus 1/4 inch.
3. For exposed head joints, do not vary from thickness indicated by more than plus or minus 1/8 inch.

3.3 LAYING MASONRY WALLS

- A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint thicknesses and for accurate location of openings, movement-type joints, returns, and offsets. Avoid using less-than-half-size units, particularly at corners, jambs, and, where possible, at other locations.
- B. Bond Pattern for Exposed Masonry: Unless otherwise indicated, lay exposed masonry in running bond; do not use units with less-than-nominal 4-inch horizontal face dimensions at corners or jambs.
- C. Built-in Work: As construction progresses, build in items specified in this and other Sections. Fill in solidly with masonry around built-in items.
- D. Fill space between steel frames and masonry solidly with mortar unless otherwise indicated.
- E. Fill cores in hollow CMUs with grout 24 inches under bearing plates, beams, lintels, posts, and similar items unless otherwise indicated.

3.4 MORTAR BEDDING AND JOINTING

- A. Lay hollow CMUs as follows:
 - 1. Bed face shells in mortar and make head joints of depth equal to bed joints.
 - 2. Bed webs in mortar in all courses of piers, columns, and pilasters.
 - 3. Bed webs in mortar in grouted masonry, including starting course on footings.
 - 4. Fully bed entire units, including areas under cells, at starting course on footings where cells are not grouted.
- B. Lay solid CMUs with completely filled bed and head joints; butter ends with sufficient mortar to fill head joints and shove into place. Do not deeply furrow bed joints or slush head joints.
- C. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness unless otherwise indicated.
- D. Cut joints flush for masonry walls to receive plaster or other direct-applied finishes (other than paint) unless otherwise indicated.

3.5 MASONRY-JOINT REINFORCEMENT

- A. General: Install entire length of longitudinal side rods in mortar with a minimum cover of 5/8 inch on exterior side of walls, 1/2 inch elsewhere. Lap reinforcement a minimum of 6 inches.
- B. Interrupt joint reinforcement at control and expansion joints unless otherwise indicated.
- C. Provide continuity at corners by using prefabricated L-shaped units.

3.6 FIELD QUALITY CONTROL

- A. Testing and Inspecting: Owner will engage special inspectors to perform tests and inspections and prepare reports. Allow inspectors access to scaffolding and work areas as needed to perform tests and inspections. Retesting of materials that fail to comply with specified requirements is done at Contractor's expense.
- B. Inspections: Special inspections in accordance with Level 2 in TMS 402/ACI 530/ASCE 5.
 - 1. Begin masonry construction only after inspectors have verified proportions of site-prepared mortar.
 - 2. Place grout only after inspectors have verified compliance of grout spaces and of grades, sizes, and locations of reinforcement.
 - 3. Place grout only after inspectors have verified proportions of site-prepared grout.
- C. Testing Frequency: One set of tests for each 5000 sq. ft. of wall area or portion thereof
- D. Testing required:
 - 1. Mortar prism test (2 total)
 - 2. Grout compressive test (2 total)

3.7 REPAIRING, POINTING, AND CLEANING

- A. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.
- B. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:
 - 1. Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes.
 - 2. Clean concrete masonry by applicable cleaning methods indicated in NCMA TEK 8-4A.

3.8 MASONRY WASTE DISPOSAL

- A. Waste Disposal: Dispose of clean masonry waste, including excess or soil-contaminated sand, waste mortar, and broken masonry units, off-site in an approved dumpster or other recycling location. Do not crush or use for fill.
- B. Masonry Waste Recycling: Return broken CMUs not used as fill to manufacturer for recycling.

END OF SECTION 042200

SECTION 051200 - STRUCTURAL STEEL FRAMING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Structural steel.
2. Shrinkage-resistant grout.

B. Related Requirements:

1. Section 053100 "Steel Decking" for field installation of fasteners through deck.

1.2 DEFINITIONS

- A. Structural Steel: Elements of the structural frame indicated on Drawings and as described in AISC 303.

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Not required for steel fabrication or erection unless specifically requested by the owners and/or owners' representative.

1.4 ACTION SUBMITTALS

A. Product Data:

1. Structural-steel materials.
2. Anchor rods.
3. Shop primer.
4. Galvanized-steel primer.
5. Galvanized repair paint.
6. Shrinkage-resistant grout.

- B. Shop Drawings: Show fabrication of structural-steel components.

- C. Delegated Design Submittal: Connections shown on the drawings have been fully designed by the engineer of record and delegated connection design is not required.

1.5 INFORMATIONAL SUBMITTALS

- A. Welding certificates.

- B. Field quality-control reports.

1.6 QUALITY ASSURANCE

- A. Fabricator Qualifications: A qualified fabricator that participates in the AISC Quality Certification Program and is designated an AISC-Certified Plant, Category BU or is accredited by the IAS Fabricator Inspection Program for Structural Steel (Acceptance Criteria 172).
- B. Installer Qualifications: A qualified Installer who participates in the AISC Quality Certification Program and is designated an AISC-Certified Erector, Category CSE.
- C. Welding Qualifications: Qualify procedures and personnel in accordance with AWS D1.1.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Comply with applicable provisions of the following specifications and documents:
 - 1. AISC 303.
 - 2. AISC 360.
 - 3. RCSC's "Specification for Structural Joints Using High-Strength Bolts."
- B. Connection Design Information:
 - a. Not required; connections have been fully-designed.
- C. Moment Connections: Not applicable / not used.
- D. Construction: Ordinarily reinforced masonry shear walls.

2.2 STRUCTURAL-STEEL MATERIALS

- A. W-Shapes, Channels: ASTM A992, Grade 50.
- B. Angles: ASTM A36, Grade 36.
- C. Plate and Bar: ASTM A36, Grade 36.
- D. Cold-Formed Hollow Structural Sections: ASTM A500, Grade C structural tubing.
- E. Welding Electrodes: Comply with AWS requirements.

2.3 BOLTS AND CONNECTORS

- A. High-Strength A325 Bolts, Nuts, and Washers: ASTM F3125, Grade A325, Type 1, heavy-hex steel structural bolts; ASTM A563, Grade DH, heavy-hex carbon-steel nuts; and ASTM F436, Type 1, hardened carbon-steel washers; all with plain finish.

2.4 RODS

- A. Headed Anchor Rods: ASTM F1554, Grade 36 or Grade 55 (S1), weldable, straight. Refer to the Structural Drawings.
 - 1. Finish: Hot-dip zinc coating, ASTM A153, Class C.
- B. Threaded Rods: ASTM A36.
 - 1. Finish: Hot-dip zinc coating, ASTM A153, Class C.

2.5 PRIMER

- A. Steel Primer:
 - 1. Fabricator's standard lead- and chromate-free, non-asphaltic, rust-inhibiting primer complying with MPI#79 and compatible with topcoat.
 - 2. Do not provide primer of steel elements to receive spray-applied fire protection materials (SAFPM).

2.6 SHRINKAGE-RESISTANT GROUT

- A. Nonmetallic, Shrinkage-Resistant Grout: ASTM C1107, factory-packaged, nonmetallic aggregate grout, noncorrosive and nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.

2.7 FABRICATION

- A. Structural Steel: Fabricate and assemble in shop to greatest extent possible. Fabricate in accordance with AISC 303 and to AISC 360.

2.8 SHOP CONNECTIONS

- A. High-Strength Bolts: Shop install high-strength bolts in accordance with RCSC's "Specification for Structural Joints Using High-Strength Bolts" for type of bolt and type of joint specified.
 - 1. Joint Type: Snug tightened.
- B. Weld Connections: Comply with AWS D1.1 for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.

2.9 GALVANIZING

- A. Hot-Dip Galvanized Finish: Apply zinc coating by the hot-dip process to structural steel in accordance with ASTM A123.

1. Fill vent and drain holes that are exposed in the finished Work unless they function as weep holes, by plugging with zinc solder and filing off smooth.

2.10 SHOP PRIMING

- A. Shop prime steel surfaces, except the following:
 1. Surfaces embedded in concrete or mortar. Extend priming of partially embedded members to a depth of 2 inches.
 2. Surfaces to be field welded.
 3. Galvanized surfaces unless indicated to be painted.
 4. Steel to receive spray-applied fire protection materials.
- B. Surface Preparation of Steel: Clean surfaces to be painted. Remove loose rust and mill scale and spatter, slag, or flux deposits. Prepare surfaces in accordance with the following specifications and standards:
 1. SSPC-SP 2.
- C. Surface Preparation of Galvanized Steel to be Painted: Prepare galvanized-steel surfaces for shop priming by thoroughly cleaning steel of grease, dirt, oil, flux, and other foreign matter, and treating with etching cleaner.
- D. Priming Galvanized Steel to be Painted: Immediately after surface preparation, apply primer in accordance with manufacturer's written instructions and at rate recommended by SSPC to provide a minimum dry film thickness of 1.5 mils. Use priming methods that result in full coverage of joints, corners, edges, and exposed surfaces.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify, with certified steel erector present, elevations of concrete- and masonry-bearing surfaces and locations of anchor rods, bearing plates, and other embedments for compliance with requirements.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 ERECTION

- A. Set structural steel accurately in locations and to elevations indicated and in accordance with AISC 303 and AISC 360.
- B. Baseplates: Clean concrete- and masonry-bearing surfaces of bond-reducing materials, and roughen surfaces prior to setting plates. Clean bottom surface of plates.
 1. Set plates for structural members on wedges, shims, or setting nuts as required.
 2. Weld plate washers to top of baseplate.

3. Snug-tighten anchor rods after supported members have been positioned and plumbed. Do not remove wedges or shims but, if protruding, cut off flush with edge of plate before packing with grout.
 4. Promptly pack shrinkage-resistant grout solidly between bearing surfaces and plates, so no voids remain. Neatly finish exposed surfaces; protect grout and allow to cure.
- C. Maintain erection tolerances of structural steel within AISC 303.

3.3 FIELD CONNECTIONS

- A. High-Strength Bolts: Install high-strength bolts in accordance with RCSC's "Specification for Structural Joints Using High-Strength Bolts" for bolt and joint type specified.
1. Joint Type: Snug tightened.
- B. Weld Connections: Comply with AWS D1.1 for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.
1. Comply with AISC 303 and AISC 360 for bearing, alignment, adequacy of temporary connections, and removal of paint on surfaces adjacent to field welds.

3.4 FIELD QUALITY CONTROL

- A. Special Inspections: Owner will engage a special inspector to perform the following special inspections:
1. Verify structural-steel materials and inspect steel frame joint details.
 2. Verify weld materials and inspect welds.
 3. Verify connection materials and inspect high-strength bolted connections.
- B. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.
1. Bolted Connections: Inspect bolted connections in accordance with RCSC's "Specification for Structural Joints Using High-Strength Bolts."
 2. Welded Connections: Visually inspect field welds in accordance with AWS D1.1.

END OF SECTION 051200

SECTION 052100 - STEEL JOIST FRAMING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. K-series and KCS-series steel joists with or without top chord extensions (TCX).
2. Steel joist accessories.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of joist, accessory, and product.

B. Shop Drawings:

1. Include layout, designation, number, type, location, and spacing of joists.
2. Include joining and anchorage details; bracing, bridging, and joist accessories; splice and connection locations and details; and attachments to other construction.

1.3 INFORMATIONAL SUBMITTALS

A. Manufacturer certificates.

B. Field quality-control reports.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: A manufacturer certified by SJI to manufacture joists complying with applicable standard specifications and load tables in SJI's "Specifications."

1. Manufacturer's responsibilities include providing professional engineering services for designing special joists to comply with performance requirements.

B. Welding Qualifications: Qualify field-welding procedures and personnel in accordance with AWS D1.1, "Structural Welding Code - Steel."

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Vulcraft
- B. New Millenium
- C. Canam
- D. Others, as reviewed and approved by the Architect.

2.2 STEEL JOISTS

- A. K-Series Steel Joist: Manufactured steel joists of type indicated in accordance with "Standard Specification for Open Web Steel Joists, K-Series" in SJI's "Specifications," with steel-angle top- and bottom-chord members, underslung ends, and parallel top chord.

2.3 PRIMERS

- A. Primer:
 - 1. SSPC-Paint 15, or manufacturer's standard shop primer complying with performance requirements in SSPC-Paint 15. Grey.
 - 2. Do not provide primer of steel elements to receive spray-applied fire protection materials (SAFPM).

2.4 STEEL JOIST ACCESSORIES

- A. Bridging:
 - 1. Provide bridging anchors and number of rows of horizontal or diagonal bridging of material, size, and type required by SJI's "Specifications" for type of joist, chord size, spacing, and span. Furnish additional erection bridging if required for stability.
- B. Furnish column extensions, either extended bottom-chord elements or a separate extension unit at column line location joists.
- C. Furnish miscellaneous accessories including splice plates and bolts required by joist manufacturer to complete joist assembly.

2.5 CLEANING AND SHOP PAINTING

- A. Clean and remove loose scale, heavy rust, and other foreign materials from fabricated joists and accessories.

- B. Apply one coat of shop primer to joists and joist accessories.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Do not install joists until supporting construction is in place and secured.
- B. Install joists and accessories plumb, square, and true to line; securely fasten to supporting construction in accordance with SJI's "Specifications," joist manufacturer's written instructions, and requirements in this Section.
 - 1. Before installation, splice joists delivered to Project site in more than one piece.
 - 2. Space, adjust, and align joists accurately in location before permanently fastening.
 - 3. Install temporary bracing and erection bridging, connections, and anchors to ensure that joists are stabilized during construction.
- C. Field weld joists to supporting steel framework. Coordinate welding sequence and procedure with placement of joists. Comply with AWS requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
- D. Bolt joists to supporting steel framework using carbon-steel bolts as dictated by the joist shop drawings and per OSHA requirements.
- E. Bolt joists to supporting steel framework using high-strength structural bolts. Comply with RCSC's "Specification for Structural Joints Using High-Strength Bolts" for high-strength structural bolt installation and tightening requirements.
- F. Install and connect bridging concurrently with joist erection, before construction loads are applied. Anchor ends of bridging lines at top and bottom chords if terminating at walls or beams.

3.2 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.
- B. Visually inspect field welds in accordance with AWS D1.1.
- C. Visually inspect bolted connections.
- D. Prepare test and inspection reports.

END OF SECTION 052100

SECTION 053100 - STEEL DECKING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Roof deck.

1.2 ACTION SUBMITTALS

A. Product Data:

1. Roof deck.

B. Shop Drawings:

1. Include layout and types of deck panels, anchorage details, reinforcing channels, pans, cut deck openings, special jointing, accessories, and attachments to other construction.

1.3 INFORMATIONAL SUBMITTALS

A. Test and Evaluation Reports:

1. Product Test Reports: For tests performed by a qualified testing agency, indicating that any proposed substitute power-actuated mechanical fasteners comply with requirements.

B. Field Quality-Control Submittals:

1. Field quality-control reports.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Store products in accordance with SDI MOC3. Stack steel deck on platforms or pallets and slope to provide drainage. Protect with a waterproof covering and ventilate to avoid condensation.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. AISI Specifications: Comply with calculated structural characteristics of steel deck in accordance with AISI S100.

2.2 ROOF DECK

- A. Vulcraft
- B. New Millenium
- C. Epic
- D. Canam
- E. Others as reviewed and approved by the Architect.
- F. Roof Deck: Fabricate panels, without top-flange stiffening grooves, to comply with SDI RD and with the following:
 - 1. Prime-Painted Steel Sheet: ASTM A1008, Structural Steel (SS), Grade 50 minimum, shop primed with manufacturer's standard baked-on, rust-inhibitive primer. G60 Galvanized.
 - 2. Do not provide primer or paint on steel elements to receive spray-applied fire protection materials (SAFPM).
 - a. Color: Manufacturer's standard gray bottom side.
 - 3. Deck Profile: As indicated on the Structural Drawings.
 - 4. Profile Depth: 1-1/2 inches.
 - 5. Design Uncoated-Steel Thickness: As indicated.
 - 6. Span Condition: Triple span or more.
 - 7. Side Laps: Overlapped.

2.3 ACCESSORIES

- A. Provide manufacturer's standard accessory materials for deck that comply with requirements indicated.
- B. Mechanical Fasteners: Corrosion-resistant, low-velocity, power-actuated or pneumatically driven carbon-steel fasteners; or self-drilling, self-threading screws.
- C. Side-Lap Fasteners: Corrosion-resistant, hexagonal washer head; self-drilling, carbon-steel screws, per the drawings.
- D. Flexible Closure Strips: Vulcanized, closed-cell, synthetic rubber.

- E. Miscellaneous Sheet Metal Deck Accessories: Steel sheet, minimum yield strength of 50,000 psi, not less than 0.0359-inch design uncoated thickness, of same material and finish as deck; of profile indicated or required for application.
- F. Column Closures, End Closures, Z-Closures, and Cover Plates: Steel sheet, of same material, finish, and thickness as deck unless otherwise indicated.
- G. Flat Sump Plates: Single-piece steel sheet, 0.0747 inch thick, of same material and finish as deck. For drains, cut holes in the field.
- H. Galvanizing Repair Paint: SSPC-Paint 20 or MIL-P-21035B, with dry film containing a minimum of 94 percent zinc dust by weight.
- I. Repair Paint: Manufacturer's standard rust-inhibitive primer of same color as primer.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Install deck panels and accessories in accordance with SDI C, SDI NC, and SDI RD, as applicable; manufacturer's written instructions; and requirements in this Section.
- B. Install temporary shoring before placing deck panels if required to meet deflection limitations.
- C. Locate deck bundles to prevent overloading of supporting members.
- D. Place deck panels on supporting frame and adjust to final position with ends accurately aligned and bearing on supporting frame before being permanently fastened. Do not stretch or contract side-lap interlocks.
- E. Place deck panels flat and square and fasten to supporting frame without warp or deflection.
- F. Cut and neatly fit deck panels and accessories around openings and other work projecting through or adjacent to deck.
- G. Provide additional reinforcement and closure pieces at openings as required for strength, continuity of deck, and support of other work.
- H. Comply with AWS requirements and procedures for manual shielded metal arc welding, appearance and quality of welds, and methods used for correcting welding work.

3.2 INSTALLATION OF ROOF DECK

- A. Fasten roof-deck panels to steel supporting members as directed on the Structural Drawings.

- B. Side-Lap and Perimeter Edge Fastening: As directed on the Structural Drawings.
- C. End Bearing: Install deck ends over supporting frame with a minimum end bearing of 2 inches, with end joints as follows:
 - 1. End Joints: Lapped 2 inches minimum.
- D. Roof Sump Pans and Sump Plates: Install over openings provided in roof deck and weld or mechanically fasten flanges to top of deck. Space welds or mechanical fasteners not more than 12 inches apart with at least one weld or fastener at each corner.
 - 1. Install reinforcing channels or zees in ribs to span between supports and weld or mechanically fasten.
- E. Miscellaneous Roof-Deck Accessories: Install ridge and valley plates, finish strips, end closures, and reinforcing channels in accordance with deck manufacturer's written instructions. Weld or mechanically fasten to substrate to provide a complete deck installation.
 - 1. Weld cover plates at changes in direction of roof-deck panels unless otherwise indicated.

3.3 REPAIR

- A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on both surfaces of deck with galvanized repair paint in accordance with ASTM A780 and manufacturer's written instructions.
- B. Repair Painting:
 - 1. Wire brush and clean rust spots, welds, and abraded areas on both surfaces of prime-painted deck immediately after installation, and apply repair paint.
 - 2. Apply repair paint, of same color as adjacent shop-primed deck, to bottom surfaces of deck exposed to view.
 - 3. Do not provide primer of steel elements to receive spray-applied fire protection materials (SAFPM).

3.4 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.
- B. Tests and Inspections:
 - 1. Special inspections and qualification of welding special inspectors for cold-formed steel floor and roof deck in accordance with quality-assurance inspection requirements of SDI QA/QC.
 - a. Field welds will be subject to visual inspection.

2. Steel decking will be considered defective if it does not pass tests and inspections.
- C. Prepare test and inspection reports.

END OF SECTION 053100

SECTION 054000 - COLD-FORMED METAL FRAMING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Exterior vestibule roof framing (CFMF)

1.2 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Not required for this project for CFMF.

1.3 ACTION SUBMITTALS

- A. Product Data: For the following:
 - 1. Cold-formed steel framing misc. materials
 - 2. Exterior roof framing joist c-sections
 - 3. Cold-formed connectors & hangers
- B. Shop Drawings:
 - 1. Include layout, spacings, sizes, thicknesses, and types of cold-formed steel framing; fabrication; and fastening and anchorage details, including mechanical fasteners.

1.4 INFORMATIONAL SUBMITTALS

- 1. For post-installed anchors and power-actuated fasteners and mechanical anchors, from ICC-ES or other qualified testing agency acceptable to authorities having jurisdiction if deviating from the specified anchors.

1.5 QUALITY ASSURANCE

- A. Code-Compliance Certification of Studs and Tracks: Provide documentation that framing members are certified according to the product-certification program from a recognized steel stud organization.
- B. Welding Qualifications: Qualify procedures and personnel according to the following:
 - 1. AWS D1.1, "Structural Welding Code - Steel."
 - 2. AWS D1.3, "Structural Welding Code - Sheet Steel."

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Clark Dietrich
- B. Marinoware
- C. CEMCO
- D. Others as reviewed and approved by the Architect.

2.2 PERFORMANCE REQUIREMENTS

- A. Cold-Formed Steel Framing Standards: Unless more stringent requirements are indicated, framing complies with AISI S100 and AISI S240.

2.3 COLD-FORMED STEEL FRAMING MATERIALS

- A. Framing Members, General: Comply with AISI S240 for the conditions indicated.
- B. Steel Sheet: ASTM A1003, Structural Grade, Type H, metallic coated, of grade and coating designation as follows:
 - 1. Grade: ST50H or as required by structural performance.
 - 2. Coating: G60

2.4 EXTERIOR NON-LOAD-BEARING WALL FRAMING

- A. Steel Studs: Manufacturer's standard C-shaped steel joist sections, of web depths indicated, punched, with stiffened flanges, as indicated on the Structural Drawings.
- B. Refer to the architectural drawings and architectural Specification for CFMF.

2.5 FRAMING ACCESSORIES

- A. Fabricate steel-framing accessories from ASTM A1003, Structural Grade, Type H, metallic coated steel sheet, of same grade and coating designation used for framing members.
- B. Provide accessories of manufacturer's standard thickness and configuration, unless otherwise indicated.

2.6 ANCHORS, CLIPS, AND FASTENERS

- A. Steel Shapes and Clips: ASTM A36, zinc coated by hot-dip process according to ASTM A123.
- B. Post-Installed Anchors: Fastener systems with bolts of same basic metal as fastened metal, if visible, unless otherwise indicated; with working capacity greater than or equal to the design load, according to an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES as appropriate for the substrate.
 - 1. Uses: Securing cold-formed steel framing to structure.
 - 2. Type: Torque-controlled expansion anchor, Torque-controlled adhesive anchor or adhesive anchor.
 - 3. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B633 or ASTM F1941, Class Fe/Zn 5, unless otherwise indicated.
- C. Power-Actuated Anchors: Fastener systems with working capacity greater than or equal to the design load, according to an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.
- D. Mechanical Fasteners: ASTM C1513, corrosion-resistant-coated, self-drilling, self-tapping, steel drill screws.
 - 1. Head Type: Low-profile head beneath sheathing; manufacturer's standard elsewhere.
- E. Steel clips are specified for each end of the joist section on the drawings.

2.7 MISCELLANEOUS MATERIALS

- A. Galvanizing Repair Paint: SSPC-Paint 20
- B. Shims: Load-bearing, high-density, multimonomer, nonleaching plastic; or cold-formed steel of same grade and metallic coating as framing members supported by shims.
- C. Sill Sealer Gasket: Closed-cell neoprene foam, 1/4 inch thick, selected from manufacturer's standard widths to match width of bottom track or rim track members as required.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Install load-bearing shims or grout between the underside of load-bearing wall bottom track and the top of foundation wall or slab at locations with a gap larger than 1/4 inch to ensure a uniform bearing surface on supporting concrete or masonry construction.
- B. Install sill sealer gasket at the underside of wall bottom track or rim track and at the top of foundation wall or slab at stud or joist locations.

3.2 INSTALLATION, GENERAL

- A. Cold-formed steel framing may be shop or field fabricated for installation, or it may be field assembled.
- B. Install cold-formed steel framing according to AISI S200, AISI S202, and manufacturer's written instructions unless more stringent requirements are indicated.
- C. Install cold-formed steel framing and accessories plumb, square, and true to line, and with connections securely fastened.
- D. Install framing members in one-piece lengths unless splice connections are indicated for track or tension members.
- E. Install temporary bracing and supports to secure framing and support loads equal to those for which structure was designed. Maintain braces and supports in place, undisturbed, until entire integrated supporting structure has been completed and permanent connections to framing are secured.
- F. Do not bridge building expansion joints with cold-formed steel framing. Independently frame both sides of joints.
- G. Install insulation, specified in Section 072100 "Thermal Insulation," in framing-assembly members, such as headers, sills, boxed joists, and multiple studs at openings, that are inaccessible on completion of framing work.
- H. Fasten hole-reinforcing plate over web penetrations that exceed size of manufacturer's approved or standard punched openings.

3.3 INSTALLATION OF EXTERIOR NON-LOAD-BEARING WALL FRAMING

- A. Install continuous tracks sized to match studs. Align tracks accurately and securely anchor to supporting structure.
- B. Fasten both flanges of studs to top and bottom track unless otherwise indicated. Space joists per plan.
- C. Set studs plumb, except as needed for diagonal bracing or required for nonplumb walls or warped surfaces and similar requirements.
- D. Isolate non-load-bearing steel framing from building structure to prevent transfer of vertical loads while providing lateral support.
 - 1. Connect drift clips to cold-formed steel framing and anchor to the building spandrel steel perimeter and deck as indicated in the Structural Drawings.
- E. Install horizontal bridging in wall studs, spaced vertically in rows indicated on Shop Drawings but not more than 96 inches apart. Fasten at each stud intersection.
 - 1. Channel Bridging: Cold-rolled steel channel, welded or mechanically fastened to webs of punched studs.

2. Strap Bridging: Combination of flat, taut, steel sheet straps of width and thickness indicated and stud-track solid blocking of width and thickness to match studs. Fasten flat straps to stud flanges and secure solid blocking to stud webs or flanges.
 3. Bar Bridging: Proprietary bridging bars installed according to manufacturer's written instructions.
- F. Install miscellaneous framing and connections, including stud kickers, web stiffeners, clip angles, continuous angles, anchors, and fasteners, to provide a complete and stable wall-framing system.

3.4 INSTALLATION TOLERANCES

- A. Install cold-formed steel framing level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet and as follows:
1. Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error are not to exceed minimum fastening requirements of sheathing or other finishing materials.

3.5 REPAIRS

- A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on fabricated and installed cold-formed steel framing with galvanized repair paint according to ASTM A780 and manufacturer's written instructions.

END OF SECTION 054000

SECTION 055000 - METAL FABRICATIONS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Shop fabricated steel items, including:
 - 1. Steel framing and supports for mechanical and electrical equipment.
 - 2. Steel framing and supports for applications where framing and supports are not specified in other Sections.
 - 3. Ladders.
 - 4. Loose steel lintels.
 - 5. Slotted channel framing (Unistrut).
 - 6. Embed plates.

1.2 RELATED REQUIREMENTS

- A. Section 042000 - Unit Masonry: Placement of metal fabrications in masonry.
- B. Section 099113 - Exterior Painting: Paint finish.
- C. Section 099123 - Interior Painting: Paint finish.

1.3 REFERENCE STANDARDS

- A. ANSI A14.3 - American National Standard for Ladders -- Fixed -- Safety Requirements.
- B. ASTM A36/A36M - Standard Specification for Carbon Structural Steel.
- C. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
- D. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
- E. ASTM A283/A283M - Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates.
- F. ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength.
- G. ASTM A501/A501M - Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing.

- H. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- I. ASTM A1011/A1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength.
- J. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination.
- K. AWS D1.1/D1.1M - Structural Welding Code - Steel.
- L. IAS AC172 - Accreditation Criteria for Fabricator Inspection Programs for Structural Steel AC172.
- M. NOMMA - National Ornamental & Miscellaneous Metals Association; www.nomma.org.
- N. SSPC-Paint 15 - Steel Joist Shop Primer/Metal Building Primer.
- O. SSPC-Paint 20 - Zinc-Rich Coating (Type I - Inorganic, and Type II - Organic).

1.4 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.
 - 2. Coordinate installation of anchorages and steel weld plates and angles for casting into concrete. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

1.5 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings: Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories. Include erection drawings, elevations, and details where applicable.
 - 1. Indicate welded connections using standard AWS A2.4 welding symbols. Indicate net weld lengths.
 - 2. Design data: Submit drawings and supporting calculations, signed and sealed by a qualified professional structural engineer.
 - a. Include the following, as applicable:

- 1) Design criteria.
- 2) Engineering analysis depicting stresses and deflections.
- 3) Member sizes and gauges.
- 4) Details of connections.
- 5) Support reactions.
- 6) Bracing requirements.

3. Provide Shop Drawings for the following:

- a. All miscellaneous steel applications.
- C. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers, certifying that shop primers are compatible with topcoats.
- D. Research/Evaluation Reports: For post-installed anchors, from ICC-ES.
- E. Designer's Qualification Statement.

1.6 QUALITY ASSURANCE

- A. Designer Qualifications: Design indicated fabrication items under direct supervision of a Professional Structural Engineer experienced in design of this work and licensed in the State in which the Project is located.
- B. Fabricator Qualifications: A qualified steel fabricator that is accredited by IAS AC172.

1.7 FIELD CONDITIONS

- A. Field Measurements: Verify actual locations of walls and other construction contiguous with metal fabrications by field measurements before fabrication.

PART 2 PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer registered in the project State to design metal fabrications complying with performance requirements and design criteria indicated.
- B. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on exterior metal fabrications by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects.
1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

2.2 MATERIALS - STEEL

- A. Recycled Content of Steel Products: Provide products with an average recycled content of steel products so postconsumer recycled content plus one-half of preconsumer recycled content is not less than the following:
 - 1. W-Shapes: 60 percent.
 - 2. Channels, Angles: 60 percent.
 - 3. Plate and Bar: 25 percent.
 - 4. Cold-Formed Hollow Structural Sections: 25 percent.
 - 5. Steel Pipe: 25 percent.
 - 6. All Other Steel Materials: 25 percent.
- B. Steel Sections: ASTM A36/A36M.
- C. Steel Tubing: ASTM A501/A501M hot-formed structural tubing.
- D. Plates: ASTM A283/A283M.
- E. Pipe: ASTM A53/A53M, Grade B Schedule 40, black finish.
- F. Slotted Channel Framing: ASTM A653/A653M, Grade 33.
- G. Slotted Channel Fittings: ASTM A1011/A1011M.
- H. Fasteners: Unless otherwise indicated, provide Type 304 stainless-steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5, at exterior walls. Select for type, grade, and class required.
 - 1. Provide stainless-steel fasteners for fastening stainless steel.
 - 2. Dissimilar Metals: Type 304 stainless-steel fasteners.
 - 3. Uncoated Steel Components: Plated-steel fasteners complying with ASTM B 633, Class Fe/Zn 25 for electrodeposited zinc coating where concealed; Type 304 stainless-steel fasteners where exposed.
- I. Bolts, Nuts, and Washers: ASTM A307, Grade A, plain.
- J. Bolts and Nuts (Weathering Conditions): Regular hexagon-head bolts, ASTM A 325, Type 3; with hex nuts, ASTM A 563, Grade C3; and, where indicated, flat washers.

- K. Stainless-Steel Bolts and Nuts: Regular hexagon-head annealed stainless-steel bolts, ASTM F 593; with hex nuts, ASTM F 594; and, where indicated, flat washers; Alloy Group 1.
- L. Anchor Bolts: ASTM F 1554, Grade 36, of dimensions indicated; with nuts, ASTM A 563; and, where indicated, flat washers.
 - 1. Hot-dip galvanize or provide mechanically deposited, zinc coating where item being fastened is indicated to be galvanized.
- M. Anchors, General: Anchors capable of sustaining, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing according to ASTM E 488/E 488M, conducted by a qualified independent testing agency.
- N. Post-Installed Anchors: Torque-controlled expansion anchors.
 - 1. Interior Locations: Carbon-steel components zinc plated to comply with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5, unless otherwise indicated.
 - 2. Exterior Locations and Where Stainless Steel Is Indicated: Alloy Group 1 stainless-steel bolts, ASTM F 593, and nuts, ASTM F 594.
- O. Welding Materials: AWS D1.1/D1.1M; type required for materials being welded.
- P. Shop and Touch-Up Primer: SSPC-Paint 15, complying with VOC limitations of authorities having jurisdiction.
 - 1. Basis of Design Product: Subject to the requirements provide Sherwin-Williams Alkyd Universal Metal Primer, Kem Kromik B-50 Series or a comparable approved product of one of the following:
 - a. AkzoNobel; International Paints/Devoe Coatings.
 - b. Benjamin Moore & Co.
 - c. PPG Architectural Finishes, Inc.
- Q. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20 Type II - Organic, complying with VOC limitations of authorities having jurisdiction.
 - 1. Basis of Design Product: ZRC Galvilitite Galvanizing Repair Compound cold galvanizing compound of 95% metallic zinc or a comparable product of an approved manufacturer.
- R. Epoxy Zinc-Rich Primer: Compatible with topcoat.
 - 1. Basis of Design Product: Subject to the requirements provide Sherwin-Williams Zinc Clad IV or a comparable approved product of one of the following:

- a. AkzoNobel; International Paints/Devoe Coatings.
 - b. Benjamin Moore & Co.
 - c. PPG Architectural Finishes, Inc.
- S. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187/D 1187M.
- T. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107/C 1107M. Provide grout specifically recommended by manufacturer for interior and exterior applications.

2.3 FABRICATION

- A. Fit and shop assemble items in largest practical sections, for delivery to site.
- B. Fabricate items with joints tightly fitted and secured.
- C. Form exposed work with accurate angles and surfaces and straight edges.
- D. Continuously seal joined members by continuous welds.
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove welding flux immediately.
 - 4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
- E. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.
 - 1. Comply with NOMMA voluntary guidelines for joint finishes; Finish #2 - completely sanded joint, some undercutting and pinholes acceptable.
- F. Provide for thermal expansion/contraction of exterior metal railings and similar linear fabrications exceeding 30 feet in running length; and not closer than 24 inches from corners and intersections.
- G. Exposed Mechanical Fastenings: Flush countersunk screws or bolts; unobtrusively located; consistent with design of component, except where specifically noted otherwise.

- H. Furnish components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.
- I. Fabricate seams and other connections that are exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.
- J. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.

2.4 FABRICATED ITEMS

- A. Provide and install items shown on Drawings with anchorage and attachments necessary for installation. The following is a list of principal items only. Refer to Drawing details for items not specifically scheduled.
- B. Ladders: Steel; in compliance with ANSI A14.3; with mounting brackets and attachments; prime paint finish.
 - 1. Rungs: One inch diameter solid round bar spaced 12 inches on center; corrugated, dimpled, kerfed, or coated for slip-resistance.
 - 2. Fit rungs in centerline of siderails; plug-weld and grind smooth on outer rail faces.
 - 3. Provide nonslip surfaces on top of each rung, either by coating rung with aluminum-oxide granules set in epoxy-resin adhesive or by using a type of manufactured rung filled with aluminum-oxide grout.
 - 4. Support each ladder at top and bottom and not more than 60 inches o.c. with welded or bolted steel brackets.
- C. Lintels: As detailed; galvanized finish.
 - 1. Paint finish as specified in Section 099113 - Exterior Painting for exterior steel and Section 099123 - Interior Painting for interior steel.
- D. Slotted Channel Framing: Fabricate channels and fittings from structural steel complying with the referenced standards; hot-dipped galvanized per ASTM A653, Grade G90 finish.
- E. Embed Plates: Fabricate embed plates for casting into concrete, and masonry construction as detailed on Drawings. Weld anchors to plates to provide full transfer of design loads and stresses. Test embed plate assemblies prior to installation under provisions of Section 05 12 00 and Structural Drawings.

2.5 FINISHES - STEEL

- A. Unless otherwise recommended by finish coating manufacturer, prepare surfaces to be shop primed in accordance with SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning" for exterior items and items indicated to receive zinc-rich primer. For other items, prepare to SSPC-SP 3, "Power Tool Cleaning."
- B. Clean surfaces of rust, scale, grease, and foreign matter prior to finishing.
- C. Prime paint all steel items, unless otherwise specified.
 - 1. Exceptions: Galvanize items to be embedded in concrete, items to be embedded in masonry, and miscellaneous framing and supports on exterior of building.
 - 2. Exceptions: Do not prime surfaces in direct contact with concrete, where field welding is required, and items to be covered with sprayed fireproofing.
- D. Prime Painting: One coat.
 - 1. Shop prime with universal shop primer unless zinc-rich primer is indicated.
 - 2. Shop Priming: Apply shop primer to comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.
- E. Galvanizing of Structural Steel Members: Galvanize after fabrication to ASTM A123/A123M requirements. Provide minimum 1.7 oz/sq ft galvanized coating.
- F. Galvanizing of Non-structural Items: Galvanize after fabrication to ASTM A123/A123M requirements. Provide minimum 1.7 oz/sq ft galvanized coating.

2.6 FABRICATION TOLERANCES

- A. Squareness: 1/8 inch maximum difference in diagonal measurements.
- B. Maximum Offset Between Faces: 1/16 inch.
- C. Maximum Misalignment of Adjacent Members: 1/16 inch.
- D. Maximum Bow: 1/8 inch in 48 inches.
- E. Maximum Deviation From Plane: 1/16 inch in 48 inches.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that field conditions are acceptable and are ready to receive work.

3.2 PREPARATION

- A. Clean and strip primed steel items to bare metal where site welding is required.
- B. Furnish setting templates to the appropriate entities for steel items required to be cast into concrete or embedded in masonry.

3.3 INSTALLATION

- A. Install items plumb and level, accurately fitted, free from distortion or defects.
- B. Provide for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.
- C. Field weld components indicated on Drawings.
- D. Perform field welding in accordance with AWS D1.1/D1.1M.
- E. Obtain approval prior to site cutting or making adjustments not scheduled.
- F. After erection, prime welds, abrasions, and surfaces not shop primed, except surfaces to be in contact with concrete.

3.4 TOLERANCES

- A. Maximum Variation From Plumb: 1/4 inch per story, non-cumulative.
- B. Maximum Offset From True Alignment: 1/4 inch.
- C. Maximum Out-of-Position: 1/4 inch.

END OF SECTION 055000

SECTION 061000 - ROUGH CARPENTRY

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Roofing nailers.
- B. Preservative treated wood materials.
- C. Fire retardant treated wood materials.
- D. Communications and electrical room mounting boards.
- E. Concealed wood blocking, nailers, and supports.
- F. Miscellaneous wood nailers, furring, and grounds.

1.2 RELATED REQUIREMENTS

1.3 REFERENCE STANDARDS

- A. ASTM C557 - Standard Specification for Adhesives for Fastening Gypsum Wallboard to Wood Framing.
- B. ASTM D2898 - Standard Practice for Accelerated Weathering of Fire-Retardant-Treated Wood for Fire Testing.
- C. ASTM D3498 - Standard Specification for Adhesives for Field-Gluing Wood Structural Panels (Plywood or Oriented Strand Board) to Wood Based Floor System Framing.
- D. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
- E. AWPA U1 - Use Category System: User Specification for Treated Wood.
- F. PS 1 - Structural Plywood.
- G. PS 20 - American Softwood Lumber Standard.

1.4 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate installation of rough carpentry members specified in other Sections.

1.5 SUBMITTALS

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

- B. Product Data: Provide technical data on wood preservative materials and construction panels.
- C. Manufacturer's Certificate: Certify that wood products supplied for rough carpentry meet or exceed specified requirements.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. General: Cover wood products to protect against moisture. Support stacked products to prevent deformation and to allow air circulation.
- B. Fire Retardant Treated Wood: Prevent exposure to precipitation during shipping, storage, or installation.

1.7 WARRANTY

- A. Correct defective work within a two-year period commencing on Date of Substantial Completion.

PART 2 PRODUCTS

2.1 GENERAL REQUIREMENTS

- A. Dimension Lumber: Comply with PS 20 and requirements of specified grading agencies.
 - 1. If no species is specified, provide species graded by the agency specified; if no grading agency is specified, provide lumber graded by grading agency meeting the specified requirements.
 - 2. Grading Agency: Grading agency whose rules are approved by the Board of Review, American Lumber Standard Committee at www.alsc.org, and who provides grading service for the species and grade specified; provide lumber stamped with grade mark unless otherwise indicated.
 - 3. Lumber of other species or grades is acceptable provided structural and appearance characteristics are equivalent to or better than products specified.
- B. Grade Stamps: Provide each piece of lumber and each panel product stamped showing grade and trademark of grading agency under which it is produced.
 - 1. Additional Stamps: Stamped showing specified requirements for fire-retardant and preservative treatments as specified.

2.2 DIMENSION LUMBER

- A. Wood Blocking, Nailers, Grounds, and Furring:
 - 1. Lumber: S4S, No. 2 or Standard Grade.

2. Boards: Standard or No. 3.

2.3 CONSTRUCTION PANELS

- A. Communications and Electrical Room Mounting Boards: PS 1 A-D plywood, or medium density fiberboard; 3/4 inch thick; flame spread index of 25 or less, smoke developed index of 450 or less, when tested in accordance with ASTM E84.
- B. Blocking Applications:
 1. Backing Plate: Proprietary fire-retardant treated wood blocking:
 - a. ClarkDietrich; Danback Fire-Retardant Treated Wood Backing Plate.
 2. Plywood Blocking/Nailers - Concealed From View But Located Within Exterior Enclosure: PS 1, C-C Plugged or better, Exterior grade.
 3. Plywood Blocking/Nailers - Other Locations: PS 1, C-D Plugged or better.

2.4 ACCESSORIES

- A. Fasteners and Anchors:
 1. Metal and Finish: Hot-dipped galvanized steel complying with ASTM A153/A153M for high humidity and preservative-treated wood locations, unfinished steel elsewhere.
 2. Anchors: Toggle bolt type for anchorage to hollow masonry.
- B. Construction Adhesives: Adhesives complying with ASTM C557 or ASTM D3498.

2.5 FACTORY WOOD TREATMENT - GENERAL

- A. Treated Lumber and Plywood: Comply with requirements of AWPA U1 - Use Category System for wood treatments determined by use categories, expected service conditions, and specific applications.
 1. Fire-Retardant Treated Wood: Mark each piece of wood with producer's stamp indicating compliance with specified requirements, and also stamped "Kiln Dried After Treatment" ("KDAT").
 2. Preservative-Treated Wood: Provide lumber and plywood marked or stamped by an ALSC-accredited testing agency, certifying level and type of treatment in accordance with AWPA standards, and also stamped "Kiln Dried After Treatment" ("KDAT").

2.6 FIRE RETARDANT TREATMENT (FRT)

- A. Exterior Type: AWPA U1, Category UCFB, Commodity Specification H, chemically treated and pressure impregnated; capable of providing a maximum flame spread index of 25 when tested in accordance with ASTM E84, with no evidence of significant combustion when test is extended for an additional 20 minutes both before and after accelerated weathering test performed in accordance with ASTM D2898.
1. Kiln dry wood after treatment to a maximum moisture content of 19 percent for lumber and 15 percent for plywood.
 2. Applications:
 - a. Treat exterior rough carpentry items.
 - b. Do not use treated wood in direct contact with the ground.
- B. Interior Type: AWPA U1, Use Category UCFA, Commodity Specification H, low temperature (low hygroscopic) type, chemically treated and pressure impregnated; capable of providing a maximum flame spread index of 25 when tested in accordance with ASTM E84, with no evidence of significant combustion when test is extended for an additional 20 minutes.
1. Kiln dry wood after treatment to a maximum moisture content of 19 percent for lumber and 15 percent for plywood.
 2. Applications:
 - a. Treat all interior rough carpentry items.
 - b. Do not use treated wood in applications exposed to weather or where the wood may become wet.

2.7 PRESERVATIVE TREATMENT (PT)

- A. Preservative Pressure Treatment of Lumber Above Grade: AWPA U1, Use Category UC3B, Commodity Specification A using waterborne preservative.
1. Kiln dry lumber after treatment to maximum moisture content of 19 percent.
 2. Applications:
 - a. Treat lumber exposed to weather.
 - b. Treat lumber in contact with flashing or waterproofing.
 - c. Treat lumber in contact with masonry or concrete.
 - d. Treat lumber less than 18 inches above grade.

- e. Treat lumber in other locations as indicated.

PART 3 EXECUTION

3.1 INSTALLATION - GENERAL

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

3.2 BLOCKING, NAILERS, AND SUPPORTS

- A. Provide framing and blocking members as indicated or as required to support finishes, fixtures, specialty items, and trim.
- B. Provide the following specific nonstructural framing and blocking:
 - 1. Cabinets and shelf supports.
 - 2. Wall brackets.
 - 3. Handrails.
 - 4. Grab bars.
 - 5. Towel and bath accessories.
 - 6. Wall-mounted door stops.
 - 7. Chalkboards and marker boards.
 - 8. Wall paneling and trim.
 - 9. Joints of rigid wall coverings that occur between studs.

3.3 INSTALLATION OF CONSTRUCTION PANELS

- A. Communications and Electrical Room Mounting Boards: Secure with screws to studs with edges over firm bearing; space fasteners at maximum 24 inches on center on all edges and into studs in field of board.
 - 1. At fire-rated walls, install board over wall board indicated as part of the fire-rated assembly.
 - 2. Install adjacent boards without gaps.

3. Size and Location: As indicated on Drawings or as required for equipment mounting.

3.4 TOLERANCES

- A. Framing Members: 1/4 inch from true position, maximum.
- B. Variation from Plane, Other than Floors: 1/4 inch in 10 feet maximum, and 1/4 inch in 30 feet maximum.

3.5 CLEANING

- A. Prevent sawdust and wood shavings from entering the storm drainage system.

SECTION 061600 - SHEATHING

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Exterior wall sheathing.
- B. Sheathing joint and penetration treatment.

1.2 RELATED REQUIREMENTS

- A. Section 061000 - Rough Carpentry: Wood panels for miscellaneous blocking and mounting boards.
- B. Section 092900 - Gypsum Board: Interior gypsum panels.

1.3 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data: For each type of process and factory-fabricated product.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Stack panels flat with spacers beneath and between each bundle to provide air circulation. Protect sheathing from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

PART 2 PRODUCTS

2.1 WALL SHEATHING

- A. Miscellaneous Plywood Sheathing: Either DOC PS 1 or DOC PS 2, Exposure 1 APA rated sheathing.
 - 1. Span Rating: Not less than 16/0.
 - 2. Nominal Thickness: Not less than 1/2 inch.
- B. Glass Mat Faced Sheathing: Glass mat faced gypsum substrate as defined in ASTM C1177/C1177M.
 - 1. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
 - 2. Fungal Resistance: No fungal growth when tested in accordance with ASTM G21.
 - 3. At Assemblies Indicated with Fire-Rating: Use type required by indicated tested assembly; if no tested assembly is indicated, use Type X board, UL or WH listed.

4. Core Type: Type X, as indicated.
5. Thickness: 5/8 inch.
6. Edges: Square.
7. Products:
 - a. USG Corporation; Securock Regular and Firecode X Sheathing.
 - b. Georgia-Pacific Gypsum; DensGlass Fireguard Sheathing.
 - c. CertainTeed Corporation; GlasRoc Type X Exterior Sheathing.
 - d. National Gypsum Company; Gold Bond eXP Sheathing.

2.2 PARAPET SHEATHING

- A. See Division 07 roofing section.

2.3 ROOF COVER BOARD

- A. See Division 07 roofing section.

2.4 FASTENERS

- A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.
 1. Provide non-corrosive fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M.
- B. Power-Driven Fasteners: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.
- C. Screws for Fastening Gypsum Sheathing to Cold-Formed Metal Framing: Steel drill screws, in length recommended by sheathing manufacturer for thickness of sheathing to be attached.
 1. For steel framing less than 0.0329 inch thick, use screws that comply with ASTM C 1002.
 2. For steel framing from 0.033 to 0.112 inch thick, use screws that comply with ASTM C 954.

2.5 SHEATHING JOINT-AND-PENETRATION TREATMENT MATERIALS

- A. As recommended by air barrier manufacturer.

PART 3 EXECUTION

3.1 INSTALLATION, GENERAL

- A. Do not use materials with defects that impair quality of sheathing or pieces that are too small to use with minimum number of joints or optimum joint arrangement. Arrange joints so that pieces do not span between fewer than three support members.
- B. Cut panels at penetrations, edges, and other obstructions of work; fit tightly against abutting construction unless otherwise indicated.
- C. Securely attach to substrate by fastening as indicated, complying with the following:
 - 1. ICC-ES evaluation report for fastener.
- D. Coordinate sheathing installation with flashing and joint-sealant installation so these materials are installed in sequence and manner that prevent exterior moisture from passing through completed assembly.
- E. Do not bridge building expansion joints; cut and space edges of panels to match spacing of structural support elements.
- F. Wall Sheathing: Secure with long dimension perpendicular to wall studs, with ends over firm bearing and staggered, using screws.
- G. Coordinate sheathing installation with installation of materials installed over sheathing so sheathing is not exposed to precipitation or left exposed at end of the workday when rain is forecast.

3.2 GYPSUM SHEATHING INSTALLATION

- A. Comply with ASTM C1280, GA-253, and with manufacturer's written instructions.
 - 1. Fasten gypsum sheathing to framing with screws with edges butted tight unless otherwise indicated.
 - 2. Install panels with a 3/8-inch gap where non-load-bearing construction abuts structural elements.
 - 3. Install panels with a 1/4-inch gap where they abut masonry or similar materials that might retain moisture, to prevent wicking.
- B. Apply fasteners so heads bear tightly against face of sheathing, but do not cut into facing.
- C. Seal sheathing joints according to sheathing manufacturer's written instructions.
 - 1. Coordinate finishing requirements with Air Barriers specified in Section 072500.

2. Apply glass-fiber sheathing tape to glass-mat gypsum sheathing joints and apply and trowel sealant to embed entire face of tape in sealant. Apply sealant to exposed fasteners with a trowel so fasteners are completely covered. Seal other penetrations and openings.

END OF SECTION 061600

SECTION 070553 - FIRE AND SMOKE ASSEMBLY IDENTIFICATION

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Identification markings for fire and smoke rated partitions, and fire rated walls.

1.2 RELATED REQUIREMENTS

- A. Section 099123 - Interior Painting: Paint finish.

1.3 REFERENCE STANDARDS

- A. ICC (IBC) - International Building Code.

1.4 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Manufacturer's printed product literature for each type of marking, indicating font, foreground and background colors, wording, and overall dimensions.

1.5 QUALITY ASSURANCE

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

1.6 FIELD CONDITIONS

- A. Do not install adhered markings when ambient temperature is lower than recommended by label or sign manufacturer.
- B. Do not install painted markings when ambient temperature is lower than recommended by coating manufacturer.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Acceptable Manufacturers:
 1. Fire Wall Signs, Inc.: www.firewallsigns.com.
 2. Safety Supply Warehouse, Inc.: www.safetysupplywarehouse.com.
 3. SmartSign: www.smartsign.com.
 4. Substitutions: See Section 016000 - Product Requirements.

2.2 FIRE AND SMOKE ASSEMBLY IDENTIFICATION

- A. Either adhered or applied (painted) identification signage may be used at Contractor's option.
- B. Regulatory Requirements: Where there is an accessible concealed floor, floor-ceiling or attic space, fire walls, fire barriers, fire partitions, smoke barriers and smoke partitions or any other wall required to have protected openings or penetrations, comply with "Marking and Identification" requirements of "Fire-Resistance Ratings and Fire Tests" chapter of ICC (IBC), and, minimally the following:
 - 1. Within accessible concealed spaces, locate identification signage within 15 feet of the end of each wall and at intervals not exceeding 30 feet measured horizontally along the wall or partition.
 - 2. Include lettering not less than 3 inches in height with a minimum 3/8-inch stroke in a contrasting color incorporating the suggested wording, "FIRE AND/OR SMOKE BARRIER—PROTECT ALL OPENINGS," or other similar wording.
- C. Adhered Fire and Smoke Assembly Identification Signs: Printed vinyl sign with factory applied adhesive backing.
- D. Applied Fire and Smoke Assembly Identification: Identification markings applied to partition with paint and a code compliant stencil. See Section 099123 for products.
- E. Languages: Provide all markings in English.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that substrate surfaces are ready to receive work.

3.2 PREPARATION

- A. See Section 099123 for substrate preparation for painted markings.

3.3 INSTALLATION

- A. Locate markings as required by the adopted building code and authorities having jurisdiction.
- B. Install adhered markings in accordance with manufacturer's instructions.
- C. Install applied markings in accordance with Section 099123.
- D. Install neatly, with horizontal edges level.

- E. Protect from damage until Date of Substantial Completion; repair or replace damaged markings.

END OF SECTION 070553

SECTION 072100 - THERMAL INSULATION

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Board insulation at perimeter foundation wall and exterior wall behind indicated wall cladding systems.

1.2 RELATED REQUIREMENTS

- A. Section 075423 - Thermoplastic Polyolefin (TPO) Membrane Roofing: Insulation specified as part of roofing system.

1.3 REFERENCE STANDARDS

- A. ASTM C578 - Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation.
- B. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
- C. NFPA 285 - Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Wall Assemblies Containing Combustible Components.

1.4 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide data on product characteristics, performance criteria, and product limitations.
- C. Manufacturer's Installation Instructions: Include information on special environmental conditions required for installation and installation techniques.

1.5 QUALITY ASSURANCE

- A. Thicknesses specified are for the thermal conductivity (k-value at 75 degrees F) specified for each material. Provide adjusted thicknesses for approved use of substituted materials with different thermal conductivity ratings. Where insulation is specified to have a specific "R" value, furnish manufacturer's standard thickness required to equal or exceed the specified value.

1.6 MOCK-UP

- A. Comply with general mock-up requirements specified in Section 014000.
- B. Integrated Exterior Mock-up: Provide a mock-up for evaluation of workmanship, including insulation products, insulation fasteners and attachments, and board joint treatments.

1. Coordinate with mock-up requirements specified in other sections.
2. Locate where directed.
3. Mock-up may remain as part of the Work.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Do not allow insulation materials to become wet, soiled, or covered with ice or snow. Comply with manufacturer's recommendations for handling, storage, and protection during installation.
- B. Protect plastic insulation from exposure to direct sunlight.
- C. Do not deliver plastic insulation materials to the project site ahead of time of installation. Protect at all times against ignition. Complete the installation and concealment of plastic materials as soon as possible in each area of work.

1.8 FIELD CONDITIONS

- A. Do not install insulation adhesives when temperature or weather conditions are detrimental to successful installation.

PART 2 PRODUCTS

2.1 APPLICATIONS

- A. Insulation at Perimeter of Foundation: Extruded polystyrene (XPS) board.
- B. Continuous Wall Insulation: Extruded polystyrene (XPS) board.

2.2 INSULATION MATERIALS

- A. Where units are included in fire rated wall, ceiling, or floor construction, provide insulation units which have been tested and rated as required for the indicated assembly.

2.3 FOAM BOARD INSULATION MATERIALS

- A. Extruded Polystyrene (XPS) Board Insulation: Comply with ASTM C578 with either natural skin or cut cell surfaces.
 1. Type and Compressive Resistance: Type IV, 25 psi (173 kPa), minimum.
 2. Smoke Developed Index (SDI): 450 or less, when tested in accordance with ASTM E84.
 3. Type and Thermal Resistance, R-value: Type IV, 5.0 (0.88), minimum, per 1 inch thickness at 75 degrees F mean temperature.

4. Complies with fire resistance requirements specified as part of an exterior non-load-bearing exterior wall assembly when tested in accordance with NFPA 285.
5. Board Thickness: As indicated on Drawings.
6. Board Edges: Square.
7. Water Absorption for Insulation Materials in Ground Contact: Type IV, 0.3 percent by volume, maximum, by total immersion, when tested in accordance with ASTM C272.
8. Acceptable Manufacturers:
 - a. Dow Chemical Company; STYROFOAM Extruded Polystyrene Insulation (XPS): www.dow.com/#sle.
 - b. Kingspan Insulation LLC; GreenGuard GG25-LG XPS Insulation Board: www.kingspan.com/#sle.
 - c. Owens Corning Corporation; FOAMULAR Extruded Polystyrene (XPS) Insulation: www.ocbuildingspec.com/#sle.
 - d. Substitutions: See Section 016000 - Product Requirements.

2.4 ACCESSORIES

- A. Insulation Fasteners: Appropriate for purpose intended and approved by insulation manufacturer.
 1. Length as required for thickness of insulation material and penetration of structural backing or framing as indicated, with metal or plastic washers.
 2. Acceptable Manufacturers:
 - a. Hilti: www.hilti.com.
 - b. Trufast: www.trufast.com.
 - c. McMaster-Carr: www.mcmaster.com.
- B. Protection Board for Below Grade Insulation: Wood fiberboard, 1/4 inch thick.
- C. Sprayed Polyurethane Foam Sealant for Miscellaneous Voids: 1- or 2-component, closed cell, foamed-in-place, polyurethane foam sealant, 1.5 to 2.0 lb/cu. ft density; flame spread index of 25 or less when tested per ASTM E 84; with primer and noncorrosive substrate cleaner recommended by foam sealant manufacturer.
- D. Adhesive: Type recommended by insulation manufacturer for indicated applications.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that substrate, adjacent materials, and insulation materials are dry and that substrates are ready to receive insulation.
- B. Verify substrate surfaces are flat, free of honeycomb, fins, or irregularities.

3.2 INSTALLATION, GENERAL

- A. Install insulation to maintain continuity of thermal protection to building elements and spaces.

3.3 BOARD INSTALLATION AT FOUNDATION PERIMETER

- A. Install boards as indicated on foundation perimeter.
 - 1. Place boards to maximize adhesive contact.
 - 2. Install in running bond pattern.
 - 3. Butt edges and ends tightly to adjacent boards and to protrusions.
- B. Cut and fit insulation tightly to protrusions or interruptions to the insulation plane.
- C. Immediately following application of board insulation, place protective boards over exposed insulation surfaces.
 - 1. Install boards horizontally from base of foundation to top of insulation.
 - 2. Butt boards tightly, with joints staggered from insulation joints.

3.4 BOARD INSTALLATION AT EXTERIOR WALLS

- A. Install corrosion resistant impaling pins or other mechanical insulation retention devices, minimum 6 per board or as otherwise recommended by insulation manufacturer, in accordance with insulation manufacturer's written recommendations.
- B. Exterior Walls Behind Veneers and Claddings: Install boards tight to substrate without gaps between boards on walls.
 - 1. Install in running bond pattern.
 - 2. Butt edges and ends tightly to adjacent boards and protrusions.
- C. Cut and fit insulation tightly to protrusions or interruptions to the insulation plane.
- D. Insulation Behind Masonry Veneer: See Section 042000 - Unit Masonry for veneer anchors.

3.5 PROTECTION

- A. Do not permit installed insulation to be damaged prior to its concealment.

END OF SECTION 072100

SECTION 072726 - FLUID-APPLIED AIR BARRIERS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Fluid-applied air barriers.

1.2 DEFINITIONS

- A. Air Barrier: Airtight barrier made of material that is virtually air impermeable with water vapor permeance as specified, having sealed seams and sealed joints to adjacent surfaces.

1.3 REFERENCE STANDARDS

- A. ASTM D412 - Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers--Tension.
- B. ASTM D751 - Standard Test Methods for Coated Fabrics.
- C. ASTM D903 - Standard Test Method for Peel or Stripping Strength of Adhesive Bonds.
- D. ASTM D1970/D1970M - Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection.
- E. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
- F. ASTM E2178 - Standard Test Method for Determining Air Leakage Rate and Calculation of Air Permeance of Building Materials.
- G. NFPA 285 - Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Wall Assemblies Containing Combustible Components.

1.4 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate the installation with adjacent flashings and weather barriers for compatibility and continuity of those systems.
 - 2. Coordinate installation of flashings at openings with Sections that specify window, door, and other opening installations.
 - 3. 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.

- B. Preinstallation Meeting: Conduct a preinstallation meeting at least two weeks prior to the start of the work of this Section.
 - 1. Agenda shall include quality standards set by approved mock-up, sequence of construction, coordination with substrate preparation, air barrier materials approved for use, compatibility of materials, coordination with installation of adjacent and covering materials, and details of construction.
 - 2. Attendance is required by Contractor, Architect, Installer, and representatives of related trades including covering materials, substrate materials and adjacent materials.

1.5 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide data on material characteristics, performance criteria, limitations, and manufacturer's standard flashing and termination details.
- C. Shop Drawings: Provide drawings of project-specific flashing, termination, and special joint conditions based on manufacturer's standard details; minimum scale 1-1/2 inch equals 1 foot.
 - 1. Show 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.
- D. 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.
- E. Manufacturer's Installation Instructions: Indicate preparation, installation methods, and storage and handling criteria.
- F. Field Test Results: Submit test results for tests described in the Field Quality Control article, including retesting if initial results are not satisfactory.
- G. Manufacturer's qualification statement.
- H. Installer's qualification statement.
- I. Testing agency qualification statement.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: Company specializing in performing the work of this section with minimum five years documented experience.
- B. Manufacturer Qualification: Use evaluated materials from a single manufacturer regularly engaged in air barrier material manufacture, and use secondary materials approved in writing by primary material manufacturer.
- C. Testing Agency Qualifications: Independent firm specializing in performing testing and inspections of the type specified in this section.
- D. System Compatibility: Assume responsibility for confirming that weather barrier system components are compatible with each other as a system, and also compatible with substrate surfaces with which they will be in contact, including but not limited to wall and sheathing surfaces, opening materials, other flashings and weather barrier materials, and joint sealants.
 - 1. Assure that system components are compatible as specified prior to preparing and making specified submittals.
 - 2. Assume responsibility for removal of incompatible system components and installation of properly compatible components at no additional cost to Owner regardless of when incompatibility is discovered.
- E. Basis of Design: Specifications are based on primary systems by specified basis of design manufacturer. Primary systems manufactured by other acceptable manufacturers are permitted, subject to compliance with specified requirements; and provided that deviations in design, weight, and performance are minor, and do not detract substantially from the indicated design intent.

1.7 MOCK-UPS

- A. Integrated Exterior Mock-up: Build mock-up representative of primary air barrier assemblies and glazing assemblies, including backup wall and typical penetrations, as acceptable to the Architect. Mock-up shall be as detailed in Drawings and shall include the air barrier materials and air barrier accessories proposed for use in the exterior wall assembly.
 - 1. Locate where directed.
 - 2. Mock-ups shall be suitable for field quality control testing.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Store products in manufacturer's unopened packaging until ready for installation.
- B. Handle materials in accordance with material manufacturer's recommendations.

1.9 FIELD CONDITIONS

- A. Maintain temperature and humidity recommended by materials manufacturers before, during, and after installation.
- B. 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 manufacturer.

1.10 WARRANTY

- A. Material Warranty: Provide material manufacturer's standard product warranty, for a minimum five years from date of Substantial Completion.
- B. 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 air tight seal, loss of watertight seal, loss of attachment, loss of adhesion and failure to cure properly.

PART 2 PRODUCTS

2.1 AIR BARRIER MATERIALS (AIR IMPERMEABLE AND WATER VAPOR PERMEABLE)

- A. Air Barrier, Fluid Applied: Vapor permeable, elastomeric waterproofing.
 - 1. Fluid Applied Air Barrier Membrane:
 - a. Dry Film Thickness (DFT): As recommended by manufacturer for each substrate, having a minimum thickness of 25 mil, 0.025 inch.
 - b. Air Permeance: 0.004 cfm/sq ft, maximum, when tested in accordance with ASTM E2178.
 - c. Water Vapor Permeance: 10 perms, minimum, when tested in accordance with ASTM E96/E96M using Procedure B - Water Method, at 73.4 degrees F.
 - d. Ultraviolet (UV) and Weathering Resistance: Approved by manufacturer for up to 180 days of weather exposure.
 - e. Elongation: 250 percent, minimum, when tested in accordance with ASTM D412.
 - f. Surface Burning Characteristics: Flame spread index of 25 or less, smoke developed index of 450 or less, Class A when tested in accordance with ASTM E84.

- g. Complies with fire resistance requirements shown on the Drawings as part of an exterior non-load-bearing exterior wall assembly when tested in accordance with NFPA 285.
- h. Nail Sealability: Pass, when tested in accordance with ASTM D1970/D1970M.
- i. Sealants, Tapes and Accessories: As recommended by coating manufacturer.
- j. Acceptable Products:
 - 1) Carlisle Coatings and Waterproofing, Inc; Fire Resist Barritech-VP: www.carlisleccw.com/#sle.
 - 2) GCP Applied Technologies; Perm-A-Barrier VPL: www.gcpat.com/#sle.
 - 3) Henry Company; Air-Bloc 17MR: www.henry.com/#sle.
 - 4) Polyglass; VertiWrap VPL: www.polyglass.com.
 - 5) Tremco Commercial Sealants & Waterproofing; ExoAir 230: www.tremcosealants.com/#sle.
 - 6) W.R. Meadows, Inc; Air-Shield LMP: www.wrmeadows.com/#sle.
 - 7) Substitutions: See Section 016000 - Product Requirements.

2.2 ACCESSORIES

- A. Sealants, Tapes, and Accessories for Sealing Air Barrier and Adjacent Substrates: As indicated or in compliance with air barrier manufacturer's installation instructions, and as required for a complete and air-tight installation.
 - 1. All accessory materials shall have air and water vapor permeance performance matching that of the primary air barrier system.
- B. Sealant for Cracks and Joints In Substrates: Resilient elastomeric joint sealant compatible with substrate and air barrier materials.
 - 1. Application: Apply at 30 to 40 mil, 0.030 to 0.040 inch, nominal thickness.
 - 2. Elongation: 400 percent, minimum, measured in accordance with ASTM D412.
 - 3. Peel Adhesion: 28 lb/inch, minimum, when tested in accordance with ASTM D903.
 - 4. Hydrostatic Head Pressure: Resists head pressure of 57 feet, maximum, when tested in accordance with ASTM D751.

5. Comply with NFPA 285 requirements for wall assembly.
- C. Primer: As recommended by primary air barrier membrane manufacturer.
- D. Flexible Flashing: Self-adhesive sheet flashing complying with ASTM D1970/D1970M, except slip resistance requirement waived if not installed on roof.
1. Thickness: 40 mil, 0.040 inch, nominal; exception from ASTM D1970/D1970M.
 2. Width: 4 inches, minimum.
 3. Water Vapor Permeance: Matching that of primary air barrier, when tested in accordance with ASTM E96/E96M Procedure A (Desiccant Method) at 73.4 degrees F.
- E. Preformed Transition Membrane: Semirigid silicone or polyester composition, tapered edges, tear resistant.
1. Products:
 - a. Dow; DOWSIL Silicone Transition Strip and System: www.dow.com/#sle.
 - b. Henry Company; Moistop Corner Shield: www.henry.com/#sle.
 - c. Momentive Performance Materials, Inc/GE Silicones; RF100 Reinforcing Fabric: www.siliconeforbuilding.com/#sle.
 - d. Tremco Commercial Sealants & Waterproofing; ProGlaze ETA System 1: www.tremcosealants.com/#sle.
 - e. Substitutions: See Section 016000 - Product Requirements.
- F. Stainless Steel Flashing: Flexible flashing with 2 mil, 0.002 inch thick Type 304 stainless steel sheet, 8 mil, 0.008 inch of butyl adhesive and siliconized release liner.
1. Width: 6 inches wide, minimum.
 2. Overlap joints at least 2 inches.
 3. Products:
 - a. Hohmann & Barnard, Inc.; Mighty-Flash SA Stainless Flashing: www.h-b.com.
 - b. Momentive Performance Materials, Inc/GE Silicones; GE Elemax SS Flashing: www.siliconeforbuilding.com/#sle.
 - c. STS Coatings, Inc; Wall Guardian Self Adhering Stainless Steel Flashing: www.stscoatings.com/#sle.

- d. VaproShield, LLC; VAPRO-SS FLASHING: www.vaproshield.com/#sle.
 - e. York Manufacturing, Inc; York 304 SA: www.yorkmfg.com/#sle.
 - f. Substitutions: See Section 016000 - Product Requirements.
- G. Liquid Flashing: One part, fast curing, nonsag, elastomeric, gun grade, trowelable.
- H. Thinners and Cleaners: As recommended by material manufacturer.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that surfaces and conditions are ready for work of this section.
- B. Ensure that the following conditions are met:
 - 1. Surfaces are sound, dry, even, and free of excess mortar or other contaminants.
 - 2. Inspect substrates to be smooth without large voids or sharp protrusions.
- C. Verify substrate is visibly dry and free of moisture.
- D. Verify sealants are compatible with membrane proposed for use.
- E. Where existing conditions are responsibility of another installer, notify Architect of unsatisfactory conditions.
- F. Do not proceed with this work until unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Remove projections, protruding fasteners, and loose or foreign matter that might interfere with proper installation.
- B. Clean and prime substrate surfaces to receive adhesives, sealants, and air barrier materials in accordance with manufacturer's installation instructions.
- C. Protection from spray-applied materials:
 - 1. Mask and cover adjacent areas to protect from over-spray.
 - 2. Ensure any required foam stop or back up materials are in place to prevent over-spray and achieve complete seal.

3.3 INSTALLATION

- A. Install materials in accordance with manufacturer's installation instructions.

- B. Air Barriers: Install continuous airtight barrier over surfaces indicated, with sealed seams and with sealed joints to adjacent surfaces.
- C. Apply sealants and adhesives within recommended temperature range in accordance with manufacturer's installation instructions.
- D. Fluid-Applied Coatings or Membranes:
 - 1. Prepare substrate in accordance with manufacturer's installation instructions; treat joints in substrate and between dissimilar materials as indicated.
 - 2. Use flashing to seal to adjacent construction and to bridge joints in coating substrate.
 - 3. Position flashing and transition materials so that membrane overlaps the membrane below by a minimum of 2 inches, unless greater overlap is recommended by the material manufacturer. Ensure membranes are securely sealed onto substrate with roller.
 - 4. Connect air barrier in exterior wall assembly continuously to the air barrier of the roof, to below-grade dampproofing/waterproofing systems, to windows, curtain wall, storefront, louvers, exterior doors, other intersection conditions and transitions from wet cavity to dry cavity.
 - 5. Provide mechanically-fastened, non-corrosive sheet metal back-up supports, preformed transition membranes, or other manufacturer-approved transition materials to span gaps greater than 1/4 inch in substrate plane and to make a smooth transition from one plane to the other.
 - 6. Apply a bead or trowel coat of mastic along top edge of membrane seams at reverse lapped seams, rough cuts, and as recommended by the material manufacturer.
 - 7. Seal top edge of the self-adhered membrane to substrate with termination mastic at end of each working day.
 - 8. Install fluid-applied membrane using equipment and methods recommended by manufacturer, to achieve a dry film thickness as required by the material manufacturer.
- E. Refer to air barrier manufacturer's detail drawings for installation procedures including:
 - 1. Changes in substrate.
 - 2. Control joints.
 - 3. Crack treatments.
 - 4. Inside and outside corners.

5. Penetrations.
6. Rough openings.
7. Sheathing joints.

F. Openings and Penetrations in Exterior Air Barriers:

1. Install opening flashings up full height of jambs, at heads, and at sills, lapping a minimum of 5 inches onto air barrier system at sills.
2. At openings with frames having nailing flanges, seal head and jamb flanges using a continuous bead of sealant compressed by flange and cover flanges with sealing tape at least 4 inches wide; do not seal sill flange.
3. At openings with nonflanged frames, seal air barrier to each side of framing at opening using flashing at least 9 inches wide, and covering entire depth of framing.
4. At head of openings, install flashing under air barrier extending at least 2 inches beyond face of jambs; seal air barrier to flashing.
5. At interior face of openings, seal gap between window/door frame and rough framing, using joint sealant over backer rod.
6. Service and Other Penetrations: Form flashing around penetrating item and seal to air barrier surface.
 - a. Seal around all penetrating items, including, but not limited to, knife plates, steel members, pipes and conduit, and cladding support systems, using manufacturer's recommended materials.
7. Seal all penetrations with sealant or liquid flashing approved by manufacturer. Locations required to be sealed include, but are not limited to, masonry tie penetrations, furring fastener penetrations, and all cladding system penetrations.

3.4 FIELD QUALITY CONTROL

- A. See Section 014000 - Quality Requirements for additional requirements.
- B. Do not cover installed air barriers until required inspections have been completed.
- C. Obtain approval of installation procedures from air barrier manufacturer based on a mock-up installed in place, prior to proceeding with remainder of installation.
- D. Take digital photographs of each portion of installation prior to covering up air barriers.
- E. Provide field testing of installed air barrier system by independent laboratory during the construction process. Perform the following:

1. Membrane Adhesion: Test in accordance with ABAA T0002-2019 using a type II pull tester except that the membrane shall be cut through to separate the material attached to the disc from the surrounding material. Perform test after curing period recommended by the material manufacturer. Record mode of failure and area where the material failed. When the air barrier material manufacturer has established a minimum adhesion level for the product on the particular substrate, the inspection report shall indicate whether this requirement has been met. Where the material manufacturer has not declared a minimum adhesion value for their product/substrate combination, the value shall simply be recorded.
 - a. Mock-up Testing: Perform test of mock-up at three locations.
 - b. Building Testing: Perform tests on building at three locations. Perform testing at 10%, 50%, and 70% completion of air barrier installation.
 2. Air Barrier Assembly Testing - Bubble Gun: Test in accordance with ASTM E1186.
 - a. Mock-up Testing: Perform three tests on sheathing seams and at each type of bracket, clip, and masonry tie.
 - b. Building Testing: Perform three tests on sheathing seams and at each type of bracket, clip, and masonry tie. Perform testing at 10%, 50%, and 70% completion of air barrier installation.
- F. If the testing and/or inspections reveal any defects or deficiencies, promptly remove and replace defective work, and retest until satisfactory results are obtained at no additional cost to the Owner.
- G. Repair air barrier and other materials damaged from field testing.

3.5 PROTECTION

- A. Protect air barrier materials from damage during installation and the remainder of the construction period, according to material manufacturer's written instructions.
- B. Do not leave materials exposed to weather longer than recommended by manufacturer.

END OF SECTION 072726

SECTION 074213.13 - METAL WALL PANELS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Manufactured metal panels with related flashings and accessory components.
- B. Subgirt framing assembly.

1.2 RELATED REQUIREMENTS

- A. Section 061000 - Rough Carpentry: Wall panel substrate.
- B. Section 079200 - Joint Sealants: Sealing joints between metal wall panel system and adjacent construction.

1.3 REFERENCE STANDARDS

- A. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix).
- B. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- C. NFPA 285 - Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Wall Assemblies Containing Combustible Components.

1.4 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate placement of wall panel system anchors and back-up support framing.
- B. Preinstallation Meeting: Convene one week before starting work of this Section.
 - 1. Require attendance by the installer and relevant sub-contractors.
 - 2. Review storage and handling procedures.
 - 3. Review procedures for protection of work and other construction.

1.5 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Product Data - Wall System: Manufacturer's data sheets on each product to be used, including:
 - 1. Physical characteristics of components shown on shop drawings.

2. Storage and handling requirements and recommendations.
 3. Installation instructions and recommendations.
- C. Shop Drawings: Show layout and elevations, dimensions and thickness of panels, connections, details and location of joints, sealants and gaskets, method of anchorage, number of anchors, supports, reinforcement, trim, flashings, and accessories.
1. Differentiate between shop and field fabrication.
 2. Indicate substrates and adjacent work with which the wall system must be coordinated.
 3. Include large-scale details of anchorages and connecting elements.
 4. Include large-scale details or schematic, exploded or isometric diagrams to fully explain flashing at a scale of not less than 1-1/2 inches per 12 inches.
 5. Include design engineer's stamp or seal on shop drawings for attachments and anchors.
- D. Selection Samples: For each color specified, submit at least 5 color chips representing Architect's designated color range.
- E. Verification Samples: Submit two samples of wall panel, 12 inch x 12 inch in size illustrating finish color, sheen, and texture.
- F. Test Reports: Submit test report verifying compliance with NFPA 285 for previously-tested exterior wall assembly.
- G. Source Quality Control Submittals.
- H. Manufacturer's qualification statement.
- I. Installer's qualification statement.

1.6 QUALITY ASSURANCE

- A. Design Engineer's Qualifications: Design structural supports and anchorages under direct supervision of a Structural Engineer experienced in design of this type of Work and licensed in the State in which the Project is located.
- B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this Section with minimum five years of documented experience.
- C. Installer Qualifications: Company specializing in installing the products specified in this Section with minimum three years of documented experience.
- D. Testing Agency Qualifications: Independent firm specializing in performing testing and inspections of the type specified in this section.

- E. Basis of Design: Specifications are based on wall panel types by specified basis of design manufacturer. Wall panel types manufactured by other acceptable manufacturers are permitted, subject to compliance with specified requirements, and provided that deviations in design, composition, and profile are minor, and do not detract substantially from the indicated design intent.

1.7 MOCK-UPS

- A. Integrated Exterior Mock-up: Provide mock-up of exterior wall assembly including wall panels, cladding support system, back-up framing, trim, flashing, trim, and accessories for evaluation of workmanship and aesthetics.
 - 1. Locate where directed.
 - 2. Mock-ups may remain as part of the Work.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Protect panels from accelerated weathering by removing or venting sheet plastic shipping wrap.
- B. Store prefinished material off the ground and protected from weather; prevent twisting, bending, or abrasion; provide ventilation; slope metal sheets to ensure proper drainage.
- C. Prevent contact with materials that may cause discoloration or staining of products.

1.9 FIELD CONDITIONS

- A. Do not install wall panels when air temperature or relative humidity are outside manufacturer's limits.

1.10 WARRANTY

- A. See Section 017800 - Closeout Submittals for additional warranty requirements.
- B. Special Manufacturer's Warranty: On manufacturer's standard form, in which manufacturer agrees to repair or replace components of metal wall panel assemblies that fail in materials and workmanship within two years from date of Substantial Completion.
- C. Finish Warranty: Provide 20-year manufacturer warranty against excessive degradation of exterior finish. Include provision for replacement of units with excessive fading, chalking, or flaking. Complete forms in Owner's name and register with warrantor.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Acceptable Manufacturers:
1. ATAS International, Inc.: www.atas.com/#sle.
 2. Berridge Manufacturing Company: www.berridge.com/#sle.
 3. Englert, Inc: www.englertinc.com/#sle.
 4. McElroy Metal: www.mcelroymetal.com/#sle.
 5. Morin Corporation: www.morincorp.com/#sle.
 6. Petersen Aluminum Corporation: www.pac-clad.com/#sle.
 7. Centria: www.centria.com.
 8. Substitutions: See Section 016000 - Product Requirements.

2.2 METAL WALL PANEL SYSTEM

- A. Wall Panel System: Factory fabricated prefinished metal panel system, site assembled.
1. Design and size components to support assembly dead loads, and to withstand live loads caused by positive and negative wind pressure acting normal to plane of wall.
 2. Design Pressure: In accordance with ASCE 7 and loads indicated on Structural Drawings.
 3. Fire Performance: Tested in accordance with, and complying with acceptance criteria of NFPA 285.
 4. Maximum Allowable Deflection of Panel: $L/180$ for length(L) of span.
 5. Movement: Accommodate movement within system without damage to components or deterioration of seals, movement between system and perimeter components when subject to seasonal temperature cycling; dynamic loading and release of loads; and deflection of structural support framing.
 6. Drainage: Provide positive drainage to exterior for moisture entering or condensation occurring within panel system.
 7. Fabrication: Formed true to shape, accurate in size, square, and free from distortion or defects; pieces of longest practical lengths.

8. Corners: Factory-fabricated in one continuous piece with minimum 2-inch returns.
- B. Exterior Wall Panels:
1. Profile: Orientation as shown in Drawings; Corrugated Style (Wavy).
 2. Side Seams: Lapped.
 3. Material: Precoated steel sheet, 22 gauge, 0.0299 inch minimum thickness.
 4. Panel Width: 36 inch.
 5. Panel Thickness: 7/8 inch.
 6. Color: Custom Color.
- C. Subgirt Framing Assembly:
1. 16 gauge, 0.0598 inch thick formed non-precoated steel sheet.
 2. Profile: As indicated on drawings; configuration as required by system manufacturer to attach panel system to building.
- D. Internal and External Corners: Same material, thickness, and finish as exterior sheets; profile to suit system; shop cut and factory mitered to required angles. Mitered internal corners to be back braced with precoated sheet stock to maintain continuity of profile.
- E. Trim, Closure Pieces, and Flashings: Same material and finish as exterior sheets; brake formed to required profiles.
1. See Section 076200.

2.3 MATERIALS

- A. Precoated Steel Sheet: Hot-dipped galvanized steel sheet, ASTM A653/A653M, Structural Steel (SS) or Forming Steel (FS), with G90/Z275 coating; continuous coil-coated on exposed surfaces with specified finish coating and on panel back with specified panel back coating.
- B. Select materials with surface flatness, smoothness, and lack of surface blemishes where exposed to view in finished system.

2.4 FINISHES

- A. Fluoropolymer Coil Coating System: Polyvinylidene fluoride (PVDF) multi-coat superior performing organic coatings system complying with AAMA 2605, including at least 70 percent PVDF resin, and at least 80 percent of coil coated metal surfaces having minimum total dry film thickness (DFT) of 0.9 mil, 0.0009 inch; custom color and gloss as selected by Architect.

1. Panel Backside Finish: Where exposed to weathering (screenwall application), finish panel backside to match exposed surface finish.
2. Products:
 - a. Arkema, Inc; Kynar 500: www.arkema.com/#sle.
 - b. PPG; Duranar: www.ppgmetalcoatings.com/#sle.
 - c. Sherwin-Williams Company; Fluropon: www.coil.sherwin.com/#sle.
 - d. Substitutions: See Section 016000 - Product Requirements.

2.5 ACCESSORIES

- A. Concealed Sealants: Non-curing butyl sealant or tape sealant, see Section 079200
- B. Exposed Sealant: Elastomeric; silicone, polyurethane, or silyl-terminated polyether/polyurethane.
- C. Fasteners: Manufacturer's standard type to suit application; stainless steel.
 1. Metal-to-Metal Fasteners: Self-drilling, self-tapping screws.
- D. Field Touch-up Paint: As recommended by panel manufacturer.
- E. Bituminous Paint: Asphalt base.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that building framing members are ready to receive panels.
- B. Verify that air barrier has been installed over substrate completely and correctly.
- C. Examine rough-in for components and systems penetrating wall panels to coordinate actual penetration locations relative to wall panel joint locations prior to installation.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Install subgirts perpendicular to panel length and in a direction to promote drainage, securely fastened to substrates and shimmed and leveled to uniform plane. Space at 24 inches on center, maximum.
- B. Protect surrounding areas and adjacent surfaces from damage during execution of this work.

3.3 INSTALLATION

- A. Install panels on walls in accordance with manufacturer's instructions.
- B. Fasten panels to structural supports; aligned, level, and plumb.
- C. Locate joints over supports.
- D. Lap panel ends 2 inches, minimum.
- E. Provide expansion and control joints where indicated.
- F. Use concealed fasteners unless otherwise indicated by Architect.
- G. All corners and openings are to be coursed out per the Architect's details. Ribs must hit the corners, and at the jamb of any opening per Drawings.
- H. Comply with standards set forth in the Architectural Sheet Metal Manual published by SMACNA.
- I. Install panels in such a manner that horizontal lines are true and level and vertical lines are plumb.
- J. Install starter and edge trim before installing wall panels.
- K. Remove protective strippable film prior to installation of panels.
- L. Attach panels using manufacturer's standard clips and fasteners, spaced in accordance with approved shop drawings.
- M. Protect installed panels from abuse by other trades. The Contractor shall be responsible for protecting the panels from wet cement, plaster, painting operations, etc. The installer shall provide walk boards in heavy roofing traffic areas to prevent damage to panels.
- N. Install accessories with positive anchorage to building, weather tight mounting, provisions for thermal expansion, and coordinate installation with flashings and other components.
 - 1. Install components required for a complete wall panel assembly including trim, flashings and other accessory items.

3.4 TOLERANCES

- A. Offset From True Alignment Between Adjacent Members Abutting or In Line: 1/16 inch, maximum.
- B. Variation from Plane or Location As Indicated on Drawings: 1/4 inch, maximum.

3.5 CLEANING

- A. Remove site cuttings from finish surfaces.
- B. Remove protective material from wall panel surfaces.
- C. Clean and wash prefinished surfaces with mild soap and water; rinse with clean water.

3.6 PROTECTION

- A. Protect metal wall panels until completion of project.
- B. Touch-up, repair, or replace damaged wall panels or accessories before Date of Substantial Completion.

END OF SECTION 074213.13

SECTION 075423 - THERMOPLASTIC POLYOLEFIN (TPO) MEMBRANE ROOFING

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Adhered system with thermoplastic polyolefin (TPO) roofing membrane.
- B. Insulation.
- C. Vapor retarder.
- D. Deck sheathing.
- E. Flashings.
- F. Roofing walkway pads.

1.2 REFERENCE STANDARDS

- A. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures.
- B. ASTM C1177/C1177M - Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing.
- C. ASTM C1289 - Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board.
- D. ASTM D6878/D6878M - Standard Specification for Thermoplastic Polyolefin-Based Sheet Roofing.
- E. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials.
- F. FM DS 1-29 - Roof Deck Securement and Above-Deck Roof Components.
- G. NRCA (RM) - The NRCA Roofing Manual.
- H. UL 790 - Standard for Standard Test Methods for Fire Tests of Roof Coverings.

1.3 ADMINISTRATIVE REQUIREMENTS

- A. Preinstallation Meeting: Convene one week before starting work of this section.
 - 1. Review preparation and installation procedures and coordinating and scheduling required with related work.

1.4 SUBMITTALS

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

- B. Product Data: Provide manufacturer's written information listed below.
 - 1. Product data indicating membrane materials, flashing materials, insulation, vapor retarder, surfacing, and fasteners.
 - 2. Preparation instructions and recommendations.
 - 3. Storage and handling requirements.
- C. Shop Drawings: Indicate joint or termination detail conditions and conditions of interface with other materials.
 - 1. Provide tapered insulation plan.
- D. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
- E. Manufacturer's Field Reports: Indicate procedures followed, ambient temperatures, humidity, wind velocity during application, and supplementary instructions given.
- F. Specimen Warranty: For approval.
- G. Warranty:
 - 1. Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.
 - 2. Submit installer's certification that installation complies with all warranty conditions for the waterproof membrane.
- H. Manufacturer's Qualification Statement.
- I. Installer's Qualification Statement.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum twenty (20) years of documented experience.
- B. Installer Qualifications: Company specializing in performing the work of this section:
 - 1. With minimum five (5) years documented experience.
 - 2. Approved by membrane manufacturer.
 - 3. Extend manufacturer's No Dollar Limit guarantee.
- C. Single Source Responsibility: Provide and install products from single source.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products in manufacturer's original containers, dry, undamaged, with seals and labels intact.
- B. Protect products in weather protected environment, clear of ground and moisture.
- C. Protect foam insulation from direct exposure to sunlight.
- D. Provide Safety Data Sheets (SDS) at the project site at all times during transportation, storage, and installation of materials.
- E. Comply with requirements from Owner to prevent overloading or disturbance of the structure when loading materials onto the roof.

1.7 FIELD CONDITIONS

- A. Do not apply roofing membrane during unsuitable weather. Refer to manufacturer's written instructions.
- B. Do not apply roofing membrane when ambient temperature is below 40 degrees F.
- C. Do not apply roofing membrane to damp or frozen deck surface or when precipitation is expected or occurring.
- D. Do not expose materials vulnerable to water or sun damage in quantities greater than can be weatherproofed the same day.
- E. Proceed with work so new roofing materials are not subject to construction traffic as work progresses.
- F. Do not allow grease, oil, fats, or other contaminants to come into direct contact with membrane.

1.8 WARRANTY

- A. System Warranty: Provide manufacturer's system warranty agreeing to repair or replace roofing that leaks or is damaged due to wind or other natural causes.
 - 1. Warranty Term: 20 years from Substantial Completion, NDL.
 - 2. For repair and replacement include costs of both material and labor in warranty.
 - 3. Include accidental punctures according to the manufacturer's standard warranty terms.
 - 4. Damage due to winds up to 55 mph.
 - 5. Include hail damage according to the manufacturer's standard warranty terms.

6. Warranty includes membrane roofing, base flashings, substrate boards, vapor retarders, roof insulation, cover boards, and other components of membrane roofing system.

PART 2 PRODUCTS

2.1 MANUFACTURER

- A. Acceptable Manufacturers:
 1. Elevate: www.holcimelevate.com.
 2. Carlisle SynTec: www.carlisle-syntec.com.
 3. Johns Manville: www.jm.com.
 4. GAF: www.gaf.com.
 5. Versico: www.versico.com.

2.2 ROOFING APPLICATIONS

- A. Material Compatibility: Roofing materials shall be compatible with one another and adjacent materials under conditions of service and application required, as demonstrated by roof membrane manufacturer based on testing and field experience.
- B. TPO Membrane Roofing: One ply membrane, fully adhered, over insulation.
- C. Roofing Assembly Performance Requirements and Design Criteria:
 1. Roof Covering External Fire Resistance Classification: Class B when tested per UL 790.
 2. Wind Uplift:
 - a. Designed to withstand wind uplift forces calculated with ASCE 7.
 - b. Design Wind Speed: As indicated on drawings.
 3. Insulation Thermal Resistance (R-Value): As indicated in Drawings.
 4. Drainage: No standing water within 48 hours after precipitation.

2.3 ROOFING MEMBRANE AND ASSOCIATED MATERIALS

- A. Membrane:
 1. Material: Thermoplastic Polyolefin (TPO) complying with ASTM D6878/D6878M.
 2. Thickness: 60 mils (0.060 inch), minimum.

3. Sheet Width: Factory fabricated into largest sheets possible.
 4. Color: White.
- B. Seaming Materials: As recommended by membrane manufacturer.
- C. Vapor Retarder: Self-adhering type complying with requirements of fire rating classification; compatible with roofing, deck sheathing, and insulation materials.
1. Vapor Permeability: 0.1 perm inch, measured in accordance with ASTM E96/E96M.
- D. Flexible Flashing Material: Same material as membrane.
- E. Base Flashing: Provide waterproof, fully adhered base flashing system at all penetrations, plane transitions, and terminations.

2.4 DECK AND PARAPET SHEATHING

- A. Deck and Parapet Sheathing: Glass mat faced gypsum panels, ASTM C1177/C1177M, fire resistant type, 1/2 inch thick.
1. Acceptable Products:
 - a. CertainTeed Corporation; GlasRoc Sheathing.
 - b. Georgia-Pacific Building Products; Dens Deck Prime.
 - c. National Gypsum Company; DEXcell FA Glass Mat Roof Board.
 - d. United States Gypsum Company; Securock Glass Mat Roof Board.

2.5 INSULATION

- A. Polyisocyanurate (ISO) Board Insulation: ASTM C1289, Type II, Class 1 - Faced with glass fiber reinforced cellulosic felt facers on both major surfaces of the core foam.
1. Grade and Compressive Strength: Grade 2, 20 psi, minimum.
 2. Product:
 - a. Membrane manufacturer's standard insulation complying with system performance requirements.

2.6 ACCESSORIES

- A. Prefabricated Flashing Accessories:
1. Corners and Seams: Same material as membrane, in manufacturer's standard thicknesses.

2. Penetrations: Same material as membrane, with manufacturer's standard cut-outs, rigid inserts, clamping rings, and flanges.
 3. Sealant Pockets: Same material as membrane, with manufacturer's standard accessories, in manufacturer's standard configuration.
 4. Pressure Sensitive Cover Strips: 6 inch wide, 45 mils (0.045 inch) thick, non-reinforced TPO membrane laminated to 35 mils (0.035 inch) thick cured synthetic rubber with pressure sensitive adhesive.
 5. TPO Pressure Sensitive RUSS:
 - a. 10 inch wide, 45 mils (0.045 inch) thick, reinforced TPO membrane with 3 inch wide, 35 mils (0.035 inch) thick cured synthetic rubber with pressure sensitive adhesive laminated to one edge.
 6. Walkway Rolls: Sure-Flex Heat Weldable Walkway Rolls; 80 mils (0.080 inch) thick; gray membrane.
 7. Miscellaneous Flashing: Non-reinforced TPO membrane; 80 mils (0.080 inch) thick, in manufacturer's standard lengths and widths.
- B. Insulation Adhesive: Two component polyurethane, expanding foam .
- C. Membrane Adhesive: As recommended by membrane manufacturer.
- D. Surface Conditioner for Adhesives: Compatible with membrane and adhesives.
- E. Sealants: As recommended by membrane manufacturer.
- F. Cleaner: Manufacturer's standard, clear, solvent-based cleaner.
- G. Primer: Manufacturer's recommended product.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that surfaces and site conditions are ready to receive work.
- B. Verify deck is supported and secure.
- C. Verify deck is clean and smooth, flat, free of depressions, waves, or projections, properly sloped and suitable for installation of roof system.
- D. Verify deck surfaces are dry and free of snow or ice.
- E. Verify that roof openings, curbs, and penetrations through roof are solidly set, and nailing strips and reglets are in place.

3.2 PREPARATION, GENERAL

- A. Clean substrate thoroughly prior to roof application.
- B. Do not begin work until other work that requires foot or equipment traffic on roof is complete.
- C. Apply manufacturer's recommended vapor retarder or temporary roof before roof installation.

3.3 METAL DECK PREPARATION

- A. Install deck sheathing on metal deck:
 - 1. Lay with long side at right angle to flutes; stagger end joints; provide support at ends.
 - 2. Cut sheathing cleanly and accurately at roof breaks and protrusions to provide smooth surface.
 - 3. Tape joints.
 - 4. Mechanically fasten sheathing to roof deck, in accordance with roofing manufacturer's instructions.
 - a. Over entire roof area, fasten sheathing using 6 fasteners with washers per sheathing board.

3.4 INSTALLATION - GENERAL

- A. Perform work in accordance with manufacturer's instructions and NRCA (RM) applicable requirements.
- B. Do not apply roofing membrane during unsuitable weather.
- C. Do not apply roofing membrane when ambient temperature is outside the temperature range recommended by manufacturer.
- D. Do not apply roofing membrane to damp or frozen deck surface or when precipitation is expected or occurring.
- E. Do not expose materials vulnerable to water or sun damage in quantities greater than can be weatherproofed the same day.
- F. Coordinate the work with installation of associated counterflashings installed by other sections as the work of this section proceeds.
- G. When substrate preparation is responsibility of another installer, notify Architect of unsatisfactory conditions before proceeding.

3.5 INSULATION APPLICATION

- A. Apply vapor retarder to deck surface in accordance with manufacturer's instructions.
 - 1. Extend vapor retarder under cant strips and blocking to deck edge.
 - 2. Install flexible flashing from vapor retarder to air seal material of wall construction, lap and seal to provide continuity of the air barrier plane.
 - 3. Ensure vapor retarder is clean and dry, continuous, and ready for application of insulation.
- B. Attachment of Insulation: Embed each layer of insulation in adhesive in full contact, in accordance with roofing and insulation manufacturers' instructions.
- C. Do not install wet, damaged, or warped insulation boards.
- D. Lay subsequent layers of insulation with joints staggered minimum 6 inch from joints of preceding layer.
- E. Place tapered insulation to the required slope pattern in accordance with manufacturer's instructions.
- F. On metal deck, place boards parallel to flutes with insulation board edges bearing on deck flutes.
- G. Lay boards with edges in moderate contact without forcing, and gap between boards no greater than 1/4 inch. Cut insulation to fit neatly to perimeter blocking and around penetrations through roof.
- H. Do not apply more insulation than can be completely waterproofed in the same day.

3.6 MEMBRANE APPLICATION

- A. Roll out membrane, free from wrinkles or tears. Place sheet into place without stretching.
- B. Shingle joints on sloped substrate in direction of drainage.
- C. Fully Adhered Application: Apply adhesive at manufacturer's recommended rate. Fully embed membrane in adhesive except in areas directly over or within 3 inches of expansion joints. Fully adhere one roll before proceeding to adjacent rolls.
- D. Seam Welding:
 - 1. Seam Welding: Overlap edges and ends and seal seams by heat welding, minimum 2 inches.
 - 2. Cover seams with manufacturer's recommended joint covers.

3. Probe seams once welds have thoroughly cooled. (Approximately 30 minutes.)
 4. Repair deficient seams within the same day.
 5. Seal cut edges of reinforced membrane after seam probe is complete.
- E. At intersections with vertical surfaces:
1. Extend membrane over cant strips and up a minimum of 4 inches onto vertical surfaces.
 2. Fully adhere flexible flashing over membrane and up to reglets.
 3. Insert flashing into reglets and secure.
- F. Install roofing expansion joints where indicated. Make joints watertight.
- G. Coordinate installation of roof drains, sumps, and scuppers and related flashings. Locate all field splices away from low areas and roof drains. Lap upslope sheet over downslope sheet.
- H. Install walkway pads at areas of concentrated traffic and as shown on Drawings.
- I. Daily Seal: Install daily seal per manufacturers instructions at the end of each work day. Prevent infiltration of water at incomplete flashings, terminations, and at unfinished membrane edges.

3.7 FIELD QUALITY CONTROL

- A. Require site attendance of roofing and insulation material manufacturers at the onset during installation of the Work.

3.8 CLEANING

- A. Remove wrappings, empty containers, paper, and other debris from the roof daily. Dispose of debris in compliance with local, State, and Federal regulations.
- B. Remove bituminous markings from finished surfaces.
- C. In areas where finished surfaces are soiled by work of this section, consult manufacturer of surfaces for cleaning advice and conform to their documented instructions.
- D. Repair or replace defaced or damaged finishes caused by work of this section.

3.9 PROTECTION

- A. Protect installed roofing and flashings from construction operations.

- B. Where traffic must continue over finished roof membrane, protect surfaces using durable materials.

END OF SECTION 075423

SECTION 076200 - SHEET METAL FLASHING AND TRIM

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Fabricated sheet metal items, including flashings, counterflashings, and drip edges.
- B. Sealants for joints within sheet metal fabrications.

1.2 RELATED REQUIREMENTS

- A. Section 061000 - Rough Carpentry: Wood nailers for sheet metal work.
- B. Section 077100 - Roof Specialties: Manufactured copings and edge flashings..
- C. Section 077200 - Roof Accessories: Manufactured metal roof curbs and hatches.
- D. Section 079200 - Joint Sealants: Sealing non-lap joints between sheet metal fabrications and adjacent construction.

1.3 REFERENCE STANDARDS

- A. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum.
- B. ASTM B32 - Standard Specification for Solder Metal.
- C. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
- D. ASTM B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate (Metric).
- E. ASTM C920 - Standard Specification for Elastomeric Joint Sealants.
- F. ASTM D226/D226M - Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing.
- G. ASTM D4586/D4586M - Standard Specification for Asphalt Roof Cement, Asbestos-Free.
- H. SMACNA (ASMM) - Architectural Sheet Metal Manual.

1.4 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate with roofing work for scheduling installation of counterflashing, rain drainage and similar items related to roofing.

2. Coordinate sheet metal flashing and trim layout and seams with sizes and locations of penetrations to be flashed, and joints and seams in adjacent materials.
 3. Coordinate sheet metal flashing and trim installation with adjoining roofing and wall materials, joints, and seams to provide leakproof, secure, and noncorrosive installation.
 4. Coordinate with the work of Section 079200 for installation of related sealants.
- B. Preinstallation Meeting: Convene one week before starting work of this Section.
1. Require attendance of parties directly concerned with the work of this Section, including those who are required to coordinate with the work, and those who are required to protect the work upon completion.
 2. Review preparation and installation procedures and coordinating and scheduling required with related work.
- C. Sequencing: Do not proceed with installation of flashing and sheet metal work until substrate construction, cants, blocking, reglets, and other construction are ready to receive the work of this Section.

1.5 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide data on shape of components, materials and finishes, anchor types and locations.
- C. Shop Drawings: Indicate material profile, jointing pattern, jointing details, fastening methods, flashings, terminations, and installation details.
1. Include identification of material, thickness, weight, and finish for each item and location in Project.
 2. Include details of expansion joints and expansion-joint covers, including showing direction of expansion and contraction from fixed points.
 3. Include details of edge conditions, including eaves, ridges, valleys, rakes, crickets, and counterflashings as applicable.
 4. Include details of connections to adjoining work.
 5. Detail formed flashing and trim at scale of not less than 1-1/2 inches per 12 inches.
- D. Samples: Submit two samples 6 x 6 inch in size illustrating each metal finish color.

1.6 QUALITY ASSURANCE

- A. Perform work in accordance with SMACNA (ASMM) requirements and standard details, except as otherwise indicated.
- B. Maintain one copy of each document on site.
- C. Fabricator and Installer Qualifications: Company specializing in sheet metal work with five years of documented experience.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Stack material to prevent twisting, bending, and abrasion, and to provide ventilation. Slope metal sheets to ensure drainage.
- B. Prevent contact with materials that could cause discoloration or staining.
- C. Protect strippable protective covering on sheet metal flashing and trim from exposure to sunlight and high humidity, except to extent necessary for period of sheet metal flashing and trim installation.

1.8 WARRANTY

- A. Correct defective Work within a five year period after Date of Substantial Completion. Defective work includes failure of watertightness or seals.
- B. Provide 20 year manufacturer warranty for prefinished sheet metal materials. Warranty shall include degradation of metal finish.

PART 2 PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Sheet Metal Assemblies:
 - 1. Capable of withstanding structural movement and exposure to wind and weather without failure or permanent deformation.
 - a. Design Pressure: Conforming with ASCE 7 or as indicated on structural drawings, whichever is most restrictive.
 - 2. Physically protect building elements and systems from damage that would permit water leakage into building enclosure assemblies under all weather conditions.
- B. Sheet Metal Standards: Comply with SMACNA's "Architectural Sheet Metal Manual" requirements for dimensions and profiles shown unless more stringent requirements are indicated.
- C. Thermal Movements: Provide sheet metal flashing and trim that allows for thermal movements from ambient and surface temperature changes.

1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.

2.2 SHEET MATERIALS

- A. Pre-Finished Galvanized Steel: ASTM A653/A653M, with G90/Z275 zinc coating; minimum gage as scheduled, shop pre-coated with PVDF coating.
 1. Exposed Coating: PVDF (Polyvinylidene Fluoride) Superior Performance Organic Finish, AAMA 621; multiple coat, thermally cured fluoropolymer finish system.
 2. Concealed Finish: Pretreat with manufacturer's standard white or light-colored acrylic or polyester backer finish, consisting of prime coat and wash coat with minimum total dry film thickness of 0.5 mil.
- B. Anodized Aluminum: ASTM B209 (ASTM B209M); minimum gage as scheduled; anodized finish of color as selected.
 1. Clear Anodized Finish: AAMA 611 AA-M12C22A41 Class I clear anodic coating not less than 0.7 mils thick.
 2. Color Anodized Finish: AAMA 611 AA-M12C22A42/44 Class I integrally or electrolytically colored anodic coating not less than 0.7 mils thick.
- C. Pre-Finished Aluminum: ASTM B209 (ASTM B209M), minimum gage as scheduled; shop pre-coated with with PVDF coating.
 1. Exposed Coating: PVDF (Polyvinylidene Fluoride) Superior Performance Organic Finish, AAMA 2605; multiple coat, thermally cured fluoropolymer finish system.
 2. Concealed Finish: Pretreat with manufacturer's standard white or light-colored acrylic or polyester backer finish, consisting of prime coat and wash coat with minimum total dry film thickness of 0.5 mil.
- D. Stainless Steel: ASTM A240, Type 304 alloy, soft temper, fully annealed, minimum gage and finish as scheduled.
 1. Finish: 2D (dull, cold rolled).

2.3 FABRICATION

- A. Form sections true to shape, accurate in size, square, and free from distortion or defects.
- B. Fabricate cleats and starter strips of same material as sheet, minimum 12 inches wide, one gage thickness heavier than exposed sheet, and interlocking with exposed sheet.
- C. Hem exposed edges on underside 1/2 inch; miter and seam corners.

- D. Fabricate corners from one piece with minimum 18 inch long legs; seam for rigidity, seal with sealant.
- E. Fabricate vertical faces with bottom edge formed outward 1/4 inch and hemmed to form drip.

2.4 SEAMS AND JOINTS

- A. Sealant Joints: Where movable, nonexpansion-type joints are required, form metal to provide for proper installation of elastomeric sealant according to cited sheet metal standard.
- B. Non-Moving Seams:
 - 1. For metal greater than 0.040 inch thick, fabricate with butt seams with backup plates, fastened one side (SMACNA Figure 3-3, Type 19); seal with butyl sealant concealed within joint.
 - 2. For metals 0.040 inch thick or less, fabricate with flat-lock seams (SMACNA Figure 3-2, Type 2); treat as follows:
 - a. Prepainted Steel and Aluminum: Form seams and seal with elastomeric sealant. Rivet joints where necessary for strength.
 - b. Unpainted Aluminum (includes mill finish and anodized: Form seams and seal with epoxy seam sealer. Rivet joints where necessary for strength.
 - c. Other Metals: Tin edges to be seamed, form seams, and solder.
- C. Moving Seams:
 - 1. For metal greater than 0.040 inch thick: Form expansion joints of butt seams with backup plates fastened to substrate (SMACNA Figure 3-3, Type 18) with no fasteners exposed through covers. Seal seams with butyl sealant concealed within joints.
 - 2. For metal 0.040 inch thick or less: Form expansion joints of intermeshing hooked flanges (SMACNA Figure 3-2, Type 1), not less than 1 inch deep, filled with butyl sealant concealed within joint.
- D. Soldered Joints: Clean surfaces to be soldered, removing oils and foreign matter. Pretin edges of sheets to be soldered to a width of 1-1/2 inches except where pretinned surface would show in finished Work.
 - 1. Do not solder prepainted metal sheet.

2.5 ROOF SHEET METAL FABRICATIONS

- A. Counterflashings: Factory fabricated and finished sheet metal that overlaps top edges of base flashing by at least 4 inches, and designed to snap into thru-wall flashing or reglets with lapped joints. Provide spring action pressure at bottom edge against base flashings.
 - 1. Type and Finish: See Sheet Metal Schedule.
- B. Roof Equipment Support Flashing: Cover raised bases and equipment supports. Fabricate with seamed and soldered joints and corners. Extend flashings over roof base flashings 4 inches minimum, and fold back bottom edge 1/2 inch. Where metal is penetrated for bolt or other fastener connections, use 4 lb sheet lead washers 2 inches larger than fastener hole.
 - 1. Comply with SMACNA (ASMM) Figure 8-11B.
 - 2. Type and Finish: See Sheet Metal Schedule.

2.6 WALL SHEET METAL FABRICATIONS

- A. Openings Flashing: Fabricate head, sill, jamb and similar flashings to extend 4 inches beyond wall openings. Form head and sill flashing with 2-inch-high end dams.
 - 1. Type and Finish: See Sheet Metal Schedule.

2.7 ACCESSORIES

- A. Fasteners: Non-corrosive type.
 - 1. General: Blind fasteners or self-drilling screws, gasketed, with hex-washer head.
 - a. Exposed Fasteners: Heads matching color of sheet metal using plastic caps or factory-applied coating. Provide metal-backed EPDM or PVC sealing washers under heads of exposed fasteners bearing on weather side of metal.
 - b. Blind Fasteners: High-strength aluminum or stainless-steel rivets suitable for metal being fastened.
 - c. Spikes and Ferrules: Same material as gutter; with spike with ferrule matching internal gutter width.
 - 2. Fasteners for Aluminum Sheet: Aluminum or Series 300 stainless steel.
 - 3. Fasteners for Zinc-Coated (Galvanized) and Aluminum-Zinc Alloy-Coated Steel Sheet: Series 300 stainless steel or hot-dip galvanized steel according to ASTM A 153/A 153M or ASTM F 2329.

4. Fasteners for Stainless-Steel Sheet: Series 300 stainless steel.
- B. Underlayment: ASTM D226/D226M, organic roofing felt, Type I (No. 15).
- C. Synthetic Underlayment: Polyethylene or polypropylene sheet.
- D. Self-Adhering, High-Temperature Sheet Underlayment: Minimum 30 mils thick, consisting of a slip-resistant polyethylene- or polypropylene-film top surface laminated to a layer of butyl- or SBS-modified asphalt adhesive, with release-paper backing; specifically designed to withstand high metal temperatures beneath metal roofing. Provide primer according to written recommendations of underlayment manufacturer.
 1. Thermal Stability: Stable after testing at 220 deg F; ASTM D 1970.
 2. Low-Temperature Flexibility: Passes after testing at minus 20 deg F; ASTM D 1970.
 3. Acceptable Products:
 - a. Carlisle Residential, a division of Carlisle Construction Materials; WIP 300HT.
 - b. Grace Construction Products, a unit of W. R. Grace & Co.; Ultra.
 - c. Henry Company; Blueskin PE200 HT.
 - d. Metal-Fab Manufacturing, LLC; MetShield.
 - e. Owens Corning; WeatherLock Metal High Temperature Underlayment.
 - f. Polyguard Products, Inc.; Deck Guard HT.
 - g. Substitutions: See Section 016000 - Product Requirements.
- E. Slip Sheet: Rosin sized building paper, 3 lb/100 sq. ft. minimum.
- F. Primer: Zinc chromate type.
- G. Protective Backing Paint: Zinc molybdate alkyd.
- H. Bituminous Coating: Cold-applied asphalt mastic, noncorrosive compound free of asbestos, sulfur, and other deleterious impurities; 15 mil dry film thickness per coat.
- I. Concealed Sealants: Non-curing butyl sealant.
- J. Exposed Sealants: ASTM C920; elastomeric sealant, with minimum movement capability as recommended by manufacturer for substrates to be sealed; color to match adjacent material.

- K. Butyl Sealant: ASTM C 1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for hooked-type expansion joints with limited movement.
- L. Epoxy Seam Sealer: Two-part, noncorrosive, aluminum seam-cementing compound, recommended by aluminum manufacturer for exterior nonmoving joints, including riveted joints.
- M. Plastic Cement: ASTM D4586/D4586M, Type I.
- N. Solder: ASTM B32; Provide type as described:
 - 1. For Stainless Steel: Grade Sn96, with acid flux of type recommended by stainless-steel sheet manufacturer.
 - 2. For Zinc-Coated (Galvanized) Steel: Maximum lead content of 0.2 percent.

2.8 FINISHES

- A. PVDF (Polyvinylidene Fluoride) Coating: Superior performance organic finish with minimum 70 percent PVDF fluoropolymer resin by weight, multiple coat, thermally cured finish system.
 - 1. Acceptable Products:
 - a. PPG Metal Coatings; Duranar: www.ppgmetalcoatings.com/#sle.
 - b. Sherwin-Williams Company; SHER-NAR 5000: oem.sherwin-williams.com/#sle.
 - c. Valspar; Fluropon: www.valsparcoilextrusion.com/#sle.
 - d. Arkema; Kynar 500: www.americas.kynar.com.
 - e. Substitutions: See Section 016000 - Product Requirements.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify roof openings, curbs, pipes, sleeves, ducts, and vents through roof are solidly set, reglets in place, and nailing strips located.
- B. Verify roofing termination and base flashings are in place, sealed, and secure.
- C. Examine substrates, areas, and conditions, with Installer present, to verify actual locations, dimensions and other conditions affecting performance of the Work.
 - 1. Verify compliance with requirements for installation tolerances of substrates.

2. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.
 3. Verify that air- or water-resistant barriers have been installed over sheathing or backing substrate to prevent air infiltration or water penetration.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Install starter and edge strips, and cleats before starting installation.
- B. Install surface mounted reglets true to lines and levels, and seal top of reglets with sealant.

3.3 UNDERLAYMENT INSTALLATION

- A. Felt Underlayment: Install felt underlayment with adhesive for temporary anchorage to minimize use of mechanical fasteners under sheet metal flashing and trim. Apply in shingle fashion to shed water, with lapped joints of not less than 2 inches.
 1. Apply slip sheet, wrinkle free, over underlayment before installing sheet metal flashing and trim.
- B. Synthetic Underlayment: Install synthetic underlayment, wrinkle free, according to manufacturers' written instructions, and using adhesive where possible to minimize use of mechanical fasteners under sheet metal. Apply in shingle fashion to shed water, with lapped and taped joints of not less than 2 inches.
 1. Do not use plastic underlayment where metals will be site soldered or where plastic sheet will be in direct contact with metal sheets exposed to solar daytime heating.
- C. Self-Adhering Sheet Underlayment: Apply primer if required by manufacturer. Comply with temperature restrictions of underlayment manufacturer for installation. Apply at locations indicated below, wrinkle free, in shingle fashion to shed water, and with end laps of not less than 6 inches staggered 24 inches between courses. Overlap side edges not less than 3-1/2 inches. Roll laps with roller. Cover underlayment within 14 days.

3.4 INSTALLATION - GENERAL

- A. Comply with SMACNA Architectural Sheet Metal Manual.
- B. General: Anchor sheet metal flashing and trim and other components of the Work securely in place, with provisions for thermal and structural movement. Use fasteners, solder, protective coatings, separators, sealants, and other miscellaneous items as required to complete sheet metal flashing and trim system.

1. Install sheet metal flashing and trim true to line, levels, and slopes. Provide uniform, neat seams with minimum exposure of solder, welds, and sealant.
 2. Install sheet metal flashing and trim to fit substrates and to result in watertight performance. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.
 3. Install exposed sheet metal flashing and trim with limited oil canning, and free of buckling and tool marks.
 4. Torch cutting of sheet metal flashing and trim is not permitted.
 5. Do not use graphite pencils to mark metal surfaces.
- C. Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with bituminous coating or by other permanent separation as recommended by SMACNA.
1. Coat back side of uncoated aluminum and stainless-steel sheet metal flashing and trim with bituminous coating where concealed flashing and trim will contact wood, ferrous metal, or cementitious construction.
 2. Coat concealed surfaces of aluminum downspout that come into contact with dissimilar metals with two coats of clear lacquer.
 3. Underlayment: Where installing metal directly on cementitious or wood substrates, install underlayment.
- D. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at maximum of 10 feet with no joints within 24 inches of corner or intersection.
- E. Fasteners: Use fastener sizes that penetrate substrate not less than recommended by fastener manufacturer to achieve maximum pull-out resistance, but in no case less than 1-1/4 inches for nails and 3/4 inch for wood screws in wood blocking or sheathing.
- F. Conceal fasteners and expansion provisions where possible in exposed work and locate to minimize possibility of leakage. Cover and seal fasteners and anchors as required for a tight installation.
- G. Seal joints as required for watertight construction.
1. Use sealant-filled joints unless otherwise indicated. Embed hooked flanges of joint members not less than 1 inch into sealant. Form joints to completely conceal sealant. When ambient temperature at time of installation is between 40 and 70 deg F, set joint members for 50 percent movement each way. Adjust setting proportionately for installation at higher ambient temperatures. Do not install sealant-type joints at temperatures below 40 deg F.

2. Prepare joints and apply sealants to comply with requirements in Division 07 Section "Joint Sealants."
- H. Soldered Joints: Clean surfaces to be soldered, removing oils and foreign matter. Pre-tin edges of sheets with solder to width of 1-1/2 inches; however, reduce pre-tinning where pre-tinned surface would show in completed Work.
1. Do not solder metallic-coated steel and aluminum sheet.
 2. Do not use torches for soldering.
 3. Heat surfaces to receive solder, and flow solder into joint. Fill joint completely. Completely remove flux and spatter from exposed surfaces.
 4. Stainless-Steel Soldering: Tin edges of uncoated sheets, using solder for stainless steel and acid flux. Promptly remove acid flux residue from metal after tinning and soldering. Comply with solder manufacturer's recommended methods for cleaning and neutralization.
- I. Rivets: Rivet joints where necessary for strength.

3.5 ROOF FLASHING INSTALLATION

- A. General: Install sheet metal flashing and trim to comply with performance requirements and cited sheet metal standard. Provide concealed fasteners where possible, and set units true to line, levels, and slopes. Install work with laps, joints, and seams that are permanently watertight and weather resistant.
- B. Recessed Reglet Flashings and Counterflashings: Insert flashings full depth into recessed reglet. Anchor by mechanical means, including driven wedges of lead or other compatible metal spaced at 12 inches on center. Seal joint with elastomeric sealant specified in Section 079200.
- C. Surface Mounted Reglet Flashings and Counterflashings: Place surface mounted reglet not less than 9 inches above top of cant strip. Place sealant in preformed groove on back of reglet and on lap before installation. Secure reglet to wall with power driven pins through neoprene washers spaced not less than 16 inches on center. Fill top groove with elastomeric sealant specified in Section 079200. After roofing is installed, install snap-lock counterflashing.
1. Lap counterflashing end joints minimum 3 inches. Do not solder joints. Provide continuous counterflashings at angles and corners, and lap over roof base flashings minimum 4 inches, unless detailed otherwise.
- D. Apply plastic cement compound between metal flashings and felt flashings.
- E. Fit flashings tight in place; make corners square, surfaces true and straight in planes, and lines accurate to profiles.

- F. Seal metal joints watertight.
- G. Equipment Support Flashing: Coordinate installation of equipment support flashing with installation of roofing and equipment. Weld or seal flashing with elastomeric sealant to equipment support member.

3.6 INSTALLATION - WALL FLASHINGS

- A. General: Install sheet metal wall flashing to intercept and exclude penetrating moisture according to cited sheet metal standard unless otherwise indicated. Coordinate installation of wall flashing with installation of wall-opening components such as windows, doors, and louvers.
- B. Opening Flashings in Frame Construction: Install continuous head, sill, jamb, and similar flashings to extend 4 inches beyond wall openings.

3.7 INSTALLATION - PRE-FINISHED SHEET METAL

- A. Take special care in the handling and installation to avoid damage to finish.
- B. Remove protective film from each unit after installation, but not before adjacent construction is complete.
- C. Touch up minor damage or defects to match factory finish. Replace units which are excessively damaged as determined by Architect.

3.8 CLEANING AND PROTECTION

- A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.
- B. Clean off excess sealants.
- C. Remove temporary protective coverings and strippable films as sheet metal flashing and trim are installed unless otherwise indicated in manufacturer's written installation instructions. On completion of sheet metal flashing and trim installation, remove unused materials and clean finished surfaces as recommended by sheet metal flashing and trim manufacturer. Maintain sheet metal flashing and trim in clean condition during construction.
- D. Replace sheet metal flashing and trim that have been damaged or that have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

3.9 SCHEDULE

- A. General:

1. Where more than one metal material is scheduled, provide sheet metal as indicated on Drawings or, if not indicated, to match metal material of adjacent wall or roof material.
 2. Unless otherwise indicated in drawings, where flashings are adjacent to metal wall and roof panel systems or aluminum glazing system frames, match adjacent metal finish and color.
 3. Counterflashing and flashing receivers used in conjunction with premanufactured roof edge flashings shall be premanufactured by manufacturer of roof edge flashings. Other counterflashing and flashing receivers may be either premanufactured or shop fabricated.
 4. Thicknesses shown are minimums. Increase thicknesses as required to comply with SPRI testing requirements and SMACNA recommendations and to meet performance requirements.
 5. Visible is defined as "able to be seen from normal public areas." Provide factory finished materials in visible locations unless otherwise indicated.
- B. Counterflashings, Visible:
1. Prefinished Galvanized Steel: 0.0217 inch.
 2. Finish: PVDF
- C. Counterflashings, Concealed:
1. Stainless Steel: 0.0187 inch.
 2. Finish: 2D dull annealed.
- D. Flashing Receivers, Visible:
1. Prefinished Galvanized Steel: 0.0217 inch.
 2. Finish: PVDF
- E. Flashing Receivers, Concealed:
1. Stainless Steel: 0.0187 inch.
 2. Finish: 2D dull annealed.
- F. Miscellaneous Sheet Metal Fabrications, Trims, Flashings, and Top of Wall Closures, Visible:
1. Aluminum: 0.040 inch thick.
 2. Prefinished Galvanized Sheet Steel: 0.0276 inch.

3. Finish: PVDF
- G. Openings Flashing in Frame Construction, Visible:
1. Aluminum: 0.025 inch thick.
 2. Prefinished Galvanized Sheet Steel: 0.0217 inch.
 3. Finish: PVDF
- H. Openings Flashing in Frame Construction, Concealed:
1. Stainless Steel: 0.0156 inch.
 2. Finish: 2D dull annealed.
- I. Aluminum Glazing Frame Flashing, Concealed:
1. Stainless Steel: 0.0187 inch.
 2. Finish: 2D dull annealed.
- J. Aluminum Glazing Frame Flashing, Visible:
1. Aluminum: 0.032 inch.
 2. Finish: PVDF
- K. Aluminum Glazing Frame Sill Extensions, Visible:
1. Aluminum: 0.040 inch.
 2. Finish: PVDF
- L. Equipment Support Cap Flashing, Roof Penetration Flashing, and Umbrella Flashing:
1. Stainless Steel: 0.0187 inch.
 2. Finish: 2D dull annealed.
- M. Masonry Drip Edges:
1. As specified in Section 04 20 00 - Unit Masonry.
 2. Stainless Steel: 0.0156 inch
 3. Finish: 2D dull annealed.

END OF SECTION 076200

SECTION 077100 - ROOF SPECIALTIES

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Roof edge flashings and copings.
- B. Roof expansion joint covers.

1.2 RELATED REQUIREMENTS

- A. Section 075423 - Thermoplastic Polyolefin (TPO) Membrane Roofing: Warranty requirements for sheet metal copings and edge metals.
- B. Section 076200 - Sheet Metal Flashing and Trim: Custom and site-fabricated sheet metal fabrications.
- C. Section 077200 - Roof Accessories: Manufactured curbs and roof hatches.

1.3 REFERENCE STANDARDS

- A. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix).
- B. ANSI/SPRI/FM 4435/ES-1 - Test Standard for Edge Systems Used with Low Slope Roofing Systems.
- C. ASTM C920 - Standard Specification for Elastomeric Joint Sealants.
- D. ASTM D226/D226M - Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing.
- E. ASTM D4586/D4586M - Standard Specification for Asphalt Roof Cement, Asbestos-Free.
- F. NRCA (RM) - The NRCA Roofing Manual.
- G. SMACNA (ASMM) - Architectural Sheet Metal Manual.

1.4 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate installation of components of this Section with installation of roofing system.
 - 2. Coordinate installation of sealants and roofing cement with work of this Section to ensure water tightness.

- B. Preinstallation Meeting: Convene one week before starting work of this Section.
 - 1. Require attendance of parties directly concerned with the work of this Section, including those who are required to coordinate with the work, and those who are required to protect the work upon completion. Include the manufacturer's technical representative.
 - 2. Review preparation and installation procedures and coordinating and scheduling required with related work.
- C. Sequencing: Do not proceed with installation of flashing and sheet metal work until substrate construction, cants, blocking, reglets, and other construction are ready to receive the work of this Section.

1.5 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide data on shape of components, materials and finishes, anchor types and locations.
- C. Shop Drawings: Indicate configuration and dimension of components, adjacent construction, required clearances and tolerances, and other affected work.
 - 1. Include identification of material, thickness, weight, and finish for each item and location in Project.
 - 2. Include details for joining, supporting, and securing, including layout and spacing of fasteners, cleats, clips, and other attachments. Include pattern of seams.
 - 3. Include details of expansion joints and expansion-joint covers, including showing direction of expansion and contraction from fixed points.
 - 4. Include details of edge conditions, including eaves, ridges, valleys, rakes, crickets, and counterflashings as applicable.
 - 5. Include details of connections to adjoining work.
 - 6. Detail formed flashing and trim at scale of not less than 1-1/2 inches per 12 inches.
- D. Selection Samples: Submit at least 5 color chips in architect's designated range for selection of metal finish and color.
- E. Verification Samples: Submit two finish samples, 6 x 6 inch, illustrating finish and color.
- F. Product Test Reports: For copings and edge metals, for tests performed by a qualified testing agency.

- G. Manufacturer's Installation Instructions: Indicate special procedures, fasteners, supporting members, and perimeter conditions requiring special attention.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Stack material to prevent twisting, bending, and abrasion, and to provide ventilation. Slope metal sheets to ensure drainage.
- B. Prevent contact with materials that could cause discoloration or staining.
- C. Protect strippable protective covering on sheet metal flashing and trim from exposure to sunlight and high humidity, except to extent necessary for period of sheet metal flashing and trim installation.

1.7 WARRANTY

- A. Correct defective Work within a five year period after Date of Substantial Completion. Defective work includes failure of watertightness or seals.
- B. Roofing-System Warranty: Coordinate requirements with roofing system Section.
- C. Provide 20 year manufacturer warranty for prefinished sheet metal materials. Warranty shall include degradation of metal finish.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Acceptable Manufacturers - Roof Edge Flashings and Copings:
 - 1. Architectural Products Co: www.archprod.com/#sle.
 - 2. ATAS International, Inc: www.atas.com/#sle.
 - 3. Drexel Metals Inc: www.drexmet.com/#sle.
 - 4. Hickman Edge Systems: www.hickmanedgesystems.com/#sle.
 - 5. Metal-Era Inc: www.metalera.com/#sle.
 - 6. Metal Roofing Systems, Inc: www.metalroofingsystems.biz/#sle.
 - 7. Pac-Clad Petersen, a Carlisle Company: www.pac-clad.com.
 - 8. Substitutions: See Section 016000 - Product Requirements.
- B. Acceptable Manufacturers - Control and Expansion Joint Covers:
 - 1. Construction Specialties, Inc: www.c-sgroup.com/#sle.
 - 2. EMSEAL Joint Systems, Ltd: www.emseal.com/#sle.

3. GAF: www.gaf.com.
4. Johns Manville: www.jm.com.
5. MM Systems Corp.: www.mmsystemscorp.com.
6. Substitutions: See Section 016000 - Product Requirements.

2.2 PERFORMANCE REQUIREMENTS

A. General:

1. Capable of withstanding structural movement and exposure to wind and weather without failure or permanent deformation.
 - a. Design Pressure: Conforming with ASCE 7 or as indicated on structural drawings, whichever is most restrictive.
2. Physically protect building elements and systems from damage that would permit water leakage into building enclosure assemblies under all weather conditions.

B. Edge Metal Assemblies:

1. Pull-Off Resistance: Tested in accordance with ANSI/SPRI/FM 4435/ES-1, RE-1, RE-2, and RE-3 as applicable to positive and negative design wind pressure as defined by SPRI ES-1.
2. Capable of withstanding structural movement, thermally induced movement, and exposure to wind and weather without failure or permanent deformation.
3. Physically protect roofing systems, roof accessories, and other building elements and systems from damage that would permit water leakage to building interior under all weather conditions.
4. Comply with roofing manufacturer's requirements for full system warranty.

C. Thermal Movements: Provide sheet metal flashing and trim that allows for thermal movements from ambient and surface temperature changes.

1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.

2.3 ROOFING COMPONENTS

- A. Where more than one material is scheduled, provide sheet metal as indicated on Drawings or, if not indicated, to match adjacent wall or roof material, unless otherwise indicated.
- B. Unless otherwise indicated in drawings, where copings and flashings are adjacent to metal panel systems, match adjacent panel finish and color.

- C. Roof Edge Flashings: Factory fabricated to sizes required; mitered corners; concealed fasteners.
 - 1. Configuration: Gravel stop and fascia, and edge securement for roof membrane.
 - 2. Material: Formed steel sheet, galvanized, 24 gauge, 0.024 inch thick, minimum.
 - 3. Finish: 70 percent polyvinylidene fluoride.
 - 4. Color: To be selected by Architect from manufacturer's custom range.
- D. Copings: Factory fabricated to sizes required; mitered corners; concealed fasteners.
 - 1. Configuration: Concealed continuous hold down cleat at both legs; internal splice piece at joints of same material, thickness, and finish as cap; concealed stainless steel fasteners.
 - 2. Material: Formed steel sheet, galvanized, 24 gauge, 0.024 inch thick, minimum.
 - 3. Finish: 70 percent polyvinylidene fluoride.
 - 4. Color: To be selected by Architect from manufacturer's custom range.
- E. Expansion Joint Covers: Composite construction flexible membrane flashing with each edge seamed to aluminum sheet metal flanges, designed for nominal joint width as indicated in Drawings. Include special formed corners, tees, intersections, and wall flashings, each sealed watertight.

2.4 FINISHES

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Superior Performance Coil Coating for Aluminum Sheets: PVDF (Polyvinylidene Fluoride) Organic Finish, AAMA 2605; multiple coat, thermally cured fluoropolymer finish system; color as indicated.
- C. Concealed Surface Finish: Apply pretreatment and manufacturer's standard acrylic or polyester backer finish consisting of prime coat and wash coat with a minimum total dry film thickness of 0.5 mil.

2.5 ACCESSORIES

- A. Fasteners: Non-corrosive type.
 - 1. General: Blind fasteners or self-drilling screws, gasketed, with hex-washer head.

- a. Exposed Fasteners: Heads matching color of sheet metal using plastic caps or factory-applied coating. Provide metal-backed EPDM or PVC sealing washers under heads of exposed fasteners bearing on weather side of metal.
 - b. Blind Fasteners: High-strength aluminum or stainless-steel rivets suitable for metal being fastened.
2. Fasteners for Zinc-Coated (Galvanized) and Aluminum-Zinc Alloy-Coated Steel Sheet: Series 300 stainless steel or hot-dip galvanized steel according to ASTM A 153/A 153M or ASTM F 2329.
- B. Sealant for Joints in Linear Components: As recommended by component manufacturer.
- C. Concealed Sealants: Non-curing butyl sealant.
- D. Exposed Sealants: ASTM C920; elastomeric sealant, with minimum movement capability as recommended by manufacturer for substrates to be sealed; color to match adjacent material.
- E. Adhesive for Anchoring to Roof Membrane: Compatible with roof membrane and approved by roof membrane manufacturer.
- F. Asphalt Roof Cement: ASTM D4586/D4586M, Type I, asbestos-free.
- G. Underlayment: ASTM D226/D226M, organic roofing felt, Type II (No. 30).
- H. Self-Adhering, High-Temperature Sheet Underlayment: Minimum 30 mils thick, consisting of a slip-resistant polyethylene- or polypropylene-film top surface laminated to a layer of butyl- or SBS-modified asphalt adhesive, with release-paper backing; specifically designed to withstand high metal temperatures beneath metal roofing. Provide primer according to written recommendations of underlayment manufacturer.
1. Thermal Stability: Stable after testing at 220 deg F; ASTM D 1970.
 2. Low-Temperature Flexibility: Passes after testing at minus 20 deg F; ASTM D 1970.
 3. Products:
 - a. Carlisle Residential, a division of Carlisle Construction Materials; WIP 300HT.
 - b. Grace Construction Products, a unit of W. R. Grace & Co.; Ultra.
 - c. Henry Company; Blueskin PE200 HT.
 - d. Metal-Fab Manufacturing, LLC; MetShield.

- e. Owens Corning; WeatherLock Metal High Temperature Underlayment.
- f. Polyguard Products, Inc.; Deck Guard HT.
- I. Slip Sheet: Rosin sized building paper, 3 lb/100 sq. ft. minimum.
- J. Bituminous Coating: Cold-applied asphalt mastic, noncorrosive compound free of asbestos, sulfur, and other deleterious impurities; 15 mil dry film thickness per coat.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that deck, curbs, roof membrane, base flashing, and other items affecting work of this Section are in place and positioned correctly.

3.2 PREPARATION

- A. Install starter and edge strips, and cleats before starting installation.

3.3 UNDERLAYMENT INSTALLATION

- A. Self-Adhering Sheet Underlayment: Apply primer if required by manufacturer. Comply with temperature restrictions of underlayment manufacturer for installation. Apply at locations indicated below, wrinkle free, in shingle fashion to shed water, and with end laps of not less than 6 inches staggered 24 inches between courses. Overlap side edges not less than 3-1/2 inches. Roll laps with roller. Cover underlayment within 14 days.
 - 1. Apply continuously under copings and roof edge specialties.
 - 2. Coordinate application of self-adhering sheet underlayment under roof specialties with requirements for continuity with adjacent air barrier materials.
- B. Felt Underlayment: Install felt underlayment with adhesive for temporary anchorage to minimize use of mechanical fasteners under sheet metal flashing and trim. Apply in shingle fashion to shed water, with lapped joints of not less than 2 inches.
- C. Apply slip sheet, wrinkle free, over underlayment before installing sheet metal flashing and trim.

3.4 INSTALLATION

- A. Install components in accordance with manufacturer's instructions and NRCA (RM) applicable requirements.
- B. Anchor components securely.
 - 1. Install cleats, anchor plates, and other anchoring and attachment accessories and devices with concealed fasteners.

2. Anchor copings with manufacturer's required devices, fasteners, and fastener spacing to meet performance requirements.
- C. Coordinate installation of components of this section with installation of roofing membrane and base flashings.
 - D. Coordinate installation of sealants and roofing cement with work of this section to ensure water tightness.
 - E. Metal Protection: Protect metals against galvanic action by separating dissimilar metals from contact with each other or with corrosive substrates by painting contact surfaces with bituminous coating or by other permanent separation as recommended by manufacturer.
 1. Coat back side of uncoated aluminum and stainless-steel roofing specialties with bituminous coating where concealed flashing and trim will contact wood, ferrous metal, or cementitious construction.
 - F. Expansion Provisions: Allow for thermal expansion of exposed roof specialties.
 1. Space movement joints at a maximum of 12 feet with no joints within 18 inches of corners or intersections.
 - G. Seal joints as required for weathertight construction. Place sealant to be completely concealed in joint.

3.5 CLEANING AND PROTECTION

- A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.
- B. Clean off excess sealants.
- C. Remove temporary protective coverings and strippable films as sheet metal flashing and trim are installed unless otherwise indicated in manufacturer's written installation instructions. On completion of sheet metal flashing and trim installation, remove unused materials and clean finished surfaces as recommended by sheet metal flashing and trim manufacturer. Maintain sheet metal flashing and trim in clean condition during construction.
- D. Replace sheet metal flashing and trim that have been damaged or that have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 077100

SECTION 077200 - ROOF ACCESSORIES

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Roof curbs.
- B. Equipment rails.
- C. Roof hatches.
- D. Non-penetrating pedestals.

1.2 RELATED REQUIREMENTS

- A. Section 077100 - Roof Specialties: Other manufactured roof specialty items.

1.3 REFERENCE STANDARDS

- A. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
- B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
- C. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- D. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation.

1.4 ADMINISTRATIVE REQUIREMENTS

- A. Coordination: Coordinate with installation of roofing system and related flashings for weather tight installation.

1.5 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Product Data: Manufacturer's data sheets on each product to be used.
 - 1. Preparation instructions and recommendations.
 - 2. Storage and handling requirements and recommendations.
 - 3. Installation methods.
 - 4. Maintenance requirements.

- C. Warranty Documentation:
 - 1. Submit manufacturer warranty.
 - 2. Ensure that forms have been completed in Owner's name and registered with manufacturer.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Store products in manufacturer's unopened packaging until ready for installation.
- B. Store products under cover and elevated above grade.

1.7 WARRANTY

- A. See Section 017800 - Closeout Submittals for additional warranty requirements.
- B. Extended Correction Period: Correct defective work within 5-year period commencing on Date of Substantial Completion.

PART 2 PRODUCTS

2.1 ROOF CURBS

- A. Acceptable Manufacturers:
 - 1. AES Industries Inc.: www.aescurb.com.
 - 2. The Pate Company: www.patecurbs.com.
 - 3. LMCurbs: www.lmcurbs.com/#sle.
 - 4. MKT Metal Manufacturing: www.mktduct.com/#sle.
 - 5. Substitutions: See Section 016000 - Product Requirements.
- B. Roof Curbs Mounting Assemblies: Factory fabricated hollow sheet metal construction, internally reinforced, and capable of supporting superimposed live and dead loads and designated equipment load with fully mitered and sealed corner joints welded or mechanically fastened, and integral counterflashing with top and edges formed to shed water.
 - 1. Applications: Roof curbs used for roof penetrations/openings as indicated on drawings, HVAC units, exhaust fans, and duct openings.
 - 2. Sheet Metal Material:
 - a. Galvanized Steel: Hot-dip zinc coated steel sheet complying with ASTM A653/A653M, SS Grade 33; G60 coating designation; 18 gauge, 0.048 inch thick.

3. Wind Restraint Straps and Base Flange Attachment: Provide wind restraint straps, welded strap connectors, and base flange attachment to roof structure at perimeter of curb of size and spacing required to meet wind uplift requirements.
 4. Platform Cap: Where portion of equipment support is not covered by equipment, provide weathertight platform cap formed from 3/4-inch thick plywood covered with metal sheet of same type, thickness, and finish as required for curb.
 5. Metal Counterflashing: See Section 076200.
 6. Provide layouts and configurations indicated on drawings.
- C. Curbs Adjacent to Roof Openings: Provide curb on each side of opening, with top of curb horizontal for equipment mounting.
1. Provide preservative treated wood nailers along top of curb.
 2. Insulate inside curbs with 3 inch thick fiberglass insulation.
 3. Height Above Finished Roof Surface: 12 inches, minimum.
- D. Equipment Rail Curbs: Straight curbs on each side of equipment, with top of curbs horizontal and level with each other for equipment mounting.
1. Provide preservative treated wood nailers along top of rails.
 2. Height Above Finished Roof Surface: 12 inches, minimum.

2.2 ROOF HATCHES

- A. Acceptable Manufacturers - Roof Access Hatches:
1. Acudor Products Inc.: www.acudor.com.
 2. Babcock-Davis: www.babcockdavis.com.
 3. Bilco Company: www.bilco.com/sle.
 4. Dur-Red Products: www.dur-red.com/#sle.
 5. Nystrom, Inc: www.nystrom.com/#sle.
 6. Substitutions: See Section 016000 - Product Requirements.
- B. Roof Hatches - General: Factory-assembled aluminum frame and cover, complete with operating and release hardware.
1. Style: Provide flat metal covers unless otherwise indicated.
 2. Mounting: Provide frames and curbs suitable for mounting conditions indicated on the Drawings.

3. Thermally Broken Hatches: Added insulation to frame and cover; outer frame and cover thermally isolated from inner frame and cover.
4. Sizes: As indicated on Drawings; single-leaf style unless indicated as double-leaf.
5. For Ladder Access: Single leaf; 30 by 36 inches.
6. Accessories:
 - a. Extension Post: Extension post for mounting to top rungs of ladder.
 - 1) Finish: Powder coated; safety yellow color.
 - 2) Basis of Design Product:
 - (a) Bilco Co.; Model 1 Ladder Up: www.bilco.com.
 - b. Deflector Plate: Minimum 20 gauge cold rolled steel with non-corrosive screw attachment to hatch support construction.
 - 1) Finish: Powder coat; safety yellow color.
 - 2) Basis of Design Product:
 - (a) Activar, Inc.; Roof Hatch Deflector Plate Kit.
- C. Frames and Curbs: One-piece curb and frame with integral cap flashing to receive roof flashings; extended bottom flange to suit mounting.
 1. Insulation: Manufacturer's standard; 3 inch rigid polyisocyanurate, located on inside hollow curb.
 2. Curb Height: 12 inches from finished surface of roof, minimum.
- D. Metal Covers: Flush, insulated, hollow metal construction.
 1. Capable of supporting 40 psf live load.
 2. Insulation: Manufacturer's standard 3 inch rigid polyisocyanurate.
 3. Gasket: Neoprene, continuous around cover perimeter.
- E. Hardware: Steel, zinc coated and chromate sealed, unless otherwise indicated or required by manufacturer.
 1. Lifting Mechanisms: Compression or torsion spring operator with shock absorbers that automatically opens upon release of latch; capable of lifting covers despite 10 psf load.
 2. Hinges: Heavy duty pintle type.

3. Hold open arm with vinyl-coated handle for manual release.
4. Latch: Upon closing, engage latch automatically and reset manual release.
5. Manual Release: Pull handle on interior.
6. Locking: Padlock hasp on interior.

2.3 NON-PENETRATING ROOFTOP SUPPORTS/ASSEMBLIES

- A. Non-Penetrating Rooftop Support/Assemblies: Manufacturer-engineered and factory-fabricated, with pedestal bases that rest on top of roofing membrane, and not requiring any attachment to roof structure and not penetrating roofing assembly.
 1. Design Loadings and Configurations: As required by applicable codes.
 2. Height: Provide minimum clearance of 6 inches under supported items to top of roofing.
 3. Support Spacing and Base Sizes: As required to distribute load sufficiently to prevent indentation of roofing assembly.
 4. Steel Components: Stainless steel, or carbon steel hot-dip galvanized after fabrication in accordance with ASTM A123/A123M.
 5. Hardware, Bolts, Nuts, and Washers: Stainless steel, or carbon steel hot-dip galvanized after fabrication in accordance with ASTM A153/A153M.
- B. Pipe Supports: Provide attachment fixtures complying with MSS SP-58 and as indicated.
 1. Attachment/Support Fixtures: As recommended by manufacturer, same type as indicated for equivalent indoor hangers and supports; corrosion resistant material.
 2. See relevant piping system specification Section for additional requirements.
- C. Duct Supports: Provide extruded aluminum supports and sized in accordance with diameter of supported ducts, and with base that is non-penetrating of roofing membrane.
- D. Non-Penetrating Pedestals: Steel pedestals with square, round, or rectangular bases.
 1. Bases: High density polypropylene.
 2. Base Sizes: As required to distribute load sufficiently to prevent indentation of roofing assembly.
 3. Steel Components: Stainless steel, or carbon steel hot-dip galvanized after fabrication in accordance with ASTM A123/A123M.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Do not begin installation until substrates have been properly prepared.
- B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 PREPARATION

- A. Clean surfaces thoroughly prior to installation.
- B. Prepare surfaces using methods recommended by manufacturer for achieving acceptable results for applicable substrate under project conditions.

3.3 INSTALLATION

- A. Install in accordance with manufacturer's instructions, in manner that maintains roofing system weather-tight integrity.
- B. Apply bituminous paint on surfaces of units in contact with cementitious materials or dissimilar metals.

3.4 ADJUSTING

- A. Adjust hardware for smooth operation.

3.5 CLEANING

- A. Clean installed work to like-new condition.

3.6 PROTECTION

- A. Protect installed products until completion of project.
- B. Touch-up, repair or replace damaged products before Date of Substantial Completion.

END OF SECTION 077200

SECTION 078100 - APPLIED FIRE PROOFING

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Applied fire protection of interior structural steel not exposed to damage or moisture.

1.2 RELATED REQUIREMENTS

- A. Section 051200 - Structural Steel Framing.
- B. Section 052100 - Steel Joist Framing.
- C. Section 053100 - Steel Decking.

1.3 REFERENCE STANDARDS

- A. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
- B. ASTM E736/E736M - Standard Test Method for Cohesion/Adhesion of Sprayed Fire-Resistive Materials Applied to Structural Members.
- C. ASTM E759/E759M - Standard Test Method for Effect of Deflection on Sprayed Fire-Resistive Material Applied to Structural Members.
- D. ASTM E760/E760M - Standard Test Method for Effect of Impact on Bonding of Sprayed Fire-Resistive Material Applied to Structural Members.
- E. ASTM E859/E859M - Standard Test Method for Air Erosion of Sprayed Fire-Resistive Materials (SFRMs) Applied to Structural Members.
- F. ASTM E937/E937M - Standard Test Method for Corrosion of Steel by Sprayed Fire-Resistive Material (SFRM) Applied to Structural Members.
- G. ASTM G21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi.

1.4 ADMINISTRATIVE REQUIREMENTS

- A. Coordination: Sequence and coordinate with other related work specified in other Sections to comply with the following requirements:
 - 1. Provide temporary enclosure as required to confine spraying operations and protect the environment.
 - 2. Provide temporary enclosures for applications to prevent deterioration of fire-resistive material due to exposure to weather and to unfavorable ambient conditions for humidity, temperature, and ventilation.

3. Avoid unnecessary exposure of fire-resistive material to abrasion and other damage likely to occur during construction operations subsequent to its application.
 4. Do not apply fire-resistive material to metal roof deck substrates until concrete topping, if any, has been completed. For metal roof decks without concrete topping, do not apply fire-resistive material to metal roof deck substrates until roofing has been completed; prohibit roof traffic during application and drying of fire-resistive material.
 5. Do not apply fire-resistive material to metal floor deck substrates until concrete topping has been completed.
 6. Defer installing ducts, piping, and other items that would interfere with applying fire-resistive material until application of fire protection is completed.
 7. Do not install enclosing or concealing construction until after fire-resistive material has been applied, inspected, and tested and corrections have been made to defective applications.
- B. Preinstallation Meeting: Convene one week before starting work of this Section.
1. Review products, design ratings, restrained and unrestrained conditions, densities, thicknesses, bond strengths, and other performance requirements.
 2. Discuss application procedures and limitations, and sequencing in relation to other work.

1.5 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittals procedures.
- B. Product Data: Provide data indicating product characteristics, performance criteria, and limitations of use.
- C. Shop Drawings: Framing plans, schedules, or both, indicating the following:
 1. Extent of fireproofing for each construction and fire-resistance rating.
 2. Applicable fire-resistance design designations of a qualified testing and inspecting agency acceptable to authorities having jurisdiction.
 3. Minimum fireproofing thicknesses needed to achieve required fire-resistance rating of each structural component and assembly.
 4. Treatment of fireproofing after application.
- D. Samples: For each exposed product and for each color and texture specified, in manufacturer's standard dimensions.

- E. Delegated Design: Design applied fire proofing thickness required by the Contract Documents to withstand fire ratings indicated and in accordance with requirements of the Building Code, and as follows:
 - 1. Provide manufacturers standard UL listing where site conditions match standard assembly listings.
- F. Manufacturer's Certificate: Certify that applied fireproofing products meet or exceed requirements of Contract Documents.
 - 1. Provide letter verifying that the UL Designs selected for the project are not load restricted.
 - 2. Provide letter approving latex paint topcoat and application over fireproofing where indicated.
- G. Test Reports: Reports from reputable independent testing agencies for proposed products, indicating compliance with specified criteria, conducted under conditions similar to those on project, as follows:
 - 1. Bond strength.
 - 2. Bond impact.
 - 3. Compressive strength.
 - 4. Fire tests using substrate materials similar those on project.
- H. Manufacturer's Installation Instructions: Indicate special procedures and conditions requiring special attention.
- I. Field Quality Control Submittals: Submit field test report.
- J. Manufacturer Reports: Indicate environmental conditions that applied fireproofing materials were installed.
- K. Manufacturer's Qualification Statement.
- L. Installer's Qualification Statement.

1.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this Section, with not less than five years of documented experience.
- B. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience
- C. Preconstruction Testing: Engage a qualified testing agency to perform preconstruction testing as follows:

1. Provide test specimens and assemblies representative of proposed materials and construction.
2. Preconstruction Adhesion and Compatibility Testing: Test for compliance with requirements for specified performance and test methods.
 - a. Bond Strength: Test for cohesive and adhesive strength according to ASTM E 736. Provide bond strength indicated in referenced fire-resistance design, but not less than minimum specified in Part 2.
 - b. Density: Test for density according to ASTM E 605. Provide density indicated in referenced fire-resistance design, but not less than minimum specified in Part 2.
 - c. Verify that manufacturer, through its own laboratory testing or field experience, attests that primers or coatings are compatible with fireproofing.
 - d. Schedule sufficient time for testing and analyzing results to prevent delaying the Work.
 - e. For materials failing tests, obtain applied-fireproofing manufacturer's written instructions for corrective measures including the use of specially formulated bonding agents or primers.

1.7 MOCK-UP

- A. Comply with general mock-up requirements specified in Section 01 40 00.
- B. In-Place Mock-up: Construct mock-up, 100 square feet in size.
 1. Comply with project requirements for fire ratings.
 2. Locate where directed.
 3. Examine installation within one hour of application to determine variances from specified requirements due to shrinkage, temperature, and humidity.
 4. Where shrinkage and cracking are evident, adjust mixture and method of application as necessary; remove materials and re-construct mock-up.
 5. Mock-up may remain as part of the Work.

1.8 FIELD CONDITIONS

- A. Do not apply fireproofing when temperature of substrate material and surrounding air is below 40 degrees F or when temperature is predicted to be below said temperature for 24 hours after application.

- B. Provide ventilation in areas to receive fireproofing during application and 24 hours afterward, to dry applied material.
- C. Provide temporary enclosure to prevent spray from contaminating air.
- D. Do not allow roof traffic during installation of roof fireproofing and drying period.

1.9 WARRANTY

- A. See Section 017800 - Closeout Submittals, for additional warranty requirements.
- B. Correct defective Work within a five year period after Date of Substantial Completion.
 - 1. Include coverage for fireproofing to remain free from cracking, checking, dusting, flaking, spalling, separation, and blistering.
 - 2. Reinstall or repair failures that occur within warranty period.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Acceptable Manufacturers:
 - 1. Carboline Company: www.carboline.com.
 - 2. GCP Applied Technologies: www.gcpat.com/fireproofing/#sle.
 - 3. Isolatek International Corp.: www.isolatek.com/#sle.
 - 4. Southwest Fireproofing Products Company: www.sfrm.com.
 - 5. Substitutions: See Section 016000 - Product Requirements.
- B. Source Limitations: Obtain fireproofing for each fire-resistance design from single source.

2.2 APPLIED FIRE PROTECTION ASSEMBLIES

- A. UL listings with a Load Restriction are not allowed.
- B. Assemblies: Provide fireproofing, including auxiliary materials, according to requirements of each fire-resistance design and manufacturer's written instructions.

- C. Thickness and Density: ASTM E605, thickness and density as required by UL test to attain the fire endurance rating shown or as required by governing authorities for the application shown. Thickness shown is the minimum thickness required solely to determine clearances and, in case of conflict, the fire endurance rating prevails. For structural members of sizes not included in the UL beam and column designs, calculate the required fireproofing thickness in accordance with the equation listed in the UL "Fire Resistance Directory" for adjustment of applied protection material thickness.
- D. Fire-Resistance Design: Indicated on Drawings, tested according to ASTM E 119 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

2.3 MATERIALS

- A. Sprayed Fire-Resistive Material for Interior Applications, Concealed: Manufacturer's standard factory mixed material, which when combined with water is capable of providing the indicated fire resistance, and conforming to the following requirements:
 - 1. Bond Strength: 150 pounds per square foot, minimum, when tested in accordance with ASTM E736 when set and dry.
 - 2. Dry Density: 15 lb/cu ft, minimum, when tested in accordance with ASTM E605.
 - 3. Thickness: As required for fire-resistance design indicated, measured according to requirements of fire-resistance design or ASTM E 605.
 - 4. Compressive Strength: When tested in accordance with ASTM E761, the material shall not deform more than 10 percent when subjected to a crushing force of 1,440 psf.
 - 5. Effect of Impact on Bonding: No cracking, spalling or delamination, when tested in accordance with ASTM E760.
 - 6. Corrosivity: No evidence of corrosion, when tested in accordance with ASTM E937.
 - 7. Air Erosion Resistance: Weight loss of 0.025 g/sq ft, maximum, when tested in accordance with ASTM E859 after 24 hours.
 - 8. Surface Burning Characteristics: Maximum flame spread index of 0 (zero) and maximum smoke developed index of 0 (zero), when tested in accordance with ASTM E84.
 - 9. Effect of Deflection: No cracking, spalling, or delamination, when tested in accordance with ASTM E759.

10. Fungal Resistance: No growth after 28 days when tested according to ASTM G21.
11. Acceptable Products:
 - a. GCP Applied Technologies; Monokote MK-6: www.gcpat.com.
 - b. Carbolite Company, subsidiary of RPM International, Fireproofing Products Div.; AD Southwest Fireproofing Type 5GP.
 - c. Isolatek International Inc.; Cafco 300: www.isolatek.com.

2.4 ACCESSORIES

- A. General: Provide auxiliary materials that are compatible with fireproofing and substrates and are approved by UL or another testing and inspecting agency acceptable to authorities having jurisdiction for use in fire-resistance designs indicated.
- B. Primer and Bonding Agent: Type recommended by fireproofing manufacturer.
- C. Overcoat: As recommended by manufacturer of applied fire protection material.
- D. Metal Lath: Expanded metal lath; minimum weight of 1.7 psf, galvanized finish.
 1. Include clips, lathing accessories, corner beads, and other anchorage devices required to attach lath to substrates and to receive fireproofing.
- E. Reinforcing Fabric: Glass- or carbon-fiber fabric of type, weight, and form required to comply with fire-resistance designs indicated; approved and provided by fireproofing manufacturer.
- F. Reinforcing Mesh: Metallic mesh reinforcement of type, weight, and form required to comply with fire-resistance design indicated; approved and provided by fireproofing manufacturer. Include pins and attachment.
- G. Water: Clean, potable.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that surfaces are ready to receive fireproofing.
- B. Verify that clips, hangers, supports, sleeves, and other items required to penetrate fireproofing are in place.
- C. Verify that ducts, piping, equipment, or other items that would interfere with application of fireproofing have not been installed.
- D. Verify that voids and cracks in substrate have been filled.

- E. Verify that projections have been removed where fireproofing will be exposed to view as a finish material.

3.2 PREPARATION

- A. Perform tests as recommended by fireproofing manufacturer in applications where adhesion of fireproofing to substrate is in question.
- B. Remove incompatible materials that could effect bond by scraping, brushing, scrubbing, or sandblasting.
- C. Prepare substrates to receive fireproofing in strict accordance with instructions of fireproofing manufacturer.
- D. Apply fireproofing manufacturer's recommended bonding agent on primed steel.
- E. Protect surfaces not scheduled for fireproofing and equipment from damage by overspray, fall-out, and dusting.
- F. Close off and seal duct work in areas where fireproofing is being applied.

3.3 APPLICATION

- A. Install metal lath over structural members as indicated or as required by UL Assembly Design Numbers.
- B. Comply with fireproofing manufacturer's written instructions for mixing materials, application procedures, and types of equipment used to mix, convey, and apply fireproofing; as applicable to particular conditions of installation and as required to achieve fire-resistance ratings indicated.
- C. Apply primer adhesive in accordance with manufacturer's instructions.
- D. Apply fireproofing in uniform thickness and density as necessary to achieve required ratings.
- E. In exposed locations, trowel surface smooth and form square edges, using tools and procedures recommended by fireproofing manufacturer.
- F. Apply overcoat at the rate recommended by fireproofing manufacturer.
- G. Finished Condition: No cracks, voids, spalls, delamination, or any exposure of substrate will be permitted upon complete drying or curing. Surface irregularities (texture and shape only) are acceptable.

3.4 FIELD QUALITY CONTROL

- A. Perform field inspection and testing in accordance with Section 014000 - Quality Requirements.

- B. Inspect installed fireproofing after application and curing for integrity, prior to its concealment.
 - 1. Submit field test reports promptly to Contractor and Architect.
- C. Ensure that actual thicknesses, densities, and bond strengths meet requirements for specified ratings and requirements of authorities having jurisdiction (AHJ).
- D. Repair or replace applied fireproofing at locations where test results indicate fireproofing does not meet specified requirements.
- E. Re-inspect the installed fireproofing for integrity of fire protection, after installation of subsequent work.

3.5 CLEANING

- A. Remove excess material, overspray, droppings, and debris.
- B. Remove fireproofing from materials and surfaces not required to be fireproofed.
- C. At exposed fireproofing, clean surfaces that have become soiled or stained, using manufacturer's recommended procedures.

END OF SECTION 078100

SECTION 078400 - FIRESTOPPING

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Firestopping systems, materials, and accessories.
- B. Fire-resistive joint systems.
- C. Firestopping at electrical junction boxes in fire-rated walls.
- D. Firestopping of all membrane penetrations, through penetrations and joint applications within fire rated assemblies, whether indicated on Drawings or not, and other openings indicated.
- E. Contractor's responsibility for determining required scope of firestopping system work, and for determining applicable tested/listed systems for the entire project, and for securing jurisdictional authority approval of firestopping systems.

1.2 RELATED REQUIREMENTS

- A. Section 070553 - Fire and Smoke Assembly Identification.

1.3 DEFINITIONS

- A. Firestopping: A material or combination of materials used to retain the continuity and integrity of fire- and smoke-rated construction by maintaining an effective barrier against the spread of flame, and to impede the passage of smoke, gases, and moisture through penetrations, blank openings, construction joints, and perimeter fire/smoke containment in or adjacent to fire-and smoke-rated wall, floor, ceiling, and other rated construction assemblies.
- B. Assembly: Particular arrangement of materials specific to type of construction described or detailed in referenced UL or other approved design.
- C. Fire-Resistance-Rated Barriers: Fire-resistance-rated fire walls, fire barriers, fire partitions, smoke barrier walls, rated floor/ceiling assemblies, and structural floors.
- D. Through Penetration: Opening or foreign material passing through or into a fire-resistance-rated assembly or structural floor such that full thickness of rated materials is interrupted.
- E. Membrane Penetration: An opening made through one side of a fire-resistance-rated assembly without passing completely through the assembly.

- F. Fire-Resistant Joint System: Gaps between adjacent sections of fire-resistance-rated walls, exterior walls, top of wall and ceiling, structural floors or roof decks, and adjacent sections of structural floors. Where fire-resistance-rated walls meet non-rated wall or floor conditions, reference "Continuity Joint" conditions.
- G. 3rd Party Tested Systems: Specific products and applications, classified and numbered by UL or other 3rd party approved testing agency in accordance with specific barrier base designs and through penetration applications.
- H. Sleeve: Metal fabrication or pipe section extending through thickness of barrier used to permanently guard penetration in accordance with tested systems.
- I. VOC: Volatile organic compound(s).

1.4 REFERENCE STANDARDS

- A. ASTM C612 - Standard Specification for Mineral Fiber Block and Board Thermal Insulation.
- B. ASTM E1996 - Standard Specification for Performance of Exterior Windows, Curtain Walls, Doors, and Impact Protective Systems Impacted by Windborne Debris in Hurricanes.
- C. ASTM E814 - Standard Test Method for Fire Tests of Penetration Firestop Systems.
- D. ASTM E1399 - Standard Test Method for Cyclic Movement and Measuring the Minimum and Maximum Joint Widths of Architectural Joint Systems.
- E. ASTM E1725 - Standard Test Methods for Fire Tests of Fire-Resistive Barrier Systems for Electrical System Components
- F. ASTM E1966 - Standard Test Method for Fire-Resistive Joint Systems.
- G. ASTM E2174 - Standard Practice for On-Site Inspection of Installed Firestop Systems.
- H. ASTM E2393 - Standard Practice for On-Site Inspection of Installed Fire Resistive Joint Systems and Perimeter Fire Barriers.
- I. ASTM E2307 - Standard Test Method for Determining Fire Resistance of Perimeter Fire Barriers Using Intermediate-Scale, Multi-story Test Apparatus.
- J. ASTM E2837 - Standard Test Method for Determining the Fire Resistance of Continuity Head-of-Wall Joint Systems Installed between Rated Wall Assemblies and Nonrated Horizontal Assemblies.
- K. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

- L. ASTM G21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi.
- M. ASTM E3038 - Standard Practice for Assessing and Qualifying Candidates as Inspectors of Firestop Systems and Fire-Resistive Joint Systems
- N. IFC - International Firestop Council Recommended Guidelines for Evaluating Firestop Systems Engineering Judgements; current edition.
- O. ITS (DIR) - Directory of Listed Products.
- P. FCIA - Firestop Contractors International Association Manual of Practice; current edition.
- Q. FM 4991 - Approval Standard of Firestop Contractors.
- R. FM (AG) - FM Approval Guide.
- S. SCAQMD 1168 - Adhesive and Sealant Applications.
- T. UL 1479 - Standard for Fire Tests of Penetration Firestops.
- U. UL 2079 - Standard for Tests for Fire Resistance of Building Joint Systems.
- V. UL (DIR) - Online Certifications Directory.
- W. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials.
- X. NFPA 96 - Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations.

1.5 ADMINISTRATIVE REQUIREMENTS

- A. Coordination: Stage and coordinate installation of firestopping systems with affected trades and adjacent work in accordance with manufacturer's instructions.
- B. Preinstallation Meeting: Convene one week before starting work of this Section. Notify Owner, who may request attendance by an independent consultant.
 - 1. Require attendance of parties directly concerned with the work of this Section, including those who are required to coordinate with the work, and those who are required to protect the work upon completion. Include the manufacturer's technical representative.
 - 2. Review installation procedures and coordination required with related work, and conditions which could affect successful performance of the work.
- C. Sequencing: Sequence work to permit firestopping materials to be installed after adjacent and surrounding work is complete.

1. Do not cover or conceal firestopping installations until Owner's inspection agency and jurisdictional authority have inspected each installation.

1.6 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Schedule of Firestopping: List each type of penetration, fire rating of the penetrated assembly, and firestopping test or design number.
- C. Product Data: Provide data on product characteristics, performance ratings, and limitations.
- D. Manufacturer's Installation Instructions: Indicate preparation and installation instructions.
- E. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
- F. Certificate from authority having jurisdiction indicating approval of materials used.

1.7 QUALITY ASSURANCE

- A. Fire Testing: Provide firestopping assemblies of designs that provide the scheduled fire ratings when tested in accordance with methods indicated.
 1. Listing in UL (FRD), FM (AG), or ITS (DIR) will be considered as constituting an acceptable test report.
 2. Valid evaluation report published by ICC Evaluation Service, Inc. (ICC-ES) at www.icc-es.org will be considered as constituting an acceptable test report.
 3. Submission of actual test reports is required for assemblies for which none of the above substantiation exists.
- B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this Section with minimum three years documented experience.
- C. Installer Qualifications: Company specializing in performing the work of this Section and:
 1. Trained by firestop system manufacturer.
 2. Meeting any of the three options below:
 - a. Approved by UL in accordance with "UL Solutions Qualified Firestop Contractor Program."
 - b. Approved by Factory Mutual Research Corporation under FM 4991

- c. Meeting all three of the following criteria:
 - 1) Verification of minimum five years documented experience installing work of this type.
 - 2) Verification of at least five satisfactorily completed projects of comparable size and type.
 - 3) Acceptable to the local authorities having jurisdiction (AHJ).
- D. Obtain firestop systems for each type and condition of penetration from a single manufacturer; intermixing of system components for each type and condition of penetration by different manufacturers is not permitted.
- E. Listed and tested assemblies and systems must be utilized, if they exist, before alternative systems requiring Engineering Judgement (EJ)/UL Technical Evaluation (UL TE) or Equivalent Fire Resistance Rated Assembly (EFRRRA) will be considered. Comply with IFC and FCIA for EJ and EFRRRA design and submittal requirements.

1.8 REGULATORY REQUIREMENTS

- A. Comply with execution requirements of authority having jurisdiction including, if applicable, the requirement that all firestopping work be performed by a single qualified firm or subcontractor.

1.9 DELIVERY, STORAGE, AND PROTECTION

- A. Deliver materials in original unopened containers identified with manufacturer's brand designation and applicable UL label.
- B. Do not use damaged or expired materials.

1.10 FIELD CONDITIONS

- A. Comply with firestopping manufacturer's recommendations for temperature and conditions. Maintain uniform temperature of minimum 40 degrees F prior to, during, and after installation of materials
- B. Provide ventilation in areas where solvent-cured materials are being installed.

1.11 WARRANTY

- A. Include agreement to repair or replace joint sealers which fail in joint adhesion, extrusion resistance, migration resistance, general durability, or apparent deterioration beyond manufacturer's printed limitations for stipulated warranty period from Date of Substantial Completion.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Basis of Design Manufacturer:
 - 1. Specified Technologies Inc.: www.stifirestop.com/#sle.
- B. Other Acceptable Manufacturers:
 - 1. 3M Fire Protection Products: www.3m.com/firestop.
 - 2. A/D Fire Protection Systems Inc.: www.adfire.com.
 - 3. GCP Applied Technologies: www.gcpat.com.
 - 4. Hilti, Inc: www.us.hilti.com/#sle.
 - 5. Nelson FireStop Products: www.nelsonfirestop.com.
 - 6. Pecora Corporation: www.pecora.com.
 - 7. RectorSeal: www.rectorseal.com.
 - 8. Tremco Commercial Sealants & Waterproofing: www.tremcosealants.com/#sle.
 - 9. USG: www.usg.com.
 - 10. Substitutions: See Section 016000 - Product Requirements.

2.2 MATERIALS - GENERAL

- A. Firestopping Materials: Any materials meeting requirements specified.
 - 1. Comply with ASTM E814, UL 1479, and UL 2079 as applicable to achieve indicated fire ratings.
- B. Volatile Organic Compound (VOC) Content: Provide products having VOC content lower than that required by SCAQMD 1168.
- C. Primers, Sleeves, Forms, Insulation, Packing, Stuffing, and Accessories: Provide type of materials as required for tested firestopping assembly.
- D. Fire Ratings: Refer to Drawings for required systems and ratings.

2.3 FIRESTOPPING ASSEMBLY REQUIREMENTS

- A. General: Use firestopping systems which are acceptable for those applications for which they are specifically designed. Use of other UL listed systems is Contractor's Option, subject to compliance with specified performance, regulatory, and quality assurance requirements.

1. Where there is no specific tested and classified firestop system for an indicated condition, obtain from the firestopping system manufacturer an Engineering Judgement (EJ) or Equivalent Fire Resistance Rated Assembly (EFRRA) according to IFC and FCIA.
- B. Scope: Install firestopping at all locations requiring protected openings where piping, conduit, cables, sleeves, ductwork and similar items penetrate fire-resistive, fire-rated, and smoke assemblies, including but not limited to:
1. Penetrations through wall, floor, and roof assemblies, including empty openings and openings containing penetrations.
 2. Membrane penetrations where items penetrate one side of the barrier assembly.
 3. Joints between rated assemblies to allow independent movement.
 4. Perimeter barriers between exterior wall assemblies and floor and roof assemblies.
 5. Joints, through-penetrations, and membrane penetrations in smoke-rated assemblies.
- C. Perimeter Fire Containment Firestopping: Use system that has been tested according to ASTM E2307 to have fire resistance F Rating equal to required fire rating of floor assembly.
1. Movement: Provide systems that have been tested to show movement capability as indicated.
 2. Temperature Rise: Provide systems that have been tested to show T Rating as indicated.
 3. Air Leakage: Provide systems that have been tested to show L Rating as indicated.
 4. Where floor assembly is not required to have a fire rating, provide systems that have been tested to show L Rating as indicated.
- D. Head-of-Wall (HW) Joint System Firestopping at Joints Between Fire-Rated Wall Assemblies and Non-Rated Horizontal Assemblies: Use system that has been tested according to ASTM E2837 to have fire resistance F Rating equal to required fire rating of wall assembly.
- E. Floor-to-Floor (FF), Floor-to-Wall (FW), Head-of-Wall (HW), and Wall-to-Wall (WW) Joints, Except Perimeter, Where Both Are Fire-Rated: Use system that has been tested according to ASTM E1966 or UL 2079 to have fire resistance F Rating equal to required fire rating of the assembly in which the joint occurs.

- F. Through Penetration Firestopping: Use system that has been tested according to ASTM E814 to have fire resistance F Rating equal to required fire rating of penetrated assembly.
1. Temperature Rise: Provide systems that have been tested to show T Rating as indicated.
 2. Air Leakage: Provide systems that have been tested to show L Rating as indicated.
 3. Watertightness: Provide systems that have been tested to show W Rating as indicated.
 4. Listing by FM (AG), ITS (DIR), UL (DIR), or UL (FRD) in their certification directories will be considered evidence of successful testing.
- G. Fire Rated Joint Systems: Integrity and indicated fire-resistance ratings as determined by UL 2079, ASTM E1399, or ASTM E1996 as applicable.
- H. Fire Rated Construction: Maintain barrier and structural floor fire resistance ratings including resistance to cold smoke at all penetrations, connections with other surfaces and types of construction, at separations required to permit building movement and sound or vibration absorption, and at other construction gaps.
- I. Smoke Barrier Construction: Maintain fire-resistance-rated wall and floor barrier and structural floor resistance in conformance with UL 1479 F & L ratings at all penetrations, connections with other surfaces and types of construction, at separations required to permit building movement and sound or vibration absorption, and at other construction gaps.
- J. Other General Characteristics:
1. Surface Burning: ASTM E84 and UL 723; flame spread less than 25, smoke developed less than 450.
 2. Air Leakage of Perimeter Firestopping Barriers and Penetrations: UL 2079; L-rating less than 2.0 cfm/sf or 5.0 cfm/lf as applicable to the type and location of joint.
 3. Durability and Longevity: Permanent.
 4. Side Effects During Installation: Non-toxic.
 5. Side Effects Under Fire Exposure: Non-toxic.
 6. Long Term Side Effects: None.

2.4 MATERIALS

- A. Putty Compound: 100 percent solids intumescent or vinyl-type formulation, free of asbestos, silicones, solvents, halogens, PCB's, and inorganic fibers; flame spread/smoke developed rating 0/0 when tested in accordance with ASTM E84; paintable, not sensitive to freezing after set.
- B. Sealant Compound: One-part intumescent, endothermic, ablative, or elastomeric acrylic water-based caulking material required by applicable UL Design; flame spread/smoke developed rating 0/0 when tested in accordance with ASTM E84.
- C. Spray-Applied Compound: Water-based, flexible coating which dries to form a flexible seal; tested in accordance with ASTM E1399, complying with wind sway and thermal category, 500 cycles at minimum 10 cycles/minute.
- D. Foam Compound: Two-part, liquid-silicone elastomer formulated to foam in place when mixed; flame spread/smoke developed rating 0/0 when tested in accordance with ASTM E84.
- E. Plastic Pipe Device: Intumescent strip material, factory or site fabricated in flexible metal collar with adjustable, screw-tightened stainless steel clamp; UL classified for use with PVC, CPVC, CCPVC, CCABS, PVDF, PP, PB, PEX, and FRPP plastic pipe.
- F. Composite Sheet: Composite, intumescent sheet, designed for firestopping large openings in conjunction with other firestopping components, capable of being cut to size in the field and fabricated to fit required penetration openings.
- G. Blanket Material: Refractory ceramic fiber blanket encapsulated with aluminum foil scrim complying with NFPA 96; widths and thicknesses required by applicable UL Design; specifically designed as a flexible, fireproof enclosure for kitchen exhaust ducts and fire-rated air ductwork.
- H. Fire-Safing Insulation: ASTM C612, Type I; high-melt mineral fibers and resinous binders formed into blankets, density not less than 4.0 lbs/cu ft, tested for 3-hour fire containment for required depths and dimensions.
- I. Firestopping Putty Pads: Non-hardening intumescent, putty pad formed to 7.25 x 7.25 x 3/16 inch or 9 x 9 x 3/16 inch self-adhering pads, 2-hour fire rating listed by UL.
- J. EP Powershield Electrical Box Insert Pad: Intumescent, non-curing insert pad for protection of electrical switch and receptacle boxes to reduce horizontal separation to less than 24 inches.

2.5 ACCESSORIES

- A. Provide necessary accessory materials specified in UL Design to achieve complete firestop system at each penetration. Include collars, sleeves, attachment devices, intumescent materials, and other items required.

- B. Primers, Sleeves, Forms, and Accessories: Type required for tested assembly design, and as recommended by firestopping manufacturer for specific substrate surfaces.
- C. Dam Material: Mineral fiberboard, mineral fiber matting, sheet metal, alumina silicate fire board, or other permanent material required as part of the firestopping system, or removable if not specifically required as part of the firestopping system.
- D. Retainers: Impale type clips to support mineral fiber safing blankets.

PART 3 EXECUTION

3.1 EXAMINATION

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

3.2 PREPARATION

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

3.3 INSTALLATION - GENERAL

- A. Install materials in manner described in fire test report and in accordance with manufacturer's instructions, completely closing openings.
- B. Do not cover installed firestopping until inspected by Owner's Independent Testing Agency or in accordance with ASTM E2174 or ASTM E2393 where applicable.
- C. Apply firestopping materials in sufficient thicknesses to achieve scheduled fire ratings, to uniform density and texture.
- D. Install firestop materials within annular spaces at openings which contain penetrating sleeves, piping, ductwork, conduit and other items requiring firestopping.
- E. Remove dam material after firestopping material has cured only if dam material is not required as part of the firestopping system; otherwise dam material to remain permanently in place.
- F. Do not cover installed firestopping until inspected by authorities having jurisdiction.
- G. Install labeling required by code.

3.4 INSTALLATION - FIRE SAFING INSULATION

- A. Install safing insulation to completely fill spaces between floor slab edges and spandrel construction as detailed.

- B. Install safing insulation to completely fill voids between floor and roof deck flutes and top of wall construction where wall ratings are indicated.
- C. Install and support safing insulation permanently in position with gaged metal to comply with tested fire assembly and applicable building code requirements.

3.5 INSTALLATION - FIRESTOPPING PADS

- A. Install firestopping putty pads on back side of electrical junction boxes or EP Powershield Electrical Box (Insert Pads) in fire-rated walls where boxes are located in same stud space on opposite sides of same wall, and elsewhere required by jurisdictional authority and local fire department.

3.6 THROUGH-PENETRATION FIRESTOPPING IDENTIFICATION

- A. Labeling: Identify firestopping systems with pre-printed metal or plastic labels in accordance with FM 4991. Attach label permanently to surfaces immediately adjacent to and within 6 inches of edge of firestop installation so that label will be visible to anyone seeking to remove penetrating items or firestop system.
 - 1. Metal Labels: Use mechanical fasteners.
 - 2. Plastic Labels: Use self-adhering type with adhesive capable of permanently bonding label to substrate and, in combination with label material, will result in partial destruction of label if removal is attempted.
- B. Include following information on each label:
 - 1. The words "Warning - Through-Penetration Firestop System - Do Not Disturb. Notify Building Management of Any Damage."
 - 2. Installing contractor's name, address, and phone number.
 - 3. Firestop system designation, including applicable testing and inspection agency.
 - 4. Date of installation.
 - 5. Firestop system manufacturer's name.
 - 6. Installer's name.
- C. Wall and Partition Identification: Refer to Section 070553 - Fire and Smoke Assembly Identification.

3.7 FIELD QUALITY CONTROL

- A. Independent Testing and Inspection Agency: Inspection agency employed and paid by Owner, will examine penetration firestopping in accordance with ASTM E2174 and ASTM E2393.

- B. Repair or replace penetration firestopping and joints at locations where inspection results indicate firestopping or joints do not meet specified requirements.

3.8 CLEANING

- A. Clean adjacent surfaces of firestopping materials.

3.9 PROTECTION

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

END OF SECTION 078400

https://systems.stfirestop.com/																		
UL Alphanumeric Schedule																		
Type of Penetrant Floor Penetration Systems	Concrete Floors - Minimum thickness Less than or equal to 5"					Concrete Floors - Minimum thickness More than 5"					Framed Floors							
	Caulk	Device	F	T	L	W	Caulk	Device	F	T	L	W	Caulk	Device	F	T	L	W
No Penetrating Item Blank Opening 0000-0999	CAJ-0014		3	2			CAJ-0014		3	2								
	CAJ-0126		2	2	X	X	CAJ-0126		2	2	X	X						
	CAJ-0113		4				CAJ-0113		4									
	CAJ-0116		2				CAJ-0116		2									
	CAJ-0061		3	2	X		CAJ-0061		3	2	X							
Metallic Pipe, Conduit or Tubing 1000-1999	CAJ-1080	CAJ-1353	3		X		CBJ-1058		2		X	X	FC-1010		2	2	X	
	CAJ-1354		2		X		CBJ-1065		2	2	X	X	FC-1013		1	1	X	
	CAJ-1240		2		X	X	CBJ-1066		2	2	X	X	FC-1014		2	1	X	
	CAJ-1533		2				FB-1014		2		X	X	FC-1053		1	1		
	FA-1118		2	2	X	X	FB-1030	FB-1021	2		X		FC-1074	FC-1075	2	1	X	
Non-Metallic Pipe, Conduit or Tubing 2000-2999	CAJ-2292		2	2			CBJ-2046		2		X		FC-2032		1	1	X	
	CAJ-2104		2		X	X	FB-2014		3	3	X	X	FC-2158		2	2	X	
	CAJ-2297		3	3	X	X	CAJ-2297		3	3	X	X	FC-2014	FC-2322	1	1		
	CAJ-2772		2	2	X	X	CAJ-2772		2	2	X	X	FC-2320		1	1		
	FA-2192		3	3	X	X	FA-2192		3	3	X	X	FC-2321		2	2	X	
FA-2210		2	1	X	X	FA-2210		2	1	X	X	FC-2348		2	1	X		
Electrical Cables 3000-3999	CAJ-3154		4	2			CBJ-3034		4				FC-3010		1	1		
	CAJ-3042		3		X		CAJ-3042		3		X		FC-3057		2			
	FA-3055		3		X	X	FA-3055		3		X	X	FC-3041		2	2	X	
	FA-3015		4		X		FA-3015		4		X		FC-3042		1	1	X	
	FA-3037		3	2	X		FA-3037		3	2	X		FC-3045		2	2	X	
	FA-3054		4		X		FA-3054		4		X		FC-3046	FC-3046	1	1	X	
	FA-3064		2	2	X		FA-3064		2	2	X		FC-3103		1			
Cable Trays with Electrical Cables 4000-4999	CAJ-4088		2				CAJ-4088		2									
	CAJ-4089		2		X		CAJ-4089		2		X							
Insulated Pipes 5000-5999	CAJ-5087		2	1	X		CAJ-5087		2	1	X		FC-5014		1	1	X	
	CAJ-5437		2	2			CAJ-5437		2	2			FC-5029		1	1		
	CAJ-5103		2	2	X	X	CAJ-5103		2	2	X	X	FC-5043		2	1	X	
	FA-5041		3	1	X	X	FA-5041		3	1	X	X						
FA-5045		3		X	X	FA-5045		3		X	X							
Miscellaneous Electrical Penetrants - Elec Buss 6000-6999	CAJ-6008		3		X		CAJ-6008		3		X							
	CAJ-6019		3				CAJ-6019		3									
	CAJ-6038		2				CAJ-6038		2									
Miscellaneous Mechanical Penetrants - "Metal Duct and Insulated Metal Duct" 7000-7999	CAJ-7023	CAJ-7027	3		X	X	CAJ-7023	CAJ-7027	3		X	X	FC-7002	FC-7034	1			
	CAJ-7160		2	2			CAJ-7160		2	2			FC-7014		1	1	X	
	CAJ-7143		2		X		CAJ-7143		2		X		FC-7023	FC-7045	1		X	
	CAJ-7106		2				CAJ-7106		2				FC-7060		1	1	X	
Groupings of Penetrations "Multiple Penetrations" 8000-8999	CAJ-8113		2	2			CAJ-8113		2	2			FC-8001		2	2	X	
	CAJ-8188		2		X	X	CAJ-8188		2		X	X	FC-8021	FC-8010	1	1		
	CAJ-8081		3		X		CAJ-8081		3		X		FC-8029	FC-8045	1		X	
	CAJ-8093		3	2	X		CAJ-8093		3	2	X		FC-8036	FC-8043	1	1		
Fuel Line Protection	FP3 / FP4		2	2			Gypsum Wall - Electrical Panel Protection	WL-7307	2	2								

LEGEND
 F - Rating
 T - Rating
 L - Rating
 W - Rating

UL System Alignment
 Left - Caulk
 Right - Device
 Middle - Shaft
 Wall
Bold - Membrane E-Wrap

https://systems.stfirestop.com/	UL Alphanumeric Schedule																		
Type of Penetrant Wall Penetration Systems	Concrete or Masonry Walls - Minimum Thickness less than or equal to 8"					Concrete or Masonry Walls - Minimum Thickness more than 8"					Gypsum Framed Walls								
	Caulk	Device	F	T	L	W	Caulk	Device	F	T	L	W	Caulk	Shaft	Device	F	T	L	W
No Penetrating Item Blank Opening	CAJ-0014		3	2			CAJ-0014		3	2			WL-0016			2	2	X	
	CAJ-0126		2	2	X	X	CAJ-0126		2	2	X	X	WL-0010			4	2	X	
	CAJ-0113		4				CAJ-0113		4				WL-0020			4			
	CAJ-0061		3	2	X		CAJ-0061		3	2	X		WL-0032			2		X	
Metallic Pipe, Conduit or Tubing	CAJ-1080		3		X		CBJ-1058		2		X	X	WL-1173	WL-1384		4			
	CAJ-1353		3		X		CBJ-1065		2	2	X	X	WL-1222	WL-1226		2	1		
	CAJ-1354		2		X		CBJ-1066		2	2	X	X	WL-1251			2			
	CAJ-1240		2		X	X							WL-1049			2		X	
	CAJ-1533		2										WL-1527	WL-1463		2	2	X	
Non-Metallic Pipe, Conduit or Tubing	CAJ-2292		2	2			CBJ-2046		2		X		WL-2241	WL-2635		2	1	X	
	CAJ-2104		2		X	X	CAJ-2297		3	3	X	X	WL-2631	WL-2243		2	2	X	
	CAJ-2297		3	3	X	X	CAJ-2772		2	2	X	X	WL-2237	WL-2288		2	2		
	CAJ-2772		2	2	X	X							WL-2257			2	2		
	WJ-2289		2	2	X								WL-2674	WL-2493		2	2	X	
	WJ-2216		2	1	X								WL-2636	WL-2637		2	2	X	
Electrical Cables	CAJ-3154		4	2			CBJ-3034		4				WL-3171	WL-3172		2			
	CAJ-3042		3		X		CAJ-3042		3		X		WL-3210	WL-3169		2			
	WJ-3063		2	1			CAJ-3154		4	2			WL-3134	WL-3435		2		X	
	WJ-3158	WJ-3158	2	2	X		WJ-3158	WJ-3158	2	2	X		WL-3306	WL-3356		2	2	X	
	WJ-4097		2		X		WJ-4097		2		X		WL-3271	WL-3271		2			
	WJ-3140		2		X		WJ-3140		2		X		WL-3390	WL-3390		4	2	X	
	WJ-3045		2				WJ-3045	WJ-3068	2				WL-3379	WL-3378		2	2	X	
	WJ-3068		2				WK-3001		4	1			WL-3459	WL-3459		2	1	X	
Electrical Box												CLIV			2	2			
Cable Trays with Electrical Cables	CAJ-4088		2				CAJ-4088		2				WL-4008	WL-4029		2			
	CAJ-4089		2		X		CAJ-4089		2		X		WL-4063	WL-4102		2		X	
	WJ-4097		2		X		WJ-4097		2		X		WL-4078	WL-4043		2	2		
													WL-4077			4			
Insulated Pipes	CAJ-5087		2	1	X		CAJ-5087		2	1	X		WL-5121			2	1		
	CAJ-5437		2	2			CAJ-5437		2	2			WL-5014			2	1	X	
	CAJ-5103		2	2	X	X	CAJ-5103		2	2	X	X	WL-5262			2	1		
Miscellaneous Electrical Penetrants - Elec Buss	CAJ-6008		3		X		CAJ-6008		3		X		WL-6001			2		X	
	CAJ-6019		3				CAJ-6019		3				WL-6020			2			
	CAJ-6038		2				CAJ-6038		2				WL-6006			2	2		
Miscellaneous Mechanical Penetrants - "Metal Duct and Insulated Metal Duct"	WJ-7089		2				WJ-7089		2				WL-7025	WL-7164		2		X	
	CAJ-7023	CAJ-7027	3		X	X	CAJ-7023	CAJ-7027	3		X	X	WL-7149	WL-7026		2		X	
	CAJ-7160		2	2			CAJ-7160		2	2			WL-7145			2	2	X	
	CAJ-7143		2		X		CAJ-7143		2		X		WL-7238			2			
	WJ-7092		2		X		WJ-7092		2		X		WL-7066			2			
Groupings of Penetrations "Multiple Penetrations"	CAJ-8188		2		X	X	CAJ-8188		2		X	X	WL-8003			2		X	
	CAJ-8081		3		X		CAJ-8081		3		X		WL-8026			2	2		
	CAJ-8093		3	2	X		CAJ-8093		3	2	X		WL-8073			2			

LEGEND
 F - Rating
 T - Rating
 L - Rating
 W - Rating

**UL System
 Alignment**
 Left - Caulk
 Right - Device
 Middle - Shaft
 Wall

**Bold -
 Membrane
 E-Wrap**

<https://systems.stifirestop.com/> **UL Alphanumeric Schedule**

Type of joint Fire Rated Joint Systems	Joint Width Less Than or Equal to 2"				Joint Width Greater Than 2", Less Than or Equal to 6"										
	0000-0999				1000-1999										
	Caulk	Spray	Device	F	T	L	M	Caulk	Spray	F	T	L	M		
Continuity Joint	CJD-0001			1			II / III								
	CJD-0002			1			II / III								
	CJD-0003			1	1		II / III								
Concrete Floor-to-Floor		FFD-0028		4	4	X	II		FFD-1007	2	2	X	II		
		FFD-0015		4	4	X	II		FFD-1025	3	3	X	II		
	FFD-0001			3	3	X	II	FFD-1008		3	3	X	II		
	FFD-0016			4	4	X	II	FFD-1001		3	3	3X	II		
Edge of Concrete Floor Slab-to-Wall	FWD-0010	FWD-0023		4	4	X	II	FWD-1001		3	3	X	II		
				4	4	X	II			3	3	X	II		
			FWS-0019	2	2	X		FWD-1007		3	3	X	II		
			FWD-0097	1	1	X	II			3	3	X	II		
Concrete or Block Wall to Flat Concrete Slab Floor (Top of Wall)	HWD-0156			4	4	X	II	HWD-1006		3	3	X	II		
	HWD-0157			4	4	X	II	HWD-1094		2	2	X	II		
	HWD-0041			3	3	X	II			3	3	X	II		
Concrete or Block Wall to Concrete Over Fluted Metal Deck (Top of Wall)		HWD-0885		2	2	X	II		HWD-1034	2	2		II		
	HWD-0245			2	2	X	II		HWD-1076	2	2	X	II		
	HWD-0039			2	2	X	II		HWD-1089	2	2		II		
Gypsum Wall to Flat Concrete Slab Floor (Top of Wall)	HWD-0034	HWD-0044		2	2	X	II					2	2	X	II
				4	4	X	II								
			HWD00689	2	2	X	II / III								
			HWD-0618	2	2	X	II / III								
Gypsum Shaft Wall to Flat Concrete Slab (Top of Wall)	HWD-0485		HWD-0548	2	2	X	II								
			HWD-0699	2	2	X	II / III								
Gypsum Wall to Concrete Over Fluted Metal Deck (Top of Wall)	HWD-0034	HWD-0103	HWD-0210		2	2	X	II	HWD-1073	2	2	X	II		
					2	2	X	II	HWD-1074	2	2	X	II		
			HWD-0043		4	4	X	II							
			HWD-0099		2	2	X	II							
			HWD-0252		2	2	X	II							
			HWD-0617		2	2	X	II							
			HWD-0749		2	2	X	II							
Gypsum Shaft Wall to Concrete Over Fluted Deck (Top of Wall)	HWD_0644	HWD-0645		2	2	X	II								
				2	2	X	II								
				2	2	X	II								
Concrete Wall to Wall	WWD-0018			4	4	X	II	WWD-1002		3	3	X	II		
	WWD-0103	WWD-0103		2	2	X	II	WWD-1007		4	4	X	II		
			WWS-0063	2	2	X		WWD-1090		2	2	X	II		
Gypsum Wall-to-Concrete Wall	WWS-0052			4	4	X		WWD-1091	WWD-1090	2	2	X	II		
				2	2	X		WWD-1091	WWD-1091	2	2	X	II		
				2	2	X		WWD-1037	WWD-1037	3	3	X	II		
Bottom of Wall	BWS-0003	BWS-0028	BWS-0017		2	2	X								
					2	2	X								
					4	4									
					2	2	X								
			BWS-0020	2	2	X									
			BWS-0029	2	2	X									

LEGEND
 F - Rating
 L - Rating
 M - Movement

UL System Alignment
 Left - Caulk
 Middle - Spray
 Right - Device
Bold - Shaft Wall

Movement:
 Class I
Thermal
 Class II
Wind-Sway
 Class III
Seismic

* Top-of-Wall Joint May Include Spray-On Monokote Fireproofing
 ** Contact STI For Current UL System or Engineering Judgment
 Note: Per UL System, Verify Class II, or Class III Movement Classification

SECTION 079200 - JOINT SEALANTS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Nonsag gunnable joint sealants.
- B. Self-leveling pourable joint sealants.
- C. Joint backings and accessories.

1.2 RELATED REQUIREMENTS

- A. Section 092900 - Gypsum Board: Sealing acoustical and sound-rated walls and ceilings.

1.3 REFERENCE STANDARDS

- A. ASTM C661 - Standard Test Method for Indentation Hardness of Elastomeric-Type Sealants by Means of a Durometer.
- B. ASTM C794 - Standard Test Method for Adhesion-in-Peel of Elastomeric Joint Sealants.
- C. ASTM C834 - Standard Specification for Latex Sealants.
- D. ASTM C920 - Standard Specification for Elastomeric Joint Sealants.
- E. ASTM C1087 - Standard Test Method for Determining Compatibility of Liquid-Applied Sealants with Accessories Used in Structural Glazing Systems.
- F. ASTM C1193 - Standard Guide for Use of Joint Sealants.
- G. ASTM C1248 - Standard Test Method for Staining of Porous Substrate by Joint Sealants.
- H. ASTM C1311 - Standard Specification for Solvent Release Sealants.
- I. ASTM C1330 - Standard Specification for Cylindrical Sealant Backing for Use with Cold Liquid-Applied Sealants.
- J. ASTM C1521 - Standard Practice for Evaluating Adhesion of Installed Weatherproofing Sealant Joints.
- K. ASTM D2240 - Standard Test Method for Rubber Property--Durometer Hardness.
- L. SCAQMD 1168 - Adhesive and Sealant Applications.

1.4 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Product Data: Submit manufacturer's technical datasheets for each product to be used; include the following:
 - 1. Physical characteristics, including movement capability, VOC content, hardness, cure time, and color availability.
 - 2. List of backing materials approved for use with the specific product.
 - 3. Backing material recommended by sealant manufacturer.
 - 4. Substrates that product is known to satisfactorily adhere to and with which it is compatible.
 - 5. Substrates the product should not be used on.
 - 6. Substrates for which use of primer is required.
 - 7. Substrates for which laboratory adhesion and/or compatibility testing is required.
 - 8. Installation instructions, including precautions, limitations, and recommended backing materials and tools.
 - 9. Sample product warranty.
 - 10. Certification by manufacturer indicating that product complies with specification requirements.
- C. Product Data for Accessory Products: Submit manufacturer's technical data sheet for each product to be used, including physical characteristics, installation instructions, and recommended tools.
- D. Color Cards for Selection: Where sealant color is not specified, submit manufacturer's color cards showing standard colors available for selection.
- E. Samples for Verification: Where custom sealant color is specified, obtain directions from Architect and submit at least two physical samples for verification of color of each required sealant.
- F. Joint-Sealant Schedule: Include the following information:
 - 1. Joint-sealant application, joint location, and designation.
 - 2. Joint-sealant manufacturer and product name.
 - 3. Joint-sealant formulation.

- 4. Joint-sealant color.
- G. Preconstruction Laboratory Test Reports: Submit at least four weeks prior to start of installation.
- H. Preinstallation Field Adhesion Test Plan: Submit at least two weeks prior to start of installation.
- I. Preinstallation Field Adhesion Test Reports: Submit filled out Preinstallation Field Adhesion Test Reports log within 10 days after completion of tests; include bagged test samples and photographic records.
- J. Executed warranty.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
- B. Installer Qualifications: Company specializing in performing the work of this section and with at least three years of documented experience.
- C. Testing Agency Qualifications: Independent firm specializing in performing testing and inspections of the type specified in this section.
- D. Preconstruction Laboratory Testing: Arrange for sealant manufacturer(s) to test each combination of sealant, substrate, backing, and accessories.
 - 1. Adhesion Testing: In accordance with ASTM C794.
 - 2. Compatibility Testing: In accordance with ASTM C1087.
 - 3. Stain Testing: In accordance with ASTM C1248; for porous substrates only.
 - 4. Allow sufficient time for testing to avoid delaying the work.
 - 5. Deliver sufficient samples to manufacturer for testing.
 - 6. Report manufacturer's recommended corrective measures, if any, including primers or techniques not indicated in product data submittals.
 - 7. Testing is not required if sealant manufacturer provides data showing previous testing, not older than 24 months, that shows satisfactory adhesion, lack of staining, and compatibility.
- E. Preinstallation Field Adhesion Test Plan: Include destructive field adhesion testing of one sample of each combination of sealant type and substrate, except interior acrylic latex sealants, and include the following for each tested sample.
 - 1. Identification of testing agency.

2. Name(s) of sealant manufacturer's field representatives who will be observing.
3. Preinstallation Field Adhesion Test Log Form: Include the following data fields, with known information filled out.
 - a. Substrate; if more than one type of substrate is involved in a single joint, provide two entries on form, for testing each sealant substrate side separately.
 - b. Test date.
 - c. Location on project.
 - d. Sealant used.
 - e. Stated movement capability of sealant.
 - f. Test method used.
 - g. Date of installation of field sample to be tested.
 - h. Date of test.
 - i. Copy of test method documents.
 - j. Age of sealant upon date of testing.
 - k. Test results, modeled after the sample form in the test method document.
 - l. Indicate use of photographic record of test.

F. Field Adhesion Test Procedures:

1. Allow sealants to fully cure as recommended by manufacturer before testing.
2. Have a copy of the test method document available during tests.
3. Take photographs or make video records of each test, with joint identification provided in the photos/videos; for example, provide small erasable whiteboard positioned next to joint.
4. Record the type of failure that occurred, other information required by test method, and the information required on the Field Quality Control Log.
5. When performing destructive tests, also inspect the opened joint for proper installation characteristics recommended by manufacturer, and report any deficiencies.
6. Deliver the samples removed during destructive tests in separate sealed plastic bags, identified with project, location, test date, and test results, to Owner.

7. If any combination of sealant type and substrate does not show evidence of minimum adhesion or shows cohesion failure before minimum adhesion, report results to Architect.
- G. Nondestructive Field Adhesion Test: Test for adhesion in accordance with ASTM C1521, using Nondestructive Spot Method.
1. Record results on Field Quality Control Log.
 2. Repair failed portions of joints.
- H. Destructive Field Adhesion Test: Test for adhesion in accordance with ASTM C1521, using Destructive Tail Procedure.
1. Sample: At least 18 inches long.
 2. Minimum Elongation Without Adhesive Failure: Consider the tail at rest, not under any elongation stress; multiply the stated movement capability of the sealant in percent by two; then multiply 1 inch by that percentage; if adhesion failure occurs before the 1-inch mark is that distance from the substrate, the test has failed.
 3. If either adhesive or cohesive failure occurs before minimum elongation, take necessary measures to correct conditions and retest; record each modification to products or installation procedures.
 4. Record results on Field Quality Control Log.
 5. Repair failed portions of joints.
- I. Field Adhesion Tests of Joints: Test for adhesion using most appropriate method in accordance with ASTM C1521, or another applicable method as recommended by manufacturer.

1.6 WARRANTY

- A. See Section 017800 - Closeout Submittals for additional warranty requirements.
- B. Manufacturer Warranty: Provide 2-year manufacturer warranty for installed sealants and accessories that fail to achieve a watertight seal, exhibit loss of adhesion or cohesion, or do not cure. Complete forms in Owner's name and register with manufacturer.
- C. Extended Correction Period: Correct defective work within 2-year period commencing on Date of Substantial Completion.

PART 2 PRODUCTS

2.1 JOINT SEALANT APPLICATIONS

A. Scope:

1. Exterior Joints:

- a. Seal open joints except open joints indicated on drawings as not sealed, including the following:
 - 1) Wall expansion and control joints.
 - 2) Joints between doors, windows, and other frames or adjacent construction.
 - 3) Joints between different exposed materials.
 - 4) Weather sealing joints identified in manufacturer's standard details.

2. Interior Joints:

- a. Do not seal interior joints indicated on drawings as not sealed.
- b. Do not seal through-penetrations in sound-rated assemblies that are also fire-rated assemblies.
- c. Seal the following joints:
 - 1) Joints between door frames and window frames and adjacent construction.

3. Do Not Seal:

- a. Intentional weep holes in masonry.
- b. Joints indicated to be covered with expansion joint cover assemblies.
- c. Joints where sealant is specified to be furnished and installed by manufacturer of product to be sealed.
- d. Joints where sealant installation is specified in other sections.
- e. Joints between suspended ceilings and walls.

B. Type S - Exterior Joints: Use nonsag nonstaining silicone sealant, unless otherwise indicated.

- 1. Type B - Bedding sealant at thresholds and sills: Butyl rubber.
- 2. Type Bn - Lap Joints in Sheet Metal Fabrications: Butyl rubber, noncuring.

3. Type Bn - Lap Joints between Manufactured Metal Panels: Butyl rubber, noncuring.
 4. Type Psl - Control and Expansion Joints in Concrete Paving: Self-leveling polyurethane sealant.
- C. Type P - Interior Joints: Use nonsag polyurethane sealant, unless otherwise indicated.
1. Type L - Wall and Ceiling Joints in Nonwet Areas: Acrylic emulsion latex sealant.
 2. Type Sm - Joints between plumbing fixtures and adjoining walls, floors, and counters: Mildew-resistant silicone sealant.
 3. Type Sm - Joints between Tile in Wet Areas and Floors, Walls, and Ceilings: Mildew-resistant silicone sealant.
 4. Type Esr - Narrow Control Joints in Interior Concrete Slabs: Self-leveling epoxy sealant.
 5. Type Psl - Other Floor Joints: Self-leveling polyurethane traffic-grade sealant.
- D. Definitions:
1. Interior Wet Areas: Bathrooms, restrooms, kitchens, food service areas, and food processing areas; fixtures in wet areas include plumbing fixtures, food service equipment, countertops, cabinets, and other similar items.

2.2 JOINT SEALANTS - GENERAL

- A. Sealants and Primers: Provide products having lower volatile organic compound (VOC) content than indicated in SCAQMD 1168.
- B. Colors for Concealed Locations: Manufacturer's standard.
- C. Colors for Locations Exposed to View: As selected by Architect from Manufacturer's Full Range.
- D. Custom Color-Matched Colors: Where indicated.

2.3 NONSAG JOINT SEALANTS

- A. Type S - Non-Staining Silicone Sealant: ASTM C920, Grade NS, Uses M and A; not expected to withstand continuous water immersion or traffic.
 1. Movement Capability: Plus and minus 50 percent, minimum.
 2. Non-Staining To Porous Materials: Non-staining to light-colored natural stone, masonry, and marble when tested in accordance with ASTM C1248.
 3. Dirt Pick-Up: Reduced dirt pick-up compared to other silicone sealants.

4. Color: To be selected by Architect from manufacturer's full range.
 5. Products:
 - a. Dow; DOWSIL 790 Silicone Building Sealant: www.dow.com/#sle.
 - b. Momentive Performance Materials, Inc/GE Silicones; SCS9000 SilPruf NB - Non-Staining Silicone Weatherproofing Sealant: www.siliconeforbuilding.com/#sle.
 - c. Pecora Corporation; Pecora 864 NST (Non-Staining Technology): www.pecora.com/#sle.
 - d. Sika Corporation; Sikasil WS-295: www.usa.sika.com/#sle.
 - e. Tremco Commercial Sealants & Waterproofing; Spectrem 1: www.tremcosealants.com/#sle.
 - f. Substitutions: See Section 016000 - Product Requirements.
- B. Type Sm - Mildew-Resistant Silicone Sealant: ASTM C920, Grade NS, Uses M and A; single component, mildew resistant; not expected to withstand continuous water immersion or traffic.
1. Color: To be selected by Architect from manufacturer's standard range.
 2. Products:
 - a. Momentive Performance Materials, Inc/GE Silicones; SCS1700 Sanitary Sealant: www.siliconeforbuilding.com.
 - b. Pecora Corporation; 860: www.pecora.com.
 - c. Sika Corporation; Sikasil GP: www.usa.sika.com/#sle.
 - d. Dow Corning Corporation; 786-M.
 - e. Tremco Incorporated; Tremsil 200.
- C. Type P - Polyurethane Sealant: ASTM C920, Grade NS, Uses M and A; single component; not expected to withstand continuous water immersion or traffic.
1. Movement Capability: Plus and minus 50 percent, minimum.
 2. Hardness Range: 20 to 35, Shore A, when tested in accordance with ASTM C661.
 3. Color: To be selected by Architect from manufacturer's standard range.
 4. Service Temperature Range: Minus 40 to 180 degrees F.

5. Products:
 - a. Pecora Corporation; Dynatrol I-XL: www.pecora.com.
 - b. Sika Corporation; Sikaflex-1a: www.usa.sika.com/#sle.
 - c. Tremco Incorporated; Dymonic FC.

- D. Type L - Acrylic Emulsion Latex: Water-based; ASTM C834, single component, non-staining, non-bleeding, non-sagging; not intended for exterior use.
 1. Color: To be selected by Architect from manufacturer's standard range.
 2. Grade: ASTM C834; Grade 0 Degrees F (Minus 18 Degrees C).
 3. Products:
 - a. Momentive Performance Materials, Inc/GE Silicones; RCS20 Acoustical Latex Sealant: www.siliconeforbuilding.com.
 - b. Pecora Corporation; AC-20+: www.pecora.com.
 - c. Sherwin-Williams Company; 950A Siliconized Acrylic Latex Caulk: www.sherwin-williams.com/#sle.
 - d. Tremco Commercial Sealants & Waterproofing; Tremflex 834: www.tremcosealants.com/#sle.
 - e. BASF Building Systems; Sonolac.

- E. Type B - Butyl Sealant: Solvent-based; ASTM C1311; single component, nonsag; not expected to withstand continuous water immersion or traffic.
 1. Service Temperature Range: Minus 13 to 180 degrees F.
 2. Products:
 - a. Sherwin-Williams Company; Storm Blaster All Season Sealant: www.sherwin-williams.com/#sle.
 - b. Pecora Corporation; BC-158.
 - c. Tremco Incorporated; Tremco Butyl Sealant

- F. Type Bn - Noncuring Butyl Sealant: Solvent-based, single component, nonsag, nonskinning, nonhardening, nonbleeding; nonvapor permeable; intended for fully concealed applications.
 1. Products:

- a. Pecora Corporation; Pecora BA-98 Non-Skinning Butyl Sealant: www.pecora.com/#sle.
- b. Tremco Commercial Sealants & Waterproofing; Acoustical/Curtainwall Sealant: www.tremcosealants.com/#sle.
- c. Substitutions: See Section 016000 - Product Requirements.

2.4 SELF-LEVELING JOINT SEALANTS

- A. Type Psl - Self-Leveling Polyurethane Sealant for Continuous Water Immersion: Polyurethane; ASTM C920, Grade P, Uses M and A; single component; explicitly approved by manufacturer for traffic exposure and continuous water immersion.
 1. Hardness Range: 35 to 55, Shore A, when tested in accordance with ASTM C661.
 2. Color: To be selected by Architect from manufacturer's standard range.
 3. Service Temperature Range: Minus 40 to 180 degrees F.
 4. Products:
 - a. Sika Corporation; Sikaflex-1c SL: www.usa.sika.com/#sle.
 - b. W. R. Meadows, Inc; POURTHANE SL: www.wrmeadows.com/#sle.
 - c. Tremco Incorporated; Vulkem 45SSL.
 - d. Pecora Corporation; NR-201.
 - e. Substitutions: See Section 016000 - Product Requirements.
- B. Type Esr - Semi-Rigid Self-Leveling Epoxy Joint Filler: Epoxy or epoxy/polyurethane copolymer; intended for filling cracks and control joints not subject to significant movement; rigid enough to support concrete edges under traffic.
 1. Composition: Multicomponent, 100 percent solids by weight.
 2. Durometer Hardness: Minimum of 85 for Type A or 35 for Type D, after seven days when tested in accordance with ASTM D2240.
 3. Color: To be selected by Architect from manufacturer's standard colors.
 4. Joint Width, Minimum: 1/8 inch.
 5. Joint Width, Maximum: 1/4 inch.
 6. Products:

- a. Adhesives Technology Corporation; CRACKBOND JF-90 HD:
www.atcepoxy.com/#sle.
- b. Euclid Chemical Company; EUCO 700: www.euclidchemical.com/#sle.
- c. Mapei; Mapeiflex Joint Sealant EP 90/50: www.mapei.com/#sle.
- d. Substitutions: See Section 016000 - Product Requirements.

2.5 ACCESSORIES

- A. Sealant Backing Materials, General: Materials placed in joint before applying sealants; assists sealant performance and service life by developing optimum sealant profile and preventing three-sided adhesion; type and size recommended by sealant manufacturer for compatibility with sealant, substrate, and application.
- B. Sealant Backing Rod, Closed-Cell Type: For exterior applications and joints subject to pedestrian or vehicular traffic.
 1. Cylindrical flexible sealant backings complying with ASTM C1330 Type C.
 2. Size: 25 to 50 percent larger in diameter than joint width.
- C. Sealant Backing Rod, Open-Cell Type: For interior applications not subject to pedestrian or vehicular traffic.
- D. Sealant Backing Rod, Bi-Cellular Type: For exterior applications and joints subject to pedestrian or vehicular traffic.
 1. Cylindrical flexible sealant backings complying with ASTM C1330 Type B.
 2. Size: 25 to 50 percent larger in diameter than joint width.
- E. Backing Tape: Self-adhesive polyethylene tape with surface that sealant will not adhere to and recommended by tape and sealant manufacturers for specific application.
- F. Masking Tape: Self-adhesive, nonabsorbent, nonstaining, removable without adhesive residue, and compatible with surfaces adjacent to joints and sealants.
- G. Joint Cleaner: Noncorrosive and nonstaining type, type recommended by sealant manufacturer; compatible with joint forming materials.
- H. Primers: Type recommended by sealant manufacturer to suit application; nonstaining.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that joints are ready to receive work.

- B. Verify that backing materials are compatible with sealants.
- C. Verify that backer rods are of the correct size.
- D. Preinstallation Adhesion Testing: Install a sample for each test location indicated in the test plan.
 - 1. Test each sample as specified in PART 1 under QUALITY ASSURANCE article.
 - 2. Notify Architect of date and time that tests will be performed, at least seven days in advance.
 - 3. Arrange for sealant manufacturer's technical representative to be present during tests.
 - 4. Record each test on Preinstallation Adhesion Test Log as indicated.
 - 5. If any sample fails, review products and installation procedures, consult manufacturer, or take other measures that are necessary to ensure adhesion; retest in a different location; if unable to obtain satisfactory adhesion, report to Architect.
 - 6. After completion of tests, remove remaining sample material and prepare joints for new sealant installation.

3.2 PREPARATION

- A. Remove loose materials and foreign matter that could impair adhesion of sealant.
- B. Clean joints, and prime as necessary, in accordance with manufacturer's instructions.
- C. Perform preparation in accordance with manufacturer's instructions and ASTM C1193.
- D. Mask elements and surfaces adjacent to joints from damage and disfigurement due to sealant work; be aware that sealant drips and smears may not be completely removable.
- E. Concrete Floor Joints That Will Be Exposed in Completed Work: Test joint filler in an inconspicuous area to verify that it does not stain or discolor slab.

3.3 INSTALLATION

- A. Install this work in accordance with sealant manufacturer's requirements for preparation of surfaces and material installation instructions.
- B. Provide joint sealant installations complying with ASTM C1193.
- C. Measure joint dimensions and size joint backers to achieve width-to-depth ratio, neck dimension, and surface bond area as recommended by manufacturer, except where specific dimensions are indicated.

- D. Install bond breaker backing tape where backer rod cannot be used.
- E. Install sealant free of air pockets, foreign embedded matter, ridges, and sags, and without getting sealant on adjacent surfaces.
- F. Do not install sealant when ambient temperature is outside manufacturer's recommended temperature range, or will be outside that range during the entire curing period, unless manufacturer's approval is obtained and instructions are followed.
- G. Nonsag Sealants: Tool surface concave, unless otherwise indicated; remove masking tape immediately after tooling sealant surface.
- H. Concrete Floor Joint Filler: After full cure, shave joint filler flush with top of concrete slab.

3.4 FIELD QUALITY CONTROL

- A. See Section 014000 - Quality Requirements for additional requirements.
- B. Perform field quality control inspection/testing as specified in PART 1 under QUALITY ASSURANCE article.
- C. Non-Destructive Adhesion Testing: If there are any failures in first 100 linear feet, notify Architect immediately.
- D. Destructive Adhesion Testing: If there are any failures in first 1,000 linear feet, notify Architect immediately.
- E. Remove and replace failed portions of sealants using same materials and procedures as indicated for original installation.
- F. Repair destructive test location damage immediately after evaluation and recording of results.

END OF SECTION 079200

SECTION 079513 - EXPANSION JOINT COVER ASSEMBLIES

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Expansion joint cover assemblies for floor, wall, and ceiling surfaces.

1.2 RELATED REQUIREMENTS

- A. Section 077100 - Roof Specialties: Roof expansion and control joint covers.

1.3 REFERENCE STANDARDS

- A. ITS (DIR) - Directory of Listed Products.
- B. UL (DIR) - Online Certifications Directory.

1.4 ADMINISTRATIVE REQUIREMENTS

- A. Installation Templates: For frames and anchors to be embedded in concrete or masonry, furnish templates to relevant installers; include installation instructions and tolerances.

1.5 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide joint assembly profiles, profile dimensions, anchorage devices and available colors and finish.
- C. Shop Drawings: Indicate joint and splice locations, miters, layout of the work, affected adjacent construction and anchorage locations.
- D. Samples: Submit two samples 6 inch long, illustrating profile, dimension, color, and finish selected.
- E. Manufacturer's Installation Instructions: Indicate rough-in sizes and required tolerances for item placement.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Basis of Design:
 - 1. EMSEAL Joint Systems, Ltd: www.emseal.com/#sle.
 - 2. Substitutions: See Section 016000 - Product Requirements.
- B. Other Acceptable Manufacturers:

1. BASF Watson Bowman Acme Corporation: www.wbacorp.com/#sle.
2. Construction Specialties, Inc.: www.c-sgroup.com/#sle.
3. Inpro: www.inprocorp.com/#sle.
4. MM Systems Corp.: www.mmsystemscorp.com.
5. Balco: www.balcousa.com.
6. Substitutions: See Section 016000 - Product Requirements.

2.2 EXPANSION JOINT COVER ASSEMBLIES

- A. Expansion Joint Cover Assemblies - General: Factory-fabricated and assembled; designed to completely fill joint openings, sealed to prevent passage of air, dust, water, smoke,; suitable for traffic expected.
 1. Basis of Design Products:
 - a. Wall Application: EMSEAL Joint Systems, Ltd: WFR.
 - b. Roof Application: EMSEAL Joint Systems, Ltd: DFR with RoofJoint TPV.
 2. Joint Dimensions and Configurations: As indicated on Drawings.
 3. Joint Cover Sizes: Selected to suit joint width and configuration, based on manufacturer's published recommendations and limitations.
 4. Lengths: Provide covers in full lengths required; avoid splicing wherever possible.
 5. Color: As selected by Architect from full range.
- B. Covers In Fire Rated Assemblies: Provide cover assembly having fire rating equivalent to that of assembly into which it is installed.
 1. Acceptable Evaluation Agencies: UL (DIR) and ITS (DIR).

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that joint preparation and dimensions are acceptable and in accordance with manufacturer's requirements.

3.2 INSTALLATION

- A. Install components and accessories in accordance with manufacturer's instructions.

B. Align work plumb and level, flush with adjacent surfaces.

END OF SECTION 079513

SECTION 080671 – DOOR HARDWARE SCHEDULE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section references specification sections relating to commercial door hardware for the following:
1. Swinging doors.
 2. Sliding Doors.
 3. Other doors to the extent indicated.
- B. Commercial door hardware includes, but is not necessarily limited to, the following:
1. Mechanical door hardware.
 2. Electromechanical and access control door hardware.
 3. Electromechanical and access control door hardware power supplies, back-ups and surge protection.
 4. Automatic operators.
 5. Cylinders specified for doors in other sections.
- C. Related Sections:
1. Division 08 Section 081700 “Integrated Door Opening Assemblies”.
 2. Division 08 Section 087100 “Door Hardware”.
 3. Division 28 Section 281500 “Integrated Access Control Hardware Devices”.
 4. Division 28 Section 281523 “Intercom Entry Systems”.
- D. Codes and References: Comply with the version year adopted by the Authority Having Jurisdiction.
1. ANSI A117.1 - Accessible and Usable Buildings and Facilities.
 2. ICC/IBC - International Building Code.
 3. NFPA 70 - National Electrical Code.
 4. NFPA 80 - Fire Doors and Windows.
 5. NFPA 101 - Life Safety Code.
 6. NFPA 105 - Installation of Smoke Door Assemblies.
 7. Michigan Building Codes, Local Amendments.
- E. Standards: Reference Related Sections for requirements regarding compliance with applicable industry standards.

1.3 SUBMITTALS

- A. Product Data: Manufacturer's product data sheets including installation details, material descriptions, dimensions of individual components and profiles, operational descriptions and finishes.
- B. Door Hardware Schedule: Prepared by or under the supervision of supplier, detailing fabrication and assembly of door hardware, as well as procedures and diagrams. Coordinate the final Door Hardware Schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.
 - 1. Format: Comply with scheduling sequence and vertical format in DHI's "Sequence and Format for the Hardware Schedule."
 - 2. Organization: Organize the Door Hardware Schedule into door hardware sets indicating complete designations of every item required for each door or opening. Organize door hardware sets in same order as in the Door Hardware Sets at the end of Part 3. Submittals that do not follow the same format and order as the Door Hardware Sets will be rejected and subject to resubmission.
 - 3. Content: Include the following information:
 - a. Type, style, function, size, label, hand, and finish of each door hardware item.
 - b. Manufacturer of each item.
 - c. Fastenings and other pertinent information.
 - d. Location of door hardware set, cross-referenced to Drawings, both on floor plans and in door and frame schedule.
 - e. Explanation of abbreviations, symbols, and codes contained in schedule.
 - f. Mounting locations for door hardware.
 - g. Door and frame sizes and materials.
 - 4. Submittal Sequence: Submit the final Door Hardware Schedule at earliest possible date, particularly where approval of the Door Hardware Schedule must precede fabrication of other work that is critical in the Project construction schedule. Include Product Data, Samples, Shop Drawings of other work affected by door hardware, and other information essential to the coordinated review of the Door Hardware Schedule.
- C. 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. Product Test Reports: Indicating compliance with cycle testing requirements, based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified independent testing agency.
- E. Operating and Maintenance Manuals: Provide manufacturers operating and maintenance manuals for each item comprising the complete door hardware installation in quantity as required in Division 01, Closeout Submittals. The manual to include the name, address, and contact information of the manufacturers providing the hardware and their nearest service

representatives. The final copies delivered after completion of the installation test to include "as built" modifications made during installation, checkout, and acceptance.

- F. Warranties and Maintenance: Special warranties and maintenance agreements specified in the Related Sections.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Inventory door hardware on receipt and provide secure lock-up and shelving for door hardware delivered to Project site. Do not store electronic access control hardware, software or accessories at Project site without prior authorization.
- B. Tag each item or package separately with identification related to the final Door Hardware Schedule, and include basic installation instructions with each item or package.
- C. Deliver, as applicable, permanent keys, cylinders, cores, access control credentials, software and related accessories directly to Owner via registered mail or overnight package service. Instructions for delivery to the Owner shall be established at the "Keying Conference".

1.5 WARRANTY

- A. General Warranty: Reference Division 01, General Requirements. Special warranties specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

1.6 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.

PART 2 - PRODUCTS

2.1 SCHEDULED DOOR HARDWARE

- A. Refer to "PART 3 – EXECUTION" for required specification sections.

PART 3 - EXECUTION

3.1 DOOR HARDWARE SETS

- A. The door hardware sets represent the design intent and direction of the owner and architect. They are a guideline only and should not be considered a detailed hardware schedule. Discrepancies, conflicting hardware and missing items should be brought to the attention of the architect with corrections made prior to the bidding process. Omitted items not included in a

hardware set should be scheduled with the appropriate additional hardware required for proper application and functionality.

1. Quantities listed are for each pair of doors, or for each single door.
 2. The supplier is responsible for handing and sizing all products.
 3. Where multiple options for a piece of hardware are given in a single line item, the supplier shall provide the appropriate application for the opening.
 4. At existing openings with new hardware the supplier shall field inspect existing conditions prior to the submittal stage to verify the specified hardware will work as required. Provide alternate solutions and proposals as needed.
- B. Products listed in the hardware sets shall be supplied by and in accordance with the requirements described in the specification section as noted for each item.
1. Section 08 17 00 – Integrated Door Opening Assemblies.
 2. Section 08 71 00 – Door Hardware.
 3. Section 28 15 00 – Integrated Access Control Hardware Devices.
 4. Section 28 15 23 - Intercom Entry Systems.
- C. Manufacturer’s Abbreviations:
1. MK - McKinney
 2. PE - Pemko
 3. SU - Securitron
 4. RU - Corbin Russwin
 5. RI - RITE Door
 6. SC - Schlage
 7. RO - Rockwood
 8. RF - Rixson
 9. NO - Norton
 10. DR - DoorBird
 11. SA - SARGENT
 12. OT - Other

Hardware Sets

Set: 1.0

Doors: [V200-1](#)

1 Continuous Hinge

[CFM__SLF-HD1-M x PT](#)

PE 087100

1 Electric Power Transfer	EL-CEPT	630	SU	087100	⚡
1 Rim Exit Device	PED5257T MELR T3557ET M51 M91 M92	630	RU	087100	⚡
1 Rim Cylinder Housing	20-079	.626	SC	087100	
1 Interchangeable Core	- to match Owner's existing restricted key system	.626	SC	087100	
1 Offset Pull	RM5277 - 24" x Type 12HD Mtg	[Finish]	RO	087100	
1 Conc Overhead Stop	6-X36	630	RF	087100	
1 Automatic Opener	6331 - confirm head detail	689	NO	087113	⚡
1 Weatherstrip	- integral within construction of door and frame assembly		00	08 4113	
1 Sweep	29326CNB x TKSP8		PE	087100	
1 Threshold	1715AK MSES25SS		PE	087100	
1 ElectroLynx Harness	QC-C1500P (power transfer or electric strike to junction box above)		MK	087100	⚡
1 ElectroLynx Harness	QC-C (power transfer to exit device rail)		MK	087100	⚡
1 Door Switch (jamb mount)	503		NO	087100	⚡
1 Door Switch (wall mount)	505 (6" x 6")		NO	087100	⚡
1 Position Switch	DPS-M-BK		SU	087100	⚡
1 Power Supply	AQL_ x Amps x Relays (consolidate as applicable)		SU	087100	⚡
1 Card Reader	HID Signo Model 20 / 40 (- Provided by Security Contractor)		00	281300	

Notes: Door normally closed and locked. Key override outside retracts latch bolt of exit device. Valid use of card reader outside will electronically retract latch of exit device permitting entry. Door shall lock and unlock upon schedule as determined in access control system. Depressing push rail upon exit shall shunt door monitoring.

Outside ADA actuator switch will not cycle automatic operator unless latch bolt is retracted (may utilize latch bolt status switch in exit device for this function).

Inside ADA actuator switch automatically retracts latch of exit device and cycles automatic operator.

Free egress always permitted.

Set: 2.0

Doors: 100A, C100

1 Continuous Hinge	CFM__SLF-HD1-M x PT		PE	087100	
1 Electric Power Transfer	EL-CEPT	630	SU	087100	⚡

1 Rim Exit Device	PED5257T MELR M51 M92 Less Pull	630	RU	087100	⚡
1 Rim Cylinder Housing	20-079	.626	SC	087100	
1 Interchangeable Core	- to match Owner's existing restricted key system	.626	SC	087100	
1 Offset Pull	RM5277 - 24" x Type 12HD Mtg	[Finish]	RO	087100	
1 Conc Overhead Stop	6-X36	630	RF	087100	
1 Surface Closer	DC8220 x mounting plate to suit application	689	RU	087100	
1 Weatherstrip	- integral within construction of door and frame assembly		00	08 4113	
1 Sweep	29326CNB x TKSP8		PE	087100	
1 Threshold	1715AK MSES25SS		PE	087100	
1 ElectroLynx Harness	QC-C1500P (power transfer or electric strike to junction box above)		MK	087100	⚡
1 ElectroLynx Harness	QC-C (power transfer to exit device rail)		MK	087100	⚡
1 Position Switch	DPS-M-BK		SU	087100	⚡
1 Power Supply	AQL_ x Amps x Relays (consolidate as applicable)		SU	087100	⚡
1 Card Reader	HID Signo Model 20 / 40 (- Provided by Security Contractor)		00	281300	

Notes: Door normally closed and locked. Key override outside retracts latch bolt of exit device.
Valid use of card reader outside will electronically retract latch of exit device.
Free egress always permitted.

Set: 3.0

Doors: 108A

1 Continuous Hinge	CFM_HD1-M		PE	087100	
1 Rim Exit Device	PED5257T M51 Less Pull	630	RU	087100	
1 Rim Cylinder Housing	20-079	.626	SC	087100	
1 Interchangeable Core	- to match Owner's existing restricted key system	.626	SC	087100	
1 Vandal Resistant Trim	VRT22 C	US32D	RO	087100	
1 Surface Closer	DC8210 A4 M85	689	RU	087100	
1 Kick Plate	K1050 10" high CSK BEV	US32D	RO	087100	
1 Weatherstrip	2891APK x TKSP - head and jambs		PE	087100	
1 Rain Guard	346C TKSP8		PE	087100	
1 Sweep	345AV TKSP		PE	087100	

1 Threshold	279x292AFGPK x MSES25SS		PE	087100	
1 Position Switch	DPS-M-BK		SU	087100	⚡

Notes: Function: Key outside retracts latch bolt. Keyed cylinder inside controls latch bolt dogging. Free egress always permitted.

Set: 4.0

Doors: **V200-2**

1 Continuous Hinge	CFM__SLF-HD1-M x PT		PE	087100	
1 Electric Power Transfer	EL-CEPT	630	SU	087100	⚡
1 Rim Exit Device	PED5257T MELR T3557ET M51 M91 M92	630	RU	087100	⚡
1 Rim Cylinder Housing	20-079	.626	SC	087100	
1 Interchangeable Core	- to match Owner's existing restricted key system	.626	SC	087100	
1 Offset Pull	RM5277 - 24" x Type 12HD Mtg	[Finish]	RO	087100	
1 Conc Overhead Stop	6-X36	630	RF	087100	
1 Automatic Opener	6331 - confirm head detail	689	NO	087113	⚡
1 Sweep	29326CNB x TKSP8		PE	087100	
1 Video Door Station	DoorBird D2100 Series - D2101V	[Finish]	DR	281523	⚡
1 ElectroLynx Harness	QC-C1500P (power transfer or electric strike to junction box above)		MK	087100	⚡
1 Video Indoor Station	DoorBird A1101	[WHT BLK]	DR	281523	⚡
1 ElectroLynx Harness	QC-C (power transfer to exit device rail)		MK	087100	⚡
1 Indoor Station Table Stand	DoorBird A8003		DR	281523	
1 Door Switch (jamb mount)	503		NO	087100	⚡
1 Door Switch (wall mount)	505 (6" x 6")		NO	087100	⚡
1 Position Switch	DPS-M-BK		SU	087100	⚡
1 Power Supply	AQL_ x Amps x Relays (consolidate as applicable)		SU	087100	⚡
1 Card Reader	HID Signo Model 20 / 40 (- Provided by Security Contractor)		00	281300	

Notes: Door normally closed and locked. Key override outside retracts latch bolt of exit device. Valid use of card reader outside or activation of remote button in intercom system will electronically retract latch of exit device permitting entry. Door shall lock and unlock upon schedule as determined in access control system. Depressing push rail upon exit shall shunt door monitoring.

Outside ADA actuator switch will not cycle automatic operator unless latch bolt is retracted (may utilize latch bolt

status switch in exit device for this function).

Inside ADA actuator switch automatically retracts latch of exit device and cycles automatic operator.

Free egress always permitted.

Set: 5.0

Doors: C100B

2 Continuous Hinge	CFM_HD1		PE	081700	
2 Recessed Fire Exit Device (exit only)	D3676 x MEC	US32D	RI	081700	
2 Surface Closer	DC6210 A3	689	RU	081700	
2 Kick Plate	K1050 10" high CSK BEV	US32D	RO	081700	
2 Electromagnetic Holder	994M	689	RF	081700	⚡
1 Meeting Edge Seal	S772C x height of door		PE	081700	
1 Smoke / Sound Seal	S88BL - head and jambs		PE	081700	

Notes: ** Integrated Door and Hardware Assembly.

Doors held open by electromagnetic door holders on adjacent walls. Power for electromagnetic holders shall be connected to fire alarm system in order that doors close immediately upon activation of fire alarm.

(Electromagnetic holder has tri-volt coils for field selectable power: 120VAC, 24VAC/DC, 12VDC)

Set: 6.0

Doors: 105, 107

3 Hinge, Full Mortise	TA2714 (NRP)	US26D	MK	087100	
1 Storeroom Lock	ML2057 PSR	626	RU	087100	
1 Mortise Cylinder Housing	30-007	.626	SC	087100	
1 Interchangeable Core	- to match Owner's existing restricted key system	.626	SC	087100	
1 Surface Closer	DC6200- pull side mount	689	RU	087100	
1 Kick Plate	K1050 10" high CSK BEV	US32D	RO	087100	
1 Wall Stop	RM860	US32D	RO	084126	
1 Smoke / Sound Seal	S88BL - head and jambs		PE	087100	

Notes: Function: Latch bolt operated by key outside or lever inside. Outside lever always rigid. Inside lever always free for egress.

Set: 7.0

Doors: T106

3 Hinge, Full Mortise	TA2714 (NRP)	US26D	MK	087100
1 Privacy Lock (w/ indicator)	ML2060 PSVN M34 V20	626	RU	087100
1 Surface Closer	DC6200- pull side mount	689	RU	087100
1 Kick Plate	K1050 10" high CSK BEV	US32D	RO	087100
1 Wall Stop	RM860	US32D	RO	084126
1 Smoke / Sound Seal	S88BL - head and jambs		PE	087100
1 Coat Hook	RM828	US32D	RO	087100

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

Set: 8.0

Doors: ES100

3 Hinge (heavy weight)	T4A3786 (NRP)	US26D	MK	087100
1 Classroom Lock	ML2055 PSR	626	RU	087100
1 Mortise Cylinder Housing	30-007	.626	SC	087100
1 Interchangeable Core	- to match Owner's existing restricted key system	.626	SC	087100
1 Surface Closer	DC6200- pull side mount	689	RU	087100
1 Kick Plate	K1050 10" high CSK BEV	US32D	RO	087100
1 Electromagnetic Holder	994M	689	RF	087100
1 Smoke / Sound Seal	S88BL - head and jambs		PE	087100

Notes: Function: Latch bolt by lever either side unless outside lever is locked by key outside. Outside lever remains locked unless unlocked by key. Inside lever always free for egress.

Door held open by electromagnetic door holder on adjacent wall. Power for electromagnetic holder shall be connected to fire alarm system in order that door closes immediately upon activation of fire alarm.

(Electromagnetic holder has tri-volt coils for field selectable power: 120VAC, 24VAC/DC, 12VDC)

Set: 9.0

Doors: 101, 102, 103, 104, 108, 109

3 Hinge (heavy weight)	T4A3786 (NRP)	US26D	MK	087100
1 Classroom Lock	ML2055 PSR	626	RU	087100

1 Mortise Cylinder Housing	30-007	.626	SC	087100
1 Interchangeable Core	- to match Owner's existing restricted key system	.626	SC	087100
1 Surface Closer	DC6210 A3	689	RU	087100
1 Kick Plate	K1050 10" high CSK BEV	US32D	RO	087100
1 Wall Stop	RM860	US32D	RO	084126
1 Smoke / Sound Seal	S88BL - head and jambs		PE	087100

Notes: Key from either side locks and unlocks lever outside.
Key from either side retracts latch bolt.
Lever outside retracts latch bolt, except when outside lever is locked by key.
Lever inside always retracts latch bolt for egress.

Set: 10.0

Doors: 203

1 No New	Door Hardware Required		OT	
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Set: Alt A-1 11.0

Doors: 105 Alt A-1, 107 Alt A-1

1 Hinge, Full Mortise, Hvy Wt	T4A3786 x PoE	US26D	MK	087100	
2 Hinge (heavy weight)	T4A3786 (NRP)	630	SU	087100	⚡
1 Access Control Mort Lock	IN220-ML20234 MB PSA BIPS LC	626	RU	281500	⚡
1 Mortise Cylinder Housing	30-007	.626	SC	087100	
1 Interchangeable Core	- to match Owner's existing restricted key system	.626	SC	087100	
1 Surface Closer	DC6200- pull side mount	689	RU	087100	
1 Kick Plate	K1050 10" high CSK BEV	US32D	RO	087100	
1 Wall Stop	RM860	US32D	RO	084126	
1 Smoke / Sound Seal	S88BL - head and jambs		PE	087100	
3 Silencer	608 / 609		RO	087100	
1 ElectroLynx Harness	PoE-C__PRJ power transfer to lock location)		MK	087100	⚡
1 Integrated Door Position Switch	- Built Into Lockset		RU	281500	
1 ElectroLynx Harness	PoE-C1300PRJ (power transfer to junction box above)		MK	087100	⚡
1 Card Reader	- Built Into Lockset		SA	281500	

Notes: Door normally closed and locked. Valid use of card reader / keypad outside temporarily unlocks outside

lever allowing access. Key override outside retracts latch bolt.
 Lockset integral with card reader, door monitoring, and request to exit (REX) function built into inside lever.
 Free egress always permitted.

Set: Alt A-1 12.0

Doors: 101 Alt A-1, 102 Alt A-1, 103 Alt A-1, 104 Alt A-1, 108 Alt A-1, 109 Alt A-1

1 Hinge, Full Mortise, Hvy Wt	T4A3786 x PoE	US26D	MK	087100	⚡
2 Hinge (heavy weight)	T4A3786 (NRP)	US26D	MK	087100	
1 Access Control Mort Lock	IN220-ML20234 MB PSA BIPS LC	626	RU	281500	⚡
1 Mortise Cylinder Housing	30-007	.626	SC	087100	
1 Interchangeable Core	- to match Owner's existing restricted key system	.626	SC	087100	
1 Surface Closer	DC6210 A3	689	RU	087100	
1 Kick Plate	K1050 10" high CSK BEV	US32D	RO	087100	
1 Wall Stop	RM860	US32D	RO	084126	
1 Smoke / Sound Seal	S88BL - head and jambs		PE	087100	
3 Silencer	608 / 609		RO	087100	
1 ElectroLynx Harness	PoE-C___PRJ power transfer to lock location)		MK	087100	⚡
1 Integrated Door Position Switch	- Built Into Lockset		RU	281500	
1 ElectroLynx Harness	PoE-C1300PRJ (power transfer to junction box above)		MK	087100	⚡
1 Card Reader	- Built Into Lockset		SA	281500	

Notes: Door normally closed and locked. Valid use of card reader / keypad outside temporarily unlocks outside lever allowing access. Key override outside retracts latch bolt.
 Lockset integral with card reader, door monitoring, and request to exit (REX) function built into inside lever.
 Free egress always permitted.

END OF SECTION 080671

SECTION 081113 - HOLLOW METAL DOORS AND FRAMES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Standard and custom hollow metal doors and frames.
2. Steel sidelight, borrowed lite and transom frames.
3. Louvers installed in hollow metal doors.
4. Light frames and glazing installed in hollow metal doors.

B. Related Sections:

1. Division 01 Section "General Conditions".
2. Division 04 Section "Unit Masonry" for embedding anchors for hollow metal work into masonry construction.
3. Division 08 Section "Integrated Door Opening Assemblies".
4. Division 08 Section "Glazing" for glass view panels in hollow metal doors.
5. Division 08 Section "Door Hardware".
6. Division 09 Sections "Exterior Painting" and "Interior Painting" for field painting hollow metal doors and frames.
7. Division 28 Section "Access Control Hardware".

C. Codes and References: Comply with the version year adopted by the Authority Having Jurisdiction.

1. ANSI/SDI A250.8 - Recommended Specifications for Standard Steel Doors and Frames.
2. ANSI/SDI A250.4 - Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors, Frames, Frames Anchors and Hardware Reinforcing.
3. ANSI/SDI A250.6 - Recommended Practice for Hardware Reinforcing on Standard Steel Doors and Frames.
4. ANSI/SDI A250.10 - Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames.
5. ANSI/SDI A250.11 - Recommended Erection Instructions for Steel Frames.
6. ASTM A1008 - Standard Specification for Steel Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability.
7. ASTM A653 - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
8. ASTM A924 - Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process.

9. ASTM C 1363 - Standard Test Method for Thermal Performance of Building Assemblies by Means of a Hot Box Apparatus.
10. ANSI/BHMA A156.115 - Hardware Preparation in Steel Doors and Frames.
11. ANSI/SDI 122 - Installation and Troubleshooting Guide for Standard Steel Doors and Frames.
12. ANSI/NFPA 80 - Standard for Fire Doors and Fire Windows; National Fire Protection Association.
13. ANSI/NFPA 105: Standard for the Installation of Smoke Door Assemblies.
14. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies; National Fire Protection Association.
15. UL 10C - Positive Pressure Fire Tests of Door Assemblies.
16. UL 1784 - Standard for Air Leakage Tests of Door Assemblies.

1.3 QUALITY ASSURANCE

- A. Source Limitations: Obtain hollow metal doors and frames through one source from a single manufacturer wherever possible.
- B. Quality Standard: In addition to requirements specified, furnish SDI-Certified manufacturer products that comply with ANSI/SDI A250.8, latest edition, "Recommended Specifications for Standard Steel Doors and Frames".
- C. Fire-Rated Door Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at positive pressure according to UL10C (neutral pressure at 40" above sill) or UL 10C.
 1. Oversize Fire-Rated Door Assemblies Construction: For units exceeding sizes of tested assemblies, attach construction label certifying doors are built to standard construction requirements for tested and labeled fire rated door assemblies except for size.
 2. Temperature-Rise Limit: Where indicated and at vertical exit enclosures (stairwell openings) and exit passageways, provide doors that have a maximum transmitted temperature end point of not more than 450 deg F (250 deg C) above ambient after 30 minutes of standard fire-test exposure.
 3. Smoke Control Door Assemblies: Comply with NFPA 105.
 - a. Smoke "S" Label: Doors to bear "S" label, and include smoke and draft control gasketing applied to frame and on meeting stiles of pair doors.
- D. Fire-Rated, Borrowed-Light Frame Assemblies: Assemblies complying with NFPA 80 that are listed and labeled, by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated, based on testing according to NFPA 257. Provide labeled glazing material.
- E. Storm Shelter Openings: Provide complete door systems for hurricane or tornado storm shelters, and other areas of refuge, complying and tested according to ICC 500 (2014/2020), ICC/NSSA Standard for the Design and Construction of Storm Shelters.
 1. Each unit to bear third party permanent label indicating compliance with the referenced testing standards.

- F. Pre-Submittal Conference: Conduct conference in compliance with requirements in Division 01 Section "Project Meetings" with attendance by representatives of Supplier, Installer, and Contractor to review proper methods and procedures for installing hollow metal doors and frames and to verify installation of electrical knockout boxes and conduit at frames with electrified or access control hardware.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Deliver hollow metal work palletized, wrapped, or crated to provide protection during transit and Project site storage. Do not use non-vented plastic.
- B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.
- C. Store hollow metal work under cover at Project site. Place in stacks of five units maximum in a vertical position with heads up, spaced by blocking, on minimum 4-inch high wood blocking. Do not store in a manner that traps excess humidity.
 - 1. Provide minimum 1/4-inch space between each stacked door to permit air circulation. Door and frames to be stacked in a vertical upright position.

1.5 PROJECT CONDITIONS

- A. Field Measurements: Verify actual dimensions of openings by field measurements before fabrication.

1.6 COORDINATION

- A. Coordinate installation of anchorages for hollow metal frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors. Deliver such items to Project site in time for installation.
- B. Building Information Modeling (BIM) Support: Utilize designated BIM software tools and obtain training needed to successfully participate in the Project BIM processes. All technical disciplines are responsible for the product data integration and data reliability of their Work into the coordinated BIM applications.

1.7 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace doors that fail in materials or workmanship within specified warranty period.
- B. Warranty includes installation and finishing that may be required due to repair or replacement of defective doors.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide steel doors and frames from a SDI Certified manufacturer:
1. CECO Door Products (C).
 2. Curries Company (CU).
 3. Steelcraft (S).

2.2 MATERIALS

- A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B; suitable for exposed applications.
- B. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B; with minimum G60 (Z180) or A60 (ZF180) metallic coating.
- C. Frame Anchors: ASTM A 653/A 653M, Commercial Steel (CS), Commercial Steel (CS), Type B; with minimum G60 (Z180) or A60 (ZF180) metallic coating.

2.3 HOLLOW METAL DOORS

- A. General: Provide 1-3/4 inch doors of design indicated, not less than thickness indicated; fabricated with smooth surfaces, without visible joints or seams on exposed faces unless otherwise indicated. Comply with ANSI/SDI A250.8 and ANSI/NAAMM HMMA 867.
- B. Exterior Doors (Energy Efficient): Face sheets fabricated of commercial quality hot-dipped zinc coated steel that complies with ASTM A924 A60. Provide doors complying with requirements indicated below by referencing ANSI/SDI A250.8 for level and model, ANSI/SDI A250.4 for physical performance level, and HMMA 867 for door construction.
1. Design: Flush panel.
 2. Core Construction: Foamed in place polyurethane and steel stiffened laminated core with no stiffener face welds, in compliance with HMMA 867 "Laminated Core".
 - a. Provide 22-gauge steel stiffeners at 6 inches on-center internally welded at 5" on-center to integral core assembly, foamed in place polyurethane core chemically bonded to all interior surfaces. No stiffener face welding is permitted.
 - b. Thermal properties to rate at a fully operable minimum U-Factor 0.37 and R-Value 2.7, including insulated door, thermal-break frame and threshold.
 3. Level/Model: Level 3 and Physical Performance Level A (Extra Heavy Duty), Minimum 16 gauge (0.053 inch - 1.3-mm) thick steel, Model 2.
 4. Vertical Edges: Vertical edges to be mechanically interlocked with hairline seam. Beveled Lock Edge, 1/8 inch in 2 inches (3 mm in 50 mm).
 5. Top and Bottom Edges: Reinforce tops and bottoms of doors with a continuous steel channel not less than 16 gauge, extending the full width of the door and welded to the face sheet. Doors with an inverted top channel to include a steel closure channel, screw

attached, with the web of the channel flush with the face sheets of the door. Plastic or composite channel fillers are not acceptable.

6. Hinge Reinforcement: Minimum 7 gauge (3/16") plate 1-1/4" x 9".
7. Hardware Reinforcements: Fabricate according to ANSI/SDI A250.6 with reinforcing plates from same material as door face sheets.

C. Interior Doors: Face sheets fabricated of commercial quality cold rolled steel that complies with ASTM A 1008/A 1008M. Provide doors complying with requirements indicated below by referencing ANSI/SDI A250.8 for level and model and ANSI/SDI A250.4 for physical performance level:

1. Design: Flush panel.
2. Core Construction: Manufacturer's standard kraft-paper honeycomb, or one-piece polystyrene core, securely bonded to both faces.
 - a. Fire Door Core: As required to provide fire-protection and temperature-rise ratings indicated.
3. Level/Model: Level 3 and Physical Performance Level A (Extra Heavy Duty), Minimum 16 gauge (0.053-inch - 1.3-mm) thick steel, Model 2.
4. Vertical Edges: Vertical edges to have the face sheets spot welded and filled full height with an epoxy filler. Welds are to be ground, filled and dressed smooth. Beveled Lock Edge, 1/8 inch in 2 inches (3 mm in 50 mm).
5. Top and Bottom Edges: Reinforce tops and bottoms of doors with a continuous steel channel not less than 16 gauge, extending the full width of the door and welded to the face sheet.
6. Hinge Reinforcement: Minimum 7 gauge (3/16") plate 1-1/4" x 9" or minimum 14 gauge continuous channel with pierced holes, drilled and tapped.
7. Hardware Reinforcements: Fabricate according to ANSI/SDI A250.6 with reinforcing plates from same material as door face sheets.

D. Manufacturers Basis of Design:

1. Curries Company (CU) - Polystyrene Core - 707 Series (interior doors).
2. Curries Company (CU) - Energy Efficient - 777 Trio-E Series (exterior doors).

2.4 HOLLOW METAL FRAMES

- A. General: Comply with ANSI/SDI A250.8 and with details indicated for type and profile.
- B. Thermal Break Frames: Subject to the same compliance standards and requirements as standard hollow metal frames. Tested for thermal performance in accordance with NFRC 102, and resistance to air infiltration in accordance with NFRC 400. Where indicated provide thermally broken frame profiles available for use in both masonry and drywall construction. Fabricate with 1/16" positive thermal break and integral vinyl weatherstripping.
- C. Exterior Frames: Fabricated of hot-dipped zinc coated steel that complies with ASTM A 653/A 653M, Coating Designation A60.
 1. Fabricate frames with mitered or coped corners. Profile as indicated on drawings.

2. Frames: Minimum 14 gauge (0.067-inch -1.7-mm) thick steel sheet.
3. Manufacturers Basis of Design:

- a. Curries Company (CU) - Mercury 3 Thermal Break TQ Series.

D. Interior Frames: Fabricated from cold-rolled steel sheet that complies with ASTM A 1008/A 1008M.

1. Fabricate frames with mitered or coped corners. Profile as indicated on drawings.
2. Frames: Minimum 16 gauge (0.053-inch -1.3-mm) thick steel sheet for door openings up to 48 inches in width.
3. Frames: Minimum 14 gauge (0.067-inch -1.7-mm) thick steel sheet for door openings greater than 48 inches in width.
4. Manufacturers Basis of Design:
 - a. Curries Company (CU) - CM Series.
 - b. Curries Company (CU) - M Series.

E. Fire rated frames: Fabricate frames in accordance with NFPA 80, listed and labeled by a qualified testing agency, for fire-protection ratings indicated.

F. Hardware Reinforcement: Fabricate according to ANSI/SDI A250.6 Table 4 with reinforcement plates from same material as frames.

2.5 FRAME ANCHORS

A. Jamb Anchors:

1. Masonry Type: Adjustable strap-and-stirrup or T-shaped anchors to suit frame size, formed from A60 metallic coated material, not less than 0.042 inch thick, with corrugated or perforated straps not less than 2 inches wide by 10 inches long; or wire anchors not less than 0.177 inch thick.
2. Stud Wall Type: Designed to engage stud and not less than 0.042 inch thick.

B. Floor Anchors: Floor anchors to be provided at each jamb, formed from A60 metallic coated material, not less than 0.042 inches thick.

C. Mortar Guards: Formed from same material as frames, not less than 0.016 inches thick.

2.6 LIGHT OPENINGS AND GLAZING

A. Stops and Moldings: Provide stops and moldings around glazed lites where indicated. Form corners of stops and moldings with butted or mitered hairline joints at fabricator's shop. Fixed and removable stops to allow multiple glazed lites each to be removed independently. Coordinate frame rabbet widths between fixed and removable stops with the type of glazing and installation indicated.

B. Moldings for Glazed Lites in Doors and Loose Stops for Glazed Lites in Frames: Minimum 20 gauge thick, fabricated from same material as door face sheet in which they are installed.

- C. Fixed Frame Moldings: Formed integral with hollow metal frames, a minimum of 5/8 inch (16 mm) high unless otherwise indicated. Provide fixed frame moldings and stops on outside of exterior and on secure side of interior doors and frames.
- D. Preformed Metal Frames for Light Openings: Manufacturer's standard frame formed of 0.048-inch-thick, cold rolled steel sheet; with baked enamel or powder coated finish; and approved for use in doors of fire protection rating indicated. Match pre-finished door paint color where applicable.

2.7 ACCESSORIES

- A. Mullions and Transom Bars: Join to adjacent members by welding or rigid mechanical anchors.
- B. Grout Guards: Formed from same material as frames, not less than 0.016 inches thick.

2.8 FABRICATION

- A. Fabricate hollow metal work to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for thickness of metal. Where practical, fit and assemble units in manufacturer's plant. When shipping limitations so dictate, frames for large openings are to be fabricated in sections for splicing or splining in the field by others.
- B. Tolerances: Fabricate hollow metal work to tolerances indicated in ANSI/SDI A250.8.
- C. Hollow Metal Doors:
 - 1. Exterior Doors: Provide optional weep-hole openings in bottom of exterior doors to permit moisture to escape where specified.
 - 2. Glazed Lites: Factory cut openings in doors with applied trim or kits to fit. Factory install glazing where indicated.
 - 3. Astragals: Provide overlapping astragals as noted in door hardware sets in Division 08 Section "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.
 - 4. Continuous Hinge Reinforcement: Provide welded continuous 12 gauge strap for continuous hinges specified in hardware sets in Division 08 Section "Door Hardware".
- D. Hollow Metal Frames:
 - 1. Shipping Limitations: Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of same thickness metal as frames.
 - 2. Welded Frames: Weld flush face joints continuously; grind, fill, dress, and make smooth, flush, and invisible.
 - a. Welded frames are to be provided with two steel spreaders temporarily attached to the bottom of both jambs to serve as a brace during shipping and handling. Spreader bars are for bracing only and are not to be used to size the frame opening.

3. Sidelight and Transom Bar Frames: Provide closed tubular members with no visible face seams or joints, fabricated from same material as door frame. Fasten members at crossings and to jambs by butt welding.
 4. High Frequency Hinge Reinforcement: Provide high frequency hinge reinforcements at door openings 48-inches and wider with mortise butt type hinges at top hinge locations.
 5. Continuous Hinge Reinforcement: Provide welded continuous 12 gauge straps for continuous hinges specified in hardware sets in Division 08 Section "Door Hardware".
 6. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated for removable stops, provide security screws at exterior locations.
 7. Mortar Guards: Provide guard boxes at back of hardware mortises in frames at all hinges and strike preps regardless of grouting requirements.
 8. Floor Anchors: Weld anchors to bottom of jambs and mullions with at least four spot welds per anchor.
 9. Jamb Anchors: Provide number and spacing of anchors as follows:
 - a. Masonry Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches on-center and as follows:
 - 1) Two anchors per jamb up to 60 inches high.
 - 2) Three anchors per jamb from 60 to 90 inches high.
 - 3) Four anchors per jamb from 90 to 120 inches high.
 - 4) Four anchors per jamb plus 1 additional anchor per jamb for each 24 inches or fraction thereof above 120 inches high.
 - b. Stud Wall Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:
 - 1) Three anchors per jamb up to 60 inches high.
 - 2) Four anchors per jamb from 60 to 90 inches high.
 - 3) Five anchors per jamb from 90 to 96 inches high.
 - 4) Five anchors per jamb plus 1 additional anchor per jamb for each 24 inches or fraction thereof above 96 inches high.
 - 5) Two anchors per head for frames above 42 inches wide and mounted in metal stud partitions.
 10. Door Silencers: Except on weatherstripped or gasketed doors, drill stops to receive door silencers. Silencers to be supplied by frame manufacturer regardless if specified in Division 08 Section "Door Hardware".
 11. Bituminous Coating: Where frames are fully grouted with an approved Portland Cement based grout or mortar, coat inside of frame throat with a water based bituminous or asphaltic emulsion coating to a minimum thickness of 3 mils DFT, tested in accordance with UL 10C and applied to the frame under a 3rd party independent follow-up service procedure.
- E. Hardware Preparation: Factory prepare hollow metal work to receive template mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping according to the Door Hardware Schedule and templates furnished as specified in Division 08 Section "Door Hardware."
1. Locate hardware as indicated, or if not indicated, according to ANSI/SDI A250.8.

2. Reinforce doors and frames to receive non-template, mortised and surface mounted door hardware.
3. Comply with applicable requirements in ANSI/SDI A250.6 and ANSI/DHI A115 Series specifications for preparation of hollow metal work for hardware.
4. Coordinate locations of conduit and wiring boxes for electrical connections with Division 26 Sections.

2.9 STEEL FINISHES

- A. Prime Finishes: Doors and frames to be cleaned, and chemically treated to insure maximum finish paint adhesion. Surfaces of the door and frame exposed to view to receive a factory applied coat of rust inhibiting shop primer.
 1. Shop Primer: Manufacturer's standard, fast-curing, lead and chromate free primer complying with ANSI/SDI A250.10 acceptance criteria; recommended by primer manufacturer for substrate; and compatible with substrate and field-applied coatings.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. General Contractor to verify the accuracy of dimensions given to the steel door and frame manufacturer for existing openings or existing frames (strike height, hinge spacing, hinge back set, etc.).
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Remove welded in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces.
- B. Prior to installation, adjust and securely brace welded hollow metal frames for square, level, twist, and plumb condition.
- C. Tolerances shall comply with SDI-117 "Manufacturing Tolerances Standard Steel Doors and Frames."
- D. Drill and tap doors and frames to receive non-template, mortised, and surface-mounted door hardware.
- E. Verify tolerances against manufacturers installations instructions for tornado and hurricane storm shelter openings.

3.3 INSTALLATION

- A. General: Install hollow metal work plumb, rigid, properly aligned, and securely fastened in place; comply with Drawings and manufacturer's written instructions.
- B. Hollow Metal Frames: Install hollow metal frames of size and profile indicated. Comply with ANSI/SDI A250.11 and NFPA 80 at fire rated openings.
 - 1. Set frames accurately in position, plumbed, leveled, aligned, and braced securely until permanent anchors are set. After wall construction is complete and frames properly set and secured, remove temporary braces, leaving surfaces smooth and undamaged. Shim as necessary to comply with installation tolerances.
 - 2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and secure with post-installed expansion anchors.
 - 3. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with mortar.
 - 4. Grout Requirements: Do not grout head of frames unless reinforcing has been installed in head of frame. Do not grout vertical or horizontal closed mullion members.
- C. Hollow Metal Doors: Fit hollow metal doors accurately in frames, within clearances specified below. Shim as necessary.
 - 1. Non-Fire-Rated Standard Steel Doors:
 - a. Jamb and Head: 1/8 inch plus or minus 1/16 inch.
 - b. Between Edges of Pairs of Doors: 1/8 inch plus or minus 1/16 inch.
 - c. Between Bottom of Door and Top of Threshold: Maximum 3/8 inch.
 - d. Between Bottom of Door and Top of Finish Floor (No Threshold): Maximum 3/4 inch.
 - 2. Fire-Rated Doors: Install doors with clearances according to NFPA 80.
- D. Field Glazing: Comply with installation requirements in Division 08 Section "Glazing" and with hollow metal manufacturer's written instructions.

3.4 ADJUSTING AND CLEANING

- A. Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including hollow metal work that is warped, bowed, or otherwise unacceptable.
- B. Remove grout and other bonding material from hollow metal work immediately after installation.
- C. Prime-Coat and Painted Finish Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat, or painted finishes, and apply touchup of compatible air drying, rust-inhibitive primer, zinc rich primer (exterior and galvanized openings) or finish paint.

3.5 FIELD QUALITY CONTROL

- A. Field Inspection (Punch Report): Reference Division 01 Sections “Closeout Procedures”. Produce project punch report for each installed door opening indicating compliance with approved submittals and verification hardware is properly installed, operating and adjusted. Include list of items to be completed and corrected, indicating the reasons or deficiencies causing the Work to be incomplete or rejected.
 - 1. Organization of List: Include separate Door Opening and Deficiencies and Corrective Action Lists organized by Mark, Opening Remarks and Comments, and related Opening Images and Video Recordings.

END OF SECTION 081113

SECTION 081700 – INTEGRATED DOOR OPENING ASSEMBLIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Integrated door opening assemblies including metal frame, integrated door system with operating hardware, and associated door hardware as specified in this section.
2. Factory fitting and hardware preparation for doors and frames.

B. Related Sections:

1. Division 01 Section "General Conditions".
2. Division 08 Section "Hollow Metal Doors and Frames" for integrated assembly doors installed in standard hollow metal frames.
3. Division 08 Section "Glazing" for glass view panels in integrated assemblies.
4. Division 09 Section "Interior Painting" for field painting integrated assembly doors and frames.
5. Division 26 "Electrical" Sections for electrical connections including conduit and wiring for door controls and operators installed on integrated assembly doors and frames with factory installed electrical knock out boxes.

C. Codes and References: Comply with the version year adopted by the Authority Having Jurisdiction.

1. ANSI A117.1 - Accessible and Usable Buildings and Facilities.
2. ANSI/SDI A250.6 - Recommended Practice for Hardware Reinforcing on Standard Steel Doors and Frames.
3. ANSI/SDI A250.8 - Recommended Specifications for Standard Steel Doors and Frames.
4. ANSI/SDI A250.11 - Recommended Erection Instructions for Steel Frames.
5. Intertek Testing Service (ITS Warnock Hersey) - Certification Listings for Fire Doors.
6. ICC/IBC - International Building Code.
7. NFPA 70 - National Electrical Code.
8. NFPA 80 - Fire Doors and Windows.
9. NFPA 101 - Life Safety Code.
10. NFPA 105 - Installation of Smoke Door Assemblies.
11. UL 10C - Positive Pressure Fire Tests of Door Assemblies.
12. Michigan Building Codes, Local Amendments.

D. Standards: All hardware specified herein to comply with the current version year of the following industry standards:

1. ANSI/BHMA Certified Product Standards, A156 Series.

1.3 SUBMITTALS

- A. Product Data: Manufacturer's product data sheets including integrated opening assembly construction and installation details, material descriptions, core descriptions, hardware reinforcements, profiles, anchorage, fire resistance rating, operational descriptions and finishes.
- B. Door Hardware Schedule: Organize the Door Hardware Schedule into door hardware sets indicating complete designations of every item required for each door or opening. Comply with scheduling sequence and vertical format in DHI's "Sequence and Format for the Hardware Schedule." Include the following information:
 1. Type, style, function, size, label, hand, and finish of each door hardware item.
 2. Manufacturer of each item.
 3. Fastenings and other pertinent information.
 4. Location of door hardware set, cross-referenced to Drawings, both on floor plans and in door and frame schedule.
 5. Explanation of abbreviations, symbols, and codes contained in schedule.
 6. Mounting locations for door hardware.
- C. Shop Drawings: Include the following:
 1. Elevations of each door design.
 2. Details of door and frames types including dimensioned profiles and metal thicknesses.
 3. Locations of reinforcement and preparations for hardware.
 4. Details of anchorages, joints, field splices, and connections.
 5. Details of accessories.
 6. Details of moldings, removable stops, and glazing.
 7. Details of conduit and preparations for power, signal, and control systems.
 8. Provide all dimensions necessary required to complete recessed pockets.
- D. Keying Schedule: Reference Division 08 Section "Door Hardware" for keying requirements.
- E. Operating and Maintenance Manuals: Provide manufacturers operating and maintenance manuals for each item comprising the complete integrated assembly installation in quantity as required in Division 01, Closeout Submittals. The manual to include the name, address, and contact information of the manufacturers providing the installed assemblies and their nearest service representatives. The final copies delivered after completion of the installation test to include "as built" modifications made during installation, checkout, and acceptance.
- F. Warranties and Maintenance: Special warranties and maintenance agreements specified in this Section.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to the project site under provisions Division 01 Section "Product Storage and Handling Requirements". Inspect doors, frames, and hardware with representatives of the supplier to verify shipment is complete and to rectify discrepancies promptly.

1. Integrated door assembly systems to be delivered to the job site complete with necessary screws, miscellaneous parts, instructions, and installation templates. Each package legibly and properly labeled to correspond to the approved Door Schedule.
- B. Furnish integrated door opening assemblies with operating hardware flush to door skin, using protective wrappings and spacers between projecting hardware. Maintain and protect door assemblies using cardboard spacers and protective edge guards along the door edges, to reduce exposure to marring or damage during storage.
- C. Store integrated door opening assemblies in dry and secure area. Do not store electronic access control software, credentials, or accessories at Project site without prior authorization.

1.5 PROJECT CONDITIONS

- A. Field Measurements: Verify actual dimensions of openings by field measurements before fabrication.

1.6 COORDINATION

- A. Building Information Modeling (BIM) Support: Utilize designated BIM software tools and obtain training needed to successfully participate in the Project BIM processes. All technical disciplines are responsible for the product data integration and data reliability of their Work into the coordinated BIM applications.
- B. Electrical Connections: Coordinate the layout and installation of scheduled electrified hardware and related access control equipment with required connections to source power junction boxes, low voltage power supplies, detection and monitoring hardware, and fire and detection alarm systems.

1.7 WARRANTY

- A. General Warranty: Reference Division 01, General Requirements. Special warranties specified in this Article will not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and are in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.
 1. This warranty does not cover defects or damage arising from improper installation, lack of or improper maintenance, improper storage, improper handling, corrosion, erosion, ordinary wear and tear, misuse, abuse, accident, unauthorized service or use with unauthorized RITE Door® products or parts.
 2. This warranty is void if any modifications are made to the product, regardless of whether the modification causes or contributes to the alleged defect. All modifications are made at the risk of the party making the modification.
- B. Warranty Periods: Manufacturer's standard written form, with the exceptions noted below, warranting integrated door opening assemblies to be free of defect in material or workmanship under normal use for a period of five (5) years.
 1. Hollow Metal Doors: Lifetime.

2. Hinges: Up to twenty-five (25) years based upon model and manufacturer.
3. Continuous Hinges: Ten (10) years.
4. Door Closers: Up to twenty-five (25) years based upon model and manufacturer.
5. Electrical Products (except MLR exit devices): Three (3) years.

- C. Warranty includes the manufacturer, at their sole option, agreeing to repair or replace products or parts found to be defective in material or workmanship according to details contained in the warranty certificate.

1.8 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 integrated door opening assemblies.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by the following:

1. Adams Rite Manufacturing (RD) - The RITE Door.
2. Total Door.
3. Substitutions: Requests for substitutions and product approval for inclusive integrated door opening assembly systems in compliance with the specifications must be submitted in writing and in accordance with the procedures and time frames outlined in Division 01, Substitution Procedures. Approval of requests is at the discretion of the architect, owner, and their designated consultants.

2.2 STEEL MATERIAL REQUIREMENTS

- A. General:

1. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B; suitable for exposed applications.
2. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B; with minimum G60 (Z180) or A60 (ZF180) metallic coating.

- B. Hollow Metal Doors: Face sheets fabricated of commercial quality cold rolled steel that complies with ASTM A 1008/A 1008M. Provide doors complying with requirements indicated below by referencing ANSI/SDI A250.8 for level and model and ANSI/SDI A250.4 for physical performance level:

1. Design: Flush panel.
2. Core Construction: Manufacturer's standard kraft-paper honeycomb, or one-piece polystyrene core, securely bonded to both faces.

- 1). Fire Door Core: As required to provide fire-protection and temperature-rise ratings indicated.
 3. Level/Model: Level 2 and Physical Performance Level B (Heavy Duty), Minimum 18 gauge (0.042-inch - 1.0-mm) thick steel, Model 1.
 4. Top and Bottom Edges: Reinforce tops and bottoms of doors with a continuous steel channel not less than 16 gauge, extending the full width of the door and welded to the face sheet.
 5. Hinge Reinforcement: Minimum 7 gauge (3/16") plate 1-1/4" x 9" or minimum 14 gauge continuous channel with pierced holes, drilled and tapped.
 6. Hardware Reinforcements: Fabricate according to ANSI/SDI A250.6 with reinforcing plates from same material as door face sheets.
- C. Steel Frames:

Fabricated from cold-rolled steel sheet that complies with ASTM A 1008/A 1008M. Comply with ANSI/SDI A250.8 and with details indicated for type and profile.

1. Fabricate frames with mitered or coped corners.
2. Fabricate frames with "closed and tight" miter seams continuously welded on face, finished smooth with no visible seam unless otherwise indicated.
3. Frames for openings up to 48 inches in width: Minimum 16 gauge thick steel sheet.
4. Frames for openings 48 inches and wider in width: Minimum 14 gauge thick steel sheet.
5. Fire rated frames: Fabricate frames in accordance with NFPA 80, listed and labeled by a qualified testing agency, for fire-protection ratings indicated.
6. Hardware Reinforcement: Fabricate according to ANSI/SDI A250.6 Table 4 with reinforcement plates from same material as frames.
7. Provide suitable adjustable type anchors for wall condition, minimum 4 each per jamb.

2.3 DOOR HARDWARE MATERIAL REQUIREMENTS:

- A. Provide a complete integrated door opening assembly, including the installation and adjustment of the latching mechanism within the door construction.
- B. Door hardware to include the following minimum products for each integrated door opening assembly as specified in the Door Hardware Sets under Part 3.
 1. Hanging Device: Continuous Hinges (geared or pinned), Pocket Pivots, Offset/Intermediate Pivots, or Butt Hinges.
 2. Integrated Locking/Latching Hardware: Exit Devices, Lever Handle Trim, or Flush Push/Pulls.

- C. Integrated exit device hardware to be clean and unobtrusive in design with a minimal bar height of 2-7/16-inches. Push rails not exceed a projection of 1-1/8-inches when in the latched position and be made of heavy duty aluminum extrusion, available in anodized and architectural finishes using metal cladding. Exit device end caps to be of metal construction, and should match the trim cover caps when available.
- D. Push and pull hardware to be clean and unobtrusive in design with a maximum projection of 1/4-inches on pull side and 5/8-inches on the push side. To be used on hollow metal doors only.
- E. Door hardware may include the following optional products for each integrated door opening assembly as specified in the Door Hardware Sets under Part 3:
 - 1. Door Closers: Surface Closer.
 - 2. Accessory Items: Magnetic Holders, Protection Plates, Edge Guards, Astragals, Smoke Seals.

2.4 FINISH REQUIREMENTS

- A. Prime Finishes: Doors and frames to be cleaned, and chemically treated to insure maximum finish paint adhesion. Surfaces of the door and frame exposed to view to receive a factory applied coat of rust inhibiting shop primer.
 - 1. Shop Primer: Manufacturer's standard, fast-curing, lead and chromate free primer complying with ANSI/SDI A250.10 acceptance criteria; recommended by primer manufacturer for substrate; and compatible with substrate and field-applied coatings.
- B. HPDL Wrapped: Color and pattern as selected by the architect.
- C. Embossed Wood Grain Pattern: Color and pattern as selected by the architect from the manufacturer's standard range.
- D. Hardware Finishes: As specified in Hardware Sets.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Verify the accuracy of dimensions given to the integrated door opening assembly manufacturer for existing openings or existing frames (strike height, hinge spacing, hinge back set, etc.).
- C. Proceed with installation only after unsatisfactory conditions have been corrected. Beginning of installation indicates acceptance of the existing conditions.
- D. Verify power supplies, as required, are available to power electrically operated devices.

3.2 INSTALLATION

- A. General: Install integrated door opening assemblies plumb, rigid, properly aligned, and securely fastened in place; comply with Drawings and manufacturer's written instructions.
- B. Install each item of mechanical and electromechanical hardware and access control equipment to comply with manufacturer's written instructions and according to specifications.
 - 1. Installers are to be trained and by the manufacturer on the proper installation and adjustment of fire, life safety, and security products including: hanging devices; integrated locking/latching devices; closing devices; and seals.
- C. Mounting Heights: Mount door hardware units at heights indicated in following applicable publications, unless specifically indicated or required to comply with governing regulations:
 - 1. Standard Steel Doors and Frames: DHI's "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames."
 - 2. Where indicated to comply with accessibility requirements, comply with ANSI A117.1 "Accessibility Guidelines for Buildings and Facilities."
 - 3. Provide blocking in drywall partitions where wall stops or other wall mounted hardware is located.
- D. Coordinate installation and interface wiring with fire alarm and smoke detection systems.
- E. Remove or protect furnished hardware accessories, prior to painting or finishing completed after the installation of the hardware accessories.

3.3 FIELD QUALITY CONTROL

- A. Field Inspection (Punch Report): Reference Division 01 Sections "Closeout Procedures". Produce project punch report for each installed door opening indicating compliance with approved submittals and verification hardware is properly installed, operating and adjusted. Include list of items to be completed and corrected, indicating the reasons or deficiencies causing the Work to be incomplete or rejected.
 - 1. Organization of List: Include separate Door Opening and Deficiencies and Corrective Action Lists organized by Mark, Opening Remarks and Comments, and related Opening Images and Video Recordings.

3.4 ADJUSTMENT

- A. Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Remove and 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.

3.5 CLEANING AND PROTECTION

- A. Protect all door opening assemblies and hardware stored on construction site in a covered and dry place. Protect exposed hardware installed on doors during the construction phase. Install hardware at the latest possible time frame.
- B. Clean operating items as necessary to restore proper finish and provide final protection and maintain conditions that ensure integrated door and operating hardware is without damage or deterioration at time of owner occupancy.
- C. Prime-Coat and Painted Finish Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat, or painted finishes, and apply touchup of compatible air drying, rust-inhibitive primer or finish paint.

3.6 DEMONSTRATION

- A. Instruct Owner's maintenance personnel to adjust, operate, and maintain integrated door opening assemblies and hardware.

3.7 HARDWARE SETS

- A. The integrated door opening hardware sets represent the design intent and direction of the owner and architect. They are a guideline only and should not be considered a detailed hardware schedule. Discrepancies, conflicting hardware and missing items should be brought to the attention of the architect with corrections made prior to the bidding process. Omitted items not included in a hardware set should be scheduled with the appropriate additional hardware required for proper application and functionality.
- B. Refer to Section 080671, Door Hardware Sets, for hardware sets.

END OF SECTION 081700

SECTION 083100 - ACCESS DOORS AND PANELS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Wall- and ceiling-mounted access units.

1.2 RELATED REQUIREMENTS

- A. Section 099123 - Interior Painting: Field paint finish.

1.3 REFERENCE STANDARDS

- A. ITS (DIR) - Directory of Listed Products.
- B. UL (FRD) - Fire Resistance Directory.

1.4 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate installation with work of other trades, and obtain information on door sizes and exact locations from other trades.
 - 2. Coordinate placement of rough-in openings with Architect in tiled walls and gypsum board ceilings.
 - 3. Coordinate placement of access doors and panels with locations of toilet partitions and urinal screens so that doors or panels are not placed in conflict with partition or screen locations.

1.5 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide sizes, types, finishes, hardware, scheduled locations, and details of adjoining work.
- C. Product Schedule: Include types, locations, sizes, latching or locking provisions & other data pertinent to installation.
- D. Manufacturer's Installation Instructions: Indicate installation requirements and rough-in dimensions.
- E. Project Record Documents: Record actual locations of each access unit.

1.6 QUALITY ASSURANCE

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

- B. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years documented experience.
- C. Basis of Design: Specifications are based on access door types and model numbers by the specified basis of design manufacturer. Access door types manufactured by other acceptable manufacturers are permitted, subject to compliance with specified requirements; and provided that deviations in dimensions and profile are minor, and do not detract substantially from the indicated design intent.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Basis of Design Manufacturers:
 - 1. Bauco Access Panel Solutions: www.accesspanelsolutions.com.
 - a. Non-Fire-Rated Units: Plus II Series; areas in gypsum board viewable to the public
 - 2. Babcock-Davis: www.babcockdavis.com/sle.
 - a. Non-Fire-Rated Units: BNT Series, in CMU walls.
 - b. Fire-Rated Units: BIT Series, in CMU walls.
- B. Other Acceptable Manufacturers:
 - 1. Acudor Products Inc.: www.acudor.com.
 - 2. Bauco Access Panel Solutions: www.accesspanelsolutions.com.
 - 3. Bilco Company: www.bilco.com.
 - 4. J. L. Industries: www.jlindustries.com.
 - 5. Karp Associates, Inc.: www.karpinc.com.
 - 6. Larsen's Manufacturing Co.: www.larsensmfg.com.
 - 7. Milcor by Commercial Products Group of Hart & Cooley, Inc.: www.milcorinc.com.
 - 8. Substitutions: See Section 01 6000 - Product Requirements.
- C. Wall- and Ceiling-Mounted Units: Factory-fabricated door and frame, fully assembled units with corner joints welded, filled and ground flush; square and without rack or warp; coordinate requirements with type of installation assembly being used for each unit.

1. Panel Materials:
 - a. Aluminum extrusions with gypsum board inlay at Non-Fire-Rated-Units in gypsum board wall and ceiling assemblies.
 - b. Steel at Fire-Rated-Units and Non-Fire-Rated-Units in CMU.
2. Style: As indicated on Drawings.
3. Doors:
 - a. Doors for Fire-Rated Units: Double-skinned hollow panel, 20 gage minimum thickness.
 - b. Doors for Non-Fire-Rated Units: Single thickness with rolled or turned in edges, 16 gage minimum thickness.
4. Frames: 16 gauge, 0.0598 inch, minimum thickness.
5. Insulation for Rated Doors: Non-combustible mineral wool or glass fiber.
6. Units in Fire-Rated Assemblies: Fire rating as required by applicable code for fire-rated assembly that access doors are being installed.
 - a. Provide products listed by ITS (DIR) or UL (FRD) as suitable for purpose indicated.
7. Finish: Primed.
8. Size: Fabricate access door frame assemblies to sizes indicated on drawings or, if not indicated, to smallest size which allows free access to concealed work requiring access. Obtain Architect's approval for rectangular sizes.
 - a. Where access to controls, etc. requiring one handed operation within arm's reach is required, provide 8 by 8 inches.
 - b. Where access to controls, etc. requiring two-handed operation or rotation within arm's reach is required, provide 12 by 12 inches.
 - c. Where upper body access is required (such as above ceilings or beyond arm's length) provide 18 by 18 inches.
 - d. Where full body access is required (such as entering a shaft) provide 24 by 24 inches.
9. Hardware:
 - a. Hinge for Fire-Rated-Units: 175 degree steel hinges with non-removable pin.

- b. Hinges for Non-Fire-Rated Units: Concealed, constant force closure spring type.
- c. Latch/Lock: Tamperproof tool-operated cam latch.
- d. Number of Locks/Latches Required: As recommended by manufacturer for size of unit.
- e. Gasketing: Extruded neoprene, around perimeter of door panel.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that rough openings are correctly sized and located.
- B. Begin installation only after substrates have been properly prepared, and if the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.
- C. Review access panel locations during wall framing rough-in to confirm location is coordinated with interior wall finishes.

3.2 PREPARATION

- A. Clean surfaces thoroughly prior to proceeding with this work.
- B. Prepare surfaces using methods recommended by manufacturer for applicable substrates in accordance with project conditions.

3.3 INSTALLATION

- A. Install units in accordance with manufacturer's instructions.
- B. Install frames plumb and level in openings, and secure units rigidly in place.
- C. Position units to provide convenient access to concealed equipment when necessary.
- D. Adjust hardware and panels for proper operation.
- E. Remove and replace panels that are warped, bowed, or otherwise damaged.

END OF SECTION 083100

SECTION 084113 - ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Aluminum-framed storefront, with vision glass.
- B. Aluminum doors and frames.
- C. Weatherstripping.

1.2 RELATED REQUIREMENTS

- A. Section 079200 - Joint Sealants: Sealing joints between frames and adjacent construction.
- B. Section 087100 - Door Hardware: Hardware items other than specified in this section.
- C. Section 088000 - Glazing: Glass and glazing accessories.

1.3 REFERENCE STANDARDS

- A. AAMA CW-10 - Care and Handling of Architectural Aluminum from Shop to Site.
- B. AAMA 501.2 - Quality Assurance and Diagnostic Water Leakage Field Check of Installed Storefronts, Curtain Walls, and Sloped Glazing Systems.
- C. AAMA 503 - Voluntary Specification for Field Testing of Newly Installed Storefronts, Curtain Walls and Sloped Glazing Systems.
- D. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum.
- E. AAMA 1503 - Voluntary Test Method for Thermal Transmittance and Condensation Resistance of Windows, Doors and Glazed Wall Sections.
- F. ASTM A36/A36M - Standard Specification for Carbon Structural Steel.
- G. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
- H. ASTM B209/B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
- I. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
- J. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric).

- K. ASTM E2112 - Standard Practice for Installation of Exterior Windows, Doors and Skylights.
- L. ASTM E330/E330M - Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference.
- M. ASTM E331 - Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference.
- N. ASTM E783 - Standard Test Method for Field Measurement of Air Leakage Through Installed Exterior Windows and Doors.
- O. ASTM E1105 - Standard Test Method for Field Determination of Water Penetration of Installed Exterior Windows, Skylights, Doors, and Curtain Walls, by Uniform or Cyclic Static Air Pressure Difference.

1.4 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate air sealing of perimeter with adjacent air barrier materials.
 - 2. Coordinate with installation of other components that comprise the exterior enclosure.
- B. Preinstallation Meeting: Conduct a preinstallation meeting one week before starting work of this Section; require attendance by all affected installers.

1.5 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide component dimensions, describe components within assembly, anchorage and fasteners, glass and infill, door hardware, and internal drainage details.
- C. Shop Drawings: Indicate system dimensions, framed opening requirements and tolerances, affected related work, expansion and contraction joint location and details, and field welding required.
- D. Selection Samples: For each color specified, submit at least 5 color chips representing Architect's designated color range.
- E. Manufacturer's Certificate: Certify that the products supplied meet or exceed the specified requirements.
- F. Design Data: Provide framing member structural and physical characteristics, engineering calculations, and dimensional limitations.

- G. Hardware Schedule: Complete itemization of each item of hardware to be provided for each door, cross-referenced to door identification numbers in Contract Documents.
- H. Field Quality Control Submittals: Report of field testing for water penetration and air leakage.
- I. Designer's qualification statement.
- J. Manufacturer's qualification statement.
- K. Installer's qualification statement.
- L. Specimen warranty.

1.6 QUALITY ASSURANCE

- A. Designer Qualifications: Design structural support framing components under direct supervision of a Professional Structural Engineer experienced in design of this work and licensed at the State in which the Project is located.
- B. Manufacturer Qualifications: Company specializing in performing work of type specified and with at least five years of documented experience.
- C. Installer Qualifications: Company specializing in performing work of type specified and with at least five years of documented experience.

1.7 MOCK-UPS

- A. Integrated Exterior Mock-up: Provide mock-up including all components occurring on project. Construct to illustrate component assembly including glazing materials, weep drainage systems, flashings, attachments, anchors, and perimeter sealant for evaluation of workmanship and aesthetics.
 - 1. Locate where directed.
 - 2. Mock-up may remain as part of work.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Handle products of this Section in accordance with AAMA CW-10.
- B. Protect finished aluminum surfaces with wrapping. Do not use adhesive papers or sprayed coatings that bond to aluminum when exposed to sunlight or weather.

1.9 FIELD CONDITIONS

- A. Do not install sealants when ambient temperature is less than 40 degrees F. Maintain this minimum temperature during and 48 hours after installation.

1.10 WARRANTY

- A. See Section 017800 - Closeout Submittals for additional warranty requirements.
- B. Correct defective Work within a two year period after Date of Substantial Completion.
- C. Provide 10 year manufacturer warranty against excessive degradation of exterior finish. Include provision for replacement of units with excessive fading, chalking, or flaking.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Basis of Design:
 - 1. Kawneer North America: www.kawneer.com.
 - a. Exterior Frame Series: TriFab VG 451T, front set glass.
 - b. Door Style: 500 Wide Stile.
- B. Other Acceptable Manufacturers:
 - 1. Boyd Aluminum: www.boydaluminum.com/#sle.
 - 2. Manko Window Systems, Inc: www.mankowindows.com/#sle.
 - 3. Oldcastle BuildingEnvelope: www.oldcastlebe.com/#sle.
 - 4. Tubelite, Inc: www.tubeliteinc.com/#sle.
 - 5. YKK AP America, Inc: www.ykkap.com/commercial/#sle.
 - 6. Substitutions: See Section 016000 - Product Requirements.

2.2 ALUMINUM-FRAMED STOREFRONT

- A. Aluminum-Framed Storefront: Factory fabricated, factory finished aluminum framing members with infill, and related flashings, anchorage and attachment devices.
 - 1. Finish: Class I natural anodized.
 - a. Factory finish all surfaces that will be exposed in completed assemblies.
 - b. Touch-up surfaces cut during fabrication so that no natural aluminum is visible in completed assemblies, including joint edges.
 - c. Coat concealed metal surfaces that will be in contact with cementitious materials or dissimilar metals with bituminous paint.

2. Finish Color: Clear Anodized.
3. Fabrication: Joints and corners flush, hairline, and weatherproof, accurately fitted and secured; prepared to receive anchors and hardware; fasteners and attachments concealed from view; reinforced as required for imposed loads.
4. Construction: Eliminate noises caused by wind and thermal movement, prevent vibration harmonics, and prevent "stack effect" in internal spaces.
5. System Internal Drainage: Drain to the exterior by means of a weep drainage network any water entering joints, condensation occurring in glazing channel, and migrating moisture occurring within system.
6. Expansion/Contraction: Provide for expansion and contraction within system components caused by cycling temperature range of 170 degrees F over a 12 hour period without causing detrimental effect to system components, anchorages, and other building elements.
7. Movement: Allow for movement between storefront and adjacent construction, without damage to components or deterioration of seals.
8. Perimeter Clearance: Minimize space between framing members and adjacent construction while allowing expected movement.
9. Maintain continuous air barrier and vapor retarder throughout assembly, primarily in line with inside pane of glazing and heel bead of glazing compound.

2.3 PERFORMANCE REQUIREMENTS

- A. Design Requirements: Design and size components to withstand the specified load requirements without damage or permanent set, when tested in accordance with ASTM E330/E330M, using loads 1.5 times the design wind loads and 10 second duration of maximum load.
 1. Design Wind Loads: Comply with requirements of applicable code.
 2. Member Deflection: Limit member deflection to L/175 of clear span, 3/4 inch total, or to flexure limit of glass in any direction, whichever is less, with full recovery of glazing materials.
 3. Provide reinforced mullion sections as may be required to comply with specified design requirements, for manufacturer's specified system.
- B. Water Penetration Resistance on Manufactured Assembly: No uncontrolled water on interior face, when tested in accordance with ASTM E331 at pressure differential of 10 psf.

1. Fastener Heads must be seated and sealed against sill flashing on any fasteners that penetrate through the sill flashing.
- C. Air Leakage Laboratory Test: Maximum of 0.06 cu ft/min sq ft of wall area, when tested in accordance with ASTM E283 at 6.24 psf pressure differential across assembly.
- D. Condensation Resistance Factor of Framing: 60, minimum, measured in accordance with AAMA 1503.
- E. Overall U-factor Including Glazing: 0.40 Btu/(hr sq ft deg F), maximum.

2.4 COMPONENTS

- A. Aluminum Framing Members: Tubular aluminum sections, thermally broken at exterior applications, drainage holes and internal weep drainage system.
 1. Glazing Stops: Flush.
 2. Cross-Section: 2 by 4-1/2 inch nominal dimension.
 3. Corner Assemblies:
 - a. 90-Degree Corners: Manufacturer's standard combination of two pocket corner extrusions.
 - b. Corners Other Than 90 Degrees: Manufacturer's standard varying degree pocket corner extrusions with aluminum sheet metal fillers and closures.
 4. Reinforced Mullions: As required or recommended by manufacturer using manufacturer's standard profile of extruded aluminum with internal reinforcement of steel shaped structural section.
- B. Glazing: See Section 088000.
- C. Swing Doors: Glazed aluminum.
 1. Thickness: 1-3/4 inches.
 2. Top Rail: 5 inches wide.
 3. Vertical Stiles: 5 inches wide.
 4. Bottom Rail: 10 inches wide.
 5. Glazing Stops: Manufacturer's standard snap-in glazing stops with gasketing; removable from inside.
 6. Finish: Same as storefront.

- D. Operable Egress Window: Aluminum project out casement; turn handle latch for egress.
 - 1. Sizes: As indicated on Drawings.
 - 2. Finish: Same as storefront.

2.5 MATERIALS

- A. Extruded Aluminum: ASTM B221 (ASTM B221M).
- B. Sheet Aluminum: ASTM B209/B209M.
- C. Structural Steel Sections: ASTM A36/A36M; shop primed.
- D. Fasteners: Stainless steel.
- E. Exposed Flashings: Aluminum sheet, 20 gauge, 0.032 inch minimum thickness; finish to match framing members.
- F. Concealed Flashings: Stainless steel, 26 gauge, 0.0187 inch minimum thickness.
- G. Sill Flashing Sealant: Elastomeric, silicone or polyurethane, compatible with flashing material.
- H. Sealant for Setting Thresholds: Non-curing butyl type.
- I. Glazing Gaskets: Type to suit application to achieve weather, moisture, and air infiltration requirements.
 - 1. Size gaskets as required by manufacturer of glazing channel frame to provide proper pressure and bite on glazing units.
- J. Glazing Accessories: See Section 088000.

2.6 ACCESSORIES

- A. Reinforcement: Where fasteners screw-anchor into aluminum less than 1/8 inch thick, reinforce the interior with aluminum or non-magnetic stainless steel to receive screw threads, or provide standard non-corrosive, pressed-in splined grommet nuts.
- B. Brackets: High-strength aluminum brackets and reinforcements where possible; otherwise provide non-magnetic stainless steel or galvanized steel complying with ASTM A123/A123M.
- C. Bituminous Coatings: Cold-applied asphalt mastic, compounded for 30 mil thickness per coat.

- D. Internal System Sealants and Gaskets: As recommended by manufacturer for use within the framing system for fabrication, assembly, and installation. Use products which will remain permanently elastic, non-shrinking, and waterproof.

2.7 FINISHES

- A. Class I Natural Anodized Finish: AAMA 611 AA-M12C22A41 Clear anodic coating not less than 0.7 mils thick.
- B. Touch-Up Materials: As recommended by coating manufacturer for field application.

2.8 HARDWARE

- A. Door Hardware: As specified in Section 087100, except as specified in this Section.
- B. Weatherstripping: Wool pile, continuous and replaceable; provide on all doors.
- C. Reinforce components internally for door hardware .

PART 3 EXECUTION

3.1 EXAMINATION

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

3.2 INSTALLATION

- A. Install wall system in accordance with manufacturer's instructions.
 - 1. Install storefronts in accordance with ASTM E2112.
- B. Attach to structure to permit sufficient adjustment to accommodate construction tolerances and other irregularities.
- C. Provide alignment attachments and shims to permanently fasten system to building structure.
- D. Align assembly plumb and level, free of warp or twist. Maintain assembly dimensional tolerances, aligning with adjacent work.
- E. Provide thermal isolation where components penetrate or disrupt building insulation.
- F. Install sill flashings. Turn up ends and edges; seal to adjacent work to form water tight end and back dams.
- G. Where fasteners penetrate sill flashings, make watertight by seating and sealing fastener heads to sill flashing.

- H. Pack fibrous insulation in shim spaces at perimeter of assembly to maintain continuity of thermal barrier.
- I. Install operating sash.
- J. Set thresholds in bed of sealant and secure.
- K. Install hardware using templates provided.
- L. Install glass in accordance with Section 088000, using glazing method required to achieve performance criteria.
- M. Install internal system sealants as installation progresses. Seal sill pan splices, end dams, water deflectors, and other components to ensure that proper water weepage paths are established and maintained within the system.
- N. Touch-up minor damage to factory applied finish; replace components that cannot be satisfactorily repaired.

3.3 TOLERANCES

- A. Maximum Variation from Plumb: 0.06 inch per 3 feet non-cumulative or 0.06 inch per 10 feet, whichever is less.
- B. Maximum Misalignment of Two Adjoining Members Abutting in Plane: 1/32 inch.
- C. Location: Limit variation from plane or dimensioned location to 1/8 inch in 12 feet, non-cumulative, and 1/2 inch in overall length of member.

3.4 FIELD QUALITY CONTROL

- A. Provide services of storefront manufacturer's field representative to observe for proper installation of system and submit report.
- B. See Section 014000 - Quality Requirements for general testing and inspection requirements.
- C. Water-Spray Test: Provide water spray quality test of installed storefront components in accordance with AAMA 501.2 during construction process and before installation of interior finishes.
 - 1. Successful Test Result: No water leakage.
 - 2. Perform a minimum of two tests in each designated area as directed by Architect.
 - 3. Conduct tests in each area prior to 10 percent and 50 percent completion of this work.

- D. Provide field testing of installed storefront system by independent laboratory in accordance with AAMA 503 during construction process and before installation of interior finishes.
1. Mock-up Testing: Perform test of mock-up prior to installation of insulation, cladding and trim but after installation of all fasteners, brackets, supports for cladding and trim, and other penetrating elements.
 2. Building Testing: Perform tests on building prior to installation of cladding and trim but after installation of all fasteners for cladding and trim and after installation of other penetrating elements. Perform testing at 10%, 50%, and 70% completion of air barrier installation.
 - a. Perform a minimum of two tests of each type in each designated area as directed by Architect.
 - b. Conduct tests in each area prior to 10 percent and 50 percent completion of this work.
 3. Field test for water penetration in accordance with ASTM E1105 with uniform static air pressure difference (Procedure A) not less than 4.18 psf.
 - a. Maximum allowable rate of water penetration in 15-minute test is 0.5 ounce that is not contained in an area with provisions to drain to exterior, or collected on surface of interior horizontal framing member.
 4. Field test for air leakage in accordance with ASTM E783 with uniform static air pressure difference of 1.57 psf.
 - a. Maximum allowable rate of air leakage is 0.09 cfm/sq ft.
- E. Repair or replace storefront components that have failed designated field testing, and retest to verify performance complies with specified requirements.

3.5 ADJUSTING

- A. Adjust operating hardware for smooth operation.

3.6 CLEANING

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

3.7 PROTECTION

- A. Protect installed products from damage until Date of Substantial Completion.

END OF SECTION 084113

SECTION 084123 - FIRE RATED STEEL ENTRANCES AND STOREFRONTS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Fire rated glazing and framing systems.

1.2 RELATED REQUIREMENTS

- A. Section 07 84 00 - Firestopping: Firestops between work of this section and other fire resistive assemblies.
- B. Section 07 92 00 – Joint Sealants: Installation of joint sealants installed with steel fire-rated glazed curtain-wall systems and for sealants to the extent not specified in this Section.

1.3 REFERENCES

- A. American Architectural Manufacturers Association (AAMA):
 - 1. AAMA 2603-2002 Voluntary Specification, Performance Requirements and Test Procedures for Pigmented Organic Coatings on Aluminum Extrusions and Panels.
 - 2. AAMA 2605 -2005 Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels.
- B. American Society for Testing and Materials (ASTM):
 - 1. Fire safety related:
 - a. ASTM E119: Methods for Fire Tests of Building Construction and Materials.
 - 2. Material related
 - a. ASTM A 1008/A 1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength, Low Alloy, and High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable; 2007.
 - b. ASTM A 1011/A 1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength; 2006b.
- C. American Welding Society (AWS):
 - 1. AWS D1.3 - Structural Welding Code - Sheet Steel; 2007

- D. Builders Hardware Manufacturers Association, Inc.:
 - 1. BHMA A156 - American National Standards for door hardware; 2006 (ANSI/BHMA A156).
- E. National Fire Protection Association (NFPA):
 - 1. NFPA 80: Fire Doors and Windows.
 - 2. NFPA 251: Fire Tests of Building Construction & Materials
 - 3. NFPA 252: Fire Tests of Door Assemblies
 - 4. NFPA 257: Fire Test of Window Assemblies
- F. Underwriters Laboratories, Inc. (UL):
 - 1. UL 9: Fire Tests of Window Assemblies.
 - 2. UL 10 B: Fire Tests of Door Assemblies
 - 3. UL 10 C: Positive Pressure Fire Tests of Window & Door Assemblies
 - 4. UL 263: Fire tests of Building Construction and Materials
 - 5. UL-752 Ratings of Bullet-Resistant Materials
- G. American National Standards Institute (ANSI):
 - 1. ANSI Z97.1: Standard for Safety Glazing Materials Used in Buildings
- H. Consumer Product Safety Commission (CPSC):
 - 1. CPSC 16 CFR 1201: Safety Standard for Architectural Glazing Materials

1.4 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Product Data: Technical Information: Submit latest edition of manufacturer's product data providing product descriptions, technical data, Underwriters Laboratories, Inc. listings and installation instructions.
- C. Shop Drawings:
 - 1. Include plans, elevations and details of product showing component dimensions; framing opening requirements, dimensions, tolerances, and attachment to structure
- D. Samples:

1. Glass sample-as provided by manufacturer.
 2. Sample of frame.
 3. Sample for Verification: Minimum 4 x 4 inches of each selected finish.
- E. Glazing Schedule: Use same designations indicated on drawings for glazed openings in preparing a schedule listing glass types and thicknesses for each size opening and location.
- F. Warranties: Submit manufacturer's warranty.
- G. Certificates of compliance from glass and glazing materials manufacturers attesting that glass and glazing materials furnished for project comply with requirements.

1.5 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Qualifications according to:
1. International Accreditation Service for a Type A Third-Party Inspection Body (Field Services ICC-ES Third-Party Inspections Standard Operating Procedures, 00-BL-S0400 and S0401)
 2. International Accreditation Service for Testing Body-Building Materials and Systems
 - a. Fire Testing
 - b. ASTM Standards E 119
 - c. CPSC Standards 16 CFR 1201
 - d. NFPA Standards 251, 252, 257
 - e. UL Standards 9, 10B, 10C, 1784, UL Subject 63
 - f. BS 476; Part 22: 1987
 - g. EN 1634-1
- B. Fire-Rated Window Assemblies: Assemblies complying with NFPA 80 that are classified and labeled by UL, for fire ratings indicated, based on testing according to NFPA 257 and UL 9.
- C. Listings and Labels - Fire Rated Assemblies: Under current follow-up service by Underwriters Laboratories® maintaining a current listing or certification. Label assemblies accordance with limits of manufacturer's listing.
- D. Regulatory Requirements: Comply with provisions of the following:

1. Where indicated to comply with accessibility requirements, comply with Americans with Disabilities Act (ADA), "Accessibility Guidelines for Buildings and Facilities (ADAAG)," and ANSI A117.1, as follows:
 - a. Handles, Pulls, Latches, Locks, and other Operating Devices: Shape that is easy to grasp with one hand and does not require tight grasping, tight pinching, or twisting of the wrist.
 - b. Door Closers: Comply with the following maximum opening-force requirements indicated:
 - 1) Fire Doors: Minimum opening force allowable by authorities having jurisdiction.
 2. Compliance with this standard requires auto openers to be added to the opening due to the weight of the doors. Coordinate the addition of auto-openers with the Division 8 section "Door Hardware" or other section containing these devices. Comply with the following for means of egress doors:
 - a. Latches, Locks, and Exit Devices: Not more than 15 lbf to release the latch. Locks shall not require the use of a key, tool, or special knowledge for operation.
 - b. Door Closers: Not more than 30 lbf to set door in motion and not more than 15 lbf to open door to minimum required width.
- E. Basis of Design: Drawing details are based on profiles by specified basis of design manufacturer. Similar profiles by other acceptable manufacturers are permitted, subject to compliance with all specified performance characteristics, and provided that deviations in dimension, profile, finish, and color are minor, and do not detract from the indicated design intent.

1.6 DELIVERY, STORAGE AND HANDLING

- A. Deliver, store and handle under provisions specified by manufacturer.

1.7 PROJECT CONDITIONS

- A. Obtain field measurements prior to fabrication of frame units. If field measurements will not be available in a timely manner coordinate planned measurements with the work of other sections.
- B. Note whether field or planned dimensions were used in the creation of the shop drawings.
- C. Coordinate the work of this section with others effected including but not limited to: other interior and/or exterior envelope components and door hardware beyond that provided by this section.

1.8 WARRANTY

- A. Provide manufacturer's standard five-year warranty.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

- A. Basis of Design: Optimum Steel Windows; optimumwindow.com.
 - 1. Fixed and Casement: FR6000 Series.

2.2 PERFORMANCE REQUIREMENTS

- A. Steel Frame System Description: Steel fire-rated glazed window system with operable out-swing casement.
 - 1. Window Sizes: As shown on Drawings.
 - 2. Fabrication: Manufacturer's standard hot rolled solid steel sections. Straighten sections prior to welding.
 - 3. Frame and Ventilator: 2-1/8 inch deep, minimum.
 - a. Frame corners shall be mitered, welded, and finished smooth and flush with adjacent surfaces.
 - 4. Windows capable of providing a fire rating for 45 minutes.
 - 5. Structural Performance:
 - a. Member deflection: Limit deflection of the edge of the glass normal to the plane of the glass to 1/175 of the glass edge length or 3/4 inch, whichever is less, of any framing member.
 - b. Accommodate movement between storefront and adjoining systems.

2.3 MATERIALS - GLASS

- A. GL-1LR- Fire-Protection-Rated Glazing: Insulated glazing unit of type, thickness, and configuration of glazing that contains flame, smoke, and does not block radiant heat, as required to achieve indicated fire rating period of 45 minutes or less.
- B. Thickness: 3/4 inch maximum.
- C. Glass Type: Fire rated laminated glass with intumescent interlayer listed by UL for designated fire rated assembly.
- D. Safety Glazing Certification: 16 CFR 1201 Category II.
- E. Glazing Method: As required for fire rating.

- F. Low-E Coating: On #2 surface.
- G. Color: Clear.
- H. Gaskets: Molded or extruded elastomeric type of profile and hardness required to maintain weather tight seal and complying with ASTM C864.
- I. Glazing Tape: Preformed, non-staining, coiled on release paper, and complying with ASTM C1281.
- J. Glazing Sealants: As recommended by window manufacturer and is compatible with materials and conditions.
- K. Logo: Each piece of fire-rated glazing shall be labeled with a permanent logo including name of product, manufacture, testing laboratory (UL), fire rating period, safety glazing standards, and date of manufacture.

2.4 WINDOW HARDWARE

- A. Casement Window Hardware:
 - 1. Operator: Manual push with concealed friction limit.
 - 2. Hinges: Spring loaded hinges & Self Closing type with fusible link; 3 hinges.
 - 3. Locking Device: Cam handle with keeper; provide 2 locks for casement windows over 48 inches high.

2.5 ACCESSORIES

- A. Fasteners: Use fasteners fabricated from Type 304 or Type 316 stainless steel.
- B. Glazing Gaskets:
 - 1. Glazing gaskets for interior or exterior applications: ASTM C 864 (extruded EPDM rubber that provides for silicone adhesion) or ASTM C1115 Standard Specification for Dense Elastomeric Silicone Rubber Gaskets and Accessories (extruded silicone).
- C. Intumescent Tape: As supplied by frame manufacturer.
- D. Setting Blocks: ¼" Calcium silicate.
- E. Perimeter Anchors: Steel.
- F. Flashings: As recommended by manufacturer; same material and finish as cover caps.
- G. Bituminous Paint: Cold-applied, asphalt-mastic paint complying with SSPC-Paint 12 requirements except containing no asbestos; formulated for 30-mil thickness per coat.

- H. Silicone Sealant: One-Part Low Modulus, neutral cure High Movement-Capable Sealant: Type S; Grade NS; Class 25 with additional movement capability of 100 percent in extension and 50 percent in compression (total 150 percent); Use (Exposure) NT; Uses (Substrates) M, G, A, and O as applicable. (Use-O joint substrates include: Metal factory-coated with a high-performance coating; galvanized steel; ceramic tile.)
1. Available Products:
 - a. Basis of Design: DOWSIL; 790 or 795, or other equivalent products by one of the following:
 - b. Momentive.
 - c. Tremco.
 - I. Intumescent Caulk: Single component, latex-based, intumescent caulk designed to stop passage of fire, smoke, and fumes through fire-rated separations; permanently flexible after cure; will not support mold growth; flame spread/smoke developed 10/10.
 1. Available Products:
 - a. 3M CP-25 WP+

2.6 MINERAL WOOL FIBER INSULATION

- A. Available Manufacturers:
1. Fibrex Insulations Inc.
 2. Owens Corning.
 3. Thermafiber.
 4. Rockwool.
- B. Unfaced, Mineral Wool-Fiber Board Insulation: ASTM C 612, maximum flame-spread and smoke-developed indexes of 15 and 0, respectively; passing ASTM E 136 for combustion characteristics; and of the following nominal density and thermal resistivity:
1. Nominal density of 4 lb/cu. ft. (64 kg/cu. m), Types IA and IB, thermal resistivity of 4 deg F x h x sq. ft./Btu x in. at 75 deg F (27.7 K x m/W at 24 deg C).

2.7 FABRICATION

- A. Obtain reviewed shop drawings prior to fabrication.
- B. Fabrication Dimensions: Fabricate fire-rated assembly to field dimensions.

- C. Factory prepared, fire-rated door assemblies to be prehung, prefinished with hardware preinstalled for field mounting.
- D. Field glaze door and frame assemblies.

2.8 FINISHES, GENERAL

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Finish frames after assembly.
- C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable. Noticeable variations in the same piece are not acceptable.

2.9 POWDERCOAT FINISHES

- A. Finish after fabrication.
- B. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable. Noticeable variations in the same piece are not acceptable.
- C. High Performance Organic Coating: Primer and silicone-modified polyester (SMP) enamel topcoat with minimum dry film thickness (DFT) of 1.2 mils, 0.0012 inch over aluminum extrusions and panels; AAMA 2604.
- D. Finish Color: As selected from manufacturer's full range of options.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Site Verification of Conditions: Verify substrate conditions (which have been previously installed under other sections) are acceptable for product installation in accordance with manufacturer's instructions. Verify openings are sized to receive curtain wall system and sill plate is level in accordance with manufacturer's acceptable tolerances.
- B. Provide openings plumb, square and within allowable tolerances.
 - 1. Provide 3/8 inch shim space at all walls
- C. Notify Architect of any conditions which jeopardize the integrity of the proposed fire wall / door system.
- D. Do not proceed until such conditions are corrected.

3.2 INSTALLATION

- A. Install fire rated systems as indicated in manufacturer's written instructions.

3.3 REPAIR AND TOUCH UP

- A. Painted Finishes:
1. Limited to minor repair of small scratches. Use only manufacturer's recommended products.
 2. Such repairs shall match original finish for quality or material and view.
 3. Repairs and touch-up not visible from a distance of 5 feet Owner and Architect to approve.
 4. Remove and replace glass that is broken, chipped, cracked, abraded, or damaged.

3.4 ADJUSTING

- A. Adjust door function and hardware for smooth operation. Coordinate with other hardware suppliers for function and use of any other attached hardware.

3.5 PROTECTION AND CLEANING

- A. Protect glass from damage immediately after installation by attaching crossed streamers to framing held away from glass. Do not apply markers to glass surface. Remove nonpermanent labels, and clean surfaces.
1. Do not clean with astringent cleaners. Use a clean "grit free" cloth and a small amount of mild soap and water or mild detergent.
 2. Do not use any of the following:
 - a. Steam jets
 - b. Abrasives
 - c. Strong acidic or alkaline detergents, or surface-reactive agents
 - d. Detergents not recommended in writing by the manufacturer
 - e. Do not use any detergent above 77 degrees F
 - f. Organic solvents including but not limited to those containing ester, ketones, alcohols, aromatic compounds, glycol ether, or halogenated hydrocarbons.
 - g. Metal or hard parts of cleaning equipment must not touch the glass surface

- B. Protect glass from contact with contaminating substances resulting from construction operations, including weld splatter. If, despite such protection, contaminating substances do come into contact with glass, remove them immediately as recommended by glass manufacturer.
- C. Wash glass on both exposed surfaces in each area of Project not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended by glass manufacturer.

END OF SECTION 084123

SECTION 084413 - GLAZED ALUMINUM CURTAIN WALLS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Aluminum-framed curtain wall, with vision glazing and spandrel glazing.

1.2 RELATED REQUIREMENTS

- A. Section 078400 - Firestopping: Firestop at system junction with structure.
- B. Section 079200 - Joint Sealants: Sealing joints between frames and adjacent construction.
- C. Section 084113 - Aluminum-Framed Entrances and Storefronts: Entrance framing and doors.
- D. Section 088000 - Glazing.

1.3 REFERENCE STANDARDS

- A. AAMA CW-10 - Care and Handling of Architectural Aluminum from Shop to Site.
- B. AAMA 501.2 - Quality Assurance and Diagnostic Water Leakage Field Check of Installed Storefronts, Curtain Walls, and Sloped Glazing Systems.
- C. AAMA 501.4 - Recommended Static Test Method for Evaluating Window Wall, Curtain Wall and Storefront Systems Subjected to Seismic and Wind-Induced Inter-Story Drift.
- D. AAMA 609 & 610 - Cleaning and Maintenance Guide for Architecturally Finished Aluminum (Combined Document).
- E. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum.
- F. AAMA 1503 - Voluntary Test Method for Thermal Transmittance and Condensation Resistance of Windows, Doors and Glazed Wall Sections.
- G. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix).
- H. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures.
- I. ASTM A36/A36M - Standard Specification for Carbon Structural Steel.
- J. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.

- K. ASTM B209/B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
- L. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
- M. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric).
- N. ASTM C794 - Standard Test Method for Adhesion-in-Peel of Elastomeric Joint Sealants.
- O. ASTM E283/E283M - Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Skylights, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen.
- P. ASTM E331 - Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference.
- Q. SSPC-Paint 20 - Zinc-Rich Coating (Type I - Inorganic, and Type II - Organic).

1.4 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate with installation of other components that comprise the exterior enclosure.
 - 2. Coordinate compatibility and design integrity to secure a weather and water tight seal with all systems, adjacent surfaces and related materials.
 - 3. Coordinate attachment and seal of perimeter air and vapor barrier materials.
 - 4. Coordinate and assume responsibility for compatibility and proper performance of sealants used as part of the work of this Section with sealants used by other trades that may be in direct contact with or adjacent to sealants used as part of the work of this Section.
- B. Preinstallation Meeting: Conduct a preinstallation meeting one week before starting work of this section; require attendance by all affected installers.

1.5 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide component dimensions, describe components within assembly, anchorage and fasteners, internal drainage details, and glazing.

- C. Shop Drawings: Indicate system dimensions, framed opening requirements and tolerances, affected related Work, expansion and contraction joint location and details, and field welding required. Include the following:
1. Adjacent and adjoining work.
 2. Jointery and internal weather seals.
 3. Glazing materials identification.
 4. Sealant identification by product name and manufacturer, including cleaning and priming requirements.
 5. Field connections, weld sizes, anchorages and fasteners, embedment length and edge distances.
 6. Perimeter sealant joint sizes, including tolerances and minimum/maximum joint sizes required.
 7. Seal and signature of professional engineer registered in the State in which the Project is located; same engineer who seals and signs design calculations.
- D. Verification Samples: Submit two samples 4 by 4 inches in size illustrating each aluminum finish.
- E. Manufacturer's Certificate: Certify that the products supplied meet or exceed the specified requirements.
- F. Design Data: Provide framing member structural and physical characteristics and engineering calculations, and identify dimensional limitations; include load calculations at points of attachment to building structure.
- G. Test Reports: Submit results of full-size mock-up (preconstruction) testing. Reports of tests previously performed on the same design are acceptable.
- H. Field Quality Control Submittals: Report of field testing for water penetration.
- I. Designer's Qualification Statement.
- J. Manufacturer's Qualification Statement.
- K. Installer's Qualification Statement.
- L. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.6 QUALITY ASSURANCE

- A. Design structural support framing components under direct supervision of a Professional Structural Engineer experienced in design of this work and licensed in the State in which the Project is located.
- B. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with not less than five years of documented experience.
 - 1. Engage single firm to assume sole responsibility for fabrication, installation, and coordination of all components of the work of this Section.
- C. Installer Qualifications: Company specializing in performing work of type specified and with at least five years of documented experience and approved by manufacturer.
- D. Basis of Design: Drawing details are based on profiles by specified basis of design manufacturer. Similar profiles by other acceptable manufacturers are permitted, subject to compliance with all specified performance characteristics, and provided that deviations in dimension, profile, and finish are minor, and do not detract from the indicated design intent.

1.7 MOCK-UPS

- A. Integrated Mock-up: Provide mock-up including each component being used on the project. Construct to illustrate component assembly, including glazing materials, weep drainage system, flashings, attachments, anchors, and perimeter sealant, for evaluation of workmanship and aesthetics.
 - 1. Do not use excessive amounts of sealant, nor other special measures or techniques, which are not representative of those to be used on the building.
 - 2. Size: As directed by Architect.
 - 3. Locate where directed.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Handle products of this section in accordance with AAMA CW-10.
- B. Protect finished aluminum surfaces with wrapping. Do not use adhesive papers or sprayed coatings that bond to aluminum when exposed to sunlight or weather.

1.9 FIELD CONDITIONS

- A. Do not install sealants when ambient temperature is less than 40 degrees F. Maintain this minimum temperature during and 48 hours after installation.

- B. Take required precautions to properly isolate and prevent any degree of incompatibility between sealants, in strict accordance with sealant manufacturer's specifications, recommendations, and instructions.
- C. Periodically test sealants in place for adhesion using methods recommended by sealant manufacturer. Promptly replace sealants which do not adhere or fail to cure.

1.10 WARRANTY

- A. See Section 017800 - Closeout Submittals for additional warranty requirements.
- B. Manufacturer Warranty: Provide 5-year manufacturer warranty against failure of glass seal on insulating glass units, including interpane dusting or misting. Include provision for replacement of failed units. Complete forms in Owner's name and register with installer.
- C. Provide ten year manufacturer warranty against excessive degradation of exterior finish. Include provision for replacement of units with excessive fading, chalking, flaking, pitting, peeling, crazing, or non-uniformity of finish.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Acceptable Manufacturers:
 - 1. Boyd Aluminum: www.boydaluminum.com/#sle.
 - 2. EFCO, a Pella Company: www.efcocorp.com.
 - 3. Kawneer North America: www.kawneer.com/#sle.
 - 4. Manko Window Systems, Inc: www.mankowindows.com/#sle.
 - 5. Oldcastle Building Envelope: www.oldcastlebe.com/#sle.
 - 6. Tubelite, Inc: www.tubeliteinc.com/#sle.
 - 7. YKK AP America, Inc: www.ykkap.com/commercial/#sle.
 - 8. Substitutions: See Section 016000 - Product Requirements.

2.2 CURTAIN WALL

- A. Aluminum-Framed Curtain Wall: Factory fabricated, factory finished aluminum framing members with infill, and related flashings, anchorage and attachment devices.
 - 1. Outside glazed, with pressure plate and mullion cover.
 - 2. Fabrication Method: Either shop/factory or field fabricated system.

3. Glazing Method: Either shop/factory or field glazed system.
 4. Vertical Mullion Face Width: 2-1/2 inches.
 5. Vertical Mullion Depth From Face of Glazing to Back of Frame: 6 inches.
 6. Extended Caps: As indicated in drawings.
 7. Finish: Class I natural anodized.
 8. Provide flush joints and corners, weathersealed, accurately fitted and secured; prepared to receive anchors; fasteners and attachments concealed from view; reinforced as required for imposed loads.
 9. Construction: Eliminate noises caused by wind and thermal movement, prevent vibration harmonics, and prevent "stack effect" in internal spaces.
 10. System Internal Drainage: Drain to the exterior by means of a weep drainage network any water entering joints, condensation occurring in glazing channel, and migrating moisture occurring within system.
 11. Maintain continuous air barrier and/or vapor retarder seal throughout assembly, primarily in line with inside pane of glazing and heel bead of glazing compound.
 12. Perimeter Clearance: Minimize space between framing members and adjacent construction while allowing expected movement.
- B. Structural Performance Requirements: Design and size components to withstand the following load requirements without damage or permanent set.
1. Design Wind Loads: Comply with the requirements of ASCE 7 and loads indicated in Structural Drawings.
 - a. Measure performance by testing in accordance with ASTM E330/E330M, using test loads equal to 1.5 times the design wind loads and 10 second duration of maximum pressure.
 - b. Member Deflection: For spans less than 13 feet 6 inches, limit member deflection to flexure limit of glass in any direction, and maximum of 1/175 of span or 3/4 inch, whichever is less and with full recovery of glazing materials.
 - c. Member Deflection: For spans over 13 feet 6 inches and less than 40 feet, limit member deflection to flexure limit of glass in any direction, and maximum of 1/240 of span plus 1/4 inch, with full recovery of glazing materials.
 2. Seismic Loads: Design and size components to withstand seismic loads and sway displacement in accordance with requirements of ASCE 7.

3. Interstory Differential Lateral Movement: Meeting pass/fail criteria of AAMA 501.4 for Use Group I, Standard Occupancy, when tested at design displacement of 0.010 times greater adjacent story height, maximum, and 1.5 times design displacement, through three complete cycles.
 4. Movement: Accommodate the following movement without damage to components or deterioration of seals:
 - a. Expansion and contraction caused by 180 degrees F surface temperature.
 - b. Expansion and contraction caused by cycling temperature range of 170 degrees F over a 12 hour period.
 - c. Movement of curtain wall relative to perimeter framing.
 - d. Deflection of structural support framing, under permanent and dynamic loads.
- C. Water Penetration Resistance on Manufactured Assembly: No uncontrolled water on indoor face when tested as follows:
1. Test Pressure Differential: 15 psf.
 2. Test Method: ASTM E331.
- D. Air Leakage: 0.06 cfm/sq ft maximum leakage of wall area when tested in accordance with ASTM E283/E283M at 6.24 psf pressure difference across assembly.
- E. Thermal Performance Requirements:
1. Condensation Resistance Factor of Framing: 60, minimum, measured in accordance with AAMA 1503.
 2. Overall U-value Including Glazing: 0.40 Btu/(hr sq ft deg F), maximum.

2.3 COMPONENTS

- A. Aluminum Framing Members: Tubular aluminum sections, thermally broken with interior section insulated from exterior, drainage holes and internal weep drainage system.
1. Cross-Section: As indicated on drawings.
 2. Reinforced Mullions: As recommended by manufacturer using manufacturer's standard profile of extruded aluminum with internal reinforcement of steel shaped structural section.
- B. Glazing: See Section 088000.

2.4 MATERIALS

- A. Extruded Aluminum: ASTM B221 (ASTM B221M).
- B. Sheet Aluminum: ASTM B209/B209M.
- C. Structural Steel Sections: ASTM A36/A36M; galvanized in accordance with requirements of ASTM A123/A123M.
- D. Structural Supporting Anchors Attached to Structural Steel: Design for bolted attachment.
- E. Anchorage and Fasteners: Concealed unless specifically approved to be exposed by Architect; carbon steel galvanized according to ASTM B633. For exposed fasteners, if approved, and fasteners in wet areas of the wall, use series 300 stainless steel.
 - 1. Finish of Exposed Items: Match adjacent mullion color.
- F. Exposed Flashings: Aluminum sheet, 20-gauge, 0.032-inch minimum thickness; finish to match framing members.
- G. Concealed Flashings: Stainless steel, 26-gauge, 0.0187-inch minimum thickness.
- H. Firestopping: See Section 078400.
- I. Weatherseal Sealant: Silicone, with adhesion in compliance with ASTM C794; compatible with glazing accessories.
- J. Sill Flashing Sealant: Elastomeric, silicone or polyurethane, and compatible with flashing material.
- K. Glazing Gaskets: Type to suit application to achieve weather, moisture, and air infiltration requirements.
- L. Glazing Accessories: See Section 088000.
- M. Shop and Touch-Up Primer for Steel Components: Zinc oxide, alkyd, linseed oil primer appropriate for use over hand cleaned steel.
- N. Touch-Up Primer for Galvanized Steel Surfaces: SSPC-Paint 20, zinc rich.

2.5 FABRICATION

- A. To fullest extent practicable, fabricate and assemble each system at factory. Where factory assembly is not practicable, fabricate, shop fit, and mark system components to ensure proper assembly in field.

- B. Fabricate components with clearances and shim spacing around perimeter of assembly that will accommodate system and building movements, and construction tolerances, and enabling installation and dynamic movement of perimeter sealers. Design for sealant joint width as specified in Section 079200.
- C. Fabricate individual system frame members and other system components in single, continuous pieces; splices are not permitted unless specifically required by project installation conditions, or for designed expansion control of system.
- D. Accurately fit and secure joints and corners. Make joints flush, hairline, and weatherproof.
- E. Fabricate all miter and 90 degree joints at the factory.
- F. Develop drainage paths with moisture weep to exterior. Install pressure plates with weep holes located above glazing support flanges to properly allow water to weep to exterior through cover plates.
- G. Prepare components to receive anchor devices. Fabricate anchors.
- H. Coat concealed metal surfaces that will be in contact with cementitious materials or dissimilar metals with bituminous paint.
- I. Arrange all fasteners and attachments to be concealed from view.
- J. Fasteners shall not penetrate gutters or drainage systems.
- K. Arrange all welds to be concealed from view. Welds may not telegraph to finished surfaces.
- L. Completely seal all welds in areas intended to retain water with an approved sealant.
- M. Reinforce framing members for imposed loads.
- N. Finishing: Apply factory finish to all surfaces that will be exposed in completed assemblies, including exposed fasteners.
 - 1. Touch-up surfaces cut during fabrication so that no natural aluminum is visible in completed assemblies, including joint edges.

2.6 FINISHES

- A. Class I Natural Anodized Finish: AAMA 611 AA-M12C22A41 Clear anodic coating not less than 0.7 mils thick.
- B. Touch-Up Materials: As recommended by coating manufacturer for field application.

2.7 ACCESSORIES

- A. Reinforcement: Where fasteners screw-anchor into aluminum less than 1/8 inch thick, reinforce the interior with aluminum or non-magnetic stainless steel to receive screw threads, or provide standard non-corrosive, pressed-in splined grommet nuts.
- B. Brackets: High-strength aluminum brackets and reinforcements where possible; otherwise provide non-magnetic stainless steel or galvanized steel complying with ASTM A123/A123M.
- C. Expansion Anchors: Lead shield or toothed steel, drilled in type expansion bolts for required attachment to concrete or masonry.
- D. Bituminous Coatings: Cold-applied asphalt mastic, compounded for 30 mil thickness per coat.
- E. Shims: 100 percent nylon; high density.
- F. Internal System Sealants and Gaskets: As recommended by manufacturer for use within the framing system for fabrication, assembly, and installation. Use products which will remain permanently elastic, non-shrinking, and waterproof.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify dimensions, tolerances, and method of attachment with other related work.
- B. Verify that wall openings and adjoining air and vapor seal materials are ready to receive work of this Section.
- C. Verify that anchorage devices have been properly installed and located.

3.2 INSTALLATION

- A. Install curtain wall system in accordance with manufacturer's instructions.
- B. Attach to structure to permit sufficient adjustment to accommodate construction tolerances and other irregularities.
- C. Provide alignment attachments and shims to permanently fasten system to building structure.
- D. Align assembly plumb and level, free of warp or twist. Maintain assembly dimensional tolerances, aligning with adjacent work.
- E. Provide thermal isolation where components penetrate or disrupt building insulation.
- F. Install sill and head flashings. Turn up ends and edges; seal to adjacent work to form water tight dam.

- G. Pack fibrous insulation in shim spaces at perimeter of assembly to maintain continuity of thermal barrier.
- H. Install flashings and other specified accessory components.
- I. Pressure Plate Framing: Install glazing and infill panels using exterior dry glazing method; see Section 088000.
- J. Touch-up minor damage to factory applied finish; replace components that cannot be satisfactorily repaired.

3.3 TOLERANCES

- A. Maximum Variation from Plumb: 0.06 inch per 3 feet noncumulative or 0.5 inches per 100 feet, whichever is less.
- B. Maximum Misalignment of Two Adjoining Members Abutting in Plane: 1/32 inch.
- C. Sealant Space Between Curtain Wall Mullions and Adjacent Construction: Maximum of 3/4 inch and minimum of 1/4 inch.

3.4 FIELD QUALITY CONTROL

- A. Provide services of curtain wall manufacturer's field representative to observe for proper installation of system and submit report.
- B. See Section 014000 - Quality Requirements for general testing and inspection requirements.
- C. Water-Spray Test: Provide water spray quality test of installed curtain wall components in accordance with AAMA 501.2 during construction process and before installation of interior finishes.
 - 1. Perform a minimum of two tests in each designated area as indicated on drawings.
 - 2. Conduct tests in each area prior to 10 percent and 50 percent completion of this work.
- D. Repair or replace curtain wall components that have failed designated field testing, and retest to verify performance complies with specified requirements.

3.5 CLEANING

- A. See Section 017000 - Execution and Closeout Requirements for additional requirements.
- B. Remove protective material from pre-finished aluminum surfaces.

- C. Wash down surfaces with a solution of mild detergent in warm water, applied with soft, clean wiping cloths, take care to remove dirt from corners, and wipe surfaces clean.
- D. Upon completion of installation, thoroughly clean aluminum surfaces in accordance with AAMA 609 & 610.

3.6 PROTECTION

- A. Protect installed products from damage.

END OF SECTION 084413

SECTION 087100 - DOOR HARDWARE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes commercial door hardware for the following:
 - 1. Swinging doors.
 - 2. Sliding doors.
 - 3. Other doors to the extent indicated.
- B. Door hardware includes, but is not necessarily limited to, the following:
 - 1. Mechanical door hardware.
 - 2. Electromechanical door hardware.
 - 3. Automatic operators.
 - 4. Cylinders specified for doors in other sections.
- C. Related Sections:
 - 1. Division 08 Section 081113 "Hollow Metal Doors and Frames".
 - 2. Division 08 Section 084113 "Aluminum-Framed Entrances and Storefronts".
 - 3. Division 28 Section 281500 "Integrated Access Control Hardware Devices".
- D. Codes and References: Comply with the version year adopted by the Authority Having Jurisdiction.
 - 1. ANSI A117.1 - Accessible and Usable Buildings and Facilities.
 - 2. ICC/IBC - International Building Code.
 - 3. NFPA 70 - National Electrical Code.
 - 4. NFPA 80 - Fire Doors and Windows.
 - 5. NFPA 101 - Life Safety Code.
 - 6. NFPA 105 - Installation of Smoke Door Assemblies.
 - 7. UL/ULC and CSA C22.2 - Standards for Automatic Door Operators Used on Fire and Smoke Barrier Doors and Systems of Doors.
 - 8. Michigan Building Codes, Local Amendments.
- E. Standards: All hardware specified herein shall comply with the following industry standards as applicable. Any undated reference to a standard shall be interpreted as referring to the latest edition of that standard:

1. ANSI/BHMA Certified Product Standards - A156 Series.
2. UL10C - Positive Pressure Fire Tests of Door Assemblies.
3. ANSI/UL 294 - Access Control System Units.
4. UL 305 - Panic Hardware.
5. ANSI/UL 437- Key Locks.

1.3 SUBMITTALS

- A. Product Data: Manufacturer's product data sheets including installation details, material descriptions, dimensions of individual components and profiles, operational descriptions and finishes.
- B. Door Hardware Schedule: Prepared by or under the supervision of supplier, detailing, fabrication and assembly of door hardware, as well as procedures and diagrams. Coordinate the final Door Hardware Schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.
 1. Format: Comply with scheduling sequence and vertical format in DHI's "Sequence and Format for the Hardware Schedule."
 2. Organization: Organize the Door Hardware Schedule into door hardware sets indicating complete designations of every item required for each door or opening. Organize door hardware sets in same order as in the Door Hardware Sets at the end of Part 3. Submittals that do not follow the same format and order as the Door Hardware Sets will be rejected and subject to resubmission.
 3. Content: Include the following information:
 - a. Type, style, function, size, label, hand, and finish of each door hardware item.
 - b. Manufacturer of each item.
 - c. Fastenings and other pertinent information.
 - d. Location of door hardware set, cross-referenced to Drawings, both on floor plans and in door and frame schedule.
 - e. Explanation of abbreviations, symbols, and codes contained in schedule.
 - f. Mounting locations for door hardware.
 - g. Door and frame sizes and materials.
 - h. Warranty information for each product.
 4. Submittal Sequence: Submit the final Door Hardware Schedule at earliest possible date, particularly where approval of the Door Hardware Schedule must precede fabrication of other work that is critical in the Project construction schedule. Include Product Data, Samples, Shop Drawings of other work affected by door hardware, and other information essential to the coordinated review of the Door Hardware Schedule.
- C. Shop Drawings: Details of electrified access control hardware indicating the following:
 1. Wiring Diagrams: Upon receipt of approved schedules, submit detailed system wiring diagrams for power, signaling, monitoring, communication, and control of the access control system electrified hardware. Differentiate between manufacturer-installed and field-installed wiring. Include the following:

- a. Elevation diagram of each unique access controlled opening showing location and interconnection of major system components with respect to their placement in the respective door openings.
 - b. Complete (risers, point-to-point) access control system block wiring diagrams.
 - c. Wiring instructions for each electronic component scheduled herein.
2. Electrical Coordination: Coordinate with related sections the voltages and wiring details required at electrically controlled and operated hardware openings.
- D. Keying Schedule: After a keying meeting with the owner has taken place prepare a separate keying schedule detailing final instructions. Submit the keying schedule in electronic format. Include keying system explanation, door numbers, key set symbols, hardware set numbers and special instructions. Owner must approve submitted keying schedule prior to the ordering of permanent cylinders/cores.
- E. Informational Submittals:
1. Product Test Reports: Indicating compliance with cycle testing requirements, based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified independent testing agency.

1.4 CLOSEOUT SUBMITTALS

- A. Operating and Maintenance Manuals: Provide manufacturers operating and maintenance manuals for each item comprising the complete door hardware installation in quantity as required in Division 01, Closeout Procedures.
- B. Project Record Documents: Provide record documentation of as-built door hardware sets in digital format (.pdf, .docx, .xlsx, .csv) and as required in Division 01, Project Record Documents.

1.5 QUALITY ASSURANCE

- A. Manufacturers Qualifications: Engage qualified manufacturers with a minimum 5 years of documented experience in producing hardware and equipment similar to that indicated for this Project and that have a proven record of successful in-service performance.
- B. Certified Products: Where specified, products must maintain a current listing in the Builders Hardware Manufacturers Association (BHMA) Certified Products Directory (CPD).
- C. Installer Qualifications: A minimum 3 years documented experience installing both standard and electrified door hardware similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.
- D. Door Hardware Supplier Qualifications: Experienced commercial door hardware distributors with a minimum 5 years documented experience supplying both mechanical and electromechanical hardware installations comparable in material, design, and extent to that indicated for this Project. Supplier recognized as a factory direct distributor by the

manufacturers of the primary materials with a warehousing facility in Project's vicinity. Supplier to have on staff a certified Architectural Hardware Consultant (AHC) available during the course of the Work to consult with Contractor, Architect, and Owner concerning both standard and electromechanical door hardware and keying.

- E. Source Limitations: Obtain each type and variety of door hardware specified in this section from a single source unless otherwise indicated.
 - 1. Electrified modifications or enhancements made to a source manufacturer's product line by a secondary or third party source will not be accepted.
 - 2. Provide electromechanical door hardware from the same manufacturer as mechanical door hardware, unless otherwise indicated.

- F. Each unit to bear third party permanent label indicating compliance with the referenced testing standards.

- G. Keying Conference: Conduct conference to comply with requirements in Division 01 Section "Project Meetings." Keying conference to incorporate the following criteria into the final keying schedule document:
 - 1. Function of building, purpose of each area and degree of security required.
 - 2. Plans for existing and future key system expansion.
 - 3. Requirements for key control storage and software.
 - 4. Installation of permanent keys, cylinder cores and software.
 - 5. Address and requirements for delivery of keys.

- H. Pre-Submittal Conference: Conduct coordination conference in compliance with requirements in Division 01 Section "Project Meetings" with attendance by representatives of Supplier(s), Installer(s), and Contractor(s) to review proper methods and the procedures for receiving, handling, and installing door hardware.
 - 1. Prior to installation of door hardware, conduct a project specific training meeting to instruct the installing contractors' personnel on the proper installation and adjustment of their respective products. Product training to be attended by installers of door hardware (including electromechanical hardware) for aluminum, hollow metal and wood doors. Training will include the use of installation manuals, hardware schedules, templates and physical product samples as required.
 - 2. Inspect and discuss electrical roughing-in, power supply connections, and other preparatory work performed by other trades.
 - 3. Review sequence of operation narratives for each unique access controlled opening.
 - 4. Review and finalize construction schedule and verify availability of materials.
 - 5. Review the required inspecting, testing, commissioning, and demonstration procedures

- I. At completion of installation, provide written documentation that components were applied according to manufacturer's instructions and recommendations and according to approved schedule.

1.6 DELIVERY, STORAGE AND HANDLING

- A. Inventory door hardware on receipt and provide secure lock-up and shelving for door hardware delivered to Project site. Do not store electronic access control hardware, software or accessories at Project site without prior authorization.
- B. Tag each item or package separately with identification related to the final Door Hardware Schedule, and include basic installation instructions with each item or package.
- C. Deliver, as applicable, permanent keys, cylinders, cores, access control credentials, software and related accessories directly to Owner via registered mail or overnight package service. Instructions for delivery to the Owner shall be established at the "Keying Conference".

1.7 COORDINATION

- A. Templates: Obtain and distribute to the parties involved templates for doors, frames, and other work specified to be factory prepared for installing standard and electrified hardware. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing hardware to comply with indicated requirements.
- B. Door Hardware and Electrical Connections: Coordinate the layout and installation of scheduled electrified door hardware and related access control equipment with required connections to source power junction boxes, low voltage power supplies, detection and monitoring hardware, and fire and detection alarm systems.
- C. Door and Frame Preparation: Doors and corresponding frames are to be prepared, reinforced and pre-wired (if applicable) to receive the installation of the specified electrified, monitoring, signaling and access control system hardware without additional in-field modifications.

1.8 WARRANTY

- A. General Warranty: Reference Division 01, General Requirements. Special warranties specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.
- B. Warranty Period: Written warranty, executed by manufacturer(s), agreeing to repair or replace components of standard and electrified door hardware that fails in materials or workmanship within specified warranty period after final acceptance by the Owner. Failures include, but are not limited to, the following:
 - 1. Structural failures including excessive deflection, cracking, or breakage.
 - 2. Faulty operation of the hardware.
 - 3. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
 - 4. Electrical component defects and failures within the systems operation.
- C. Warranty Period: Unless otherwise indicated, warranty shall be one year from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 BUTT HINGES

- A. Hinges: ANSI/BHMA A156.1 butt hinges with number of hinge knuckles and other options as specified in the Door Hardware Sets.
1. Quantity: Provide the following hinge quantity:
 - a. Two Hinges: For doors with heights up to 60 inches.
 - b. Three Hinges: For doors with heights 61 to 90 inches.
 - c. Four Hinges: For doors with heights 91 to 120 inches.
 - d. For doors with heights more than 120 inches, provide 4 hinges, plus 1 hinge for every 30 inches of door height greater than 120 inches.
 2. Hinge Size: Provide the following, unless otherwise indicated, with hinge widths sized for door thickness and clearances required:
 - a. Widths up to 3'0": 4-1/2" standard or heavy weight as specified.
 - b. Sizes from 3'1" to 4'0": 5" standard or heavy weight as specified.
 3. Hinge Weight and Base Material: Unless otherwise indicated, provide the following:
 - a. Exterior Doors: Heavy weight, non-ferrous, ball bearing or oil impregnated bearing hinges unless Hardware Sets indicate standard weight.
 - b. Interior Doors: Standard weight, steel, ball bearing or oil impregnated bearing hinges unless Hardware Sets indicate heavy weight.
 4. Hinge Options: Comply with the following:
 - a. Non-removable Pins: With the exception of electric through wire hinges, provide set screw in hinge barrel that, when tightened into a groove in hinge pin, prevents removal of pin while door is closed; for all out-swinging lockable doors.
 5. Manufacturers:
 - a. Ives (IV) - 5BB Series, 5-knuckle.
 - b. McKinney (MK) - TA/T4A Series, 5-knuckle.
 - c. dormakaba BEST (ST) - F/FBB Series, 5-knuckle.

2.2 CONTINUOUS HINGES

- A. Continuous Geared Hinges: ANSI/BHMA A156.26 Grade 1-600 continuous geared hinge. with minimum 0.120-inch thick extruded 6063-T6 aluminum alloy hinge leaves and a minimum overall width of 4 inches. Hinges are non-handed, reversible and fabricated to template screw locations. Factory trim hinges to suit door height and prepare for electrical cut-outs.
1. Where specified, provide modular continuous geared hinges that ship in two or three pieces and form a single continuous hinge upon installation.

2. Manufacturers:
 - a. Ives (IV).
 - b. Pemko (PE).
 - c. dormakaba BEST (ST).

2.3 POWER TRANSFER DEVICES

- A. Concealed Quick Connect Electric Power Transfers: Provide concealed wiring pathway housing mortised into the door and frame for low voltage electrified door hardware. Furnish with Molex™ standardized plug connectors and sufficient number of concealed wires (up to 12) to accommodate the electrified functions specified in the Door Hardware Sets. Connectors plug directly to through-door wiring harnesses for connection to electric locking devices and power supplies. Wire nut connections are not acceptable.
 1. Manufacturers:
 - a. Pemko (PE) - EL-CEPT Series.
 - b. Securitron (SU) - EL-CEPT Series.
- B. Electrified Quick Connect Data Transfer Hinges: Provide combined electrified power and Ethernet data transfer hinges with Molex™ standardized plug connectors to accommodate electrified functions with a 1-year warranty as 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. Data transfer hinges feature two 6-position and two 4-position Molex connectors, 9 multi-strand wires; 2 twisted pairs (26 AWG), 4 straight conductors (28 gauge) and 1 straight conductor (22 AWG) with concealed plug connectors eliminating the need for separate or exposed wiring. Rated 350 mA continuous @ 48 volts DC nominal, the hinge is capable of two PoE wiring configurations:
 - a. Power over Data (5 wire): Power and Data supplied together over the 2 twisted 26 AWG) pairs. The 22 AWG conductor is used for the earth ground connection.
 - b. Data with Power over Spares (9 wire): Data over 2 twisted (26 AWG) pairs with Power over spare pairs 94 straight 28 AWG conductors). The 22 Awg conductor is used for earth ground connection.
 2. Manufacturers:
 - a. Markar Products; ASSA ABLOY Architectural Door Accessories (MR) - PoE Series.
 - b. McKinney (MK) - PoE Series.
 - c. Pemko (PE) - PoE Series.
- C. Electric Door Wire Harnesses: Provide electric/data transfer wiring harnesses with standardized plug connectors to accommodate up to twelve (12) wires. Connectors plug directly to through-door wiring harnesses for connection to electric locking devices and power supplies. Provide sufficient number and type of concealed wires to accommodate electric function of specified

hardware. Provide a connector for through-door electronic locking devices and from hinge to junction box above the opening. Wire nut connections are not acceptable. Determine the length required for each electrified hardware component for the door type, size and construction, minimum of two per electrified opening.

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

2.4 DOOR OPERATING TRIM

- A. Door Push Plates and Pulls: ANSI/BHMA A156.6 door pushes and pull units of type and design specified in the Hardware Sets. Coordinate and provide proper width and height as required where conflicting hardware dictates.
 1. Push/Pull Plates: Minimum .050 inch thick, size as indicated in hardware sets, with beveled edges, secured with exposed screws unless otherwise indicated.
 2. Door Pull and Push Bar Design: Size, shape, and material as indicated in the hardware sets. Minimum clearance of 2 1/2-inches from face of door unless otherwise indicated.
 3. Offset Pull Design: Size, shape, and material as indicated in the hardware sets. Minimum clearance of 2 1/2-inches from face of door and offset of 90 degrees unless otherwise indicated.
 4. Pulls, where applicable, shall be provided with a 10" clearance from the finished floor on the push side to accommodate wheelchair accessibility.
 5. Fasteners: Provide manufacturer's designated fastener type as indicated in Hardware Sets. When through-bolt fasteners are in the same location as a push plate, countersink the fasteners flush with the door face allowing the push plate to sit flat against the door.
 6. Manufacturers:
 - a. Ives (IV).
 - b. Rockwood (RO).
 - c. Trimco (TC).

2.5 CYLINDERS AND KEYING

- A. General: Cylinder manufacturer to have minimum (10) years experience designing secured master key systems and have on record a published security keying system policy.
 1. Manufacturers:
 - a. Schlage (SC).
 - b. No Substitution.

- B. Cylinder Types: Original manufacturer cylinders able to supply the following cylinder formats and types:
1. Threaded mortise cylinders with rings and cams to suit hardware application.
 2. Rim cylinders with back plate, flat-type vertical or horizontal tailpiece, and raised trim ring.
 3. Bored or cylindrical lock cylinders with tailpieces as required to suit locks.
 4. Tubular deadlocks and other auxiliary locks.
 5. Mortise and rim cylinder collars to be solid and recessed to allow the cylinder face to be flush and be free spinning with matching finishes.
 6. Keyway: Match Facility Restricted Keyway.
- C. Large Format Interchangeable Cores: Provide removable cores (LFIC) as specified, core insert, removable by use of a special key, and for use with only the core manufacturer's cylinder and door hardware.
- D. Patented Cylinders: ANSI/BHMA A156.5, Grade 1 Certified Products Directory (CPD) listed cylinders employing a utility patented and restricted keyway requiring the use of a patented key. Cylinders are to be protected from unauthorized manufacture and distribution by manufacturer's United States patents. Cylinders are to be factory keyed with owner having the ability for on-site original key cutting.
1. Patented key systems shall not be established with products that have an expired patent. Expired systems shall only be specified and supplied to support existing systems.
 2. Manufacturers:
 - a. Schlage (SC) – Confirm With Owner
- E. Keying System: Each type of lock and cylinders to be factory keyed.
1. Supplier shall conduct a "Keying Conference" to define and document keying system instructions and requirements.
 2. Furnish factory cut, nickel-silver large bow permanently inscribed with a visual key control number as directed by Owner.
 3. Existing System: Field verify and key cylinders to match Owner's existing system.
- F. Key Quantity: Provide the following minimum number of keys:
1. Change Keys per Cylinder: Two (2)
 2. Master Keys (per Master Key Level/Group): Five (5).
 3. Construction Keys (where required): Ten (10).
 4. Construction Control Keys (where required): Two (2).
 5. Permanent Control Keys (where required): Two (2).
- G. Construction Keying: Provide temporary keyed construction cores.
- H. Key Registration List (Bitting List):
1. Provide keying transcript list to Owner's representative in the proper format for importing into key control software.

2. Provide transcript list in writing or electronic file as directed by the Owner.

2.6 MORTISE LOCKS AND LATCHING DEVICES

- A. Mortise Locksets, Grade 1 (Heavy Duty): Provide ANSI/BHMA A156.13, Series 1000, Operational Grade 1 Certified Products Directory (CPD) listed mortise locksets. Listed manufacturers shall meet all functions and features as specified herein.
 1. Manufacturers:
 - a. Corbin Russwin Hardware (RU) - ML2000 Series.
 - b. Sargent Manufacturing (SA) - 8200 Series.
 - c. Schlage (SC) - L9000 Series.

2.7 CONVENTIONAL EXIT DEVICES

- A. General Requirements: All exit devices specified herein shall meet or exceed the following criteria:
 1. At doors not requiring a fire rating, provide devices complying with NFPA 101 and listed and labeled for "Panic Hardware" according to UL305. Provide proper fasteners as required by manufacturer including sex nuts and bolts at openings specified in the Hardware Sets.
 2. Where exit devices are required on fire rated doors, provide devices complying with NFPA 80 and with UL labeling indicating "Fire Exit Hardware". Provide devices with the proper fasteners for installation as tested and listed by UL. Consult manufacturer's catalog and template book for specific requirements.
 3. Except on fire rated doors, provide exit devices with hex key dogging device to hold the pushbar and latch in a retracted position. Provide optional keyed cylinder dogging on devices where specified in Hardware Sets.
 4. Devices must fit flat against the door face with no gap that permits unauthorized dogging of the push bar. The addition of filler strips is required in any case where the door light extends behind the device as in a full glass configuration.
 5. Flush End Caps: Provide flush end caps made of architectural metal in the same finish as the devices as in the Hardware Sets. Plastic end caps will not be acceptable.
 6. Lever Operating Trim: Where exit devices require lever trim, furnish manufacturer's heavy duty escutcheon trim with threaded studs for thru-bolts.
 - a. Lock Trim Design: As indicated in Hardware Sets, provide finishes and designs to match that of the specified locksets.
 - b. Where function of exit device requires a cylinder, provide a cylinder (Rim or Mortise) as specified in Hardware Sets.
 7. Vertical Rod Exit Devices: Where surface or concealed vertical rod exit devices are used at interior openings, provide as less bottom rod (LBR) unless otherwise indicated. Provide dust proof strikes where thermal pins are required to project into the floor.
 8. Narrow Stile Applications: At doors constructed with narrow stiles, or as specified in Hardware Sets, provide devices designed for maximum 2" wide stiles.
 9. Dummy Push Bar: Nonfunctioning push bar matching functional push bar.

10. Rail Sizing: Provide exit device rails factory sized for proper door width application.
 11. Through Bolt Installation: For exit devices and trim as indicated in Door Hardware Sets.
- B. Conventional Push Rail Exit Devices (Heavy Duty): ANSI/BHMA A156.3, Grade 1 Certified Products Directory (CPD) listed exit devices. Listed manufacturers shall meet all functions and features as specified herein.
1. Provide exit devices with functions and features as follows:
 - a. Where required by code, provide knurling or abrasive coating on all levers leading to hazardous areas.
 - b. Meets UL and CUL Standard 10C Positive Pressure, Fire Test of Door Assemblies with levers that meet A117.1 Accessibility Code.
 - c. No catch points: addition of applied deflectors or other added components are not allowed.
 - d. No visible plastic.
 - e. Heavy duty end caps with flush and overlapping options made of stainless steel, brass, or bronze with architectural finishes.
 - f. Constructed of all stainless steel.
 - g. Stainless steel pullman type latch with deadlock feature.
 - h. Narrow or wide style exterior trim as specified in the hardware sets.
 - i. Center case adjustability on concealed vertical rod exit devices; single operation with hex key individually adjusts top or bottom latches. No retainer screws or clips required to maintain adjustment.
 - j. Ten-year limited warranty for mechanical features.
 2. Electromechanical exit devices shall have the following functions and features:
 - a. Universal Molex plug-in connectors that have standardized color-coded wiring and are field configurable in fail safe or fail secure and operate from 12vdc to 24vdc regulated.
 - b. Wire routing for all non-access control electromechanical functions and EcoFlex trim to be contained within the carrier of the device eliminating the need for cavities in doors to be drilled. Include a protective film so that wires don't get damaged if the rail needs to be removed.
 - c. EcoFlex or equivalent technology that reduces energy consumption up to 92% as certified by GreenCircle.
 - d. Options to be available for request-to-exit or enter signaling, latchbolt and touchbar monitoring.
 - e. Field configurable electrified trim to fail-safe or fail-secure that operates from 12-24VDC.
 3. Manufacturers:
 - a. Corbin Russwin Hardware (RU) - PED4000 / PED5000 Series.
 - b. Sargent Manufacturing (SA) - PE80 Series.
 - c. Von Duprin (VD) - 35A/98 XP Series.

2.8 SURFACE DOOR CLOSERS

- A. All door closers specified herein shall meet or exceed the following criteria:
1. General: Door closers to be from one manufacturer, matching in design and style, with the same type door preparations and templates regardless of application or spring size. Closers to be non-handed with full sized covers.
 2. Standards: Closers to comply with UL-10C for Positive Pressure Fire Test and be U.L. listed for use of fire rated doors.
 3. Cycle Testing: Provide closers which have surpassed 15 million cycles.
 4. Size of Units: Comply with manufacturer's written recommendations for sizing of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Where closers are indicated for doors required to be accessible to the Americans with Disabilities Act, provide units complying with ANSI ICC/A117.1.
 5. Closer Arms: Provide heavy duty, forged steel closer arms unless otherwise indicated in Hardware Sets.
 6. Closers shall not be installed on exterior or corridor side of doors; where possible install closers on door for optimum aesthetics.
 7. Closer Accessories: Provide door closer accessories including custom templates, special mounting brackets, spacers and drop plates as required for proper installation. Provide through-bolt and security type fasteners as specified in the hardware sets.
- B. Door Closers, Surface Mounted (Large Body Cast Iron): ANSI/BHMA A156.4, Grade 1 Certified Products Directory (CPD) listed surface mounted, heavy duty door closers with complete spring power adjustment, sizes 1 thru 6; and fully operational adjustable according to door size, frequency of use, and opening force. Closers to be rack and pinion type, one piece cast iron body construction, with adjustable backcheck and separate non-critical valves for closing sweep and latch speed control.
1. Manufacturers:
 - a. Corbin Russwin Hardware (RU) - DC8000 Series.
 - b. Norton Rixson (NO) - 9500 Series.
 - c. Sargent Manufacturing (SA) - 281 Series.
- C. Door Closers, Surface Mounted (Heavy Duty): ANSI/BHMA A156.4, Grade 1 Certified Products Directory (CPD) listed surface mounted, heavy duty door closers with complete spring power adjustment, sizes 1 thru 6; and fully operational adjustable according to door size, frequency of use, and opening force. Closers to be rack and pinion type, one piece cast iron or aluminum alloy body construction, with adjustable backcheck and separate non-critical valves for closing sweep and latch speed control. Provide non-handed units standard..
1. Manufacturers:
 - a. Corbin Russwin Hardware (RU) - DC6000 Series.
 - b. Norton Rixson (NO) - 7500 Series.
 - c. Sargent Manufacturing (SA) - 351 Series.

2.9 ELECTROMECHANICAL DOOR OPERATORS

- A. Electromechanical Door Operators (High Traffic): Provide ANSI/BHMA A156.19 Certified Products Directory (CPD) listed low energy operators that are UL325/991 and UL10C certified and comply with requirements for the Americans with Disabilities Act (ADA). Operators shall accommodate openings up to 250 pounds and 48” wide.
1. Provide operators with features as follows:
 - a. Non-handed with push and pull side mounting.
 - b. Activation by push button, hands-free or radio frequency devices.
 - c. Adjustable opening force and closing power.
 - d. Two-year limited warranty.
 - e. Wi-Fi interface where the operator is a secure, password protected WiFi hot spot with no connection to building’s IT required.
 - 1) Simple setup with no app required.
 - 2) View status and make adjustments without removing the cover.
 - 3) Built-in logic to support single use restroom applications with no external relay boards, logic modules, position switches required.
 - f. Mounting backplate to simplify and speed up installation.
 - g. Integration with access control systems.
 2. Operators shall have the following functionality:
 - a. Adjustable Hold Open: Amount of time a door will stay in the full open position after an activation.
 - b. Blow Open for Smoke Ventilation: Door opens when signal is received from alarm system allowing air or smoke to flow through opening. Door will stay open until signal from alarm system is stopped.
 - c. Emergency Interface Relay: Door closes and ignores any activation input until signal is discontinued.
 - d. Infinite Hold Open: Door will hold open at set position until power is turned off.
 - e. Latch Assist: At closed position, after an activation, the door is pulled in. After the door has closed, the door is pulled in to assist with latch release/engagement.
 - f. Obstruction Detection: Door closes if it hits an obstruction while opening; door will reverse to open position if it hits an obstruction while closing. Door will stop once it hits an obstruction and will rest against the obstruction until removed.
 - g. Open Delay: Delays operator opening for locking hardware.
 - h. Outside Wall Switch Disable: When contact is closed, outside wall switch is disabled.
 - i. Power Assist: Senses the door is being opened manually and applies small amount of power to assist the user in opening the door with force less than 5 lbs. The door opens only as far as it is moved manually, then closes once released.
 - j. Power Close: Additional force to assist door closing between 7° and 2°.
 - k. Presence Detector Input: Input for external sensor to detect presence at door open or close position only.
 - l. Push & Go: As the door is manually opened, the operator "senses" movement and opens door to the full-open position.

- m. Selector Mode Switch: Off disables the signal inputs unless Blow Open is activated, on activates the signal inputs, hold open activates the unit (unless Blow Closed is activated) to the hold open position.
 - n. Vestibule Delay: When the wall switch is pressed, first door in vestibule will open. Second door will open once vestibule door delay has expired. Delay is adjustable.
 - o. Executive Mode Feature: When the door receives an activation signal it opens and remains open until either a second signal is received, or the door is manually moved in closing direction.
3. Manufacturers:
- a. Horton Automatics (HO) - S4100LE Series.
 - b. LCN (LC) – 4640 Series.
 - c. Norton Rixson (NO) - 6300 Series.

2.10 SURFACE MOUNTED CLOSER HOLDERS

- A. Electromagnetic Door Holders: ANSI A156.15 electromagnetic door holder/releases with a minimum 20 to 40 pounds holding power and single coil construction able to accommodate 12VDC, 24VAC, 24VDC and 120VAC. Coils to be independently wound, employing an integral fuse and armatures to include a positive release button.
1. Manufacturers:
- a. Norton Rixson (RF) - 980/990 Series.

2.11 ARCHITECTURAL TRIM

- A. Door Protective Trim
- 1. General: Door protective trim units to be of type and design as specified below or in the Hardware Sets.
 - 2. Size: Fabricate protection plates (kick, armor, or mop) not more than 2" less than door width (LDW) on stop side of single doors and 1" LDW on stop side of pairs of doors, and not more than 1" less than door width on pull side. Coordinate and provide proper width and height as required where conflicting hardware dictates. Height to be as specified in the Hardware Sets.
 - 3. Where plates are applied to fire rated doors with the top of the plate more than 16" above the bottom of the door, provide plates complying with NFPA 80. Consult manufacturer's catalog and template book for specific requirements for size and applications.
 - 4. Protection Plates: ANSI/BHMA A156.6 protection plates (kick, armor, or mop), fabricated from the following:
 - a. Stainless Steel: 300 grade, 050-inch thick.
 - 5. Options and fasteners: Provide manufacturer's designated fastener type as specified in the Hardware Sets. Provide countersunk screw holes.
 - 6. Manufacturers:

- a. Ives (IV).
- b. Rockwood (RO).
- c. Trimco (TC).

2.12 DOOR STOPS AND HOLDERS

- A. General: Door stops and holders to be of type and design as specified below or in the Hardware Sets.
- B. Door Stops and Bumpers: ANSI/BHMA A156.16, Grade 1 door stops and wall bumpers. Provide wall bumpers, either convex or concave types with anchorage as indicated, unless floor or other types of door stops are specified in Hardware Sets. Do not mount floor stops where they will impede traffic. Where floor or wall bumpers are not appropriate, provide overhead type stops and holders.
 - 1. Manufacturers:
 - a. Ives (IV).
 - b. Rockwood (RO).
 - c. Trimco (TC).
- C. Overhead Door Stops and Holders: ANSI/BHMA A156.8, Grade 1 Certified Products Directory (CPD) listed overhead stops and holders to be surface or concealed types as indicated in Hardware Sets. Track, slide, arm and jamb bracket to be constructed of extruded bronze and shock absorber spring of heavy tempered steel. Provide non-handed design with mounting brackets as required for proper operation and function.
 - 1. Manufacturers:
 - a. Norton Rixson (RF).

2.13 ARCHITECTURAL SEALS

- A. General: Thresholds, weatherstripping, and gasket seals to be of type and design as specified below or in the Hardware Sets. Provide continuous weatherstrip gasketing on exterior doors and provide smoke, light, or sound gasketing on interior doors where indicated. At exterior applications provide non-corrosive fasteners and elsewhere where indicated.
- B. Smoke Labeled Gasketing: Assemblies complying with NFPA 105 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for smoke control ratings indicated, based on testing according to UL 1784.
 - 1. Provide smoke labeled perimeter gasketing at all smoke labeled openings.
- C. Fire Labeled Gasketing: Assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to UL-10C.

1. Provide intumescent seals as indicated to meet UL10C Standard for Positive Pressure Fire Tests of Door Assemblies, and NFPA 252, Standard Methods of Fire Tests of Door Assemblies.
- D. Sound-Rated Gasketing: Assemblies that are listed and labeled by a testing and inspecting agency, for sound ratings indicated.
- E. Replaceable Seal Strips: Provide only those units where resilient or flexible seal strips are easily replaceable and readily available from stocks maintained by manufacturer.
- F. Manufacturers:
 1. National Guard Products (NG).
 2. Pemko (PE).
 3. Reese Enterprises, Inc. (RE).

2.14 ELECTRONIC ACCESSORIES

- A. Door Position Switches: Door position magnetic reed contact switches specifically designed for use in commercial door applications. On recessed models the contact and magnetic housing snap-lock into a 1" diameter hole. Surface mounted models include wide gap distance design complete with armored flex cabling. Provide SPDT, N/O switches with optional Rare Earth Magnet installation on steel doors with flush top channels.
 1. Manufacturers:
 - a. Security Door Controls (SD) - DPS Series.
 - b. Securitron (SU) - DPS Series.
- B. Intelligent Switching Power Supplies: Provide power supplies with single, dual or multi-voltage configurations at 12 and/or 24VDC. Power Supply shall have battery backup function with an integrated battery charging circuit. The power supply shall have a standard, integrated Fire Alarm Interface (FAI). The power supply shall provide capability for secondary voltage, power distribution, direct lock control and network monitoring through add on modules. The power supply shall be expandable up to 16 individually protected outputs. Output modules shall provide individually protected, continuous outputs and/or individually protected, relay controlled outputs. Network modules shall provide remote monitoring functions such as status reporting, fault reporting and information logging.
 1. Provide the least number of units, at the appropriate amperage level, sufficient to exceed the required total draw for the specified electrified hardware and access control equipment.
 2. Manufacturers:
 - a. Securitron (SU) - AQL Series.

2.15 FABRICATION

- A. Fasteners: Provide door hardware manufactured to comply with published templates generally prepared for machine, wood, and sheet metal screws. Provide screws according to manufacturers recognized installation standards for application intended.

2.16 FINISHES

- A. Standard: Designations used in the Hardware Sets and elsewhere indicate hardware finishes complying with ANSI/BHMA A156.18, including coordination with traditional U.S. finishes indicated by certain manufacturers for their products.
- B. Provide quality of finish, including thickness of plating or coating (if any), composition, hardness, and other qualities complying with manufacturer's standards, but in no case less than specified by referenced standards for the applicable units of hardware
- C. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine scheduled openings, with Installer present, for compliance with requirements for installation tolerances, labeled fire door assembly construction, wall and floor construction, and other conditions affecting performance.
- B. Notify architect of any discrepancies or conflicts between the door schedule, door types, drawings and scheduled hardware. Proceed only after such discrepancies or conflicts have been resolved in writing.

3.2 PREPARATION

- A. Hollow Metal Doors and Frames: Comply with ANSI/DHI A115 series.
- B. Wood Doors: Comply with ANSI/DHI A115-W series.

3.3 INSTALLATION

- A. Install each item of mechanical and electromechanical hardware and access control equipment to comply with manufacturer's written instructions and according to specifications.
 - 1. Installers are to be trained and certified by the manufacturer on the proper installation and adjustment of fire, life safety, and security products including: hanging devices; locking devices; closing devices; and seals.
- B. Mounting Heights: Mount door hardware units at heights indicated in following applicable publications, unless specifically indicated or required to comply with governing regulations:

1. Standard Steel Doors and Frames: DHI's "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames."
 2. DHI TDH-007-20: Installation Guide for Doors and Hardware.
 3. Where indicated to comply with accessibility requirements, comply with ANSI A117.1 "Accessibility Guidelines for Buildings and Facilities."
 4. Provide blocking in drywall partitions where wall stops or other wall mounted hardware is located.
- C. Retrofitting: Install door hardware to comply with manufacturer's published templates and written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing work specified in Division 9 Sections. Do not install surface-mounted items until finishes have been completed on substrates involved.
- D. Push Plates and Door Pulls: When through-bolt fasteners are in the same location as a push plate, countersink the fasteners flush with the door face allowing the push plate to sit flat against the door.
- E. Thresholds: Set thresholds for exterior and acoustical doors in full bed of sealant complying with requirements specified in Division 7 Section "Joint Sealants."
- F. Storage: Provide a secure lock up for hardware delivered to the project but not yet installed. Control the handling and installation of hardware items so that the completion of the work will not be delayed by hardware losses before and after installation.

3.4 FIELD QUALITY CONTROL

- A. Field Inspection (Punch Report): Reference Division 01 Sections "Closeout Procedures". Produce project punch report for each installed door opening indicating compliance with approved submittals and verification hardware is properly installed, operating and adjusted. Include list of items to be completed and corrected, indicating the reasons or deficiencies causing the Work to be incomplete or rejected.
1. Organization of List: Include separate Door Opening and Deficiencies and Corrective Action Lists organized by Mark, Opening Remarks and Comments, and related Opening Images and Video Recordings.

3.5 ADJUSTING

- A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.

3.6 CLEANING AND PROTECTION

- A. Protect all hardware stored on construction site in a covered and dry place. Protect exposed hardware installed on doors during the construction phase. Install any and all hardware at the latest possible time frame.
- B. Clean adjacent surfaces soiled by door hardware installation.
- C. Clean operating items as necessary to restore proper finish. Provide final protection and maintain conditions that ensure door hardware is without damage or deterioration at time of owner occupancy.

3.7 DEMONSTRATION

- A. Instruct Owner's maintenance personnel to adjust, operate, and maintain mechanical and electromechanical door hardware.

3.8 DOOR HARDWARE SETS

- A. The hardware sets represent the design intent and direction of the owner and architect. They are a guideline only and should not be considered a detailed hardware schedule. Discrepancies, conflicting hardware and missing items should be brought to the attention of the architect with corrections made prior to the bidding process. Omitted items not included in a hardware set should be scheduled with the appropriate additional hardware required for proper application and functionality.
 - 1. Quantities listed are for each pair of doors, or for each single door.
 - 2. The supplier is responsible for handing and sizing all products.
 - 3. Where multiple options for a piece of hardware are given in a single line item, the supplier shall provide the appropriate application for the opening.
 - 4. At existing openings with new hardware the supplier shall field inspect existing conditions prior to the submittal stage to verify the specified hardware will work as required. Provide alternate solutions and proposals as needed.
- B. Refer to Section 080671, Door Hardware Sets, for hardware sets.

END OF SECTION 087100

SECTION 088000 - GLAZING

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Insulating glass units.
- B. Glazing units.
- C. Plastic films.
- D. Glazing compounds.

1.2 RELATED REQUIREMENTS

- A. Section 079200 - Joint Sealants: Sealants for other than glazing purposes.
- B. Section 084113 - Aluminum-Framed Entrances and Storefronts: Frames for storefront assemblies.
- C. Section 084413 - Glazed Aluminum Curtain Walls: Frames for curtain wall assemblies.
- D. Section 088813 - Fire-Rated Glazing.

1.3 REFERENCE STANDARDS

- A. 16 CFR 1201 - Safety Standard for Architectural Glazing Materials.
- B. ANSI Z97.1 - American National Standard for Safety Glazing Materials Used in Buildings - Safety Performance Specifications and Methods of Test.
- C. ASTM C864 - Standard Specification for Dense Elastomeric Compression Seal Gaskets, Setting Blocks, and Spacers.
- D. ASTM C920 - Standard Specification for Elastomeric Joint Sealants.
- E. ASTM C1036 - Standard Specification for Flat Glass.
- F. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass.
- G. ASTM C1172 - Standard Specification for Laminated Architectural Flat Glass.
- H. ASTM C1193 - Standard Guide for Use of Joint Sealants.
- I. ASTM C1376 - Standard Specification for Pyrolytic and Vacuum Deposition Coatings on Flat Glass.
- J. ASTM E1300 - Standard Practice for Determining Load Resistance of Glass in Buildings.

- K. ASTM E2190 - Standard Specification for Insulating Glass Unit Performance and Evaluation.
- L. GANA (GM) - GANA Glazing Manual.
- M. GANA (SM) - GANA Sealant Manual.
- N. GANA (LGRM) - Laminated Glazing Reference Manual.
- O. IGMA TM-3000 - North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial & Residential Use.
- P. NFRC 100 - Procedure for Determining Fenestration Product U-factors.
- Q. NFRC 200 - Procedure for Determining Fenestration Product Solar Heat Gain Coefficient and Visible Transmittance at Normal Incidence.
- R. NFRC 300 - Test Method for Determining the Solar Optical Properties of Glazing Materials and Systems.
- S. Walker, McGough, Foltz and Lyerla - WMFL 8801 Attack Resistant Standard.
- T. Underwriter's Laboratories - UL 752 Bullet Resisting Equipment.

1.4 DEFINITIONS

- A. Bullet-Resistant Glass: A multiple lamination of glass or glass and plastic that is designed to resist penetration from medium-to-super-power small arms and high-power rifles and to minimize spalling.
- B. Forced Entry Glass: A multiple lamination of glass or glass and plastic that is designed to resist penetration from physical attack.

1.5 ADMINISTRATIVE REQUIREMENTS

- A. Preinstallation Meeting: Convene a preinstallation meeting one week before starting work of this section; require attendance by each of the affected installers.
 - 1. Discuss installation requirements and limitations, coordination with other affected installers, and special applications.

1.6 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Product Data on Each Glazing Type: Provide structural, physical and environmental characteristics, size limitations, special handling and installation requirements.

- C. Product Data on Glazing Compounds and Accessories: Provide chemical, functional, and environmental characteristics, limitations, special application requirements, and identify available colors.
- D. Samples: Submit two samples 12 by 12 inch in size of insulating, laminated, and decorative glass units.
- E. Certificate: Certify that products of this section meet or exceed specified requirements.
- F. Product Test Reports: For coated glass, insulating glass and glazing sealants, for tests performed by a qualified testing agency.
 - 1. For glazing sealants, provide test reports based on testing current sealant formulations within previous 36-month period.
- G. Preconstruction adhesion and compatibility test report.
- H. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.7 QUALITY ASSURANCE

- A. Perform Work in accordance with GANA (GM), GANA (SM), GANA (LGRM), and IGMA TM-3000 for glazing installation methods.
- B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum five years of documented experience.
 - 1. Provide certified glass products through ANSI accredited certifications that include plant audits and independent laboratory performance testing.
- C. Installer Qualifications: Company specializing in performing work of the type specified and with at least five years documented experience.
- D. Testing Agency Qualifications: Independent firm specializing in performing testing and inspections of the type specified in this section.
 - 1. Sealant Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1021 to conduct the testing indicated.
- E. Provide each type of glass, primary sealant, and gasket from a single manufacturer with not less than five years documented experience in the production of required materials.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Comply with manufacturer's instructions for shipping, handling, storing, and protection of glass and glazing materials. Exercise exceptional care to prevent edge damage to glass, and damage to coatings.

1.9 FIELD CONDITIONS

- A. Do not install glazing when ambient temperature is less than 40 degrees F.
- B. Maintain minimum ambient temperature before, during and 24 hours after installation of glazing compounds.
- C. Install sealants only when ambient temperature conditions can be maintained at or above 40 degrees F during installation and 48 hours immediately following installation.

1.10 WARRANTY

- A. See Section 017800 - Closeout Submittals for additional warranty requirements.
- B. Insulating Glass Units: Provide a ten (10) year manufacturer warranty to include coverage for seal failure, interpane dusting or misting, including providing products to replace failed units.
- C. Laminated Glass: Provide a five (5) year manufacturer warranty to include coverage for delamination, including providing products to replace failed units.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Float Glass Manufacturers:
 - 1. Cardinal Glass Industries: www.cardinalcorp.com/#sle.
 - 2. Guardian Glass, LLC: www.guardianglass.com/#sle.
 - 3. Pilkington North America Inc: www.pilkington.com/na/#sle.
 - 4. Saint Gobain North America: www.saint-gobain.com/#sle.
 - 5. Vitro Architectural Glass (formerly PPG Glass): www.vitroglazings.com/#sle.
 - 6. Substitutions: See Section 016000 - Product Requirements.

2.2 PERFORMANCE REQUIREMENTS - EXTERIOR GLAZING ASSEMBLIES

- A. Provide type and thickness of exterior glazing assemblies to support assembly dead loads, and to withstand live loads caused by positive and negative wind pressure acting normal to plane of glass.
 - 1. Design Pressure: Calculated in accordance with ASCE 7 and requirements in Structural Drawings.
 - 2. Comply with ASTM E1300 for design load resistance of glass type, thickness, dimensions, and maximum lateral deflection of supported glass.

3. Provide glass edge support system sufficiently stiff to limit the lateral deflection of supported glass edges to less than $1/175$ of their lengths under specified design load.
 4. Design glazing units to reliably perform and remain reliably engaged on all edges under all service and thermal stresses, including those associated with partial shading.
 5. Limit center of glass deflection to the lesser of $3/4$ inch or $L/100$ (where L is short side dimension of glass unit), or flexure limit of glass, whichever is less, with full recovery of glazing materials.
 6. Assure and confirm compatibility of all materials in contact with each other.
 7. Glass thicknesses listed are minimum.
- B. Weather-Resistive Barrier Seals: Provide completed assemblies that maintain continuity of building enclosure water-resistive barrier, vapor retarder, and/or air barrier.
1. In conjunction with weather barrier related materials described in other sections, as follows:
 - a. Air Barriers: See Division 07
 2. To utilize inner pane of multiple pane insulating glass units for continuity of vapor retarder and/or air barrier seal.
 3. To maintain a continuous vapor retarder and/or air barrier throughout glazed assembly from glass pane to heel bead of glazing sealant.
- C. Thermal and Optical Performance: Provide exterior glazing products with performance properties as indicated. Performance properties are in accordance with manufacturer's published data as determined with the following procedures and/or test methods:
1. Center of Glass U-Value: Comply with NFRC 100 using Lawrence Berkeley National Laboratory (LBNL) WINDOW 6.3 computer program.
 2. Center of Glass Solar Heat Gain Coefficient (SHGC): Comply with NFRC 200 using Lawrence Berkeley National Laboratory (LBNL) WINDOW 6.3 computer program.
 3. Solar Optical Properties: Comply with NFRC 300 test method.

2.3 GLASS MATERIALS

- A. Float Glass: Provide float glass based glazing unless otherwise indicated.

1. Annealed Type: ASTM C1036, Type I - Transparent Flat, Class 1 - Clear, Quality - Q3.
 2. Kind HS - Heat-Strengthened Type: Complies with ASTM C1048.
 3. Kind FT - Fully Tempered Type: Complies with ASTM C1048.
 4. Fully Tempered Safety Glass: Complies with ANSI Z97.1 or 16 CFR 1201 criteria for safety glazing used in hazardous locations.
 5. Impact Resistant Safety Glass: Complies with ANSI Z97.1 - Class B, or 16 CFR 1201 - Category II criteria.
 6. Patterned Glass Type: ASTM C1036, Type II - Patterned Flat Glass, Quality - Q5, Form 3 - Patterned glass, with color and performance characteristics as indicated.
 7. Thicknesses: As indicated; provide greater thickness as required for exterior glazing wind load design.
- B. Laminated Glass: Float glass laminated in accordance with ASTM C1172.
1. Laminated Safety Glass: Complies with ANSI Z97.1 - Class B or 16 CFR 1201 - Category II impact test requirements.
 2. Laminated Security glass: Assemblies are to be bonded with polyvinyl and/or aliphatic polyurethane interlayers, as required, and fabricated in an autoclave using heat, plus pressure producing products free of foreign substances and air pockets.

2.4 INSULATING GLASS UNITS

- A. Manufacturers:
1. Glass: Any of the manufacturers specified for float glass.
 2. Oldcastle BuildingEnvelope: www.obe.com.
 3. Viracon, Apogee Enterprises, Inc: www.viracon.com/#sle.
 4. Substitutions: See Section 016000 - Product Requirements.
- B. Fabricator: Certified by glass manufacturer for type of glass, coating, and treatment involved and capable of providing specified warranty.
- C. Insulating Glass Units - General: Types as indicated.
1. Durability: Certified by an independent testing agency to comply with ASTM E2190.

2. Coated Glass: Comply with requirements of ASTM C1376 for pyrolytic (hard-coat) or magnetic sputter vapor deposition (soft-coat) type coatings on flat glass; coated vision glass, Kind CV; coated overhead glass, Kind CO; or coated spandrel glass, Kind CS.
 3. Metal-Edge Spacers: Aluminum, bent and soldered corners.
 4. Spacer Color: Black.
 5. Edge Seal:
 - a. Dual-Sealed System: Provide polyisobutylene sealant as primary seal applied between spacer and glass panes, and silicone, polysulfide, or polyurethane sealant as secondary seal applied around perimeter.
 - b. Color: Black.
 6. Purge interpane space with dry air, hermetically sealed.
- D. GL-1 Insulating Glass Units: Vision glass, double glazed.
1. Applications: Exterior glazing unless otherwise indicated.
 2. Space between lites filled with argon.
 3. Outboard Lite: Heat-strengthened float glass, 1/4 inch thick, minimum.
 - a. Tint: Clear.
 - b. Coating: Low-E (passive type), on #2 surface.
 - 1) Basis of Design: Solarban 70.
 4. Inboard Lite: Heat-strengthened float glass, 1/4 inch thick, minimum.
 - a. Tint: Clear.
 5. Total Thickness: 1 inch.
 6. Thermal Transmittance (U-Value): 0.24, nominal.
 7. Visible Light Transmittance (VLT): 64 percent, nominal.
 8. Solar Heat Gain Coefficient (SHGC): 0.27, nominal.
 9. Glazing Method: Dry glazing method, gasket glazing.
- E. GL-1L Insulating Glass Units: Laminated safety glazing, Non-Rated.
1. Space between lites filled with argon.

2. Outboard Lite: Same as GL-1.
 3. Laminated Inboard Lite; Outer pane: Heat-strengthened float glass, 1/8 inch thick, minimum.
 - a. Tint: Clear.
 4. Interlayer: Polyvinyl butyral (PVB), 0.060 inch thickness.
 5. Laminated Inboard Lite; Inner pane: Heat-strengthened float glass, 1/8 inch thick, minimum.
 - a. Tint: Clear.
 6. Total Thickness: 1 inch.
 7. Thermal Transmittance (U-Value): 0.25, nominal.
- F. GL-1TL Insulating Glass Units: Tempered Laminated safety glazing.
1. Space between lites filled with argon.
 2. Outboard Lite: Same as GL-1 except use fully tempered float glass.
 3. Laminated Inboard Lite; Outer pane: Fully tempered float glass, 1/8 inch thick, minimum.
 - a. Tint: Clear.
 4. Interlayer: Polyvinyl butyral (PVB), 0.060 inch thick.
 5. Laminated Inboard Lite; Inner pane: Fully tempered float glass, 1/8 inch thick, minimum.
 - a. Tint: Clear.
 6. Total Thickness: 1 inch.
 7. Thermal Transmittance (U-Value): 0.25, nominal.
- G. GL-1T Insulating Glass Units: Tempered safety glazing.
1. Space between lites filled with argon.
 2. Glass Type: Same as GL-1 except use fully tempered float glass for both outboard and inboard lites.
- H. GL-1S Insulating Glass Units: Spandrel glazing.
1. Applications: Exterior spandrel glazing unless otherwise indicated.

2. Space between lites filled with argon.
3. Outboard Lite: Heat-strengthened float glass, 1/4 inch thick, minimum.
 - a. Tint: Clear
 - b. Coating: Same as on vision units, on #2 surface.
4. Inboard Lite: Heat strengthened unless otherwise required to have tempered safety glazing for compliance with CPSC 16CFR 1201 float glass, 1/4 inch thick.
 - a. Tint: Clear.
 - b. Opacifier: Ceramic frit, on #4 surface.
 - c. Opacifier Color: To be selected by Architect from Manufacturer's standard range.
5. Total Thickness: 1 inch.
6. Thermal Transmittance (U-Value): 0.24, nominal.

2.5 MONOLITHIC GLAZING UNITS

- A. General - Combined Requirements: If a particular glass unit is indicated to comply with more than one type of requirement, such as color, safety characteristics, or other requirements. Comply with all specified requirements for each type as scheduled on Drawings.
- B. GL-2 - Forced Entry and Bullet Resistant Security Glazing – Glass and Polycarbonate.
 1. Basis of Design: OldCastle Building Envelope: Armor Protect #124200;
<https://obe.com/products/forced-entry-armorprotect/>
 - a. Applications: Door Sidelites and interior glazing as indicated in drawings.
 - b. Tint: Clear.
 - c. Thickness: 1-3/8 inch, nominal.
 - d. Bullet Resistance: Pass UL 752 tests in compliance with ballistic criteria level and weapon description indicated; Level 3 - .44 magnum lead semi-wadcutter gas checked
 - e. Forced Entry Resistance: Pass WMFL 60-Minute Attack Resistance and 25 rounds .44 magnum.
- C. GL-4 - Monolithic Interior Vision Glazing: Non-fire-rated.
 1. Applications: Locations indicated on drawings.

2. Glass Type: Heat-strengthened float glass.
 3. Tint: Clear.
 4. Thickness: 1/4 inch, nominal.
- D. GL-4T - Monolithic Interior Safety Glazing: Non-fire-rated.
1. Applications: Locations indicated on drawings.
 2. Glass Type: Fully tempered safety glass as specified.
 3. Tint: Clear.
 4. Thickness: 1/4 inch, nominal.

2.6 PLASTIC FILMS

- A. Decorative Plastic Film: Polyester type.
1. Application: Locations as indicated on drawings.
 2. Color: As selected by Architect from manufacturer's full range of options.
 3. Thickness Without Liner: 0.002 inch.
 4. Manufacturers:
 - a. 3M Fasara: www.3m.com.
 - b. Avery Dennison: www.averydennison.com/#sle.
 - c. Llumar, an Eastman Chemical Company; Decorative Window Film: www.llumar.com/#sle.
 - d. Substitutions: See Section 016000 - Product Requirements.

2.7 GLAZING COMPOUNDS

- A. General Requirements:
1. Provide black exposed glazing accessory materials, unless specifically indicated otherwise.
 2. Provide materials of hardness as recommended by manufacturer for required application and condition of installation in each case. Provide only compounds which are known to be fully compatible with surfaces contacted, including glass products, seals, and glazing channel surfaces.

- B. Preformed Butyl Rubber Glazing Sealant: Tape or ribbon (coiled on release paper) of polymerized butyl, or mixture of butyl and polyisobutylene, compounded with inert fillers and pigments, solvent-based with minimum 95 percent solids, thread or fabric reinforcement, tack-free within 24 hours, paintable, non-staining.
- C. Silicone Sealant: Single component; neutral curing; capable of water immersion without loss of properties; nonbleeding, nonstaining; ASTM C920 Type S, Grade NS, Class 25, Uses M, A, and G; with cured Shore A hardness range of 15 to 25; color as selected.
- D. Manufacturers:
 - 1. Bostik Inc: www.bostik-us.com/#sle.
 - 2. Dow Corning Corporation: www.dowcorning.com/construction/#sle.
 - 3. Master Builders Solutions: www.master-builders-solutions.com/en-us/#sle.
 - 4. Momentive Performance Materials, Inc: www.momentive.com/#sle.
 - 5. Pecora Corporation: www.pecora.com/#sle.
 - 6. Tremco Commercial Sealants & Waterproofing: www.tremcosealants.com/#sle.

2.8 ACCESSORIES

- A. Setting Blocks: Silicone, with 80 to 90 Shore A durometer hardness; ASTM C864 Option II. Length of 0.1 inch for each square foot of glazing or minimum 4 inch by width of glazing rabbet space minus 1/16 inch by height to suit glazing method and pane weight and area.
- B. Spacer Shims: Neoprene, 50 to 60 Shore A durometer hardness; ASTM C864 Option II. Minimum 3 inch long by one half the height of the glazing stop by thickness to suit application.
- C. Glazing Gaskets: Resilient silicone extruded shape to suit glazing channel retaining slot; ASTM C864 Option II; color black.
 - 1. Size gaskets as required by manufacturer of glazing channel frame to provide proper pressure and bite on glazing units.
- D. Glazing Splines: Resilient silicone extruded shape to suit glazing channel retaining slot; ASTM C864 Option II; color black.
- E. Glazing Clips: Manufacturer's standard type.
- F. Cleaners, Primers and Sealers: Type recommended by glazing material manufacturer.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that openings for glazing are correctly sized and within tolerances, including those for size, squareness, and offsets at corners.
- B. Verify that the minimum required face and edge clearances are being provided.
- C. Verify that surfaces of glazing channels or recesses are clean, free of obstructions that may impede moisture movement, weeps are clear, and support framing is ready to receive glazing system.
- D. Verify that sealing between joints of glass framing members has been completed effectively.
- E. Proceed with glazing system installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean contact surfaces with appropriate solvent and wipe dry immediately before glazing. Remove coatings that are not tightly bonded to substrates.
- B. Seal porous glazing channels or recesses with substrate compatible primer or sealer.
- C. Prime surfaces scheduled to receive sealant where required for proper sealant adhesion.

3.3 INSTALLATION, GENERAL

- A. Install glazing in compliance with written instructions of glass, gaskets, and other glazing material manufacturers, unless more stringent requirements are indicated, including those in glazing referenced standards.
- B. Install glazing sealants in accordance with ASTM C1193, GANA (SM), and manufacturer's instructions.
- C. Do not exceed edge pressures around perimeter of glass lites as stipulated by glass manufacturer.
- D. Set glass lites of system with uniform pattern, draw, bow, and similar characteristics.
- E. Set glass lites in proper orientation so that coatings face exterior or interior as indicated.
- F. Prevent glass from contact with any contaminating substances that may be the result of construction operations such as, and not limited to the following; weld splatter, fire-safing, plastering, mortar droppings, and paint.

3.4 INSTALLATION - DRY GLAZING METHOD (GASKET GLAZING)

- A. Application - Exterior and/or Interior Glazed: Set glazing infills from either the exterior or the interior of the building.
- B. Place setting blocks at 1/4 points with edge block no more than 6 inch from corners.
- C. Rest glazing on setting blocks and push against fixed stop with sufficient pressure on gasket to attain full contact.
- D. Install removable stops without displacing glazing gasket; exert pressure for full continuous contact.

3.5 INSTALLATION - PLASTIC FILM

- A. Install plastic film with adhesive, applied in accordance with film manufacturer's instructions.
- B. Place without air bubbles, creases or visible distortion.
- C. Install film tight to perimeter of glass and carefully trim film with razor sharp knife. Provide 1/16 inch to 1/8 inch gap at perimeter of glazed panel unless otherwise required. Do not score the glass.

3.6 FIELD QUALITY CONTROL

- A. See Section 014000 - Quality Requirements for additional requirements.
- B. Glass and Glazing product manufacturers to provide field surveillance of the installation of their products.
- C. Monitor and report installation procedures and unacceptable conditions.

3.7 CLEANING

- A. Remove excess glazing materials from finish surfaces immediately after application using solvents or cleaners recommended by manufacturers.
- B. Remove nonpermanent labels immediately after glazing installation is complete.
- C. Clean glass and adjacent surfaces after sealants are fully cured.
- D. Clean glass on both exposed surfaces not more than 4 days prior to Date of Substantial Completion in accordance with glass manufacturer's written recommendations.

3.8 PROTECTION

- A. After installation, mark pane with an 'X' by using removable plastic tape or paste; do not mark heat absorbing or reflective glass units.

- B. Remove and replace glass that is damaged during construction period prior to Date of Substantial Completion.

END OF SECTION 088000

SECTION 090561 - COMMON WORK RESULTS FOR FLOORING PREPARATION

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. This section applies to floors identified in Contract Documents that are receiving the following types of floor coverings:
 - 1. Resilient flooring.
 - 2. Carpet tile.
 - 3. Thin-set tile.
 - 4. Resinous flooring.
 - 5. Other adhesively applied flooring.
- B. Preparation of new and existing concrete floor slabs for installation of floor coverings.
- C. Testing of concrete floor slabs for moisture and alkalinity (pH).
- D. Adhesive bond testing.
- E. Remediation of concrete floor slabs due to unsatisfactory moisture or alkalinity (pH) conditions.
 - 1. Perform all specified remediation of concrete floor slabs. If such remediation is indicated by testing agency's report and is due to a condition not under Contractor's control or could not have been predicted by examination prior to entering into the contract, a contract modification will be issued.
- F. Patching compound.
- G. Remedial floor coatings.

1.2 REFERENCE STANDARDS

- A. ASTM C109/C109M - Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 50 mm [2 in.] Cube Specimens).
- B. ASTM C1315 - Standard Specification for Liquid Membrane-Forming Compounds Having Special Properties for Curing and Sealing Concrete.
- C. ASTM C309 - Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.
- D. ASTM C472 - Standard Test Methods for Physical Testing of Gypsum, Gypsum Plasters, and Gypsum Concrete.

- E. ASTM F710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring.
- F. ASTM F1869 - Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride.
- G. ASTM F2170 - Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes.

1.3 ADMINISTRATIVE REQUIREMENTS

- A. Coordination: Coordinate scheduling of cleaning and testing, so that preliminary cleaning has been completed for at least 24 hours prior to testing.

1.4 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Floor Covering and Adhesive Manufacturers' Product Literature: For each specific combination of substrate, floor covering, and adhesive to be used; showing:
 - 1. Moisture and alkalinity (pH) limits and test methods.
 - 2. Manufacturer's required bond/compatibility test procedure.
- C. Remedial Materials Product Data: Manufacturer's published data on each product to be used for remediation.
 - 1. Manufacturer's qualification statement.
 - 2. Certificate: Manufacturer's certification of compatibility with types of flooring and adhesive applied over remedial product.
 - 3. Test reports indicating compliance with specified performance requirements, performed by nationally recognized independent testing agency.
 - 4. Manufacturer's installation instructions.
 - 5. Specimen Warranty: Copy of warranty to be issued by coating manufacturer and certificate of underwriter's coverage of warranty.
- D. Testing Agency's Report:
 - 1. Description of areas tested; include floor plans and photographs if helpful.
 - 2. Summary of conditions encountered.
 - 3. Moisture and alkalinity (pH) test reports.
 - 4. Copies of specified test methods.

5. Recommendations for remediation of unsatisfactory surfaces.
 6. Product data for recommended remedial coating.
 7. Submit report to Architect.
 8. Submit report not more than two business days after conclusion of testing.
- E. Adhesive Bond and Compatibility Test Report.
- F. Floor Moisture Testing Technician Certificate: International Concrete Repair Institute (ICRI) Concrete Slab Moisture Testing Technician- Grade I certificate.

1.5 QUALITY ASSURANCE

- A. Moisture and alkalinity (pH) testing shall be performed by an independent testing agency employed and paid by Contractor.
- B. Contractor may perform adhesive and bond test with Contractor's own personnel or hire a testing agency.
- C. Testing Agency Qualifications: Independent testing agency experienced in the types of testing specified.
1. Submit evidence of experience consisting of at least 3 test reports of the type required, with project Owner's project contact information.
- D. Contractor's Responsibility Relating to Independent Agency Testing:
1. Provide access for and cooperate with testing agency.
 2. Confirm date of start of testing at least 10 days prior to actual start.
 3. Allow at least 4 business days on site for testing agency activities.
 4. Achieve and maintain specified ambient conditions.
 5. Notify Architect when specified ambient conditions have been achieved and when testing will start.
- E. Floor Moisture Testing Technician Qualifications: International Concrete Repair Institute (ICRI) Concrete Slab Moisture Testing Technician Certification- Grade I.
- F. Remedial Coating Installer Qualifications: Company specializing in performing work of the type specified in this section, trained by or employed by coating manufacturer, and able to provide at least 3 project references showing at least 3 years' experience installing moisture emission coatings.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, handle, and protect products in accordance with manufacturer's instructions and recommendations.
- B. Deliver materials in manufacturer's packaging; include installation instructions.
- C. Keep materials from freezing.

1.7 FIELD CONDITIONS

- A. Maintain ambient temperature in spaces where concrete testing is being performed, and for at least 48 hours prior to testing, at not less than 65 degrees F or more than 85 degrees F.
- B. Maintain relative humidity in spaces where concrete testing is being performed, and for at least 48 hours prior to testing, at not less than 40 percent and not more than 60 percent.

1.8 WARRANTY

- A. Provide manufacturer's warranty covering flooring delamination failures for 10 years minimum.
 - 1. Include cost of repair or removal of failed flooring, remediation with a moisture vapor impermeable surface coating, and replacement of flooring with comparable flooring system.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Self-Leveling Compound: Floor covering manufacturer's recommended product, suitable for conditions, and compatible with adhesive and floor covering. In the absence of any recommendation from flooring manufacturer, provide a product
 - 1. Compressive Strength: Minimum 5000 pounds per square inch after 28 days, tested per ASTM C109/C109M.
 - 2. Flexural Strength: Minimum 1000 psi after 28 days, tested according to ASTM C348.
 - 3. Thickness: Capable of thicknesses from 1/2 inch minimum to maximum [10] inch.
- B. Patching Compound: Floor covering manufacturer's recommended product, suitable for conditions, and compatible with adhesive and floor covering. In the absence of any recommendation from flooring manufacturer, provide a product with the following characteristics:

1. Cementitious moisture-, mildew-, and alkali-resistant compound, compatible with floor, floor covering, and floor covering adhesive, and capable of being feathered to nothing at edges.
 2. Latex or polyvinyl acetate additions are permitted; gypsum content is prohibited.
 3. Compressive Strength: 3000 psi, minimum, after 28 days, when tested in accordance with ASTM C109/C109M or ASTM C472, whichever is appropriate.
 4. Acceptable Manufacturers:
 - a. ARDEX Engineered Cements; ARDEX Feather Finish:
www.ardexamericas.com/#sle.
 - b. H.B. Fuller Construction Products, Inc; TEC Feather Edge Skim Coat:
www.tecspecialty.com/#sle.
 - c. LATICRETE International, Inc; SKIM LITE: www.laticrete.com/#sle.
 - d. USG Corporation; Durock Brand Advanced Skim Coat Floor Patch:
www.usg.com/#sle.
 - e. Schonox HPS North America; Schonox SL Moisture Resistant Floor Patch and Skim Coat.
 - f. Custom Building Products.
 - g. Henry Company.
 - h. Sika; Level SkimCoat.
 - i. Mapei.
 - j. Substitutions: See Section 016000 - Product Requirements.
- C. Alternate Flooring Adhesive: Floor covering manufacturer's recommended product, suitable for the moisture and pH conditions present; low-VOC. In the absence of any recommendation from flooring manufacturer, provide a product recommended by adhesive manufacturer as suitable for substrate and floor covering and for conditions present.
- D. Remedial Floor Coating: Single- or multi-layer coating or coating/overlay combination intended by its manufacturer to resist water vapor transmission to degree sufficient to meet flooring manufacturer's emission limits, resistant to the level of alkalinity (pH) found, and suitable for adhesion of flooring without further treatment.
1. Thickness: As required for application and in accordance with manufacturer's installation instructions.

2. Use product recommended by flooring manufacturer. In the absence of a recommendation from flooring manufacturer, use testing agency recommendation. In the absence of testing agency recommendation, use one of the following systems.
3. Acceptable Products:
 - a. Allied Construction Technologies, Inc; AC Tech 2170 FC:
www.actechperforms.com/#sle.
 - b. ARDEX Engineered Cements; ARDEX VB 100:
www.ardexamericas.com/#sle.
 - c. Custom Building Products; TechMVC Moisture Vapor and Alkalinity Barrier:
www.custombuildingproducts.com/#sle.
 - d. Floor Seal Technology, Inc; MES 100: www.floorseal.com/#sle.
 - e. ISE Logik Industries; MVEC 710 with MVBP 600.
 - f. LATICRETE International, Inc; LATICRETE VAPOR BAN E:
www.laticrete.com/#sle.
 - g. Sika Corporation; Sikafloor Moisture Tolerance Epoxy Primer:
www.sikafloorusa.com/#sle.
 - h. SINAK Corporation; VECT-R: www.sinak.com/#sle.
 - i. USG Corporation; Durock CoverPrep: www.usg.com/#sle.
 - j. UZIN UTZ NORTH AMERICA, INC; UZIN PE 460 with UZIN PE 280:
<https://us.uzin.com/#sle>.
 - k. Substitutions: See Section 016000 - Product Requirements.
- E. Remedial Colloidal Silica Floor Treatment: Clear, penetrating floor treatment intended by its manufacturer to vapor-proof concrete slabs by closing capillary system of concrete, and eliminating route of moisture vapor emission while preserving mechanical key for adhesive bonding.
 1. Acceptable Products:
 - a. Spray-Lock Concrete Protection; SCP 327: www.concreteprotection.com.
 - b. Substitutions: See Section 016000 - Product Requirements.
- F. Water Vapor Emission Controlling Curing Compound: Single-component curing compound for preventative water vapor emission control for newly placed concrete.

1. Coordinate with curing requirements specified in 033000 - Cast-in-Place Concrete.
2. Comply with ASTM C309 and ASTM C1315, Type I Class A or C.
3. Acceptable Products:
 - a. Creteseal Concrete Waterproofing Products, Inc.; Creteseal 2000: www.creteseal.com.
 - b. Floor Seal Technology, Inc.; VaporSeal 309 System: www.floorseal.com.
 - c. SINAK Corporation; VC5: www.sinak.com.
 - d. Substitutions: See Section 016000 - Product Requirements.

PART 3 EXECUTION

3.1 CONCRETE SLAB PREPARATION

- A. Perform following operations in the order indicated:
 1. Preliminary cleaning.
 2. Moisture vapor emission tests; 3 tests in the first 1000 square feet and one test in each additional 1000 square feet, unless otherwise indicated or required by flooring manufacturer.
 3. Internal relative humidity tests; in same locations as moisture vapor emission tests, unless otherwise indicated.
 4. Alkalinity (pH) tests; in same locations as moisture vapor emission tests, unless otherwise indicated.
 5. Specified remediation, if required.
 6. Patching, smoothing, and leveling, as required.
 7. Other preparation specified.
 8. Adhesive bond and compatibility test.
 9. Protection.
- B. Remediations:
 1. Active Water Leaks or Continuing Moisture Migration to Surface of Slab: Correct this condition before doing any other remediation; re-test after correction.

2. Excessive Moisture Emission or Relative Humidity: If an adhesive that is resistant to the level of moisture present is available and acceptable to flooring manufacturer, use that adhesive for installation of the flooring; if not, apply remedial floor coating or remedial sheet membrane over entire suspect floor area.
3. Excessive Alkalinity (pH): If remedial floor coating is necessary to address excessive moisture, no additional remediation is required; if not, if an adhesive that is resistant to the level present is available and acceptable to the flooring manufacturer, use that adhesive for installation of the flooring; otherwise, apply a skim coat of specified patching compound over entire suspect floor area.

3.2 PRELIMINARY CLEANING

- A. Clean floors of dust, solvents, paint, wax, oil, grease, asphalt, residual adhesive, adhesive removers, film-forming curing compounds, sealing compounds, alkaline salts, excessive laitance, mold, mildew, and other materials that might prevent adhesive bond.
- B. Do not use solvents or other chemicals for cleaning.

3.3 MOISTURE VAPOR EMISSION TESTING

- A. Where the floor covering manufacturer's requirements conflict with either the referenced test method or this specification, comply with the manufacturer's requirements.
- B. Where this specification conflicts with the referenced test method, comply with the requirements of this section.
- C. Test in accordance with ASTM F1869 and as follows.
- D. Plastic sheet test and mat bond test may not be substituted for the specified ASTM test method, as those methods do not quantify the moisture content sufficiently.
- E. In the event that test values exceed floor covering manufacturer's limits, perform remediation as indicated. In the absence of manufacturer limits, perform remediation if test values exceed 3 pounds per 1000 square feet per 24 hours.
- F. Report: Report the information required by the test method.

3.4 INTERNAL RELATIVE HUMIDITY TESTING

- A. Where the floor covering manufacturer's requirements conflict with either the referenced test method or this specification, comply with the manufacturer's requirements.

- B. Where this specification conflicts with the referenced test method, comply with the requirements of this section.
- C. Test in accordance with ASTM F2170 Procedure A and as follows.
 - 1. Testing with electrical impedance or resistance apparatus may not be substituted for the specified ASTM test method, as the values determined are not comparable to the ASTM test values and do not quantify the moisture content sufficiently.
- D. In the event that test values exceed floor covering manufacturer's limits, perform remediation as indicated. In the absence of manufacturer limits, perform remediation if any test value exceeds 75 percent relative humidity.
- E. Report: Report the information required by the test method.

3.5 ALKALINITY TESTING

- A. Where the floor covering manufacturer's requirements conflict with either the referenced test method or this specification, comply with the manufacturer's requirements.
- B. The following procedure is the equivalent of that described in ASTM F710, repeated here for the Contractor's convenience.
 - 1. Use a wide range alkalinity (pH) test paper, its associated chart, and distilled or deionized water.
 - 2. Place several drops of water on a clean surface of concrete, forming a puddle approximately 1 inch in diameter. Allow the puddle to set for approximately 60 seconds, then dip the alkalinity (pH) test paper into the water, remove it, and compare immediately to chart to determine alkalinity (pH) reading.
 - 3. Use of a digital pH meter with probe is acceptable; follow meter manufacturer's instructions.
- C. In the event that test values exceed floor covering manufacturer's limits, perform remediation as indicated. In the absence of manufacturer limits, perform remediation if alkalinity (pH) test value is over 10.

3.6 PREPARATION

- A. See individual floor covering section(s) for additional requirements.
- B. Comply with requirements and recommendations of floor covering manufacturer.
- C. Fill and smooth surface cracks, grooves, depressions, control joints and other non-moving joints, and other irregularities with patching compound.

- D. Do not fill expansion joints, isolation joints, or other moving joints.

3.7 ADHESIVE BOND AND COMPATIBILITY TESTING

- A. Comply with requirements and recommendations of floor covering manufacturer.

3.8 APPLICATION

- A. Comply with requirements and recommendations of manufacturer.
- B. Curing compounds and membrane forming products are usually considered unacceptable by flooring and adhesive manufacturers. If such materials are used, either obtain the approval of the flooring and adhesive manufacturers prior to use.

3.9 PROTECTION

- A. Cover prepared floors with building paper or other durable covering.

END OF SECTION 090561

SECTION 092216 - NON-STRUCTURAL METAL FRAMING

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Metal partition, ceiling, and soffit framing.
- B. Framing accessories.

1.2 RELATED REQUIREMENTS

- A. Section 061000 - Rough Carpentry: Wood blocking within stud framing.
- B. Section 092900 - Gypsum Board: Execution requirements for anchors for attaching work of this section.

1.3 REFERENCE STANDARDS

- A. AISI S100 - North American Specification for the Design of Cold-Formed Steel Structural Members.
- B. AISI S100-12 - North American Specification for the Design of Cold-Formed Steel Structural Members.
- C. AISI S220 – North American Specification for the Design of Cold-Formed Steel Framing – Nonstructural members.
- D. ASTM A36/A36M - Standard Specification for Carbon Structural Steel.
- E. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- F. ASTM A1003/A1003M - Standard Specification for Steel Sheet, Carbon, Metallic- and Nonmetallic-Coated for Cold-Formed Framing Members.
- G. ASTM C645 - Standard Specification for Nonstructural Steel Framing Members.
- H. ASTM C754 - Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products.
- I. ASTM C1002 - Standard Specification for Steel Self-Piercing Tapping Screws for Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs.
- J. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
- K. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements.

- L. ASTM E413 - Classification for Rating Sound Insulation.

1.4 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Shop Drawings:
 - 1. Indicate prefabricated work, component details, framed openings, anchorage to structure, acoustic details, and accessories.
 - 2. Describe method for securing studs to tracks, and for blocking and reinforcement of framing connections.
- C. Product Data: Provide data describing framing member materials and finish, product criteria, load charts, and limitations.
- D. Product Data: Provide manufacturer's data on partition head to structure connectors, showing compliance with requirements.
- E. Evaluation Reports: Submit evaluation reports for framing, tracks, anchors, and fasteners from ICC-ES or other qualified testing agency acceptable to authorities having jurisdiction.
- F. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Company specializing in performing the work of this section with minimum five years documented experience and approved by manufacturer.
- B. Code-Compliance Certification of Studs and Tracks: Provide documentation that framing members are certified in accordance with the product-certification program of the the Certified Steel Stud Association, the Steel Framing Industry Association, or the Steel Stud Manufacturers Association.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Protect cold-formed metal framing from corrosion, deformation, and other damage during delivery, storage, and handling as required by AISI S202 "Code of Standard Practice."

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Metal Framing, Connectors, and Accessories:
 - 1. CEMCO: www.cemcosteel.com/#sle.

2. ClarkDietrich Building Systems: www.clarkdietrich.com/#sle.
3. Jaimes Industries: www.jaimesind.com/#sle.
4. Marino: www.marinoware.com/#sle.
5. MBA Building Supplies, Inc.: www.mbastuds.com.
6. MRI Steel Framing LLC: www.mristeel framing.com.
7. State Building Products, Inc.: <http://www.statebp.com>.
8. Steel Construction Systems: www.steelconsystems.com/#sle.
9. The Steel Network, Inc: www.SteelNetwork.com/#sle.
10. Substitutions: See Section 016000 - Product Requirements.

2.2 FRAMING MATERIALS

- A. Design Requirements: Design metal framing to comply with performance requirements, including anchorage to structural system and necessary modifications to meet specified requirements and maintain visual design concepts.
 1. Design framing systems in accordance with AISI S220, "North American Specification for the Design of Cold-Formed Steel Framing - Nonstructural Members" and ASTM C645, Section 10, unless otherwise indicated.
- B. Performance Requirements:
 1. Interior Suspended Gypsum Board Ceilings, Soffits, and Bulkheads: Design and install to provide deflection of not more than $L/360$ of distance between supports.
 2. Interior Metal Stud/Gypsum Board Assemblies: Design and install to withstand lateral loading (air pressure) of 5 PSF with deflection limit not more than $L/240$ of partition height.
 3. Interior Metal Stud/Gypsum Board Assemblies at Locations with Ceramic Tile or Other Hard Surface Finishes: Design and install to withstand lateral loading (air pressure) with deflection limit not more than $L/360$ of partition height.
 4. Where documents indicate a stud size, size shall be considered minimum. Increase gage to meet minimum performance requirements.
 5. Accommodate building structure deflections in connections to structure.
- C. Fire Rated Assemblies: Comply with applicable code and tested according to ASTM E 119 and as scheduled in Drawings.

- D. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated, according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.
- E. Loadbearing Studs: As specified in Section 054000.
- F. Non-Loadbearing Framing System Components: AISI S220 and ASTM C645, Section 10; galvanized sheet steel, of size and properties necessary to comply with ASTM C754 for the spacing indicated, with maximum deflection of wall framing of limits listed above.
 - 1. Protective Coating: AISI S220, ASTM A 653/A 653M, G40, (Z120); or coating with equivalent corrosion resistance of ASTM A653/A653M, G40 (Z120), hot-dip galvanized unless otherwise indicated.
 - a. Galvannealed products are unacceptable.
 - 2. Studs: C shaped with flat or formed webs.
 - a. Minimum Base-Steel Thickness: 0.033 inch (20-gage drywall) unless otherwise indicated.
 - b. Minimum Base-Steel Thickness at Wall Tile: 0.033 inch.
 - c. Minimum Base-Steel Thickness at Opening Jambs: 0.033 inch.
 - 3. Runners: U shaped, sized to match studs.
 - a. Minimum Base-Steel Thickness: Same as studs.
 - 4. Equivalent Gauge Studs and Runners:
 - a. High strength, roll-formed and embossed with surface deformations to stiffen the framing members so they are structurally comparable to conventional ASTM C645 steel studs and tracks.
 - b. Minimum Base Steel Thickness: 0.0181 inch (20 EQ).
 - c. Prohibited Locations: High-strength (EQ) studs may not be used at the following locations:
 - 1) Walls at vestibules or other areas expected to be exposed to wind loads greater than 5 psf.
 - 2) Walls to receive cement backer board, wall tile or other inflexible finishes.
 - 3) Walls to receive abuse resistant or impact resistant gypsum board.

- 4) Walls used to support countertop construction, casework, audio/visual equipment, or other similar elements.
- 5) Walls greater than 15 feet in height.
- d. Acceptable Product: ClarkDietrich; ProSTUD20 and ProTRAK20 with Smart Edge technology.
5. Ceiling Carrying Channels: C shaped (Main Runners).
 - a. Minimum Base-Steel Thickness: 0.053 inch.
 - b. Minimum Depth: 1-1/2 inches.
 - c. Minimum flange width: 1/2 inch.
6. Ceiling Furring Channels (Furring Members):
 - a. Cold-Rolled Channels: 0.053-inch uncoated-steel thickness, with minimum 1/2-inch-wide flanges, 3/4 inch deep.
 - b. Steel Studs and Runners: 0.0296-inch minimum base-steel thickness.
 - c. Equivalent Gauge Studs and Runners: 0.0181 inch (20 EQ) minimum base-steel thickness.
 - 1) Acceptable Product: ClarkDietrich; ProSTUD20 and ProTRAK20 with Smart Edge technology.
 - d. Hat-Shaped, Rigid Furring Channels: 0.0296-inch minimum base-steel thickness, 7/8-inch deep.
7. Furring: Hat-shaped sections, minimum depth of 7/8 inch.
 - a. Minimum Base-Steel Thickness: 0.0296 inch.
8. Cold-Rolled U-Channel Bridging: Steel, 0.0538-inch minimum base-steel thickness, with minimum 1/2-inch- wide flanges.
 - a. Depth: 1-1/2 inches.
9. Z-Shaped Furring: With slotted or non-slotted web, face flange of 1-1/4 inches, wall attachment flange of 3/4 inch, minimum uncoated-steel thickness of 0.018 inch, and depth required to fit insulation thickness indicated.
- G. Grid Suspension System for Gypsum Board Ceilings: ASTM C 645, direct-hung, non-rated system unless otherwise noted, composed of main beams and cross-furring members that interlock.

1. Where fire-rated grid system may be required by authorities having jurisdiction provide hanger wire suspension 8-inches off fire breaks in accordance with system manufacturer's written guidelines.
2. Acceptable Products:
 - a. Armstrong World Industries, Inc.; Drywall Grid Systems (non-rated).
 - b. Chicago Metallic Corporation; Drywall Grid System (non-rated).
 - c. USG Corporation; Drywall Suspension System (non-rated).
- H. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.062-inch-diameter wire, or double strand of 0.048-inch-diameter wire.
- I. Wire Hangers: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.16 inch in diameter.
- J. Flat Hangers: Steel sheet, 1 by 3/16 inch by length indicated.
- K. Partition Head to Structure Connections: Provide mechanical anchorage devices that accommodate deflection using slotted holes, screws, and anti-friction bushings, preventing rotation of studs while maintaining structural performance of partition.
 1. Structural Performance: Maintain lateral load resistance and vertical movement capacity required by applicable code, when evaluated in accordance with AISI S100.
 2. Material: ASTM A653/A653M steel sheet, SS Grade 50, with G60/Z180 hot-dipped galvanized coating.
 3. Provide components UL-listed for use in UL-listed fire-resistance-rated head of partition joint systems indicated on drawings.
 4. Provide top track preassembled with connection devices spaced to fit stud spacing indicated on drawings; minimum track length of 12 feet.
- L. Deflection and Firestop Track: Intumescent strip factory-applied to track flanges expands when exposed to heat or flames to provide a perimeter joint seal.
 1. Products:
 - a. ClarkDietrich; BlazeFrame Firestop Deflection Track:
www.clarkdietrich.com/#sle.
 - b. Fire Trak Corp.; Fire Trak System.
 - c. Metal-Lite, Inc; The System.
 - d. Slip Trak Systems; SLP-TRK.

- e. Steel Network, Inc. (The); VertiTrack Series.
- f. Substitutions: See Section 016000 - Product Requirements.

M. Preformed Top Track Firestop Seal:

- 1. Provide components UL-listed for use in UL-listed fire-rated head of partition joint systems specified in Section 078400.
- 2. Products:
 - a. Hilti, Inc; Top Track Seal CFS TTS: www.us.hilti.com/#sle.
 - b. Specified Technologies Inc; SpeedFlex TTG Track Top Gasket: www.stfirestop.com/#sle.
 - c. Substitutions: See Section 016000 - Product Requirements.

N. Non-Loadbearing Framing Accessories:

- 1. Ceiling Hangers: Type and size as specified in ASTM C754 for spacing required.
- 2. Partial Height Wall Framing Support: Provides stud reinforcement and anchored connection to floor.
 - a. Materials: ASTM A36/A36M formed sheet steel support member with factory-welded ASTM A1003/A1003M steel plate base.
 - b. Products:
 - 1) ClarkDietrich; Pony Wall (PW): www.clarkdietrich.com/#sle.
 - 2) Substitutions: See Section 016000 - Product Requirements.
- 3. Framing Connectors: ASTM A653/A653M G90 galvanized steel clips; secures cold rolled channel to wall studs for lateral bracing.
- 4. Flexible Wood Backing: Fire-retardant-treated wood with sheet steel connectors.
 - a. Products:
 - 1) ClarkDietrich; Danback: www.clarkdietrich.com/#sle.
 - 2) Substitutions: See Section 016000 - Product Requirements.
- 5. Sheet Metal Backing: 0.0538 inch thick, galvanized.
- 6. Fasteners for Metal Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.

7. Fasteners: ASTM C1002 self-piercing tapping screws.
 8. Anchorage Devices: Powder actuated.
 9. Acoustic Sealant: Acrylic emulsion latex or water-based elastomeric sealant; do not use solvent-based non-curing butyl sealant.
- O. Sound Isolation Tape: Elastomeric foam tape for sound decoupling.
1. Surface Burning Characteristics: Provide assemblies with flame spread index of 75 or less and smoke developed index of 450 or less, when tested in accordance with ASTM E84.
 2. Tape Thickness: 1/4 inch.
 3. Products:
 - a. Armacell LLC; ArmaSound MTD: www.armacell.us/#sle.
 - b. Substitutions: See Section 016000 - Product Requirements.
- P. Tracks and Runners: Same material and thickness as studs, bent leg retainer notched to receive studs.
- Q. Acoustic Insulation and Sealant: As specified in Section 092900 - Gypsum Board.
- R. Isolation Strip at Exterior Walls: Provide one of the following:
1. Asphalt-Saturated Organic Felt: ASTM D 226, Type I (No. 15 asphalt felt), nonperforated.
 2. Foam Gasket: Adhesive-backed, closed-cell vinyl foam strips that allow fastener penetration without foam displacement, 1/8 inch thick, in width to suit steel stud size.

2.3 FABRICATION

- A. Fabricate assemblies of framed sections to sizes and profiles required.
- B. Fit, reinforce, and brace framing members to suit design requirements.
- C. Fit and assemble in largest practical sections for delivery to site, ready for installation.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify that rough-in utilities are in proper location.

- C. Examine areas and substrates for compliance with requirements and other conditions affecting performance. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Suspended Assemblies: Coordinate installation of suspension systems with installation of overhead structure to ensure that inserts and other provisions for anchorages to building structure have been installed to receive hangers at spacing required to support the Work and that hangers will develop their full strength.
- B. Coordination with Sprayed Fire-Resistive Materials:
 - 1. Before sprayed fire-resistive materials are applied, attach offset anchor plates or ceiling runners (tracks) to surfaces indicated to receive sprayed fire-resistive materials. Where offset anchor plates are required, provide continuous plates fastened to building structure not more than 24 inches o.c.
 - 2. After sprayed fire-resistive materials are applied, remove them only to extent necessary for installation of non-load-bearing steel framing. Do not reduce thickness of fire-resistive materials below that required for fire-resistance ratings indicated. Protect adjacent fire-resistive materials from damage.

3.3 INSTALLATION OF STUD FRAMING

- A. Comply with requirements of ASTM C754.
- B. Install framing and accessories plumb, square, and true to line, with connections securely fastened.
- C. Install bracing at terminations in assemblies.
 - 1. For interior non-load bearing walls indicated to terminate above suspended ceilings provide 20-gauge stud diagonal bracing of walls at door openings, corner wall intersections and at maximum 10'-0" intervals to structural supports or substrates above. Otherwise extend framing full height to structural supports or substrates above suspended ceilings.
- D. Do not bridge building control and expansion joints with non-load-bearing steel framing members. Frame both sides of joints independently.
- E. Extend partition framing to structure where indicated and to ceiling in other locations.
- F. Partitions Terminating at Ceiling: Attach ceiling runner securely to ceiling track in accordance with manufacturer's instructions.

- G. Partitions Terminating at Structure: Attach top runner to structure, maintain clearance between top of studs and structure, and connect studs to track using specified mechanical devices in accordance with manufacturer's instructions; verify free movement of top of stud connections; do not leave studs unattached to track.
- H. Align and secure top and bottom runners at 24 inches on center unless otherwise indicated.
- I. At partitions indicated with an acoustic rating:
 - 1. Install acoustic insulation, sealants, and accessories as described in Section 09 21 16.
 - 2. Provide components and install as required to produce STC ratings as indicated, based on published tests by manufacturer conducted in accordance with ASTM E90 with STC rating calculated in accordance with ASTM E413.
 - 3. Sound Isolation Tape: Apply to vertical studs and top and bottom tracks/runners in accordance with manufacturer's instructions.
- J. Fire-Resistance-Rated Partitions: Install framing to comply with fire-resistance-rated assembly indicated and support closures and to make partitions continuous from floor to underside of solid structure.
 - 1. Firestop Track: Where indicated, install to maintain continuity of fire-resistance-rated assembly indicated.
- K. Fit runners under and above openings; secure intermediate studs to same spacing as wall studs.
- L. Install studs vertically at spacing indicated on drawings unless otherwise required to meet performance requirements.
- M. Install studs so flanges within framing system point in same direction.
- N. Where studs are installed directly against exterior masonry walls or dissimilar metals at exterior walls, install isolation strip between studs and exterior wall.
- O. Align stud web openings horizontally.
- P. Secure studs to tracks using crimping method. Do not weld.
- Q. Stud splicing is not permissible.
- R. Fabricate corners using a minimum of three studs.
- S. Install double studs at wall openings, door and window jambs, not more than 2 inches from each side of openings.

1. Extend jamb studs through suspended ceilings and attach to underside of overhead structure.
 2. Install cripple studs at head adjacent to each jamb stud, with a minimum 1/2-inch clearance from jamb stud to allow for installation of control joint in finished assembly.
- T. Brace stud framing system rigid.
- U. Coordinate erection of studs with requirements of door frames and window frames; install supports and attachments.
- V. Coordinate installation of bucks, anchors, and blocking with electrical, mechanical, and other work to be placed within or behind stud framing.
- W. Furring: Coordinate with sound isolation clip spacing and locations. Lap splices a minimum of 6 inches.
- X. Use sheet metal backing/blocking for reinforcement of the following:
1. Framed openings.
 2. Wall mounted cabinets.
 3. Plumbing fixtures.
 4. Toilet accessories.
 5. Wall mounted door hardware.
 6. Wall mounted televisions or other equipment.

3.4 CEILING AND SOFFIT FRAMING

- A. Contractor's Option: At the Contractor's option suspended ceiling systems may be either suspended steel framing system or grid suspension system.
- B. Comply with requirements of ASTM C754.
- C. Install furring after work above ceiling or soffit is complete. Coordinate the location of hangers with other work.
- D. Install furring independent of walls, columns, and above-ceiling work.
- E. Securely anchor hangers to structural members or embed in structural slab. Space hangers as required to limit deflection to criteria indicated.
1. Hanger spacing not to exceed 48 inches on center.
- F. Suspend hangers from building structure as follows:

1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structural or suspension system.
 - a. Splay hangers only where required to miss obstructions and offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
2. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with locations of hangers required to support standard suspension system members, install supplemental suspension members and hangers in the form of trapezes or equivalent devices.
3. Wire Hangers: Secure by looping and wire tying, either directly to structures or to inserts, eye screws, or other devices and fasteners that are secure and appropriate for substrate, and in a manner that will not cause hangers to deteriorate or otherwise fail.
4. Do not attach hangers to steel roof deck.
5. Do not attach hangers to permanent metal forms. Furnish cast-in-place hanger inserts that extend through forms.
6. Do not attach hangers to rolled-in hanger tabs of composite steel floor deck.
7. Do not connect or suspend steel framing from ducts, pipes, or conduit.
- G. Space main carrying channels at maximum 48 inch on center, and not more than 6 inches from wall surfaces. Lap splice securely.
- H. Securely fix carrying channels to hangers to prevent turning or twisting and to transmit full load to hangers.
- I. Place furring channels perpendicular to carrying channels, not more than 2 inches from perimeter walls, and rigidly secure. Lap splices securely.
- J. Reinforce openings in suspension system that interrupt main carrying channels or furring channels with lateral channel bracing. Extend bracing minimum 24 inches past each opening.
- K. Laterally brace suspension system.
- L. Fire-Resistance-Rated Assemblies: Wire tie furring channels to supports.
- M. Grid Suspension Systems: Attach perimeter wall track or angle where grid suspension systems meet vertical surfaces. Mechanically join main beam and cross-furring members to each other and butt-cut to fit into wall track.

- N. Installation Tolerances: Install suspension systems that are level to within 1/8 inch in 12 feet measured lengthwise on each member that will receive finishes and transversely between parallel members that will receive finishes.

3.5 TOLERANCES

- A. Maximum Variation From True Position: 1/8 inch in 10 feet.
- B. Maximum Variation From Plumb: 1/8 inch in 10 feet.

END OF SECTION 092216

SECTION 092900 - GYPSUM BOARD

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Performance criteria for gypsum board assemblies.
- B. Acoustic insulation.
- C. Gypsum wallboard.
- D. Joint treatment and accessories.

1.2 RELATED REQUIREMENTS

- A. Section 092216 - Non-Structural Metal Framing.

1.3 REFERENCE STANDARDS

- A. ASTM C475/C475M - Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board.
- B. ASTM C557 - Standard Specification for Adhesives for Fastening Gypsum Wallboard to Wood Framing.
- C. ASTM C754 - Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products.
- D. ASTM C840 - Standard Specification for Application and Finishing of Gypsum Board.
- E. ASTM C954 - Standard Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs from 0.033 in. (0.84 mm) to 0.112 in. (2.84 mm) in Thickness.
- F. ASTM C1002 - Standard Specification for Steel Self-Piercing Tapping Screws for Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs.
- G. ASTM C1047 - Standard Specification for Accessories for Gypsum Wallboard and Gypsum Veneer Base.
- H. ASTM C1325 - Standard Specification for Fiber-Mat Reinforced Cementitious Backer Units.
- I. ASTM C1396/C1396M - Standard Specification for Gypsum Board.
- J. ASTM C1658/C1658M - Standard Specification for Glass Mat Gypsum Panels.

- K. ASTM D3273 - Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber.
- L. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
- M. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements.
- N. ASTM E413 - Classification for Rating Sound Insulation.
- O. GA-216 - Application and Finishing of Gypsum Panel Products.
- P. GA-600 - Fire Resistance and Sound Control Design Manual.
- Q. UL (FRD) - Fire Resistance Directory.

1.4 ADMINISTRATIVE REQUIREMENTS

- A. Coordination: Coordinate the installation of gypsum board assemblies with size, location, and installation of service utilities.
- B. Preinstallation Meeting: Conduct a preinstallation meeting one week prior to the start of the work of this section; require attendance by all affected installers.
- C. Sequencing: Install service utilities in an orderly and expeditious manner.

1.5 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide data on gypsum board, accessories, joint finishing system, and acoustic insulation and sealants.
- C. Shop Drawings: Indicate special details associated with fireproofing and acoustic seals.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: Company specializing in performing work of the type specified and with at least five years of documented experience.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials in original packages, containers, or bundles bearing brand name and identification of manufacturer or supplier.
- B. Store gypsum products and accessories indoors and keep above freezing. Elevate boards above floor, on nonwicking supports, in accordance with manufacturer's recommendations.

- C. Protected against damage from weather, direct sunlight, surface contamination, corrosion, construction traffic, and other causes. Stack gypsum panels flat to prevent sagging.

1.8 FIELD CONDITIONS

- A. Environmental Limitations: Comply with requirements of ASTM C840 or gypsum board manufacturer's written recommendations, whichever are more stringent.

PART 2 PRODUCTS

2.1 GYPSUM BOARD ASSEMBLIES

- A. Provide completed assemblies complying with ASTM C840 and GA-216.
 - 1. See PART 3 for finishing requirements.
- B. Interior Partitions, Indicated as Acoustic: Provide completed assemblies with the following characteristics:
 - 1. Acoustic Attenuation: STC as indicated calculated in accordance with ASTM E413, based on tests conducted in accordance with ASTM E90.
- C. NFPA Assemblies: Provide completed exterior assemblies tested in accordance with NFPA 285 where indicated.
- D. Fire Rated Assemblies: Provide completed assemblies tested according to ASTM E 119 and as scheduled in Drawings.
 - 1. UL Assembly Numbers: Provide construction equivalent to that listed for the particular assembly in the current UL (FRD).

2.2 BOARD MATERIALS

- A. Manufacturers - Gypsum-Based Board:
 - 1. American Gypsum Company: www.americangypsum.com.
 - 2. CertainTeed Corporation: www.certainteed.com.
 - 3. Georgia-Pacific Gypsum: www.gpgypsum.com.
 - 4. National Gypsum Company: www.nationalgypsum.com.
 - 5. USG Corporation: www.usg.com.
 - 6. Substitutions: See Section 016000 - Product Requirements.
- B. Gypsum Wallboard: Paper-faced gypsum panels as defined in ASTM C1396/C1396M; sizes to minimize joints in place; ends square cut.

1. Application: Use for vertical surfaces and ceilings, unless otherwise indicated.
2. Glass mat faced gypsum panels as defined in ASTM C1658/C1658M, suitable for paint finish, of the same core type and thickness may be substituted for paper-faced board unless otherwise required below.
 - a. Glass mat faced gypsum panels are required for all pre-rock applications and gypsum installation prior to building being enclosed.
3. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
 - a. Mold-resistant board is required whenever board is being installed before the building is enclosed and conditioned.
 - b. Mold resistant board is required in areas subject to wetting, steam, or high humidity.
4. At Assemblies Indicated with Fire-Resistance Rating: Use type required by indicated tested assembly; if no tested assembly is indicated, use Type X board, UL or WH listed.
5. At Above Grade Assemblies Indicated to Comply with NFPA 285: Use Type X board for interior drywall.
6. Thickness:
 - a. Vertical Surfaces: 5/8 inch.
 - b. Ceilings: 5/8 inch, unless otherwise noted.
 - c. Multi-Layer Assemblies: Thicknesses as indicated on drawings.
7. Paper-Faced Products:
 - a. American Gypsum Company; FireBloc Type X Gypsum Wallboard: www.americangypsum.com/#sle.
 - b. American Gypsum Company; FireBloc Type C Gypsum Wallboard: www.americangypsum.com/#sle.
 - c. CertainTeed Corporation; Type C Drywall: www.certainteed.com/#sle.
 - d. CertainTeed Corporation; Type X Drywall: www.certainteed.com/#sle.
 - e. Georgia-Pacific Gypsum; ToughRock Fireguard X: www.gpgypsum.com/#sle.
 - f. Georgia-Pacific Gypsum; ToughRock Fireguard C: www.gpgypsum.com/#sle.

- g. Gold Bond Building Products, LLC provided by National Gypsum Company; Gold Bond Fire-Shield Gypsum Board:
www.goldbondbuilding.com/#sle.
 - h. Gold Bond Building Products, LLC provided by National Gypsum Company; Gold Bond Fire-Shield C 5/8" Gypsum Board:
www.goldbondbuilding.com/#sle.
 - i. USG Corporation; Sheetrock Firecode Type X.
 - j. USG Corporation; Sheetrock Firecode Type C.
 - k. USG Corporation; Sheetrock Ecosmart Type X
 - l. Substitutions: See Section 016000 - Product Requirements.
8. Mold-Resistant, Paper-Faced Products:
- a. American Gypsum Company; M-Bloc Type X:
www.americangypsum.com/#sle.
 - b. American Gypsum Company; M-Bloc Type C:
www.americangypsum.com/#sle.
 - c. CertainTeed Corporation; M2Tech 5/8" Type X Moisture & Mold Resistant Drywall: www.certainteed.com/#sle.
 - d. Georgia-Pacific Gypsum; ToughRock Fireguard X Mold-Guard:
www.gpgypsum.com/#sle.
 - e. National Gypsum Company; Gold Bond XP Gypsum Board.
 - f. Gold Bond Building Products, LLC provided by National Gypsum Company; Gold Bond XP Fire-Shield Gypsum Board:
www.goldbondbuilding.com/#sle.
 - g. USG Corporation; Sheetrock Mold Tough Firecode Type X.
 - h. USG Corporation; Sheetrock Mold Tough Ecosmart Firecode Type X.
 - i. Substitutions: See Section 016000 - Product Requirements.

2.3 ACCESSORIES

- A. Sound Attenuation Insulation: ASTM C665; mineral fiber or glass fiber batt, friction fit type, unfaced, produced by combining thermosetting resins with mineral fibers manufactured from glass, slag wool, or rock wool.
 - 1. Thickness: As indicated on Drawings, minimum 2 inches.

2. Fire-Rated Assemblies: Use insulation type required by indicated tested assembly.
- B. Sound Isolation Tape: Elastomeric foam tape for sound decoupling.
1. Surface Burning Characteristics: Provide assemblies with flame spread index of 75 or less and smoke developed index of 450 or less, when tested in accordance with ASTM E84.
 2. Tape Thickness: 1/4 inch.
- C. Acoustic Sealant: Acrylic emulsion latex or water-based elastomeric sealant; do not use solvent-based non-curing butyl sealant.
1. Products:
 - a. Franklin International, Inc; Titebond GREENchoice Professional Acoustical Smoke and Sound Sealant: www.titebond.com/#sle.
 - b. Liquid Nails, a brand of PPG Architectural Coatings: www.liquidnails.com/#sle.
 - c. Specified Technologies Inc; Smoke N Sound Acoustical Sealant: www.stifirestop.com/#sle.
 - d. Pecora Corporation; AC-20 FTR.
 - e. Specified Technologies, Inc.; Smoke N Sound Acoustical Sealant.
 - f. Grabber Construction Products; Acoustical Sealant GSC.
 - g. Accumetric LLC; BOSS 826 Acoustical Sound Sealant.
 - h. USG Corporation; SHEETROCK Acoustical Sealant.
 - i. Substitutions: See Section 016000 - Product Requirements.
 2. Acoustical joint sealant shall have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
 3. Color of exposed acoustical joint sealants: Match adjacent surface.
- D. Acoustical Outlet Box Pads:
1. Minimum thickness - 1/8 inch.
 2. Adhesion - adheres readily to metal or plastic.
 3. Service temperature - 30 degrees to 200 degrees F.
 4. Shall contain no asbestos.

5. Minimum shelf life - 1 year.
 6. Non Fire Rated Products:
 - a. Lowry's Outlet Box Pads as manufactured by Harry A. Lowry & Associates, Inc., Sun Valley, CA.
 - b. Sound Pad #68 as manufactured by L.H. Dottie Co., City of Commerce, CA.
 7. Fire Rated Products:
 - a. Flamesafe FSP 1077 Putty Pads as manufactured by W.R. Grace & Co., Hartfield, PA.
 - b. Putty Pads as manufactured by Specified Technologies Inc., Somerville, NJ.
 - c. Hilti CP617 Putty Pads as manufactured by Hilti, Tulsa, OK.
 - d. 3M Fire Barrier Moldable Putty Pads type MPP-X to fit box size as manufactured by 3M, St. Paul, MN.
 - e. Metacaulk ® Putty Pads as manufactured by RectorSeal, Houston, TX.
- E. Finishing Accessories: ASTM C1047, galvanized steel, rolled zinc, rigid plastic, or composite, unless noted otherwise.
1. Types: As detailed or required for finished appearance.
 2. Special Shapes: In addition to conventional corner bead and control joints, provide U-bead, L-bead, LC-bead, and Casing Bead at exposed panel edges.
 3. Acceptable Products:
 - a. Same manufacturer as framing materials.
 - b. ClarkDietrich (Finishing Accessories) www.clarkdietrich.com
 - c. Phillips Manufacturing Co: www.phillipsmfg.com/#sle.
 - d. Trim-tex, Inc: www.trim-tex.com/#sle.
 - e. Substitutions: See Section 016000 - Product Requirements.
- F. Joint Materials: ASTM C475/C475M and as recommended by gypsum board manufacturer for project conditions.
1. Tape: 2 inch wide, coated glass fiber tape for joints and cornersexterior and glass-mat gypsum.

2. Tape: 2 inch wide, creased paper tape for joints and corners for interior gypsum board.
 3. Tape for Tile Backing Panels: As recommended by panel manufacturer.
 4. Joint Compound: Drying type, vinyl-based, ready-mixed.
- G. Finishing Compound: Surface coat and primer, takes the place of skim coating.
- H. High Build Drywall Surfer: Vinyl acrylic latex-based coating for spray application, designed to take the place of skim coating and separate paint primer in achieving Level 5 finish.
- I. Screws for Fastening of Gypsum Panel Products to Cold-Formed Steel Studs Less than 0.033 inches in Thickness and Wood Members: ASTM C1002; self-piercing tapping screws, corrosion-resistant.
- J. Screws for Fastening of Gypsum Panel Products to Steel Members from 0.033 to 0.112 inch in Thickness: ASTM C954; steel drill screws, corrosion-resistant.
- K. Screws for Fastening of Gypsum Panel Products to Wood Framing: Type W screws, corrosion resistant. Nails not permitted.
- L. Anchorage to Substrate: Tie wire, screws, and other metal supports, of type and size to suit application; to rigidly secure materials in place.
- M. Adhesive for Attachment to Metal:
1. Products:
 - a. Franklin International, Inc; Titebond PROvantage Professional Drywall Adhesive: www.titebond.com/#sle.
 - b. Liquid Nails, a brand of PPG Architectural Coatings: www.liquidnails.com/#sle.
 - c. Substitutions: See Section 016000 - Product Requirements.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that project conditions are appropriate for work of this section to commence.
- B. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 ACOUSTIC ACCESSORIES INSTALLATION

- A. General: Limit installation of outlet boxes and other penetrations to one penetration per stud bay. Seal all penetrations and gaps with acoustic sealant, outlet box pads, or other acoustic shielding materials as approved by Architect in accordance with manufacturer's written instructions and tested assembly instructions.
- B. Preparation for acoustic sealant:
 - 1. Surface Cleaning of Joints: Clean out joints immediately before installing acoustical joint sealants to comply with joint-sealant manufacturer's written instructions.
 - 2. Joint Priming: Prime joint substrates where recommended by acoustical-joint-sealant manufacturer. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.
 - 3. Masking Tape: Use masking tape where required to prevent contact of sealant or primer with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.
- C. Acoustic Insulation: Place tightly within spaces, around cut openings, behind and around electrical and mechanical items within partitions, and tight to items passing through partitions.
- D. Sound Isolation Tape: Apply to vertical studs and top and bottom tracks/runners in accordance with manufacturer's instructions.
- E. Install sound attenuation blankets before installing gypsum panels unless blankets are readily installed after panels have been installed on one side.
- F. Acoustic Sealant: Install as follows:
 - 1. Comply with ASTM C 919, ASTM C 1193, and manufacturer's written recommendations for closing off sound-flanking paths around or through assemblies, including sealing partitions to underside of floor slabs above acoustical ceilings.
 - 2. Acoustical Ceiling Areas: Apply acoustical joint sealant at perimeter edge moldings of acoustical ceiling areas in a continuous ribbon concealed on back of vertical legs of moldings before they are installed.
 - 3. Place one bead continuously on substrate before installation of perimeter framing members.
 - 4. Place continuous bead at perimeter of each layer of gypsum board.

5. Seal around all penetrations by conduit, pipe, ducts, and rough-in boxes, except where firestopping is provided.
- G. Acoustical Outlet Box Pads: Install as follows within acoustic partitions:
1. Remove any water, excess dust, dirt and oil from the surfaces.
 2. Comply with manufacturer's written instructions and UL requirements.
 3. Ensure the entire surface is covered. Seal around conduit where it connects to outlet box using manufacturer's recommended materials.

3.3 BOARD INSTALLATION

- A. Comply with ASTM C840 and manufacturer's instructions. Install to minimize butt end joints, especially in highly visible locations.
- B. Install panels with face side out. Butt panels together for a light contact at edges and ends with not more than 1/16 inch (1.5 mm) of open space between panels. Do not force into place.
- C. Form control and expansion joints with space between edges of adjoining gypsum panels.
- D. Cover both faces of support framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases braced internally.
1. Unless concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. (0.7 sq. m) in area.
 2. Fit gypsum panels around ducts, pipes, and conduits.
 3. Where partitions intersect structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by structural members; allow 1/4- to 3/8-inch- (6.4- to 9.5-mm-) wide joints to install sealant.
- E. Single-Layer Nonrated: Install gypsum board in most economical direction, with ends and edges occurring over firm bearing.
- F. Double-Layer Non-Rated: Use gypsum board for first layer, placed parallel to framing or furring members, with ends and edges occurring over firm bearing. Place second layer perpendicular to framing or furring members. Offset joints of second layer from joints of first layer.
- G. Fire-Resistance-Rated Construction: Install gypsum board in strict compliance with requirements of assembly listing.

- H. Exposed Gypsum Board in Interior Wet Areas: Seal joints, cut edges, and holes with water-resistant sealant.
- I. Installation on Metal Framing: Use screws for attachment of gypsum board.
- J. Where tile backing panels abut other types of panels in same plane, shim surfaces to produce a uniform plane across panel surfaces.
- K. STC-Rated Assemblies: Seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C 919 and with manufacturer's written instructions for locating edge trim and closing off sound-flanking paths around or through assemblies, including sealing partitions above acoustical ceilings.

3.4 INSTALLATION OF TRIM AND ACCESSORIES

- A. Control Joints: Place control joints consistent with lines of building spaces and as indicated.
 - 1. Not more than 30 feet apart on walls and ceilings over 50 feet long.
 - 2. At exterior soffits, not more than 30 feet apart in both directions.
- B. Corner Beads: Install at external corners, using longest practical lengths.
- C. Edge Trim: Install at locations where gypsum board abuts dissimilar materials.

3.5 JOINT TREATMENT

- A. Glass Mat Faced Gypsum Board and Exterior Glass Mat Faced Sheathing: Use fiberglass joint tape, embed and finish with setting type joint compound.
- B. Paper Faced Gypsum Board: Use paper joint tape, embed with drying type joint compound and finish with drying type joint compound.
- C. Finish gypsum board in accordance with levels defined in ASTM C840, as follows:
 - 1. Level 5: Walls and ceilings to receive semi-gloss or gloss paint finish, walls to receive wallcoverings, and other areas specifically indicated.
 - 2. Level 4: Walls and ceilings to receive paint finish or wall coverings, unless otherwise indicated.
 - 3. Level 3: Walls to receive textured wall finish.
 - 4. Level 2: In utility areas, behind cabinetry, and on backing board to receive tile finish.

5. Level 1: Fire-resistance-rated wall areas above finished ceilings, whether or not accessible in the completed construction.
- D. Tape, fill, and sand exposed joints, edges, and corners to produce smooth surface ready to receive finishes.
 1. Feather coats of joint compound so that camber is maximum 1/32 inch.
- E. Where Level 5 finish is indicated, spray apply high build drywall surfacer over entire surface after joints have been properly treated; achieve a flat and tool mark-free finish.
- F. Fill and finish joints and corners of cementitious backing board as recommended by manufacturer.

3.6 TOLERANCES

- A. Maximum Variation of Finished Gypsum Board Surface from True Flatness: 1/8 inch in 10 feet in any direction.

3.7 PROTECTION

- A. Protect installed gypsum board assemblies from subsequent construction operations.
- B. Repair damage from construction operations.

END OF SECTION 092900

SECTION 093000 - TILING

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Tile for wall applications.
- B. Tile accessories, setting, and grouting materials.

1.2 RELATED REQUIREMENTS

- A. Section 079200 - Joint Sealants: Sealing joints between tile work and adjacent construction and fixtures.

1.3 REFERENCE STANDARDS

- A. ANSI A108/A118/A136 - American National Standard Specifications for the Installation of Ceramic Tile (Compendium).
- B. ASTM C499 - Standard Test Method for Facial Dimensions and Thickness of Flat, Rectangular Ceramic Wall and Floor Tile; 2009.
- C. TCNA (HB) - Handbook for Ceramic, Glass, and Stone Tile Installation.
- D. TCNA (HB-GP) - Handbook for Gauged Porcelain Tiles and Gauged Porcelain Tile Panels/Slabs Installation.

1.4 DEFINITIONS

- A. DCOF: Dynamic Coefficient of Friction.
- B. Module Size: Actual tile size, with minor facial dimension as measured by ASTM C499, plus joint width indicated.
- C. Facial Dimension: Actual tile size, with minor facial dimension as measured by ASTM C499.
- D. Large Format Tile: Any tile unit that maintains an edge of 15 inches or greater in any dimension.

1.5 ADMINISTRATIVE REQUIREMENTS

- A. Coordination: Align substrate joints and tiling system joints where required by specified reference standards.
- B. Preinstallation Meeting: Convene a preinstallation meeting one week before starting work of this Section; require attendance by all affected installers.
 - 1. Review installation procedures and coordination requirements.

1.6 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide manufacturers' data sheets on tile, mortar, grout, and accessories. Include instructions for using grouts and adhesives.
- C. Verification Samples:
 - 1. Full-sized units of each type and composition of tile and for each color and finish specified. For ceramic mosaic tile in color blend patterns, provide one full sheet of each specified color blend.
 - 2. Full-sized units of each type of trim and accessory for each color and finish specified.
 - 3. Grout color samples for each type and color specified.
- D. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
- E. Installer's Qualification Statement:
 - 1. Submit documentation of National Tile Contractors Association (NTCA) or Tile Contractors' Association of America (TCAA) accreditation.
- F. Maintenance Data: Include recommended cleaning methods, cleaning materials, and stain removal methods.
- G. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. Extra Tile: 5 percent of each size, color, and surface finish combination.

1.7 QUALITY ASSURANCE

- A. Maintain one copy of ANSI A108/A118/A136, TCNA (HB), and TCNA (HB-GP) on-site.
- B. Manufacturer Qualifications: Company specializing in manufacturing the types of products specified in this Section, with minimum five years of documented experience.
- C. Installer Qualifications:
 - 1. Company specializing in performing tile installation, with minimum of five years of documented experience.
 - a. Accredited Five-Star member of the National Tile Contractors Association (NTCA) or Trowel of Excellence member of the Tile Contractors' Association of America (TCAA).

- D. Provide materials obtained from only one manufacturer for each type and color of tile, and for each type of mortar, grout, adhesive, and sealant.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Protect adhesives from freezing or overheating in accordance with manufacturer's instructions.
- B. Store tile and cementitious materials on elevated platforms, under cover, and in a dry location.
- C. Protect adhesives from freezing or overheating in accordance with manufacturer's instructions.

1.9 FIELD CONDITIONS

- A. Comply with referenced standards and manufacturer's recommendations for protection and maintenance of environmental conditions during and after installation.
- B. Do not install solvent-based products in an unventilated environment.
- C. Maintain ambient and substrate temperature of 50 degrees F during installation, and for at least seven days after installation. Maintain higher temperatures for proprietary mortars and grouts when recommended by manufacturer.
- D. Vent temporary heaters to the exterior to prevent damage to tile work due to carbon dioxide accumulation.

1.10 WARRANTY

- A. Manufacturer's Special Warranty: Manufacturer agrees to repair or replace materials that fail within specified warranty period.
 - 1. Warranty Period: 10 years from date of Substantial Completion.
- B. Installer's Special Warranty: Specified form, signed by Installer, covering Work of this Section, for warranty period of 2 years.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Acceptable Manufacturers:
 - 1. Manufacturers and products specified on Drawings.

2.2 TILING MATERIALS

- A. ANSI Standards for Tile Installation Materials: Provide materials complying with ANSI A108.02, ANSI standards referenced in other Part 2 articles, ANSI standards referenced by TCNA installation methods specified in tile installation schedules, and other requirements specified.
- B. Factory Blending: For tile exhibiting color variations within ranges, blend tile in factory and package so tile units taken from one package show same range in colors as those taken from other packages and match approved Samples.

2.3 TRIM AND ACCESSORIES

- A. Metal Trim: Finish as selected by Architect, style and dimensions as indicated on drawings, for setting using tile mortar or adhesive. Provide trim height to match tile and setting bed thickness.
 - 1. Basis of Design Applications, Unless Otherwise Indicated:
 - a. Floor Edge Terminations or Reducer Strip Transitions: Schluter Reno.
 - b. Coved Inside Corner: Schluter Dilex-AHK with corner transitions, end caps, and accessories.
 - c. Movement Joints: Schluter Dilex-BWS: PVC, color as selected.
 - d. Wall Tile Edge Termination: Schluter Jolly.
 - e. Outside Corners: Schluter Quadec.
 - 2. Other Acceptable Manufacturers:
 - a. Genesis APS International: www.genesis-aps.com/#sle.
 - b. Ceramic Tool Company, Inc.
 - c. Futura Industries.
 - d. National Metal Shapes, Inc. Aluminum L-S Profiles.
 - e. Substitutions: See Section 016000 - Product Requirements.
- B. Thresholds and Transitions - General: Provide transitions that are uniform in color and finish, fabricated to sizes and profiles indicated to provide transition between tile surfaces and adjoining finished floor surfaces. Fabricate thresholds to heights indicated, but not more than 1/2 inch above adjoining floor surfaces, with transition edges beveled on a slope not exceeding 1:2.

2.4 SETTING MATERIALS

- A. Modified Dry Set Cement Mortar Bond Coat: ANSI A118.4 and ANSI A118.11.
1. Applications: Use this type of bond coat where no other type of bond coat is indicated.
 2. Products:
 - a. ARDEX Engineered Cements; X 3+: www.ardexamericas.com/#sle.
 - b. Custom Building Products; MegaLite Crack Prevention Mortar, ProLite Tile & Stone Mortar, or Complete Contact Fortified Mortar: www.custombuildingproducts.com/#sle.
 - c. H.B. Fuller Construction Products, Inc; TEC Ultimate Large Tile Mortar or Ultimate 6 Plus Mortar: www.tecspecialty.com/#sle.
 - d. LATICRETE International, Inc; 4-XLT: www.laticrete.com/#sle.
 - e. Mapei Corporation; Ultralite or Ultracontact: www.mapei.com.
 - f. Substitutions: See Section 016000 - Product Requirements.

2.5 GROUTS

- A. High Performance Polymer Modified Grout: ANSI A118.7 polymer modified cement grout.
1. Applications: Use this type of grout where no other type of grout is indicated.
 2. Use sanded grout for joints 1/8 inch wide and larger; use unsanded grout for joints less than 1/8 inch wide.
 3. Color(s): As selected by Architect from manufacturer's full line.
 4. Acceptable Products:
 - a. ARDEX Engineered Cements; ARDEX FL (Sanded) or FGC (Unsanded): www.ardexamericas.com/#sle.
 - b. Custom Building Products; Prism Color Consistent Grout: www.custombuildingproducts.com/#sle.
 - c. H.B. Fuller Construction Products, Inc; TEC AccuColor Plus Grout: www.tecspecialty.com/#sle.
 - d. LATICRETE International, Inc.; LATICRETE PermaColor: www.laticrete.com.
 - e. Mapei Corporation; Ultracolor Plus FA: www.mapei.com/#sle.

- f. Substitutions: See Section 016000 - Product Requirements.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that wall surfaces are smooth and flat within the tolerances specified for that type of work, are dust-free, and are ready to receive tile.
- B. Verify that required wall-mounted utilities are in correct location.

3.2 PREPARATION

- A. Protect surrounding work from damage.
- B. Vacuum clean surfaces and damp clean.
- C. Seal substrate surface cracks with filler. Level existing substrate surfaces to acceptable flatness tolerances.

3.3 INSTALLATION - GENERAL

- A. Blending: For tile exhibiting color or pattern variations within the ranges of accepted submittals, verify that tile has been blended in the packages so that tile units taken from one package show same range in colors or patterns as those taken from other packages. If not blended in the packages, blend tile in the field before installation.
- B. Wall System Coverage: Where specified for individual setting methods, install wall tile units with 100 percent mortar coverage by complying with applicable special requirements for back buttering of tile units in referenced ANSI A108 specifications.
- C. Movement Joints: Comply with TCNA (HB) Method EJ171F requirements for locations, spacing, and installation of applicable movement joints, whether or not specifically indicated or detailed on Drawings, and as follows:
 - 1. Field Joint Spacing - Interior: Maximum 24 feet on center in each direction; reduce spacing to maximum 10 feet on center in areas exposed to direct sunlight or moisture.
 - 2. Joint Width: Match adjacent grouted joint widths, unless TCNA EJ171 requires a specific joint width based on joint location or joint service conditions.
 - 3. Apply sealant joint to junction of tile and dissimilar materials and junction of dissimilar planes, including but not limited to floor to wall joints, corners, and metal trim and non-ceramic accessory items.
 - 4. Keep movement joints free of setting adhesive and grout.

5. Where metal trims are not specified, form internal angles and corners square, not grouted, with sealant joint.
 6. Where metal trims are not specified, form external angles and corners square, not grouted, with sealant joint.
 7. Apply specified sealant to joints.
- D. Lay tile to pattern indicated. Do not interrupt tile pattern through openings.
 - E. Cut and fit tile to penetrations through tile, leaving sealant joint space. Form corners and bases neatly.
 - F. Place tile joints uniform in width, subject to variance in tolerance allowed in tile size. Make grout joints without voids, cracks, excess mortar or excess grout, or too little grout.
 - G. Sound tile after setting. Replace hollow sounding units.
 - H. Keep control and expansion joints free of mortar, grout, and adhesive.
 - I. Prior to grouting, allow installation to completely cure; minimum of 48 hours.
 - J. Grout tile joints, except where movement joints are indicated or specified.
 - K. At changes in plane and tile-to-tile control joints, use tile sealant instead of grout, with either bond breaker tape or backer rod as appropriate to prevent three-sided bonding.
 - L. Allow completed tiling assemblies to cure full 72 hours before allowing heavy foot or equipment traffic on final installations.

3.4 INSTALLATION - WALL TILE

- A. Over interior concrete and masonry install in accordance with TCNA (HB) Method W202, thin-set with dry-set or latex-Portland cement bond coat.

3.5 TOLERANCES

- A. Comply with applicable requirements of ANSI A108.2, unless otherwise specified in this Section.
- B. Flatness - Finished Tiling Surfaces:
 1. Ceramic Tile: 1/4 inch in 10 feet.
 2. Stone Tile: 1/8 inch in 10 feet.
- C. Lippage - Adjacent Tile Units:

1. Glazed Wall Tile and Mosaic Tile: 1/32 inch; joint width 1/16 inch to 1/8 inch; 1 x 1 inch to 6 x 6 inch tile size.
2. Pressed Floor Tile and Porcelain Tile: 1/32 inch; joint width 1/16 inch to less than 1/4 inch; all tile sizes.
3. Pressed Floor Tile and Porcelain Tile: 1/16 inch; joint width greater than 1/4 inch; all tile sizes.

3.6 CLEANING

- A. Clean tile and grout surfaces.
- B. Remove grout efflorescence as required with product approved by tile and grout manufacturer.
- C. Unglazed tile may be cleaned with sulfamic acid solutions only when permitted by the tile and grout manufacturer's printed instructions, but not sooner than 14 days after completion of installation. Protect metal surfaces, iron, and vitreous fixtures from effects of acid cleaning. Flush surfaces with clean water before and after acid cleaning.
- D. Leave finished installation clean and free of cracked, chipped, broken, un-bonded, or otherwise defective tile work.

3.7 PROTECTION

- A. Do not permit traffic over finished floor surface for minimum 7 days after installation.
- B. Protect installed tile work with kraft paper or other heavy covering during construction period to prevent staining, damage, and wear. If recommended by tile manufacturer, apply coat of neutral protective cleaner to completed tile walls and floors.

END OF SECTION 093000

SECTION 095113 - ACOUSTICAL PANEL CEILINGS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Suspended metal grid ceiling system.
- B. Acoustical units.

1.2 RELATED REQUIREMENTS

- A. Section 083100 - Access Doors and Panels: Access panels.

1.3 REFERENCE STANDARDS

- A. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- B. ASTM C635/C635M - Standard Specification for Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings.
- C. ASTM C636/C636M - Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels.
- D. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
- E. ASTM E1264 - Standard Classification for Acoustical Ceiling Products.

1.4 ADMINISTRATIVE REQUIREMENTS

- A. Sequencing: Sequence work to ensure acoustical ceilings are not installed until building is enclosed, sufficient heat is provided, dust generating activities have terminated, and overhead work is completed, tested, and approved.
 - 1. Do not install acoustical units until after interior wet work is dry.

1.5 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide data on suspension system components and acoustical units.
- C. Samples: Submit two samples minimum 6 x 6 inch in size illustrating material and finish of acoustical units.
- D. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.

E. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.

1. Extra Acoustical Units: Quantity equal to 5 percent of total installed.

1.6 QUALITY ASSURANCE

A. Suspension System Manufacturer Qualifications: Company specializing in manufacturing the products specified in this Section with minimum three years documented experience.

B. Acoustical Unit Manufacturer Qualifications: Company specializing in manufacturing the products specified in this Section with minimum three years documented experience.

C. System Installer Qualifications: Company specializing in the installation of products specified in this Section with minimum three years documented experience.

1.7 FIELD CONDITIONS

A. Maintain uniform temperature of minimum 60 degrees F, and maximum humidity of 20 to 40 percent prior to, during, and after acoustical unit installation.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Basis of Design Manufacturer:

1. As scheduled.

B. Other Acceptable Manufacturers - Acoustic Panels:

1. Armstrong World Industries, Inc.: www.armstrong.com.

2. CertainTeed Corporation: www.certainteed.com/#sle.

3. Rockfon, LLC: www.rockfon.com.

4. USG Corporation: www.usg.com/#sle.

5. Substitutions: See Section 016000 - Product Requirements.

C. Acceptable Manufacturers - Suspension Systems:

1. Same as for acoustical units.

2.2 PERFORMANCE REQUIREMENTS

A. Interior Suspended Ceilings, Soffits, and Bulkheads: Maintain deflection of not more than L/360 of distance between supports.

- B. Surface Burning Characteristics: Flame spread/Smoke developed index of 25/450, maximum, when tested in accordance with ASTM E84.

2.3 ACOUSTICAL CEILINGS

- A. Acoustical Units - General: ASTM E1264, Class A.
 - 1. Provide units with manufacturer's proprietary anti-humidity, sag-resistant composition and anti-microbial treatment to inhibit the propagation of mold and mildew.

2.4 SUSPENSION SYSTEMS

- A. Metal Suspension Systems - General: Complying with ASTM C635/C635M; die cut and interlocking components, with perimeter moldings, hold down clips, stabilizer bars, clips, and splices as required.
 - 1. Materials:
 - a. Steel Grid: ASTM A653/A653M, G30 coating, except provide not less than G60 coating for severe or wet environments.
- B. Exposed Suspension System: Hot-dipped galvanized steel grid.
 - 1. Structural Classification: Heavy-duty, when tested in accordance with ASTM C635/C635M.
 - 2. Profile: Tee; 15/16 inch face width.
 - 3. Finish: Baked enamel.
 - 4. Color: White, unless otherwise indicated.

2.5 ACCESSORIES

- A. Support Channels and Hangers: Galvanized steel; size and type to suit application and ceiling system flatness requirement specified.
- B. Hanger Wire: 12 gauge, 0.08 inch galvanized steel wire.
- C. Hold-Down Clips: Manufacturer's standard clips to suit application.
- D. Perimeter Moldings: Same metal and finish as grid.
 - 1. Size: As required for installation conditions.
 - 2. Angle Molding: L-shaped, for mounting at same elevation as face of grid.
 - 3. At Circular Penetrations: Provide edge moldings fabricated to diameter required to fit penetration precisely.

- E. Touch-up Paint: Type and color to match acoustical and grid units.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify that layout of hangers will not interfere with other work.
- C. Examine acoustical panels before installation. Reject acoustical panels that are wet, moisture damaged, or mold damaged.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Install after major above-ceiling work is complete.
- B. Coordinate the location of hangers with other work.

3.3 INSTALLATION - SUSPENSION SYSTEM

- A. Install suspension system in accordance with ASTM C636/C636M and manufacturer's instructions and as supplemented in this section.
- B. Rigidly secure system, including integral mechanical and electrical components, for maximum deflection of 1:360.
- C. Locate system on room axis according to reflected plan.
- D. Perimeter Molding: Install at intersection of ceiling and vertical surfaces and at junctions with other interruptions.
 - 1. Use longest practical lengths.
- E. Suspension System, Non-Seismic: Hang suspension system independent of walls, columns, ducts, pipes and conduit. Where carrying members are spliced, avoid visible displacement of face plane of adjacent members.
- F. Where ducts or other equipment prevent the regular spacing of hangers, reinforce the nearest affected hangers and related carrying channels to span the extra distance.
- G. Do not support components on main runners or cross runners if weight causes total dead load to exceed deflection capability.
- H. Support fixture loads using supplementary hangers located within 6 inches of each corner, or support components independently.
- I. Do not eccentrically load system or induce rotation of runners.

3.4 INSTALLATION - ACOUSTICAL UNITS

- A. Install acoustical units in accordance with manufacturer's instructions.
- B. Fit acoustical units in place, free from damaged edges or other defects detrimental to appearance and function.
- C. Fit border trim neatly against abutting surfaces.
- D. Install acoustical units level, in uniform plane, and free from twist, warp, and dents.
- E. Cutting Acoustical Units:
 - 1. Cut to fit irregular grid and perimeter edge trim.
 - 2. Make field cut edges of same profile as factory edges; finish cut edges to match factory finished edges if cut edge is exposed to view.
 - 3. Double cut and field paint exposed reveal edges to match factory finished edges.
- F. Where round obstructions occur, provide preformed closures to match perimeter molding.
- G. Install hold-down clips on panels within 10 ft of an exterior door.

3.5 TOLERANCES

- A. Maximum Variation from Flat and Level Surface: 1/8 inch in 10 feet.
- B. Maximum Variation from Plumb of Grid Members Caused by Eccentric Loads: 2 degrees.

3.6 CLEANING

- A. Clean exposed surfaces of acoustical panel ceilings, including trim, edge moldings, and suspension-system members. Comply with manufacturer's written instructions for cleaning and touchup of minor finish damage. Remove and replace ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION 095113

SECTION 096500 - RESILIENT FLOORING

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Resilient tile flooring.
- B. Installation accessories.

1.2 RELATED REQUIREMENTS

- A. Section 090561 - Common Work Results For Flooring Preparation: Independent agency testing of concrete slabs, cleaning, or preparation.

1.3 REFERENCE STANDARDS

- A. ASTM E648 - Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source.
- B. ASTM F1700 - Standard Specification for Solid Vinyl Floor Tile.
- C. NFPA 253 - Standard Method of Test for Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source.

1.4 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide data on specified products, describing physical and performance characteristics; including sizes, patterns and colors available; and installation instructions.
- C. Selection Samples: Submit manufacturer's complete set of color samples for Architect's initial selection.
- D. Verification Samples: Submit two samples, minimum 6 x 12 inch in size illustrating color and pattern for each resilient flooring product specified.
- E. Concrete Subfloor Test Report: Submit a copy of the moisture and alkalinity (pH) test reports.
- F. Manufacturer's Qualification Statement.
- G. Installer's Qualification Statement.
- H. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. See Section 016000 - Product Requirements, for additional provisions.

2. Extra Flooring Material: Additional quantity equivalent to 2 percent of each type and color.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing specified flooring with minimum three years documented experience.
- B. Installer Qualifications: Company specializing in installing specified flooring with minimum three years documented experience.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Upon receipt, immediately remove any shrink-wrap and check materials for damage and the correct style, color, quantity and run numbers.
- B. Store all materials off of the floor in an acclimatized, weather-tight space.
- C. Maintain temperature in storage area between 55 degrees F and 90 degrees F.
- D. Deliver and store materials in manufacturer's original unopened containers, with brand names and production lot numbers clearly marked.
- E. Protect roll materials from damage by storing on end.
- F. Do not double stack pallets.

1.7 FIELD CONDITIONS

- A. Store materials for not less than 48 hours prior to installation in area of installation at a minimum temperature of 65 degrees F to achieve temperature stability. Thereafter, maintain conditions above 55 degrees F.
- B. Install resilient flooring and accessories after other finishing operations, including painting have been completed.
- C. Do not install resilient flooring over concrete slabs until slabs have been fully cured, and are sufficiently dry to achieve proper bond with adhesive as determined by resilient flooring manufacturer's recommended bond and moisture test.

1.8 WARRANTY

- A. Resilient Flooring: Provide manufacturer's warranty, as follows:
 1. Materials: Minimum 15 years from date of purchase, covering manufacturing defects and wear due to normal foot traffic.
 2. Installation: Minimum 2 years from date of installation; warrant entire installation against loss of adhesion to substrates.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Acceptable Manufacturers:
 - 1. Manufacturers and products specified on Drawings.
 - 2. Substitutions: See Section 01 6000 - Product Requirements.

2.2 TILE FLOORING

- A. Luxury Vinyl Tile:
 - 1. Minimum Requirements: Comply with ASTM F1700, of Class corresponding to type specified.
 - 2. Critical Radiant Flux (CRF): Minimum 0.45 watt per square centimeter, when tested in accordance with ASTM E648, NFPA 253, ASTM E648, or NFPA 253.
 - 3. Wear Layer Thickness: 0.020 inch minimum or as scheduled on drawings.
 - 4. Total Thickness: 0.125 inch minimum or as scheduled on drawings.
 - 5. Type and Color: As indicated on drawings.

2.3 ACCESSORIES

- A. Subfloor Filler: White premix latex; type recommended by adhesive material manufacturer.
- B. Adhesives: Waterproof; types recommended by flooring manufacturer.
 - 1. Provide only products having lower volatile organic compound (VOC) content than required by the more stringent of the South Coast Air Quality Management District Rule No.1168 and the Bay Area Air Quality Management District Regulation 8, Rule 51.
- C. Resilient Wall Base, Edge Strips, and Accessories: Specified in Section 096513.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that surfaces are flat to tolerances acceptable to flooring manufacturer, free of cracks that might telegraph through flooring, clean, dry, and free of curing compounds, surface hardeners, and other chemicals that might interfere with bonding of flooring to substrate.
- B. Minimum F(F) Floor Flatness Values:

1. Under Resilient Flooring: F(F) of 35.
- C. Verify that wall surfaces are smooth and flat within the tolerances specified for that type of work, are dust-free, and are ready to receive resilient base.
- D. Cementitious Subfloor Surfaces: Verify that substrates are ready for resilient flooring installation by testing for moisture and alkalinity (pH).
 1. Test in accordance with Section 090561.
 2. Obtain instructions if test results are not within limits recommended by resilient flooring manufacturer and adhesive materials manufacturer.
 3. If flooring manufacturer does not recommend specific remediation materials and procedures, follow moisture and alkalinity remediation procedures in Section 090561.
- E. Verify that required floor-mounted utilities are in correct location.

3.2 PREPARATION

- A. Prepare floor substrates for installation of flooring in accordance with Section 090561.
- B. Prepare floor substrates as recommended by flooring and adhesive manufacturers.
- C. Clean substrate.

3.3 INSTALLATION - GENERAL

- A. Starting installation constitutes acceptance of subfloor conditions.
- B. Install in accordance with manufacturer's written instructions.
- C. Adhesive-Applied Installation:
 1. Spread only enough adhesive to permit installation of materials before initial set.
 2. Fit joints and butt seams tightly.
 3. Set flooring in place, press with heavy roller to attain full adhesion.
- D. Where type of floor finish, pattern, or color are different on opposite sides of door, terminate flooring under centerline of door.
- E. Install edge strips at unprotected or exposed edges, where flooring terminates, and where indicated.
 1. Resilient Strips: Attach to substrate using adhesive.
- F. Scribe flooring to walls, columns, cabinets, floor outlets, and other appurtenances to produce tight joints.

3.4 INSTALLATION - TILE FLOORING

- A. Mix tile from container to ensure shade variations are consistent when tile is placed, unless otherwise indicated in manufacturer's installation instructions.
- B. Install flooring in pattern as indicated in drawings. Allow minimum 1/2 full size tile width at room or area perimeter.
- C. Install plank tile with a random offset of at least 6 inches from adjacent rows.

3.5 CLEANING

- A. Remove excess adhesive from floor, base, and wall surfaces without damage.
- B. Clean in accordance with manufacturer's written instructions.

3.6 PROTECTION

- A. Prohibit traffic on resilient flooring for 48 hours after installation.
- B. Place protective coverings over finished floors; do not remove coverings until Date of Substantial Completion.

END OF SECTION 096500

SECTION 096513 - RESILIENT WALL BASE AND ACCESSORIES

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Resilient wall base.
- B. Resilient edge and transition strips.
- C. Flooring system accessories.

1.2 RELATED REQUIREMENTS

- A. Section 096813 - Tile Carpeting.

1.3 REFERENCE STANDARDS

- A. ASTM F1861 - Standard Specification for Resilient Wall Base.

1.4 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on specified products, describing physical and performance characteristics; including sizes, patterns and colors available; and installation instructions.
- C. Selection Samples: If basis of design color is not provided, submit manufacturer's complete set of color samples for Architect's selection.
- D. Verification Samples: Submit two samples, minimum 4x4 inch in size illustrating color and pattern for each resilient flooring product specified.
- E. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. See Section 016000 - Product Requirements, for additional provisions.
 - 2. Extra Wall Base: 24 linear feet of each type and color.
 - 3. Clearly identify each package.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing specified flooring with minimum three years documented experience.
- B. Installer Qualifications: Company specializing in installing specified flooring with minimum three years documented experience.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Upon receipt, immediately remove any shrink-wrap and check materials for damage and the correct style, color, quantity and run numbers.
- B. Store all materials off of the floor in an acclimatized, weather-tight space.
- C. Maintain temperature in storage area between 55 degrees F and 90 degrees F.
- D. Deliver and store materials in manufacturer's original unopened containers, with brand names and production lot numbers clearly marked.
- E. Protect roll materials from damage by storing on end.
- F. Do not double stack pallets.

1.7 FIELD CONDITIONS

- A. Store materials for not less than 48 hours prior to installation in area of installation at a minimum temperature of 65 degrees F to achieve temperature stability. Thereafter, maintain conditions above 55 degrees F.
- B. Install resilient accessories after other finishing operations, including painting have been completed.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Basis of Design Manufacturers:
 - 1. Manufacturers and products specified on Drawings.
 - 2. Substitutions: See Section 01 6000 - Product Requirements.

2.2 RESILIENT BASE

- A. General: Comply with adhesives and sealants and flooring system product requirements specified.
- B. Resilient Base: ASTM F1861, Type TS rubber, vulcanized thermoset; top set, Style B, Cove.
 - 1. Acceptable Manufacturers:
 - a. Mannington Commercial: www.manningtoncommercial.com.
 - b. Johnsonite, a Tarkett Company: www.commercial.tarkett.com
 - c. Roppe Corp.: www.roppe.com.

- d. ShawContract: www.shawcontract.com.
 - e. Substitutions: See Section 016000 - Product Requirements.
- 2. Group: I (solid, homogeneous).
 - 3. Height: 4 inch.
 - 4. Thickness: 0.125 inch.
 - 5. Finish: Satin.
 - 6. Color: As indicated on drawings.

2.3 ACCESSORIES

- A. Subfloor Filler: White premix latex; type recommended by adhesive material manufacturer.
- B. Adhesives: Waterproof; types recommended by flooring manufacturer.
 - 1. Compatible with materials being adhered; maximum VOC content of 50 g/L.
- C. Moldings and Edge Strips: Homogeneous vinyl or rubber type; tapered or bullnose edge; one inch wide; color selected by Architect.
- D. Moldings, Transition and Edge Strips: As scheduled in drawings.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that wall surfaces are smooth and flat within the tolerances specified for that type of work, are dust-free, and are ready to receive resilient base.

3.2 PREPARATION

- A. Prepare substrates as recommended by flooring and adhesive manufacturers.
- B. Remove substrate ridges and bumps. Fill minor low spots, cracks, joints, holes, and other defects with sub-floor filler to achieve smooth, flat, hard surface.
 - 1. Prohibit traffic until filler is fully cured.
- C. Clean substrate.

3.3 INSTALLATION - GENERAL

- A. Starting installation constitutes acceptance of conditions.
- B. Install in accordance with manufacturer's written instructions.

- C. Adhesive-Applied Installation:
 - 1. Spread only enough adhesive to permit installation of materials before initial set.
 - 2. Fit joints and butt seams tightly.

3.4 INSTALLATION - RESILIENT BASE

- A. Apply wall base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.
- B. Fit joints tightly and make vertical. Install in longest lengths possible; maintain minimum dimension of 18 inches between joints.
- C. Miter internal corners. At external corners, 'V' cut back of base strip to 2/3 of its thickness and fold.
 - 1. Outside Corners: Use straight pieces of maximum lengths possible. Form without producing discoloration (whitening) at bends.
- D. Install base on solid backing. Bond tightly to wall and floor surfaces.
- E. Do not stretch wall base during installation.
- F. Scribe and fit to door frames and other interruptions.

3.5 INSTALLATION - RESILIENT ACCESORIES

- A. Install edge strips at unprotected or exposed edges, where flooring terminates, and where indicated.
 - 1. Type and Location: As indicated in Drawings.
 - 2. Resilient Strips: Attach to substrate using adhesive.

3.6 CLEANING

- A. Remove excess adhesive from floor, base, and wall surfaces without damage.
- B. Clean in accordance with manufacturer's written instructions.

3.7 PROTECTION

- A. Prohibit traffic on resilient flooring for 48 hours after installation.

END OF SECTION 096513

SECTION 096700 - FLUID-APPLIED FLOORING

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Fluid-applied flooring and base.

1.2 RELATED REQUIREMENTS

- A. Section 079200 - Joint Sealants: Sealing joints between fluid-applied flooring and adjacent construction and fixtures.
- B. Section 090561 - Common Work Results For Flooring Preparation: Concrete slab moisture and alkalinity testing and remediation procedures.

1.3 REFERENCE STANDARDS

- A. ICRI 310.2R - Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings, Polymer Overlays, and Concrete Repair.

1.4 DEFINITIONS

- A. DCOF: Dynamic Coefficient of Friction.
- B. Slip-Resistant: Installed flooring surface which has a wet coefficient of friction of 0.42, minimum, as measured according to ANSI B101.3 (DCOF Slip Resistance Test).

1.5 ADMINISTRATIVE REQUIREMENTS

- A. Preinstallation Meeting: Conduct a preinstallation meeting at least one week prior to the start of the work of this Section; require attendance by all affected installers, manufacturer, Contractor, and Architect.
 - 1. Discuss installation testing, prep, procedures, details, and other pertinent issues.

1.6 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on specified products, describing physical and performance characteristics; sizes, patterns and colors available.
- C. Samples for Selection: Submit samples showing range of options for color, texture, and aggregate for each system.
- D. Samples for Verification: Submit two samples, 12 x 12 inch in size illustrating color and pattern for each floor material for each color specified.

- E. Concrete Subfloor Test Report: Submit a copy of the moisture and alkalinity (pH) test reports.
- F. Manufacturer's Certificate: Provide letter of certification from manufacturer stating that installer is a certified applicator and is familiar with manufacturers required procedures for application of specified finish system
 - 1. Slip-Resistance: Certify that specified floor finish system, when installed, comply with specified requirements for slip-resistance.
- G. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.
- H. Manufacturer's Qualification Statement.
- I. Applicator's Qualification Statement.
- J. Maintenance Data: Include maintenance procedures, recommended maintenance materials, procedures for stain removal, repairing surface, and suggested schedule for cleaning.

1.7 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this Section with minimum five years documented experience.
- B. Applicator Qualifications: Company specializing in performing the work of this Section.
 - 1. Minimum five years of documented experience.
 - 2. Approved by manufacturer.
- C. Basis of Design: Specifications are based on flooring types by the specified basis of design manufacturer. Flooring types manufactured by other acceptable manufacturers are permitted, subject to compliance with all specified requirements; and provided that deviations in composition, construction, performance, and finish are minor and do not detract substantially from the indicated design intent.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials in original packages and containers, with seals unbroken, bearing manufacturer's labels indicating brand name and directions for storage and mixing with other components.
- B. Store resin materials in a dry, secure area.
- C. Store materials for three days prior to installation in area of installation to achieve temperature stability.

1.9 FIELD CONDITIONS

- A. Maintain minimum temperature in storage area of 55 degrees F.
- B. Store materials in area of installation for minimum period of 24 hours prior to installation.
- C. Maintain ambient temperature required by manufacturer 72 hours prior to, during, and 24 hours after installation of materials.
- D. Concrete substrate shall be properly cured for a minimum of 28 days.

1.10 WARRANTY

- A. Fluid-applied Flooring: Provide manufacturer's warranty, as follows:
 - 1. Materials: Minimum 2 years from Date of Substantial Completion.
 - 2. Installation: Minimum 2 years from Date of Substantial Completion; warrant entire installation against loss of adhesion to substrates.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Basis of Design Manufacturer:
 - 1. Tnemec Company: www.tnemec.com.
- B. Other Acceptable Manufacturers:
 - 1. Dur-A-Flex, Inc.: www.dur-a-flex.com.
 - 2. Key Resin Company: www.keyresin.com.
 - 3. PPG Paints Megaseal Fluid Applied Flooring: www.ppgpaints.com/#sle and www.ppgpmc.com/home.aspx/#sle.
 - 4. Sherwin-Williams Company: General Polymers Brand: www.generalpolymers.com.
 - 5. Terrazzo & Marble Supply Companies: www.tmsupply.com.

2.2 FLOORING APPLICATIONS - GENERAL

- A. Slip-Resistance: Installed flooring must be slip resistant.

2.3 FLOORING MATERIALS

- A. Fluid-Applied Flooring: Epoxy base coat(s) with embedded vinyl flakes.

1. Aggregate: Vinyl flakes.
2. Top Coat: Polyurethane.
3. System Thickness: 1/8 inch, nominal, when dry.
4. Base: Integral 4 inch cove base with metal cap.
5. Color: As selected by Architect.
6. Basis of Design Products: Themec Company
 - a. 224-503 Deco-Fleck and 284-0000 Deco-Clear.

2.4 ACCESSORIES

- A. Base Caps: Zinc with projecting base of 1/8 inch; color as selected.
- B. Cant Strips: Molded material compatible with flooring.
- C. Subfloor Filler: Type recommended by fluid-applied flooring manufacturer.
- D. Primer: Type recommended by fluid-applied flooring manufacturer.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that subfloor surfaces are smooth and flat within the tolerances specified for that type of work and are ready to receive flooring.
- B. Verify that wall surfaces are smooth and flat within the tolerances specified for that type of work, are dust-free, and are ready to receive flooring.
- C. Verify that subfloor surfaces are dust-free and free of substances that could impair bonding of materials to subfloor surfaces.
- D. Cementitious Subfloor Surfaces: Verify that substrates are ready for fluid-applied flooring installation by testing for moisture and alkalinity (pH).
 1. Test in accordance with Section 090561.
 2. Obtain instructions if test results are not within limits recommended by fluid-applied flooring manufacturer.
- E. Verify that required floor-mounted utilities are in correct location.

3.2 PREPARATION

- A. Remove subfloor ridges and bumps. Fill low spots, cracks, joints, holes, and other defects with subfloor filler.

- B. Prepare concrete surfaces according to ICRI 310.2R.
- C. Prepare concrete surfaces according to manufacturer's guidelines.
- D. Apply, trowel, and float filler to achieve smooth, flat, hard surface. Grind irregularities above the surface level. Prohibit traffic until filler is cured.
- E. Vacuum clean substrate.
- F. Apply primer to surfaces required by flooring manufacturer.

3.3 INSTALLATION - ACCESSORIES

- A. Install cant strips at base of walls where flooring is to be extended up wall as base.
- B. Integral Cove Base: Apply cove base mix to wall surfaces before applying flooring. Apply according to manufacturer's written instructions and details including those for taping, mixing, priming, troweling, sanding, and top coating of cove base. Round internal and external corners.
- C. Install terminating cap strip at top of base; attach securely to wall substrate.

3.4 INSTALLATION - FLOORING

- A. Apply in accordance with manufacturer's instructions.
 - 1. Coordinate application of components to provide optimum adhesion of resinous flooring system to substrate, and optimum intercoat adhesion.
 - 2. Cure resinous flooring components according to manufacturer's written instructions. Prevent contamination during application and curing processes.
 - 3. At substrate expansion and isolation joints, provide joint in resinous flooring to comply with resinous flooring manufacturer's written recommendations.
 - a. Apply joint sealant to comply with manufacturer's written recommendations.
- B. Apply primer to surfaces required by flooring manufacturer at manufacturer's recommended rate.
- C. Waterproofing: Apply waterproofing membrane and broadcast aggregate as recommended by manufacturer.
- D. Apply each coat to minimum thickness required by manufacturer.
 - 1. Mix and apply mortar and base coat(s) as indicated for flooring system and at coverage rates recommended in writing by manufacturer. Screed mortar materials, compact and smooth, with steel finishing trowels.

2. Aggregate: Broadcast in number of coats indicated for flooring system and at spreading rates recommended in writing by manufacturer
3. Apply topcoat(s) in number of coats indicated for flooring system and at spreading rates recommended in writing by manufacturer.

E. Finish to uniform, level surface.

3.5 TERMINATIONS

- A. Chase edges to “lock” the coating system into the concrete substrate along lines of termination.
- B. Penetration Treatment: Lap and seal coating onto the perimeter of the penetrating item by bridging over compatible elastomer at the interface to compensate for possible movement.
- C. Treat floor drains by chasing the coating to lock in place at point of termination.

3.6 JOINTS AND CRACKS

- A. Treat control joints to bridge potential cracks and to maintain monolithic protection.
- B. Treat cold joints and construction joints to bridge potential cracks and to maintain monolithic protection on horizontal and vertical surfaces as well as horizontal and vertical interfaces.
- C. Discontinue floor coating system at vertical and horizontal contraction and expansion joints by installing backer rod and compatible sealant after coating installation is completed. Provide sealant type recommended by manufacturer for traffic conditions and chemical exposures to be encountered.

3.7 PROTECTION

- A. Prohibit traffic on floor finish for 48 hours after installation.
- B. Barricade area to protect flooring until fully cured.

END OF SECTION 096700

SECTION 096813 - TILE CARPETING

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Carpet tile, fully adhered.

1.2 RELATED REQUIREMENTS

- A. Section 090561 - Common Work Results For Flooring Preparation: Cleaning, and preparation.

1.3 REFERENCE STANDARDS

- A. CRI 104 - Standard for Installation of Commercial Carpet.

1.4 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on specified products, describing physical and performance characteristics; sizes, patterns, colors available, and method of installation.
- C. Samples: Submit two carpet tiles illustrating color and pattern design for each carpet color selected.
- D. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.
- E. Concrete Subfloor Test Report: Submit a copy of the moisture and alkalinity (pH) test reports.
- F. Product Schedule: Use same room and product designations indicated on Drawings and in schedules.
- G. Qualification Data: For qualified Installers indicating they are certified INSTALL (International Standards & Training Alliance) professionals.
- H. Maintenance Data: Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning.
- I. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. Extra Carpet Tiles: Quantity equal to 5 percent of total installed of each color and pattern installed.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing specified carpet tile with minimum three years documented experience.
- B. Installer Qualifications: Company specializing in installing carpet tile with minimum three years documented experience.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. General: Comply with CRI 104 section for "Storage and Handling."
- B. Deliver carpeting materials in original mill protective wrapping, with mill register numbers and tags attached.
- C. Store inside, in well ventilated area, protected from weather, moisture, and soiling.

1.7 FIELD CONDITIONS

- A. Sub-floor preparation is to include all required work to prepare the existing floor for installation of the product as specified in this document and Manufacturer's installation instructions.
 - 1. All material used in sub-floor preparation and repair shall be recommended by the flooring manufacturer and shall be chemically and physically compatible with the flooring system.
- B. Stage materials in area of installation for minimum period of 24 hours prior to installation.
- C. Maintain minimum 70 degrees F ambient temperature 24 hours prior to, during and 24 hours after installation.
- D. Ventilate installation area during installation and for 72 hours after installation.
- E. Do not commence with carpet installation until painting and finishing work is complete and ceilings and overhead work has been tested, approved, and completed.
- F. Do not install carpet tile over concrete slabs until slabs have cured and are sufficiently dry to bond with adhesive and concrete slabs have pH range recommended by carpet tile manufacturer.

1.8 WARRANTY

- A. Special Carpet Tile Warranty: Written warranty, signed by carpet tile manufacturer agreeing to replace carpet tile that does not comply with requirements or that fails within specified warranty period. Warranty does not include deterioration or failure of carpet tile due to unusual traffic, failure of substrate, vandalism, or abuse. Failures include, but are not limited to, more than 10 percent loss of face fiber, edge raveling, snags, runs, and delamination.
 - 1. Warranty Period: 10 years from date of Substantial Completion.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Acceptable Manufacturer:
 - 1. Manufacturers and products specified on Drawings.
 - 2. Substitutions: Not permitted.

2.2 ACCESSORIES

- A. Subfloor Filler: White premix latex; type recommended by flooring material manufacturer.
- B. Resilient Wall Base and Accessories: Specified in Section 096513.
- C. Adhesives:
 - 1. Compatible with materials being adhered; maximum VOC content of 50 g/L; CRI (GLP) certified.
- D. Carpet Tile Adhesive: Recommended by carpet tile manufacturer; releasable type.
- E. Miscellaneous Materials: Provide other items recommended by carpet manufacturer and installer for the indicated conditions of carpet use, and as required for complete installation.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that subfloor surfaces are smooth and flat within tolerances specified for that type of work and are ready to receive carpet tile.
- B. Verify that subfloor surfaces are dust-free and free of substances that could impair bonding of adhesive materials to subfloor surfaces.

- C. Cementitious Subfloor Surfaces: Verify that substrates are ready for flooring installation by testing for moisture and alkalinity (pH).
 - 1. Test in accordance with Section 090561.
 - 2. Obtain instructions if test results are not within limits recommended by flooring material manufacturer and adhesive materials manufacturer.
 - 3. If flooring manufacturer does not recommend specific remediation materials and procedures, follow moisture and alkalinity remediation procedures in Section 090561.
- D. Verify that required floor-mounted utilities are in correct location.

3.2 PREPARATION

- A. General: Comply with CRI 104 sections for "Site Conditions" and "Floor Preparation" for preparing substrates indicated to receive carpet tile installation.
- B. Prepare floor substrates as recommended by flooring and adhesive manufacturers.
- C. Remove coatings, including curing compounds, and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, without using solvents. Use mechanical methods recommended in writing by carpet tile manufacturer.
- D. Remove subfloor ridges and bumps. Fill minor or local low spots, cracks, joints, holes, and other defects with subfloor filler.
- E. Apply, trowel, and float filler to achieve smooth, flat, hard surface. Prohibit traffic until filler is cured.
- F. Vacuum clean substrate.
- G. There will be no exceptions to the provisions stated in the Manufacturer's installation instructions.

3.3 INSTALLATION

- A. Starting installation constitutes acceptance of subfloor conditions.
- B. Install carpet tile in accordance with manufacturer's instructions and CRI 104 (Commercial).
- C. Blend carpet from different cartons to ensure minimal variation in color match.
- D. Cut carpet tile clean. Fit carpet tight to intersection with vertical surfaces without gaps.
- E. Locate change of color or pattern between rooms under door centerline.

- F. Fully adhere carpet tile to substrate.
- G. Trim carpet tile neatly at walls and around interruptions.
- H. Extend carpet tile into toe spaces, door reveals, closets, open-bottomed obstructions, alcoves, and similar openings.
- I. Complete installation of edge strips, concealing exposed edges.

3.4 CLEANING

- A. Remove excess adhesive without damage, from floor, base, and wall surfaces.
- B. Clean and vacuum carpet surfaces.

3.5 PROTECTION

- A. Protect installed carpet tile to comply with CRI 104.
 - 1. Do not use plastic protection. Use kraft paper, corrugated box material or hardboard as recommended by carpet tile manufacturers.
- B. Protect carpet tile against damage from construction operations and placement of equipment and fixtures during the remainder of construction period. Use protection methods indicated or recommended in writing by carpet tile manufacturer.

END OF SECTION 096813

SECTION 098430 - SOUND-ABSORBING WALL AND CEILING UNITS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Sound-absorbing ceiling units.
- B. Mounting accessories.

1.2 REFERENCE STANDARDS

1.3 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Product Data: Manufacturer's printed data sheets for products specified.
- C. Shop Drawings: Fabrication and installation details, panel layout and attachment hardware.
- D. Selection Samples: Manufacturer's color charts for fabric covering, indicating full range of fabrics, colors, and patterns available.
- E. Verification Samples: Fabricated samples of each type of panel specified; 12 by 12 inch, showing construction, edge details, and fabric covering.
- F. Test Reports: Certified test data from an independent test agency verifying that panels meet specified requirements for acoustical and fire performance.

1.4 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products of the type specified in this section, with at least three years of documented experience.
- B. Basis of Design: Specifications are based on products by specified basis of design manufacturer. Products manufactured by other acceptable manufacturers are permitted, subject to compliance with specified requirements, and provided that deviations in design, performance, composition, color, and profile are minor, and do not detract substantially from the indicated design intent.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Protect acoustical units from moisture during shipment, storage, and handling. Deliver in factory-wrapped bundles; do not open bundles until units are needed for installation.
- B. Store units flat, in dry, well-ventilated space; do not stand on end.
- C. Protect edges from damage.

PART 2 PRODUCTS

2.1 ACOUSTICAL CEILING BAFFLES

- A. Acceptable Manufacturer: Manufacturers and products specified on Drawings.
- B. Substitutions: Not permitted.

2.2 FABRICATION

- A. Tolerances: Fabricate to finished tolerance of plus or minus 1/16 inch for thickness, overall length and width, and squareness from corner to corner.

2.3 ACCESSORIES

- A. Suspension System: Manufacturers and products specified on Drawings.
- B. Miscellaneous Materials: Provide other items recommended by manufacturer and installer and as required for complete installation.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine substrates for conditions detrimental to installation of acoustical units. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install acoustical units in locations as indicated, following manufacturer's installation instructions.
- B. Install mounting accessories and supports in accordance with shop drawings.
- C. Align panels accurately, with edges plumb and top edges level. Scribe to fit accurately at adjoining work and penetrations.
- D. Suspend ceiling baffles at locations and heights as indicated.

3.3 CLEANING

- A. Clean fabric facing upon completion of installation from dust and other foreign materials, following manufacturer's instructions.

3.4 PROTECTION

- A. Provide protection of installed acoustical panels until Date of Substantial Completion.
- B. Replace panels that cannot be cleaned and repaired to satisfaction of the Architect.

END OF SECTION 098430

SECTION 099113 - EXTERIOR PAINTING

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Surface preparation.
- B. Field application of paints.
- C. Scope: Finish exterior surfaces exposed to view, unless fully factory-finished and unless otherwise indicated.
- D. Do Not Paint or Finish the Following Items:
 - 1. Items factory-finished unless otherwise indicated; materials and products having factory-applied primers are not considered factory finished.
 - 2. Items indicated to receive other finishes.
 - 3. Items indicated to remain unfinished.
 - 4. Fire rating labels, equipment serial number and capacity labels, and operating parts of equipment.
 - 5. Non-metallic roofing and flashing.
 - 6. Stainless steel, anodized aluminum, bronze, terne coated stainless steel, zinc, and lead.
 - 7. Weathering steel.
 - 8. Floors, unless specifically indicated.
 - 9. Ceramic and other types of tiles.
 - 10. Brick, glass unit masonry, architectural concrete, cast stone, integrally colored plaster and stucco, unless otherwise noted.
 - 11. Glass.
 - 12. Concealed pipes, ducts, and conduits.

1.2 RELATED REQUIREMENTS

- A. Section 055000 - Metal Fabrications: Shop-primed items.
- B. Section 099123 - Interior Painting.

1.3 DEFINITIONS

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

1.4 REFERENCE STANDARDS

- A. 40 CFR 59, Subpart D - National Volatile Organic Compound Emission Standards for Architectural Coatings; U.S. Environmental Protection Agency.
- B. ASTM D16 - Standard Terminology for Paint, Related Coatings, Materials, and Applications.
- C. MPI (APSM) - Master Painters Institute Architectural Painting Specification Manual.
- D. SCAQMD 1113 - Architectural Coatings.
- E. SSPC-SP 1 - Solvent Cleaning.
- F. SSPC-SP 2 - Hand Tool Cleaning.
- G. SSPC-SP 6 - Commercial Blast Cleaning.

1.5 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide complete list of products to be used, with the following information for each:
 - 1. Manufacturer's name, product name and/or catalog number, and general product category (e.g. "alkyd enamel").
 - 2. MPI product number (e.g. MPI #47).
 - 3. Cross-reference to specified paint system(s) product is to be used in; include description of each system.
- C. Samples: Submit three paper "draw down" samples, 8-1/2 by 11 inches in size, illustrating range of colors available for each finishing product specified.
 - 1. Where sheen is specified, submit samples in only that sheen.
 - 2. Where sheen is not specified, discuss sheen options with Architect before preparing samples, to eliminate sheens definitely not required.
 - 3. Paint color submittals will not be considered until color submittals for major materials not to be painted, such as masonry, siding, and factory finished metals, have been approved.

- D. Certification: By manufacturer that paints and finishes comply with VOC limits specified.
- E. Manufacturer's Instructions: Indicate special surface preparation procedures.
- F. Maintenance Data: Submit data including finish schedule showing where each product/color/finish was used, product technical data sheets, material safety data sheets (MSDS), care and cleaning instructions, touch-up procedures, repair of painted and finished surfaces, and color samples of each color and finish used.
- G. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. See Section 016000 - Product Requirements, for additional provisions.
 - 2. Extra Paint and Finish Materials: 1 gallon of each color; from the same product run, store where directed.
 - 3. Label each container with color in addition to the manufacturer's label.

1.6 QUALITY ASSURANCE

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

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.
- B. Container Label: Include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.
- C. Paint Materials: Store at minimum ambient temperature of 45 degrees F and a maximum of 90 degrees F, in ventilated area, and as required by manufacturer's instructions.

1.8 FIELD CONDITIONS

- A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the paint product manufacturer.
- B. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.

- C. Do not apply exterior paint and finishes during rain or snow, or when relative humidity is outside the humidity ranges required by the paint product manufacturer.
- D. Minimum Application Temperatures for Latex Paints: 50 degrees F for exterior; unless required otherwise by manufacturer's instructions.
- E. Provide lighting level of 80 ft candles measured mid-height at substrate surface.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Provide paints and finishes used in any individual system from the same manufacturer; no exceptions.
- B. Paints:
 - 1. PPG Paints: www.ppgpaints.com/#sle.
 - 2. Sherwin-Williams Company: www.sherwin-williams.com/#sle.
 - 3. Benjamin Moore: www.benjaminmoore.com.
- C. Primer Sealers: Same manufacturer as top coats.

2.2 PAINTS AND FINISHES - GENERAL

- A. Paints and Finishes: Ready mixed, unless required to be a field-catalyzed paint.
 - 1. Provide paints and finishes of a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating, with good flow and brushing properties, and capable of drying or curing free of streaks or sags.
 - 2. Provide materials that are compatible with one another and the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.
 - 3. For opaque finishes, tint each coat including primer coat and intermediate coats, one-half shade lighter than succeeding coat, with final finish coat as base color.
 - 4. Supply each paint material in quantity required to complete entire project's work from a single production run.
 - 5. Do not reduce, thin, or dilute paint or finishes or add materials unless such procedure is specifically described in manufacturer's product instructions.
- B. Volatile Organic Compound (VOC) Content:
 - 1. Provide paints and finishes that comply with the most stringent requirements specified in the following:

- a. 40 CFR 59, Subpart D--National Volatile Organic Compound Emission Standards for Architectural Coatings.
 - b. SCAQMD 1113 Rule.
2. Determination of VOC Content: Testing and calculation in accordance with 40 CFR 59, Subpart D (EPA Method 24), exclusive of colorants added to a tint base and water added at project site; or other method acceptable to authorities having jurisdiction.
- C. Flammability: Comply with applicable code for surface burning characteristics.
- D. Sheens: Provide the sheens specified; where sheen is not specified, sheen will be selected later by Architect from the manufacturer's full line.
- E. Colors: As indicated in Color Schedule.
1. Extend colors to surface edges; colors may change at any edge as directed by Architect.

2.3 PAINT SYSTEMS - EXTERIOR

- A. Paint E-OP - Exterior Surfaces to be Painted, Unless Otherwise Indicated: Including applications listed below.
1. Two top coats and one coat primer.
 - a. If flash rusting occurs, use two coats of primer.
 2. Top Coat(s): Exterior Latex; MPI #10, 11, 15.
 - a. Application: Concrete, concrete masonry, brick, wood, and fiber cement substrates, where indicated.
 - b. Products:
 - 1) PPG Paints Speedhide Exterior 100% Acrylic Latex.
 - 2) Benjamin Moore Ben 100% Acrylic Exterior Finish.
 - 3) Sherwin Williams A-100 Exterior Acrylic Latex.
 3. Top Coat(s): Exterior Light Industrial Coating, Water Based; MPI #161, 163, or 164.
 - a. Application: Primed and galvanized metals (doors, fences, lintels, etc).
 - b. Products:
 - 1) PPG Paints Pitt-Tech Plus WB DTM Industrial Enamel.

- 2) Benjamin Moore Super Spec HP DTM Acrylic.
 - 3) Sherwin Williams Pro Industrial DTM Acrylic B66 Series.
4. Top Coat Sheen:
- a. Flat: MPI gloss level 1; use this sheen for overhead surfaces.
 - b. Satin: MPI gloss level 4; use this sheen at wood, cementitious or masonry substrates unless otherwise noted.
 - c. Semi-Gloss: MPI gloss level 5; use this sheen at metal substrates unless otherwise noted.
5. Primer: As recommended by top coat manufacturer for specific substrate.

2.4 PRIMERS

- A. Primers: Provide the following unless other primer is required or recommended by manufacturer of top coats.

1. Alkali Resistant Water Based Primer; MPI #3.
 - a. Products:
 - 1) PPG Paints: 4-603XI Perma-Crete Interior/Exterior Alkali Resistant Primer. (MPI #3)
 - 2) Benjamin Moore Ultra Spec Acrylic High-Build Masonry Primer.
 - 3) Sherwin Williams Loxon Concrete & Masonry Primer (MPI #3).
2. Interior/Exterior Latex Block Filler; MPI #4.
 - a. Products:
 - 1) Kilz Pro-X p50 Block Filler Primer.
 - 2) PPG Paints: 6-15XI Speedhide Masonry Hi Fill Latex Block Filler. (MPI #4)
 - 3) Benjamin Moore Ultra Spec High-Build Masonry Block Filler.
 - 4) Sherwin Williams B25W25 Preprite Block Filler. (MPI #4).
3. Water Based Primer for Galvanized Metal; MPI #134.
 - a. Products:
 - 1) PPG Paints: 4020 PF Pitt-Tech Plus Interior/Exterior Waterborne Acrylic Primer Finish DTM Industrial Enamel. (MPI #134).

- 2) Sherwin Williams Pro-Cryl Universal Metal Primer B-66 Series.
4. Rust-Inhibitive Water Based Primer.
 - a. Products:
 - 1) Benjamin Moore: MO4 Acrylic Metal Primer.
 - 2) ICI Paints: Devoe Coatings DevFlex 4020PF Direct to Metal Primer & Flat Finish.
 - 3) PPG Industries: 90-708 Series, Pitt-Tech One-Pack Interior/Exterior Industrial Primer.
 - 4) Sherwin Williams: DTM Acrylic Primer Finish B66W1.

2.5 ACCESSORY MATERIALS

- A. Accessory Materials: Provide primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials as required for final completion of painted surfaces.
- B. Patching Material: Latex filler.
- C. Fastener Head Cover Material: Latex filler.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Do not begin application of paints and finishes until substrates have been properly prepared.
- B. Verify that surfaces are ready to receive work as instructed by the product manufacturer.
- C. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially effect proper application.
- D. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.
- E. Test shop-applied primer for compatibility with subsequent cover materials.

3.2 PREPARATION

- A. Clean surfaces thoroughly and correct defects prior to application.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

- C. Remove or repair existing paints or finishes that exhibit surface defects.
- D. Remove or mask surface appurtenances, including electrical plates, hardware, light fixture trim, escutcheons, and fittings, prior to preparing surfaces for finishing.
- E. Seal surfaces that might cause bleed through or staining of topcoat.
- F. Remove mildew from impervious surfaces by scrubbing with solution of tetra-sodium phosphate and bleach. Rinse with clean water and allow surface to dry.
- G. Aluminum: Remove surface contamination and oils and wash with solvent according to SSPC-SP 1.
- H. Galvanized Surfaces:
 - 1. Remove surface contamination and oils and wash with solvent according to SSPC-SP 1.
 - 2. Prepare surface according to SSPC-SP 2.
- I. Ferrous Metal:
 - 1. Solvent clean according to SSPC-SP 1.
 - 2. Shop-Primed Surfaces: Sand and scrape to remove loose primer and rust. Feather edges to make touch-up patches inconspicuous. Clean surfaces with solvent. Prime bare steel surfaces.
 - 3. Remove rust, loose mill scale, and other foreign substances using using methods recommended in writing by paint manufacturer and blast cleaning according to SSPC-SP 6 "Commercial Blast Cleaning". Protect from corrosion until coated.
- J. Metal Doors to be Painted: Prime metal door top and bottom edge surfaces.

3.3 APPLICATION

- A. Remove unfinished louvers, grilles, covers, and access panels on mechanical and electrical components and paint separately.
- B. Apply products in accordance with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual".
- C. Where adjacent sealant is to be painted, do not apply finish coats until sealant is applied.
- D. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.
- E. Apply each coat to uniform appearance.

- F. Dark Colors and Deep Clear Colors: Regardless of number of coats specified, apply additional coats until complete hide is achieved.
- G. Sand metal surfaces lightly between coats to achieve required finish.
- H. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.
- I. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

3.4 CLEANING

- A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.

3.5 PROTECTION

- A. Protect finishes until completion of project.
- B. Touch-up damaged finishes after Substantial Completion.

3.6 SCHEDULE

- A. Paint ME-OP-3L - Ferrous Metals, Unprimed, Opaque, 3 Coat:
 - 1. One coat of primer.
 - 2. Semi-gloss: Two coats of light industrial coating.
- B. Paint ME-OP-2L - Ferrous Metals, Primed, Opaque, 2 Coat:
 - 1. Touch-up with rust-inhibitive primer recommended by top coat manufacturer.
 - 2. Semi-gloss: Two coats of light industrial coating.
- C. Paint MgE-OP-3L - Galvanized Metals, Opaque, 3 Coat:
 - 1. One coat galvanize primer.
 - 2. Semi-gloss: Two coats of light industrial coating.
- D. Paint CE-OP-3L - Masonry/Concrete, Opaque, 3 Coat:
 - 1. One coat of block filler.
 - 2. Satin: Two coats of latex enamel.

END OF SECTION 099113

SECTION 099123 - INTERIOR PAINTING

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Surface preparation.
- B. Field application of paints.
- C. Scope: Finish interior surfaces exposed to view, unless fully factory-finished and unless otherwise indicated.
 - 1. Both sides and edges of plywood backboards for electrical and telecom equipment before installing equipment.
 - 2. Prime surfaces to receive wall coverings.
 - 3. Mechanical and Electrical:
 - a. In finished areas, paint insulated and exposed pipes, conduit, boxes, insulated and exposed ducts, hangers, brackets, collars and supports, mechanical equipment, and electrical equipment, unless otherwise indicated.
 - b. In finished areas, paint shop-primed items.
 - c. Paint interior surfaces of air ducts that are visible through grilles and louvers with one coat of flat black paint to visible surfaces.
 - d. Paint dampers exposed behind louvers, grilles, and convactor and baseboard cabinets to match face panels.
- D. Do Not Paint or Finish the Following Items:
 - 1. Items factory-finished unless otherwise indicated; materials and products having factory-applied primers are not considered factory finished.
 - 2. Items indicated to receive other finishes.
 - 3. Items indicated to remain unfinished.
 - 4. Fire rating labels, equipment serial number and capacity labels, bar code labels, and operating parts of equipment.
 - 5. Stainless steel, anodized aluminum, bronze, terne-coated stainless steel, and lead items.
 - 6. Marble, granite, slate, and other natural stones.

7. Floors, unless specifically indicated.
8. Ceramic and other tiles.
9. Brick, architectural concrete, cast stone, integrally colored plaster, and stucco.
10. Glass.
11. Acoustical materials, unless specifically indicated.
12. Concealed pipes, ducts, and conduits.

1.2 RELATED REQUIREMENTS

- A. Section 055000 - Metal Fabrications: Shop-primed items.

1.3 DEFINITIONS

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

1.4 REFERENCE STANDARDS

- A. 40 CFR 59, Subpart D - National Volatile Organic Compound Emission Standards for Architectural Coatings; U.S. Environmental Protection Agency.
- B. ASTM D16 - Standard Terminology for Paint, Related Coatings, Materials, and Applications.
- C. ASTM D4258 - Standard Practice for Surface Cleaning Concrete for Coating.
- D. MPI (APSM) - Master Painters Institute Architectural Painting Specification Manual.
- E. SCAQMD 1113 - Architectural Coatings.
- F. SSPC-SP 1 - Solvent Cleaning.
- G. SSPC-SP 2 - Hand Tool Cleaning.
- H. SSPC-SP 6 - Commercial Blast Cleaning.
- I. SSPC-SP 13 - Surface Preparation of Concrete.

1.5 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide complete list of products to be used, with the following information for each:
 1. Manufacturer's name, product name and/or catalog number, and general product category (e.g., "alkyd enamel").

2. MPI product number (e.g., MPI #47).
 3. Cross-reference to specified paint system products to be used in project; include description of each system.
- C. Samples: Submit three paper "draw down" samples, 8-1/2 by 11 inches in size, illustrating range of colors available for each finishing product specified.
1. Where sheen is specified, submit samples in only that sheen.
 2. Where sheen is not specified, discuss sheen options with Architect before preparing samples, to eliminate sheens not required.
 3. Allow 30 days for approval process, after receipt of complete samples by Architect.
 4. Paint color submittals will not be considered until color submittals for major materials not to be painted, such as factory finished metals, wood cabinets, and wood doors, have been approved.
- D. Certification: By manufacturer that paints and finishes comply with VOC limits specified.
- E. Manufacturer's Instructions: Indicate special surface preparation procedures.
- F. Maintenance Data: Submit data including finish schedule showing where each product/color/finish was used, product technical data sheets, material safety data sheets (MSDS), care and cleaning instructions, touch-up procedures, repair of painted and finished surfaces, and color samples of each color and finish used.
- G. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
1. Extra Paint and Finish Materials: 1 gal of each color; from the same product run, store where directed.
 2. Label each container with color in addition to the manufacturer's label.

1.6 QUALITY ASSURANCE

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

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.

- B. Container Label: Include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.
- C. Paint Materials: Store at minimum ambient temperature of 45 degrees F and a maximum of 90 degrees F, in ventilated area, and as required by manufacturer's instructions.

1.8 FIELD CONDITIONS

- A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the paint product manufacturer.
- B. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.
- C. Do not apply materials when relative humidity exceeds 85 percent, at temperatures less than 5 degrees F above the dew point, or to damp or wet surfaces.
- D. Minimum Application Temperatures for Paints: 50 degrees F for interiors unless required otherwise by manufacturer's instructions.
- E. Provide lighting level of 80 fc measured mid-height at substrate surface.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Provide paints and finishes used in any individual system from the same manufacturer; no exceptions.
- B. Paints:
 - 1. PPG Paints: www.ppgpaints.com/#sle.
 - 2. Sherwin-Williams Company: www.sherwin-williams.com/#sle.
 - 3. Benjamin Moore: www.benjaminmoore.com.
- C. Primer Sealers: Same manufacturer as top coats.
- D. Substitutions: See Section 016000 - Product Requirements.

2.2 PAINTS AND FINISHES - GENERAL

- A. Paints and Finishes: Ready-mixed, unless intended to be a field-catalyzed paint.
 - 1. Provide paints and finishes of a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating, with good flow and brushing properties, and capable of drying or curing free of streaks or sags.

2. Provide materials that are compatible with one another and the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.
3. For opaque finishes, tint each coat including primer coat and intermediate coats, one-half shade lighter than succeeding coat, with final finish coat as base color.
4. Supply each paint material in quantity required to complete entire project's work from a single production run.
5. Do not reduce, thin, or dilute paint or finishes or add materials unless such procedure is specifically described in manufacturer's product instructions.

B. Volatile Organic Compound (VOC) Content:

1. Provide paints and finishes that comply with the most stringent requirements specified in the following:
 - a. 40 CFR 59, Subpart D--National Volatile Organic Compound Emission Standards for Architectural Coatings.
 - b. SCAQMD 1113 Rule.
 - c. Architectural coatings VOC limits of the State in which the Project is located.
2. Determination of VOC Content: Testing and calculation in accordance with 40 CFR 59, Subpart D (EPA Method 24), exclusive of colorants added to a tint base and water added at project site; or other method acceptable to authorities having jurisdiction.

C. Flammability: Comply with applicable code for surface burning characteristics.

D. Sheens: Provide the sheens specified; where sheen is not specified, sheen will be selected later by Architect from the manufacturer's full line.

E. Colors: As indicated on drawings.

1. Extend colors to surface edges; colors may change at any edge as directed by Architect.
2. In finished areas, finish pipes, ducts, conduit, and equipment the same color as the wall/ceiling under which they are mounted.

2.3 PAINT SYSTEMS - INTERIOR

A. LATEX PAINTS

1. Paint I-OP-3L - Interior Latex Enamel.

a. Products:

- 1) PPG Paints Speedhide Zero Interior Latex, 6-4110XI Series, Flat. (MPI #53)
- 2) PPG Paints Speedhide Zero Interior Latex, 6-4310XI Series, Eggshell. (MPI #44)
- 3) PPG Paints Speedhide Zero Interior Latex, 6-4410XI Series, Satin. (MPI #52)
- 4) PPG Paints Speedhide Zero Interior Latex, 6-4510XI Series, Semi-Gloss. (MPI #54)
- 5) Sherwin-Williams ProMar 200 Zero VOC Interior Latex, Flat. (MPI #53)
- 6) Sherwin-Williams ProMar 200 Zero VOC Interior Latex, Semi-Gloss. (MPI #43)
- 7) Sherwin-Williams ProMar 200 Zero VOC Interior Latex, Low Sheen. (MPI #44)
- 8) Sherwin-Williams ProMar 200 Zero VOC Interior Latex, Eg-Shel. (MPI #52)
- 9) Benjamin Moore Ultra Spec 500 Flat N536. (MPI #53)
- 10) Benjamin Moore Ultra Spec 500 Low Sheen N537. (MPI #44)
- 11) Benjamin Moore Ultra Spec 500 Eggshell N538. (MPI #52)
- 12) Benjamin Moore Ultra Spec 500 Semi-Gloss N539. (MPI #43)

B. WATERBASED EPOXY PAINTS

1. Paint I-OP-3EW - Waterbased Epoxy.

a. Products:

- 1) PPG Paints Pitt-Glaze WB1 Pre-Catalyzed Water-Borne Acrylic Epoxy, 16-310 Series, Eggshell. (MPI #151)
- 2) PPG Paints Pitt-Glaze WB1 Pre-Catalyzed Water-Borne Acrylic Epoxy, 16-510 Series, Semi-Gloss. (MPI #153)
- 3) Sherwin-Williams Pro Industrial Pre-Catalyzed Waterbased Epoxy, Eg-Shel. (MPI #151)

- 4) Sherwin-Williams Pro Industrial Pre-Catalyzed Waterbased Epoxy, Semi-Gloss. (MPI #153)
- 5) Benjamin Moore Corotech Pre-Catalyzed Waterborne Epoxy, V342, Eggshell. (MPI #151)
- 6) Benjamin Moore Corotech Pre-Catalyzed Waterborne Epoxy, V341, Semi-Gloss. (MPI #153)

C. ACRYLIC PAINTS

1. Paint MI-OP-3LA - Acrylic Enamel.

a. Products:

- 1) PPG Paints Pitt-Tech Plus WB DTM Industrial Enamel, 90-1210 Series, Semi-Gloss. (MPI #153)
- 2) Sherwin-Williams Pro Industrial DTM Acrylic, B66 Series, Semi-Gloss (MPI #153)
- 3) Benjamin Moore Super Spec HP DTM Acrylic, Semi-Gloss. (MPI #153)

2. Paint Msl-OP-3D - Acrylic Dry Fall.

a. Products:

- 1) PPG Paints Speedhide Super Tech Water Based Interior Dry-Fog Latex, 6-724XI, Eggshell. (MPI #155)
- 2) Sherwin-Williams Waterborne Acrylic Dryfall, Flat. (MPI #118).
- 3) Benjamin Moore Latex Dry Fall, Flat. (MPI #118)

2.4 PRIMERS

A. Primers: Provide the following unless other primer is required or recommended by manufacturer of top coats.

1. Interior/Exterior Latex Block Filler.

a. Products:

- 1) Kilz Pro-X p50 Block Filler Primer.
- 2) PPG Paints Speedhide Masonry Hi Fill Latex Block Filler, 6-15XI .
- 3) Sherwin-Williams PrepRite Block Filler.

2. Interior Drywall Primer Sealer.

- a. Products:
 - 1) PPG Paints Speedhide Zero Interior Latex Sealer, 6-4900XI.
 - 2) Sherwin-Williams ProMar 200 Zero VOC Interior Latex Primer, B28 Series.
 - 3) Benjamin Moore Ultra Spec 500 Primer 534.
3. Interior Rust-Inhibitive Water Based Primer.
 - a. Products:
 - 1) PPG Paints Pitt-Tech Plus Interior/Exterior EP DTM Waterborne Acrylic Primer/Finish, 90-1908. (MPI #107)
 - 2) Sherwin-Williams Pro-Cryl Universal Waterbased Primer.
 - 3) Benjamin Moore Ultra Spec HP Acrylic Metal Primer, HP04.
4. Interior Water Based Primer for Galvanized Metal.
 - a. Products:
 - 1) PPG Paints Pitt-Tech Plus EP DTM Industrial Primer, 90-1912. (MPI #134)
 - 2) Sherwin-Williams Pro-Cryl Universal Waterbased Primer.
 - 3) Benjamin Moore Ultra Spec HP Acrylic Metal Primer, HP04.

2.5 ACCESSORY MATERIALS

- A. Accessory Materials: Provide primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials as required for final completion of painted surfaces.
- B. Patching Material: Latex filler.
- C. Fastener Head Cover Material: Latex filler.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Do not begin application of paints and finishes until substrates have been adequately prepared.
- B. Verify that surfaces are ready to receive work as instructed by the product manufacturer.

- C. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially affect proper application.
- D. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.
- E. Test shop-applied primer for compatibility with subsequent cover materials.
- F. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces is below the following maximums:
 - 1. Gypsum Wallboard: 12 percent.
 - 2. Masonry, Concrete, and Concrete Masonry Units: 12 percent.

3.2 PREPARATION

- A. Clean surfaces thoroughly and correct defects prior to application.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
- C. Remove or repair existing paints or finishes that exhibit surface defects.
- D. Remove surface appurtenances, including electrical plates, hardware, light fixture trim, escutcheons, and fittings, prior to preparing surfaces or finishing.
- E. Seal surfaces that might cause bleed through or staining of topcoat.
- F. Concrete:
 - 1. Remove release agents, curing compounds, efflorescence, and chalk. Do not coat surfaces if moisture content or alkalinity of surfaces to be coated exceeds that permitted in manufacturer's written instructions.
 - 2. Clean surfaces with pressurized water. Use pressure range of 1,500 to 4,000 psi at 6 to 12 inches. Allow to dry.
 - 3. Clean concrete according to ASTM D4258. Allow to dry.
 - 4. Prepare surface as recommended by top coat manufacturer and according to SSPC-SP 13.
- G. Masonry:
 - 1. Remove efflorescence and chalk. Do not coat surfaces if moisture content, alkalinity of surfaces, or if alkalinity of mortar joints exceed that permitted in manufacturer's written instructions. Allow to dry.
 - 2. Prepare surface as recommended by top coat manufacturer.

3. Clean surfaces with pressurized water. Use pressure range of 600 to 1,500 psi at 6 to 12 inches. Allow to dry.
- H. Gypsum Board: Fill minor defects with filler compound. Spot prime defects after repair.
- I. Aluminum: Remove surface contamination and oils and wash with solvent according to SSPC-SP 1.
- J. Galvanized Surfaces:
1. Remove surface contamination and oils and wash with solvent according to SSPC-SP 1.
 2. Prepare surface according to SSPC-SP 2.
- K. Ferrous Metal:
1. Solvent clean according to SSPC-SP 1.
 2. Shop-Primed Surfaces: Sand and scrape to remove loose primer and rust. Feather edges to make touch-up patches inconspicuous. Clean surfaces with solvent. Prime bare steel surfaces. Re-prime entire shop-primed item.
 3. Remove rust, loose mill scale, and other foreign substances using methods recommended in writing by paint manufacturer and blast cleaning according to SSPC-SP 6 Commercial Blast Cleaning. Protect from corrosion until coated.
- L. Metal Doors to be Painted: Prime metal door top and bottom edge surfaces.

3.3 APPLICATION

- A. Remove unfinished louvers, grilles, covers, and access panels on mechanical and electrical components and paint separately.
- B. Apply products in accordance with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual".
- C. Where adjacent sealant is to be painted, do not apply finish coats until sealant is applied.
- D. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.
- E. Apply each coat to uniform appearance in thicknesses specified by manufacturer.
- F. Dark Colors and Deep Clear Colors: Regardless of number of coats specified, apply as many coats as necessary for complete hide.
- G. Sand metal surfaces lightly between coats to achieve required finish.

- H. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.
- I. Mechanical Work: Painting of mechanical work includes the following:
 - 1. Interior Occupied Areas: Unless otherwise indicated, paint the following when exposed to view in finished construction:
 - a. Structural supports for mechanical equipment.
 - b. Mechanical equipment (except pre-finished equipment).
 - c. Piping, pipe hangers, and supports.
 - d. Ductwork.
 - e. Insulation on pipe and ductwork.
 - f. Accessory items.
 - g. Fire suppression system piping.
- J. Electrical Work: Painting of electrical work includes the following:
 - 1. Interior Occupied Areas: Unless otherwise indicated, paint the following when items exposed to view in finished construction:
 - a. Structural supports for electrical equipment.
 - b. Electrical equipment (except pre-finished equipment).
 - c. Conduit and fittings, panels and boxes, and wiremold.
 - d. Panelboards, including telephone equipment.
 - e. Accessory items.
- K. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

3.4 CLEANING

- A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.
- B. Cleanup: At the end of each workday, remove empty cans, rags, rubbish, and other discarded paint materials from Project site.
 - 1. After completing painting, clean glass and paint-spattered surfaces. Remove spattered paint by washing and scraping without scratching or damaging adjacent finished surfaces.

3.5 PROTECTION

- A. Protect finishes until completion of project.
- B. Touch-up damaged finishes after Substantial Completion.

3.6 SCHEDULE - PAINT SYSTEMS

- A. Paint I-OP-3L - CMU Substrates, Latex Enamel (Eggshell):
 - 1. Block Filler: Block Filler 10 mils DFT.
 - 2. Intermediate Coat: Latex Enamel, 1.6 mils DFT.
 - 3. Topcoats: Latex Enamel, 1.6 mils DFT.
- B. Paint I-OP-3WE - CMU Substrates, Waterbased Epoxy (Semi-gloss):
 - 1. Block Filler: Masonry Epoxy Block Filler 10 mils DFT.
 - 2. Intermediate Coat: Waterbased Epoxy, 2.5-3.0 mils DFT.
 - 3. Topcoats: Waterbased Epoxy, 2.5-3.0 mils DFT.
- C. Paint MI-OP-3LA - Steel Substrates, Acrylic Enamel (Semi-gloss):
 - 1. Prime Coat: Rust-Inhibitive Water Based Primer, 3.0 mils DFT.
 - 2. Intermediate Coat: Acrylic Enamel, 1.4 mils DFT.
 - 3. Topcoats: Acrylic Enamel, 1.4 mils DFT.
- D. Paint Msl-OP-3D - Steel Substrates, Acrylic Dry-Fall (Exposed Overhead Steel - Flat):
 - 1. Prime Coat: Rust-Inhibitive Water Based Primer, 3.0 mils DFT.
 - 2. Intermediate Coat: Interior Acrylic Dry-Fall, 3.0-4.5 mils DFT.
 - 3. Topcoats: Interior Acrylic Dry-Fall, 3.0-4.5 mils DFT.
- E. Paint I-OP-3L - Gypsum Board Substrates, Latex Enamel (Ceilings - Flat; Walls - Eggshell, Unless Otherwise Noted):
 - 1. Prime Coat: Interior Latex Primer Sealer, 1.4 mils DFT.
 - 2. Intermediate Coat: Latex Enamel, 1.6 mils DFT.
 - 3. Topcoats: Latex Enamel, 1.6 mils DFT.
- F. Paint I-OP-3EW - Gypsum Board Substrates, Waterbased Epoxy (Toilet Room Walls - Eggshell):

1. Prime Coat: Interior Latex Primer Sealer, 1.4 mils DFT.
 2. Intermediate Coat: Waterbased Epoxy, 1.6 mils DFT.
 3. Topcoats: Waterbased Epoxy, 1.6 mils DFT.
- G. Primer GI-P-1L -Gypsum Board Substrates to Receive Wall Covering, Primer, 1 Coat:
1. Prime Coat: Interior Latex Primer Sealer, 1.4 mils DFT.

END OF SECTION 099123

SECTION 101100 - VISUAL DISPLAY UNITS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Markerboards

1.2 RELATED REQUIREMENTS

- A. Section 061000 - Rough Carpentry: Blocking and supports.

1.3 REFERENCE STANDARDS

- A. ANSI A208.1 - American National Standard for Particleboard.
- B. ASTM A424/A424M - Standard Specification for Steel, Sheet, for Porcelain Enameling.
- C. ASTM C208 - Standard Specification for Cellulosic Fiber Insulating Board.

1.4 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturer's data on markerboard and accessories.
- C. Shop Drawings: Indicate wall elevations, dimensions, joint locations, special anchor details.
- D. Samples: Submit two samples minimum 2 by 2 inch in size illustrating materials and finish, color and texture of markerboard.

1.5 QUALITY ASSURANCE

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

1.6 WARRANTY

- A. Provide five year warranty for markerboard to include warranty against discoloration due to cleaning, crazing or cracking, and staining.

PART 2 PRODUCTS

2.1 VISUAL DISPLAY UNITS

- A. Markerboards: As scheduled on drawings.
 - 1. Color: Projection-friendly White.

2. Core: Particle board or fiber board core, manufacturer's standard thickness, laminated to face sheet.
3. Backing: Aluminum foil or mylar backer, laminated to core.
4. Size: As indicated on Drawings.
5. Frame: As indicated on drawings , with concealed fasteners.
6. Accessories: Provide map rail and marker tray.
7. Basis of Design Manufacturer:
 - a. Claridge Products and Equipment, Inc: www.claridgeproducts.com.
 - 1) Product: LCS Deluxe Porcelain Whiteboard.
8. Other Acceptable Manufacturers:
 - a. Brite Visual Products, Inc., dba US Markerboard: www.usmarkerboard.com.
 - b. Marsh Industries, Inc.: www.marsh-ind.com.
 - c. MooreCo, Inc: www.moorecoinc.com/#sle.
 - d. Nelson Adams NACO: www.nelsonadamsnaco.com/#sle.
 - e. Polyvision Corporation: www.polyvision.com/#sle.
 - f. Substitutions: See Section 016000 - Product Requirements.

2.2 MATERIALS

- A. Porcelain Enameled Steel Sheet: ASTM A424/A424M, Type I, Commercial Steel, with fired-on vitreous finish.
- B. Particleboard: ANSI A208.1; wood chips, set with waterproof resin binder, sanded faces.
- C. Fiber Board: ASTM C208, cellulosic fiber board.

2.3 ACCESSORIES

- A. Map Rail: Extruded aluminum, manufacturer's standard profile, with cork insert and runners for accessories; 1 inch wide overall, full width of frame.
- B. Temporary Protective Cover: Sheet polyethylene, 8 mil thick.
- C. Marker Tray: Aluminum manufacturer's standard profile, concealed fasteners, same finish as frame.

- D. Mounting Brackets: Concealed.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that internal wall blocking is ready to receive work and positioning dimensions are as indicated on shop drawings.

3.2 PREPARATION

- A. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.3 INSTALLATION

- A. Install boards in accordance with manufacturer's instructions.
- B. Install with top of marker tray at 30 inches above finished floor, unless otherwise indicated in drawings.
- C. Secure units level and plumb.

3.4 CLEANING

- A. Clean board surfaces in accordance with manufacturer's instructions.
- B. Cover with protective cover, taped to frame.
- C. Remove temporary protective cover at Date of Substantial Completion.

END OF SECTION 101100

SECTION 101400 - SIGNAGE

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Room and door signs.
- B. Interior directional and informational signs.
- C. Emergency evacuation maps.
- D. Dimensional letter signs.
- E. Vinyl wall graphics.
- F. Signs required for Building Code compliance and building occupancy.

1.2 REFERENCE STANDARDS

- A. 36 CFR 1191 - Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines.
- B. ADA Standards - 2010 ADA Standards for Accessible Design.
- C. ICC A117.1 - Accessible and Usable Buildings and Facilities.

1.3 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Manufacturer's printed product literature for each type of sign, indicating sign styles, font, foreground and background colors, locations, overall dimensions of each sign.
- C. Signage Schedule: Provide information sufficient to completely define each sign for fabrication, including room number, room name, other text to be applied, sign and letter sizes, fonts, and colors.
 - 1. When room numbers to appear on signs differ from those on Drawings, include the drawing room number on schedule.
 - 2. When content of signs is indicated to be determined later, request such information from Owner through Architect at least 2 months prior to start of fabrication; upon request, submit preliminary schedule.
 - 3. Submit for approval by Owner through Architect prior to fabrication.
- D. Samples: Submit two samples of each type of sign, of size similar to that required for project, illustrating sign style, font, and method of attachment.

- E. Selection Samples: Where colors are not specified, submit two sets of color selection charts or chips.

1.4 QUALITY ASSURANCE

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

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Package signs as required to prevent damage before installation.
- B. Package room and door signs in sequential order of installation, labeled by floor or building.
- C. Store tape adhesive at normal room temperature.

1.6 FIELD CONDITIONS

- A. Do not install tape adhesive when ambient temperature is lower than recommended by manufacturer.
- B. Maintain this minimum temperature during and after installation of signs.

PART 2 PRODUCTS

2.1 SIGNAGE APPLICATIONS

- A. Accessibility Compliance: Signs are required to comply with ADA Standards and ICC A117.1 and applicable building codes, unless otherwise indicated; in the event of conflicting requirements, comply with the most comprehensive and specific requirements.
- B. Room and Door Signs:
 - 1. Sign Type: Flat signs with graphic symbols and panel media as specified.
 - 2. Provide "tactile" signage, with letters raised minimum 1/32 inch and Grade II braille.
 - 3. Character Height: As indicated on drawings.
 - 4. Rest Rooms: Identify with pictograms, the names "MEN" and "WOMEN", or as indicated on drawings, and braille.
 - 5. Interior Rooms: Identify with room names and numbers to be determined later, not those shown on the Drawings, and braille.
- C. Interior Directional and Informational Signs:

1. Sign Type: Flat signs with panel media as specified.
 2. Tactile Exit Signs: Identify with either "EXIT" or "EMERGENCY EXIT" and braille.
 - a. Locations: Adjacent to each door to an egress stairway, exit passageway, and exit discharge.
- D. Emergency Evacuation Maps:
1. Provide for emergency evacuation maps as indicated in drawings or as required by Authority Having Jurisdiction (AHJ).
 2. Map content to be provided by Owner.
 3. Use clear plastic panel silk-screened on reverse, in brushed aluminum frame, screw-mounted.
- E. Code-Required Door and Room Signs: Provide all signs required by Authority Having Jurisdiction (AHJ) for building occupancy; determine requirements and report to Owner and Architect prior to making specified submittals. Include cost of these signs in Contract Sum.

2.2 FLAT SIGNS

- A. Flat Signs: Signage media without frame.
1. Material: Plastic or acrylic having a non-glare finish.
 2. Edges: Square.
 3. Corners: Square.
 4. Wall Mounting of One-Sided Signs: Tape adhesive.
 5. Signs Mounted on Glass: Where signs are mounted on glass, provide blank back-panel of matching size and material to conceal mounting unless otherwise noted.
- B. Color and Font: Unless otherwise indicated:
1. Character Font: Helvetica, Arial, or other sans serif font.
 2. Character Case: Upper case only.
 3. Background Color: As selected by Architect from manufacturer's standard range.
 4. Character Color: Contrasting color as selected.

2.3 DIMENSIONAL LETTERS

- A. Metal Letters:

1. Metal: Aluminum sheet, flat.
2. Metal Thickness: 1/4 inch minimum.
3. Letter Height: As indicated on drawings.
4. Finish: Painted; As selected by Architect from manufacturer's full range.
5. Mounting: Concealed screws.

2.4 VINYL WALL GRAPHICS

- A. Premium grade, 0.003 inch (3 mil) minimum thickness machine cut graphics, having pressure sensitive adhesive backing.

2.5 ACCESSORIES

- A. Mounting Devices: Except as specified for each sign type, provide mounting devices specifically recommended by manufacturer for indicated application; concealed upon finished installation.
- B. Concealed Screws: Stainless steel, galvanized steel, chrome plated, or other non-corroding metal.
- C. Tape Adhesive: Double sided tape, permanent adhesive.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that substrate surfaces are ready to receive work.

3.2 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install neatly, with horizontal edges level.
- C. Locate signs and mount at heights indicated on drawings and in accordance with ADA Standards and ICC A117.1.
- D. Locate signs where indicated:
 1. Emergency Evacuation Maps: Locate centered between elevator doors, or where indicated on Drawings.
 2. If no location is indicated obtain Architect's instructions.

- E. Protect from damage until Date of Substantial Completion; repair or replace damaged items.

END OF SECTION 101400

SECTION 102113.19 - SOLID PLASTIC TOILET COMPARTMENTS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Solid plastic toilet compartments.
- B. Urinal screens.

1.2 RELATED REQUIREMENTS

- A. Section 061000 - Rough Carpentry: Blocking and supports.
- B. Section 102800 - Toilet, Bath, and Laundry Accessories.

1.3 REFERENCE STANDARDS

- A. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
- B. NFPA 286 - Standard Methods of Fire Tests for Evaluating Contribution of Wall and Ceiling Interior Finish to Room Fire Growth.

1.4 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate the work with placement of support framing and anchors in walls and ceilings.
 - 2. Coordinate location and installation of toilet accessories mounted on or in immediate proximity to toilet partitions.

1.5 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on panel construction, hardware, and accessories.
- C. Shop Drawings: Indicate partition plan, elevation views, dimensions, details of wall supports, door swings.
- D. Selection Samples: Submit manufacturer's full range of available colors, for selection.
- E. Verification Samples: Submit two samples of partition panels, 4 by 4 inch in size illustrating panel finish, color, and sheen.
- F. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Basis of Design Manufacturer: Scranton Products: www.scrantonproducts.com
- B. Other Acceptable Manufacturers:
 - 1. Bradley Corp.: www.bradleycorp.com.
 - 2. General Partitions Mfg. Corp.: www.generalpartitions.com.
 - 3. ASI Global Steel Products Corp.: www.globalpartitions.com.
 - 4. Knickerbocker Partition Corp.: www.knickerbockerpartition.com.
 - 5. Substitutions: Section 016000 - Product Requirements.

2.2 SOLID PLASTIC TOILET COMPARTMENTS

- A. Solid Plastic Toilet Compartments: Factory fabricated doors, pilasters, and divider panels made of solid molded high density polyethylene (HDPE), tested in accordance with NFPA 286; floor-mounted headrail-braced.
 - 1. Comply with ASTM E84, Class B, for finish surfaces of partition systems.
 - 2. Color and Finish: As selected by Architect from manufacturer's full line.
- B. Doors:
 - 1. Thickness: 1 inch.
 - 2. Width: 24 inch.
 - 3. Width for Handicapped Use: 36 inch, out-swinging.
 - 4. Height: 55 inch.
- C. Panels:
 - 1. Thickness: 1 inch.
 - 2. Height: 55 inch.
 - 3. Depth: As indicated on Drawings.
- D. Pilasters:
 - 1. Thickness: 1 inch.
 - 2. Width: As required to fit space; minimum 3 inch.

- E. Screens: Without doors; to match compartments; mounted to wall with continuous panel brackets.
- F. Mounting: Floor mounted and headrail braced.

2.3 ACCESSORIES

- A. Pilaster Shoes: Stainless steel, satin finish, 3 inches high; concealing floor and ceiling fastenings.
 - 1. Provide adjustment for floor variations with screw jack through steel saddles integral with pilaster.
 - 2. Provide ceiling attachment using two adjustable hanging studs, attached to above-ceiling framing.
- B. Wall Brackets: Stainless steel; continuous type.
- C. Attachments, Screws, and Bolts: Stainless steel, tamper proof type.
 - 1. For attaching panels and pilasters to brackets: Through-bolts and nuts; tamper proof.
- D. Hinges: Stainless steel, manufacturer's standard finish.
 - 1. Continuous-type hinge, self closing.
- E. Door Hardware: Stainless steel, manufacturer's standard finish.
 - 1. Door Latch: Slide type with exterior emergency access feature.
 - 2. Door Strike and Keeper with Rubber Bumper: Mount on pilaster in alignment with door latch.
 - 3. Provide door pull for outswinging doors and on both sides of accessible stall doors.
- F. Coat Hook with Rubber Bumper: One per compartment, mounted on door.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that field measurements are as indicated on Drawings.
- B. Verify correct spacing of and between plumbing fixtures.
- C. Verify correct location of built-in framing, anchorage, and bracing.

3.2 INSTALLATION

- A. Install partitions secure, rigid, plumb, and level in accordance with manufacturer's instructions.
- B. Maintain 3/8 inch to 1/2 inch space between wall and panels and between wall and end pilasters.
- C. Attach panel brackets securely to walls using anchor devices. Adjust locations of brackets as required to eliminate conflict with wall tile edges and other transitions between dissimilar wall finish materials.
- D. Attach panels and pilasters to brackets.
- E. Field touch-up of scratches or damaged finish will not be permitted. Replace damaged or scratched materials with new materials.

3.3 TOLERANCES

- A. Maximum Variation From True Position: 1/4 inch.
- B. Maximum Variation From Plumb: 1/8 inch.

3.4 ADJUSTING

- A. Adjust and align hardware to uniform clearance at vertical edge of doors, not exceeding 3/16 inch.
- B. Adjust hinges to position doors in partial opening position when unlatched. Return out-swinging doors to closed position.
- C. Adjust adjacent components for consistency of line or plane.

END OF SECTION 102113.19

SECTION 102800 - TOILET, BATH, AND LAUNDRY ACCESSORIES

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Commercial toilet accessories.
- B. Under-lavatory pipe supply covers.
- C. Utility room accessories.

1.2 RELATED REQUIREMENTS

- A. Section 09 22 16: Placement of reinforcement for backing plate reinforcement.

1.3 REFERENCE STANDARDS

- A. ADA Standards - 2010 ADA Standards for Accessible Design.
- B. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
- C. ASTM A269/A269M - Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service.
- D. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- E. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.
- F. ASTM B86 - Standard Specification for Zinc and Zinc-Aluminum (ZA) Alloy Foundry and Die Castings.
- G. ASTM B456 - Standard Specification for Electrodeposited Coatings of Copper Plus Nickel Plus Chromium and Nickel Plus Chromium.
- H. ASTM C1036 - Standard Specification for Flat Glass.
- I. ASTM C1503 - Standard Specification for Silvered Flat Glass Mirror.
- J. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
- K. ICC A117.1 - Accessible and Usable Buildings and Facilities.

1.4 ADMINISTRATIVE REQUIREMENTS

- A. Coordinate the work with the placement of internal wall reinforcement to receive anchor attachments.

- B. Coordinate locations of accessories with other work to avoid interference, and to assure proper operation and servicing of accessory units.

1.5 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Submit data on accessories describing size, finish, details of function, and attachment methods.
- C. Manufacturer's Installation Instructions: Indicate special procedures and conditions requiring special attention.

1.6 QUALITY ASSURANCE

- A. Provide accessories by the same manufacturer for each type of accessory unit. For units exposed in the same areas, provide matching finishes.
- B. Comply with ASTM F446 for grab bars and accessories, anchorage, test methods, and performance.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Do not deliver accessories to site until rooms in which they are to be installed are ready to receive them.
- B. Pack accessories individually in a manner to protect accessory and its finish.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Acceptable Manufacturers:
 - 1. ASI - American Specialties, Inc: www.americanspecialties.com/#sle.
 - 2. Bobrick Washroom Equipment, Inc: www.bobrick.com.
 - 3. Bradley Corporation: www.bradleycorp.com/#sle.

2.2 MATERIALS

- A. Accessories - General: Shop assembled, free of dents and scratches and packaged complete with anchors and fittings, steel anchor plates, adapters, and anchor components for installation.
 - 1. Grind welded joints smooth.
 - 2. Fabricate units made of metal sheet of seamless sheets with flat surfaces.

- B. Keys: Provide two keys for each accessory to Owner; master key lockable accessories.
- C. Stainless Steel Sheet: ASTM A666, Type 304.
- D. Stainless Steel Tubing: ASTM A269/A269M, Grade TP304 or TP316.
- E. Galvanized Sheet Steel: Hot-dipped galvanized steel sheet, ASTM A653/A653M, with G90/Z275 coating.
- F. Zinc Alloy: Die cast, ASTM B86.
- G. Mirror Glass: Annealed float glass, ASTM C1036 Type I, Class 1, Quality Q2, with silvering, protective and physical characteristics complying with ASTM C1503.
- H. Fasteners, Screws, and Bolts: Hot dip galvanized; tamper-proof; security type.
- I. Expansion Shields: Fiber, lead, or rubber as recommended by accessory manufacturer for component and substrate.

2.3 FINISHES

- A. Stainless Steel: Satin finish, unless otherwise noted.
- B. Chrome/Nickel Plating: ASTM B456, SC 2, polished finish, unless otherwise noted.
- C. Baked Enamel: Pretreat to clean condition, apply one coat primer and minimum two coats epoxy baked enamel.
- D. Powder-Coated Steel: Clean, degrease, and neutralize. Follow immediately with a phosphatizing treatment, prime coat, and two finish coats of powder coat enamel.
- E. Galvanizing for Items Other than Sheet: Comply with ASTM A123/A123M; galvanize ferrous metal and fastening devices.
- F. Back paint components where contact is made with building finishes to prevent electrolysis.

2.4 COMMERCIAL TOILET ACCESSORIES

- A. As scheduled in Drawings.

2.5 UNDER-LAVATORY PIPE AND SUPPLY COVERS

- A. Under-Lavatory Pipe and Supply Covers:
 - 1. Insulate exposed drainage piping, including hot, cold, and tempered water supplies under lavatories or sinks to comply with ADA Standards.
 - 2. Exterior Surfaces: Smooth non-absorbent, non-abrasive surfaces.

3. Construction: 1/8 inch flexible PVC.
 - a. Surface Burning Characteristics: Flame spread index of 25 or less and smoke developed index of 450 or less, when tested in accordance with ASTM E84.
 - b. Comply with ICC A117.1.
4. Color: White.
5. Fasteners: Reusable, snap-locking fasteners with no sharp or abrasive external surfaces.

2.6 UTILITY ROOM ACCESSORIES

- A. Combination Utility Shelf/Mop and Broom Holder: 0.05 inch thick stainless steel, Type 304, with 1/2 inch returned edges, 0.06 inch steel wall brackets.
 1. Product: As scheduled in drawings.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify exact location of accessories for installation.
- C. For electrically-operated accessories, verify that electrical power connections are ready and in the correct locations.
- D. Verify that field measurements are as indicated on drawings.
- E. See Section 09 22 16 for installation of blocking, reinforcing plates, and concealed anchors in walls and ceilings.

3.2 PREPARATION

- A. Deliver inserts and rough-in frames to site for timely installation.
- B. Provide templates and rough-in measurements as required.

3.3 INSTALLATION

- A. Install accessories in accordance with manufacturers' instructions in locations indicated on drawings.
- B. Install plumb and level, securely and rigidly anchored to substrate.
- C. Mounting Heights: As required by accessibility regulations, unless otherwise indicated.

3.4 PROTECTION

- A. Protect installed accessories from damage due to subsequent construction operations.

END OF SECTION 102800

SECTION 104400 - FIRE PROTECTION SPECIALTIES

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Fire extinguishers.
- B. Fire extinguisher cabinets.
- C. Accessories.

1.2 RELATED REQUIREMENTS

- A. Section 061000 - Rough Carpentry: Wood blocking product and execution requirements.

1.3 REFERENCE STANDARDS

- A. ASTM E814 - Standard Test Method for Fire Tests of Penetration Firestop Systems.
- B. FM (AG) - FM Approval Guide.
- C. NFPA 10 - Standard for Portable Fire Extinguishers.
- D. UL (DIR) - Online Certifications Directory.

1.4 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Manufacturer's Installation Instructions: Indicate special criteria and wall opening coordination requirements.
- C. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
- D. Maintenance Data: Include test, refill or recharge schedules and re-certification requirements.

1.5 QUALITY ASSURANCE

- A. Basis of Design: Specifications are based on specialty types and model numbers by the specified basis of design manufacturer. Specialty types manufactured by other acceptable manufacturers are permitted, subject to compliance with all specified requirements, and provided that deviations in dimensions and profile are minor, and do not detract substantially from the indicated design intent.

1.6 FIELD CONDITIONS

- A. Do not install extinguishers when ambient temperature may cause freezing of extinguisher ingredients.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Fire Extinguishers:
 - 1. Activar Construction Products Group, Inc. - JL Industries:
www.activarcpg.com/#sle.
 - 2. Kidde, a unit of United Technologies Corp.: www.kidde.com.
 - 3. Larsen's Manufacturing Co.: www.larsensmfg.com.
 - 4. Nystrom, Inc.: www.nystrom.com.
 - 5. Potter-Roemer: www.potterroemer.com/#sle.
 - 6. Substitutions: See Section 016000 - Product Requirements.
- B. Cabinet Basis of Design Manufacturer:
 - 1. Larsen's Manufacturing Co.: www.larsensmfg.com.
 - a. Fire Extinguisher Cabinets: Architectural Series, 2409 semi-recessed with Vertical Duo door.
- C. Other Acceptable Cabinet Manufacturers:
 - 1. Activar Construction Products Group: www.activarcpg.com/#sle.
 - 2. Kidde, a unit of United Technologies Corp.: www.kidde.com.
 - 3. Nystrom, Inc.: www.nystrom.com.
 - 4. Potter-Roemer: www.potterroemer.com/#sle.
 - 5. Substitutions: See Section 016000 - Product Requirements.

2.2 FIRE EXTINGUISHERS

- A. General: Comply with product requirements of NFPA 10 and applicable codes, whichever is more stringent.
 - 1. Provide extinguishers labeled by UL (DIR) or FM (AG) for purpose specified and as indicated.

- B. Multipurpose Dry Chemical Type Fire Extinguishers: Carbon steel tank, with pressure gauge.
 - 1. Stored Pressure Operated: Deep Drawn.
 - 2. Class: A:B:C type.
 - 3. Size: 10 pound.
 - 4. Finish: Baked polyester powder coat red color.
 - 5. Temperature Range: -65 degrees F to 120 degrees F.

2.3 CABINETS

- A. Fire Rating: Listed and labeled in accordance with ASTM E814 requirements for fire resistance rating of walls where being installed.
- B. Cabinet Construction: Non-fire rated.
 - 1. Formed primed steel sheet; 0.036 inch thick base metal.
- C. Fire Rated Cabinet Construction: Fire rating to match wall rating.
 - 1. Steel; double wall or outer and inner boxes with 5/8 inch thick fire barrier material.
- D. Cabinet Configuration: Semi-recessed type, unless otherwise indicated or specified.
 - 1. Sized to accommodate scheduled items and accessories.
 - 2. Semi-Recessed Cabinets: Maximum 4 inch projection from wall surface, including handles and other components.
 - a. Provided recessed handle.
 - 3. Provide cabinet enclosure with right angle inside corners and seams, and with formed perimeter trim and door stiles.
- E. Door Glazing: Tempered glass, clear, 1/8 inch thick, and set in resilient channel glazing gasket.
 - 1. Glazing Style: Provide Vertical Duo door.
- F. Cabinet Mounting Hardware: Appropriate to cabinet, with pre-drilled holes for placement of anchors.
- G. Fabrication: Weld, fill, and grind components smooth.
- H. Finish of Cabinet Exterior Trim and Door: Baked enamel, white color.

- I. Finish of Cabinet Interior: White colored enamel.

2.4 ACCESSORIES

- A. Extinguisher Brackets: Formed steel, chrome-plated.
- B. Lettering: FIRE EXTINGUISHER decal, or vinyl self-adhering, pre-spaced black lettering in accordance with authorities having jurisdiction (AHJ).

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify rough openings for cabinet are correctly sized and located.

3.2 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Fire Extinguisher Cabinets: Install cabinets plumb and level in wall openings, maximum 30 inches from finished floor to inside bottom of cabinet.
- C. Secure rigidly in place.
- D. Place extinguishers in cabinets.
- E. Position cabinet signage at locations required by Authorities Having Jurisdiction.

END OF SECTION 104400

SECTION 105113 - METAL LOCKERS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Metal lockers.

1.2 RELATED REQUIREMENTS

- A. Section 061000 - Rough Carpentry: Wood blocking and nailers.

1.3 REFERENCE STANDARDS

- A. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

1.4 SUBMITTALS

- A. See Section 013000-Administrative Requirements, for submittal procedures.
- B. Product Data: Manufacturer's published data on locker construction, sizes and accessories.
- C. Shop Drawings: Indicate locker plan layout, numbering plan.
- D. Samples: Submit two samples 6 by 6 inches in size showing color and finish of metal locker material.
- E. Manufacturer's Installation Instructions: Indicate component installation assembly.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Protect locker finish and adjacent surfaces from damage.

1.6 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of metal lockers that fail in materials or workmanship, excluding finish, within specified warranty period.
- B. Failures include, but are not limited to, the following:
 - 1. Structural failures.
 - 2. Faulty operation of latches and other door hardware
- C. Warranty Period: 10 years from date of Substantial Completion.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Basis of Design Manufacturer:
 - 1. ASI Storage Solutions; Traditional Plus, All Welded Construction Lockers:
www.asistorage.com.
- B. Other Acceptable Manufacturers:
 - 1. Lyon Workspace Products: www.lyonworkspace.com/#sle.
 - 2. Republic Storage Systems Co: www.republicstorage.com/#sle.

2.2 LOCKER APPLICATIONS

- A. Heavy Duty Welded Lockers: Metal lockers, free-standing with matching closed base.
 - 1. Size: Indicated on drawings.
 - 2. Configuration: Single tier.
 - 3. Fittings: Size and configuration as indicated on drawings.
 - a. Hat shelf.
 - b. Hooks: One double prong.
 - 4. Ventilation: Louvers at top and bottom of door panel.
 - 5. Locking: Built-in combination locks.
 - 6. Provide sloped top.

2.3 METAL LOCKERS

- A. Accessibility: Comply with ICC A117.1 and ADA Standards.
- B. Lockers: Factory assembled, made of formed sheet steel, ASTM A653/A653M SS Grade 33/230, with G60/Z180 coating, stretcher leveled; metal edges finished smooth without burrs; baked enamel finished inside and out.
 - 1. Where ends or sides are exposed, provide flush panel closures.
 - 2. Provide filler strips where indicated, securely attached to lockers.
 - 3. Color: To be selected by Architect from manufacturer's full range.
- C. Locker Body: Formed and flanged; with steel stiffener ribs; electric spot welded.
 - 1. Body and Shelves: 16 gage, 0.0598 inch.

- D. Frames: Formed channel shape, welded and ground flush, welded to body, resilient gaskets and latching for quiet operation.
 - 1. Door Frame: 16 gage, 0.0598 inch, minimum.
- E. Doors: Channel edge; welded construction, manufacturer's standard stiffeners, grind and finish edges smooth.
 - 1. Form recess for operating handle and locking device.
- F. Hinges: Continuous piano hinge with powder coat finish to match locker color.
- G. Sloped Top: 18 gage, 0.0478 inch, with closed ends.
- H. Trim and Fillers: 18 gage, 0.0478 inch.
- I. Coat Hooks: Stainless steel or zinc-plated steel.
- J. Number Plates: Provide rectangular shaped aluminum plates. Form numbers 1/2 inch high of block font style with ADA designation, in contrasting color.
- K. Locks: Locker manufacturer's standard type indicated above.
- L. Built-In Lock Boxes: Same material as locker, manufacturer's standard size, with built-in combination locks.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that prepared bases are in correct position and configuration.
- B. Verify bases are properly sized.

3.2 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Place and secure on prepared base.
- C. Install lockers plumb and square.
- D. Secure lockers with anchor devices to suit substrate materials. Minimum Pullout Force: 100 pounds.
- E. Bolt adjoining locker units together to provide rigid installation.
- F. Install end panels, filler panels, and sloped tops.
- G. Install fittings if not factory installed.

H. Replace components that do not operate smoothly.

3.3 CLEANING

A. Clean locker interiors and exterior surfaces.

END OF SECTION 105113

SECTION 122400 - ROLLER WINDOW SHADES

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Window shades and accessories.

1.2 REFERENCE STANDARDS

- A. ASTM G21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi.
- B. NFPA 701 - Standard Methods of Fire Tests for Flame Propagation of Textiles and Films.

1.3 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate with window installation and placement of concealed blocking to support shades.
- B. Preinstallation Meeting: Convene one week prior to commencing work related to products of this Section; require attendance of all affected installers.
- C. Sequencing:
 - 1. Do not fabricate shades until field dimensions for each opening have been taken.
 - 2. Do not install shades until final surface finishes and painting are complete.

1.4 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets including materials, finishes, fabrication details, dimensions, profiles, mounting requirements, and accessories.
- C. Shop Drawings: Include shade schedule indicating size, location and keys to details, head, jamb and sill details, and operation direction.
- D. Source Quality Control Submittals: Provide test reports indicating compliance with specified fabric properties.
- E. Selection Samples: Where shade cloth is not scheduled, include fabric samples in full range of available colors and patterns.

- F. Verification Samples: Minimum size 6 inches square, representing actual materials, color and pattern.
- G. Manufacturer's Instructions: Include instructions for storage, handling, protection, examination, preparation, and installation of product.
- H. Operation and Maintenance Data: List of all components with part numbers, sources of supply, and operation and maintenance instructions; include copy of shop drawings.
- I. Warranty: Submit sample of manufacturer's warranty and documentation of final executed warranty completed in Owner's name and registered with manufacturer.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this Section, with not less than five years of experience.
- B. Installer Qualifications: Company specializing in performing work of this type with minimum five years of experience.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver shades in manufacturer's unopened packaging, labeled to identify each shade for each opening.
- B. Handle and store shades in accordance with manufacturer's recommendations.

1.7 FIELD CONDITIONS

- A. Do not install products under environmental conditions outside manufacturer's absolute limits.

1.8 WARRANTY

- A. See Section 017800 - Closeout Submittals, for additional warranty requirements.
- B. Provide manufacturer's warranty from Date of Substantial Completion, covering the following:
 - 1. Manufacturer's standard non-depreciating 25 year limited warranty.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Acceptable Manufacturers - Roller Shades:
 - 1. Draper, Inc.: www.draperinc.com.
 - 2. Hunter Douglas Architectural: www.hunterdouglasarchitectural.com.

3. MechoShade Systems, Inc.: www.mechoshade.com.
 4. SWFcontract, a division of Springs Window Fashions, LLC.:
www.swfcontract.com.
 5. Substitutions: See Section 016000 - Product Requirements.
- B. Source Limitations: Furnish products produced by a single manufacturer and obtained from a single supplier.

2.2 WINDOW SHADE APPLICATIONS

- A. Shades: Types as Scheduled.
1. Type: Roll down, closed position is at window sill.
 2. Color: As selected by Architect from manufacturer's full range of colors.
 3. Mounting: Surface mount unless otherwise noted.
 4. Operation: Manual.

2.3 ROLLER SHADES

- A. Roller Shades: Fabric roller shades complete with mounting brackets, roller tubes, hembars, hardware and accessories.
1. Drop: Regular roll.
 2. Size: As indicated on drawings.
- B. Fabric: Non-flammable, color-fast, impervious to heat and moisture, and able to retain its shape under normal operation.
1. Flammability: Pass NFPA 701 large and small tests.
 2. Fungal Resistance: No growth when tested according to ASTM G21.
- C. Roller Tubes: As required for type of operation.
1. Material: Extruded aluminum or galvanized steel; as required for shade location.
 2. Size: Manufacturer's standard, selected for suitability for installation conditions, span, and weight of shades.
 3. Fabric Attachment: Utilize extruded channel in tube to accept vinyl spline welded to fabric edge.
 4. Finish: Baked enamel; color from manufacturer's standards.

5. Take-Up Roller: Manufacturer's standard roller tube pre-tensioned for winding lift cable in bottom-up type shades.
- D. Hembars: Designed for weight requirements and adaptation to uneven surfaces, to maintain bottom of shade straight and flat.
 1. Style: Manufacturer's standard concealed hembar, flat profile with closed ends.
- E. Manual Operation for Interior Shades: Clutch operated continuous loop; beaded ball chain.

2.4 ACCESSORIES

- A. Fascias: Size as required to conceal shade mounting.
 1. Color and Style: As selected by Architect from shade manufacturer's full selection.
- B. Brackets and Mounting Hardware: As recommended by manufacturer for mounting configuration and span indicated.
- C. Fasteners: Non-corrosive, and as recommended by shade manufacturer.

2.5 FABRICATION

- A. Field measure finished openings prior to ordering or fabrication.
- B. Fabricate shades to fit openings within specified tolerances.
 1. Vertical Dimensions: Fill openings from head to sill with 1/2 inch space between bottom bar and window sill.
 2. Horizontal Dimensions - Inside Mounting: Fill openings from jamb to jamb.
- C. Dimensional Tolerances: As recommended in writing by manufacturer.
- D. At openings requiring continuous multiple shade units with separate rollers, locate roller joints at window mullion centers; butt rollers end-to-end.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine finished openings for deficiencies that may preclude satisfactory installation.
- B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.
- C. Start of installation shall be considered acceptance of substrates.

3.2 PREPARATION

- A. Prepare surfaces using methods recommended by manufacturer for achieving best result for substrate under the project conditions.

3.3 INSTALLATION

- A. Install in accordance with manufacturer's instructions, using mounting devices as indicated.
- B. Installation Tolerances:
 - 1. Inside Mounting: Maximum space between shade and jamb when closed of 1/16 inch.
 - 2. Maximum Offset From Level: 1/16 inch.
- C. Replace shades that exceed specified dimensional tolerances at no extra cost to Owner.
- D. Adjust level, projection and shade centering from mounting bracket. Verify there is no telescoping of shade fabric. Ensure smooth shade operation.

3.4 CLEANING

- A. Clean soiled shades and exposed components as recommended by manufacturer.
- B. Replace shades that cannot be cleaned to "like new" condition.

3.5 PROTECTION

- A. Protect installed products from subsequent construction operations.
- B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION 122400

SECTION 123200 - MANUFACTURED WOOD CASEWORK

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Manufactured casework, with cabinet hardware.

1.2 RELATED REQUIREMENTS

- A. Section 123600 - Countertops: Additional requirements for countertops.

1.3 DEFINITIONS

- A. Exposed: Portions of casework visible when drawers and cabinet doors are closed, including end panels, bottoms of cases more than 42 inches above finished floor, tops of cases less than 72 inches above finished floor and all members visible in open cases or behind glass doors.
- B. Semi-Exposed: Portions of casework and surfaces behind solid doors, tops of cases more than 72 inches above finished floor and bottoms of cabinets more than 30 inches but less than 42 inches above finished floor.
- C. Concealed: Sleepers, web frames, dust panels and other surfaces not generally visible after installation and cabinets less than 30 inches above finished floor.

1.4 ADMINISTRATIVE REQUIREMENTS

- A. Preinstallation Meeting: Conduct a preinstallation meeting one week prior to the start of the work of this section; require attendance by all affected installers.
- B. Keying Conference: Conduct conference prior to ordering keys. Incorporate conference decisions into keying submittal.

1.5 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Product Data: Component dimensions, configurations, construction details, joint details, attachments.
- C. Shop Drawings: Indicate casework types, sizes, and locations, using large scale plans, elevations, and cross sections. Include rough-in and anchors and reinforcements, placement dimensions and tolerances, clearances required, and keying information.
- D. Samples for Finish Selection: Fully finished, for color selection. Minimum sample size: 2 inches by 3 inches.
 - 1. Plastic laminate samples, for color, texture, and finish selection.

- E. Maintenance Data: Manufacturer's recommendations for care and cleaning.
- F. Finish touch-up kit for each type and color of materials provided.

1.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.
- B. Quality Certification: Comply with AWI (QCP) woodwork association quality certification service/program in accordance with requirements for work specified in this section.
 - 1. Provide labels or certificates indicating that the installed work complies with AWI/AWMAC/WI (AWS) requirements for grade or grades specified.
 - 2. Provide designated labels on shop drawings as required by certification program.
 - 3. Provide designated labels on installed products as required by certification program.
 - 4. Submit certifications upon completion of installation that verifies this work is in compliance with specified requirements.
 - 5. Replace, repair, or rework all work for which certification is refused.
- C. Installer Qualifications: Company specializing in performing work of the type specified in this section, with not less than three years of documented experience.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Protect items provided by this section, including finished surfaces and hardware items during handling and installation. For metal surfaces, use polyethylene film or other protective material standard with the manufacturer.
- B. Acceptance at Site:
 - 1. Do not deliver or install casework until the conditions specified under Part 3, Examination Article of this section have been met. Products delivered to sites that are not enclosed and/or improperly conditioned will not be accepted if warping or damage due to unsatisfactory conditions occurs.
- C. Storage:
 - 1. Store casework in the area of installation. If necessary, prior to installation, temporarily store in another area, meeting the environmental requirements specified under Part 3, "Site Verification of Conditions" Article of this section.

1.8 WARRANTY

- A. See Section 017800 - Closeout Submittals for additional warranty requirements.
- B. Correct defective Work within a five year period after Date of Substantial Completion, at no additional cost to Owner. Defects include, but are not limited to:
 - 1. Ruptured, cracked, or stained finish coating.
 - 2. Discoloration or lack of finish integrity.
 - 3. Cracking or peeling of finish.
 - 4. Delamination of components.
 - 5. Failure of adhesives.
 - 6. Failure of hardware.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Acceptable Manufacturers:
 - 1. Case Systems: www.casesystems.com.
 - 2. Diversified Fixture: www.diversifiedfixture.com.
 - 3. RPA, Inc.: www.rpaincalabama.com.
 - 4. Stevens Industries, Inc.: www.stevensadvantage.com.
 - 5. TMI Systems Design Corporation: www.tmisystems.com.
 - 6. Substitutions: See Section 016000 - Product Requirements.

2.2 CASEWORK, GENERAL

- A. Quality Standard: AWI/AWMAC/WI (AWS), unless noted otherwise.
- B. Plastic Laminate Faced Cabinets: Performance Duty Level 2.

2.3 FABRICATION

- A. Assembly: Shop assemble casework items for delivery to site in units easily handled and to permit passage through building openings.
- B. Construction: As required for selected grade.
- C. Fittings and Fixture Locations: Cut and drill components for fittings and fixtures.

- D. Hardware Application: Factory-machine casework members for hardware that is not surface applied.
- E. Access Panels: Where indicated, for maintenance of utility service and mechanical and electrical components.
- F. Removable back panels on all base cabinets.
- G. Edging: Fit shelves, doors, and exposed edges with specified edging. Do not use more than one piece for any single length.
- H. Scribes and Fillers: Panels of matching construction and finish, for locations where cabinets do not fit tight to adjacent construction.

2.4 PLASTIC-LAMINATE-CLAD CASEWORK

- A. Plastic-Laminate-Clad Casework: Solid wood and wood panel construction; each unit self-contained and not dependent on adjacent units or building structure for rigidity; in sizes necessary to avoid field cutting except for scribes and filler panels. Include adjustable levelers for base cabinets.
 - 1. Style: Flush overlay. Ease doors and drawer fronts slightly at edges.
 - 2. Cabinet Nominal Dimensions: Unless otherwise indicated, provide cabinets of widths and heights indicated on drawings, and with following front-to-back dimensions:
 - a. Base Cabinets: 24 inches.
 - b. Tall Cabinets: 24 inches.
 - c. Wall Cabinets: 13 inches.
 - 3. Plastic Laminate: Apply plastic laminate finish in full uninterrupted sheets consistent with manufactured sizes. Fit corners and joints hairline.
 - a. Finish: Matte or suede, gloss rating of 5 to 20.
 - b. Surface Color and Pattern: As selected by Architect from manufacturer's full line.
 - c. Exposed Interior Surfaces: Thermally fused laminate.
 - 1) Color: White unless otherwise indicated.
 - d. Cap exposed plastic laminate finish edges with material of same finish and pattern.

2.5 COUNTERTOPS

- A. Countertops: See Section 123600.

2.6 CABINET HARDWARE

- A. Manufacturer's standard types, styles and finishes.
- B. Comply with BHMA A156.9 requirements.
- C. Locks: Provide locks on casework drawers and doors where indicated. Lock with 5 pin cylinder and 2 keys per lock.
- D. Shelves in Cabinets:
 - 1. Adjustable Shelf Supports: Standard side-mounted system using multiple holes for pin supports and coordinated self rests, polished chrome finish, for nominal 1 inch spacing adjustments.
- E. Swinging Doors: Hinges, pulls, and catches.
 - 1. Hinges: Concealed, number as required by referenced standards for width, height, and weight of door.
 - a. Concealed Hinges: Installed in cabinet edge, and on door back, bright chromium plated over nickel on base material.
 - 2. Pulls: ADA compliant pulls as scheduled on drawings, finish as selected by Architect.
 - 3. Catches: Magnetic at base and wall cabinets, mechanical at tall cabinets.
- F. Drawers: Pulls and slides.
 - 1. Pulls: ADA compliant pulls as scheduled on drawings, finish as selected by Architect.
 - 2. Slides: Steel, full extension arms, ball bearings; self-closing; capacity as recommended by manufacturer for drawer height and width.

2.7 MATERIALS

- A. Wood-Based Materials:
 - 1. Solid Wood: Air-dried to 4.5 percent moisture content, then tempered to 6 percent moisture content before use.
 - 2. Composite Wood Panels: Containing no urea-formaldehyde resin binders.

- B. Concealed Solid Wood or Plywood: Any species and without defects affecting strength or utility.
- C. High Pressure Decorative Laminate (HPDL): NEMA LD 3, types as recommended for specific applications. complying with Grade requirements, and standard with the manufacturer.
- D. Thermally Fused Laminate (TFL): Melamine resin, NEMA LD 3, Type VGL laminate panels.

2.8 ACCESSORIES

- A. Bolts, Nuts, Washers, Lags, Pins, and Screws: Of size and type to suit application; galvanized or chrome-plated finish in concealed locations and stainless steel or chrome-plated finish in exposed locations.
- B. Concealed Joint Fasteners: Corrosion-resistant, standard with manufacturer.
- C. Grommets: Standard plastic, painted metal, or rubber grommets for cut-outs, in color to match adjacent surface.

PART 3 EXECUTION

3.1 PREPARATION

- A. Large Components: Ensure that large components can be moved into final position without damage to other construction.

3.2 EXAMINATION

- A. Site Verification of Environmental Conditions:
 - 1. Do not deliver casework until the following conditions have been met:
 - a. Building has been enclosed (windows and doors sealed and weather-tight).
 - b. An operational HVAC system that maintains temperature and humidity at occupancy levels has been put in place.
 - c. Ceiling, overhead ductwork, piping, and lighting have been installed.
 - d. Installation areas do not require further “wet work” construction.
- B. For Base Cabinets Installation: Examine floor levelness and flatness of installation space. Do not proceed with installation if encountered floor conditions required more than 1/2 inch leveling adjustment. When installation conditions are acceptable, for each space, establish the high point of the floor. Set and make level and plumb first cabinet in relation to this high point.

- C. For Wall Cabinets Installation: Examine wall surfaces in installation space. Do not proceed with installation if the following conditions are encountered:
 - 1. Maximum variation from plane of masonry wall exceeds 1/4 inch in 10 ft and 1/2 inch in 20 ft or more, and/or maximum variation from plumb exceeds 1/4 inch per story.
 - 2. Maximum Variation of finished gypsum board surface from true flatness: 1/8 inch in 10 feet in any direction.
- D. Verify adequacy of support framing and anchors.
- E. Verify that service connections are correctly located and of proper characteristics.

3.3 INSTALLATION

- A. Perform installation in accordance with manufacturer's instructions.
- B. Use anchoring devices to suit conditions and substrate materials encountered. Use concealed fasteners to the greatest degree possible. Use exposed fasteners only where allowed by approved shop drawings, or where concealed fasteners are impracticable.
- C. Set casework items plumb and square, securely anchored to building structure.
- D. Align cabinets to adjoining components, install filler and/or scribe panels where necessary to close gaps.
- E. Fasten together cabinets in continuous runs, with joints flush, uniform and tight. Misalignment of adjacent units not to exceed 1/16 inch. In addition, do not exceed the following tolerances:
 - 1. Variation of Tops of Base Cabinets from Level: 1/16 inch in 10 feet.
 - 2. Variation of Bottoms of Wall Cabinets from Level: 1/8 inch in 10 feet.
 - 3. Variation of Faces of Cabinets from a True Plane: 1/8 inch in 10 feet.
 - 4. Variation of Adjacent Surfaces from a True Plane (Lippage): 1/32 inch.
 - 5. Variation in Alignment of Adjacent Door and Drawer Edges: 1/16 inch.
- F. Secure wall and floor cabinets to concealed reinforcement at gypsum board assemblies.
- G. Base Cabinets: Fasten cabinets to service space framing and/or wall substrates, with fasteners spaced not more than 16 inches on center. Bolt adjacent cabinets together with joints flush, tight, and uniform.

1. Where base cabinets are installed away from walls or service space framing, anchor to floor at toe space at not more than 24 inches on center, and at sides of cabinets with not less than two fasteners per side.
- H. Wall Cabinets: Fasten to hanging strips, and/or wall substrates. Fasten each cabinet through back, near top, at not less than 16 inches on center.
- I. Install hardware uniformly and precisely.
- J. Countertops: Install countertops intended and furnished for field installation in one true plane, with ends abutting at hairline joints, and no raised edges.
- K. Replace units that are damaged, including those that have damaged finishes.

3.4 ADJUSTING

- A. Adjust operating parts, including doors, drawers, hardware, and fixtures to function smoothly.

3.5 CLEANING

- A. Clean casework and other installed surfaces thoroughly.

3.6 PROTECTION

- A. Do not permit finished casework to be exposed to continued construction activity.
- B. Protect casework and countertops from ongoing construction activities. Prevent workmen from standing on, or storing tools and materials on casework or countertops.
- C. Repair damage, including to finishes, that occurs prior to Date of Substantial Completion, using methods prescribed by manufacturer; replace units that cannot be repaired to like-new condition.

END OF SECTION 123200

SECTION 123600 - COUNTERTOPS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Countertops for architectural cabinet work.
- B. Sills.

1.2 RELATED REQUIREMENTS

- A. Section 064100 - Architectural Wood Casework.

1.3 REFERENCE STANDARDS

- A. AWI (QCP) - Quality Certification Program.
- B. ISFA 2-01 - Classification and Standards for Solid Surfacing Material.
- C. NEMA LD 3 - High-Pressure Decorative Laminates.
- D. PS 1 - Structural Plywood.

1.4 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate sizing and configuration of countertops with associated casework and adjacent construction.
 - 2. Coordinate sizing and locations of cutouts for plumbing fixtures with base cabinet configurations for proper alignments as indicated on Drawings.

1.5 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Product Data: Manufacturer's data sheets on each product to be used, including:
 - 1. Preparation instructions and recommendations.
 - 2. Storage and handling requirements and recommendations.
 - 3. Specimen warranty.
- C. Shop Drawings: Complete details of materials and installation; combine with shop drawings of cabinets and casework specified in other Sections.

1. Indicate plans, sections, dimensions, seam locations, component sizes, edge details, fabrication details, attachment provisions, sizes of furring, blocking, and coordination requirements with adjacent work. Show locations and sizes of cutouts and holes for plumbing fixtures, faucets, soap dispensers, waste receptacles and other items installed in countertops.
- D. Verification Samples: For each finish product specified, minimum size 6 inches square, representing actual product, color, and patterns.
- E. Test Reports: Chemical resistance testing, showing compliance with specified requirements.
- F. Installation Instructions: Manufacturer's installation instructions and recommendations.
- G. Maintenance Data: Manufacturer's instructions and recommendations for maintenance and repair of countertop surfaces.

1.6 QUALITY ASSURANCE

- A. Fabricator Qualifications: Company specializing in fabricating the products specified in this section with minimum five years of documented experience.
- B. Installer Qualifications: Company specializing in performing work of the type specified in this Section, with not less than three years of documented experience.
- C. Quality Certification:
 1. Comply with AWI (QCP) woodwork association quality certification service/program in accordance with requirements for work specified in this section: www.awiqcp.org/#sle.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Store products in manufacturer's unopened packaging until ready for installation.
- B. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

1.8 FIELD CONDITIONS

- A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.
- B. Field Measurements: Verify dimensions of construction to receive countertops by field measurements before fabrication and indicate measurements on Shop Drawings.

1.9 WARRANTY

- A. Solid Surface Material Manufacturer Warranty: Provide manufacturer's standard warranty for solid surface material for period of 10 years against material defects.

PART 2 PRODUCTS

2.1 COUNTERTOPS

- A. Quality Standard: Custom Grade, in accordance with AWI/AWMAC/WI (AWS), unless noted otherwise.
- B. Solid Surfacing Countertops and Sills: Solid surfacing sheet or plastic resin casting over continuous substrate.
 - 1. Flat Sheet Thickness: 1/2 inch, minimum.
 - 2. Solid Surfacing Sheet and Plastic Resin Castings: Complying with ISFA 2-01 and NEMA LD 3; acrylic or polyester resin, mineral filler, and pigments; homogenous, non-porous and capable of being worked and repaired using standard woodworking tools; no surface coating; color and pattern consistent throughout thickness.
 - a. Finish on Exposed Surfaces: Matte, gloss rating of 5 to 20.
 - b. Color and Pattern: As indicated on drawings.
 - 3. Other Components Thickness: 1/2 inch, minimum.
 - 4. Exposed Edge Treatment: Built up to minimum 1-1/4 inch thick; square edge.
 - 5. Back and End Splashes: Same sheet material, square top; minimum 4 inches high.
 - 6. Skirts: As indicated on Drawings.
 - 7. Fabricate in accordance with manufacturer's standard requirements.

2.2 MATERIALS

- A. Plywood for Supporting Substrate: PS 1 Exterior Grade, A-C veneer grade, minimum 5-ply; minimum 3/4 inch thick; join lengths using metal splines.
- B. Adhesives: Chemical resistant waterproof adhesive as recommended by manufacturer of materials being joined.
- C. Joint Sealant: Mildew-resistant silicone sealant, clear.

2.3 ACCESSORIES

- A. Americans with Disabilities Act (ADA)-Compliant Vanity and Countertop Brackets:
1. Material: Steel or aluminum.
 2. Finish: Manufacturer's standard, factory-applied powder coat.
 3. Color: Selected by Architect from manufacturer's standard range.
 4. Products:
 - a. A&M Hardware, Inc ; ADA Vanity Brackets:
<http://www.aandmhardware.com/#sle>.
 - b. Rangine Corporation; Rakks ADA Vanity Brackets; www.rakks.com.
 - c. Substitutions: See Section 016000 - Product Requirements.

2.4 FABRICATION

- A. Fabricate tops and splashes in the largest sections practicable, with top surface of joints flush.
1. Join lengths of tops using best method recommended by manufacturer.
 2. Fabricate to overhang fronts and ends of cabinets 1 inch except where top butts against cabinet or wall.
 3. Prepare all cutouts accurately to size; replace tops having improperly dimensioned or unnecessary cutouts or fixture holes.
- B. Provide back/end splash wherever counter edge abuts vertical surface unless otherwise indicated.
1. Secure to walls with contact surfaces set in waterproof adhesive.
 2. Height: 4 inches, unless otherwise indicated.
- C. Solid Surfacing: Fabricate tops up to 144 inches long in one piece; join pieces with adhesive sealant in accordance with manufacturer's recommendations and instructions.
1. Arrange seams symmetrically or in orderly locations, minimum 12 inches from edges of sink and similar cutouts.
- D. Cutouts and Holes:

1. Undercounter Fixtures: Make cutouts for undercounter fixtures in shop using template or pattern furnished by fixture manufacturer. Form cutouts to smooth, even curves.
2. Provide vertical edges, slightly eased at juncture of cutout edges with top and bottom surfaces of countertop and projecting 3/16 inch into fixture opening.
3. Counter-Mounted Fixtures: Prepare countertops in shop for field cutting openings for counter-mounted fixtures. Mark tops for cutouts and drill holes at corners of cutout locations. Make corner holes of largest radius practical.
4. Fittings: Drill countertops in shop for plumbing fittings, undercounter soap dispensers, and similar items.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that blocking/backing has been installed prior to installation of countertop brackets and prefabricated vanities.
- B. Do not begin installation until substrates have been properly prepared.
- C. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.
- D. Verify that wall surfaces have been finished and mechanical and electrical services and outlets are installed in proper locations.
- E. Verify actual site dimensions and location of adjacent materials prior to commencing work.
- F. Examine cabinets upon which counter tops are to be installed. Verify cabinets are level to within 1/8" in 10' - 0"

3.2 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.

3.3 INSTALLATION

- A. Securely attach countertops to cabinets using concealed fasteners. Make flat surfaces level; shim where required.
- B. Attach countertops using compatible adhesive.

- C. Set countertops to comply with requirements indicated. Shim and adjust, with uniform joints of widths indicated and with edges and faces aligned according to established relationships and indicated tolerances. Install anchors and other attachments indicated or necessary to secure countertops in place.
- D. Bond joints with countertop manufacturer's recommended adhesive and draw tight as countertops are set. Mask areas of countertops adjacent to joints to prevent adhesive smears.
- E. Clamp units to temporary bracing, supports, or each other to ensure that countertops are properly aligned and joints are of specified width.
- F. Seal joint between back/end splashes and vertical surfaces.

3.4 TOLERANCES

- A. Variation From Horizontal: 1/8 inch in 10 feet, maximum.
- B. Offset From Wall, Countertops: 1/8 inch maximum; 1/16 inch minimum.
- C. Field Joints: 1/8 inch wide, maximum.

3.5 CLEANING

- A. Clean countertops surfaces thoroughly.

3.6 PROTECTION

- A. Protect installed products until completion of project.
- B. Touch-up, repair or replace damaged products before Date of Substantial Completion.

END OF SECTION 123600

SECTION 22 05 00 - PLUMBING REQUIREMENTS

PART 1 GENERAL

1.1 RELATED SPECIFICATIONS AND DOCUMENTS

- A. Drawings and related specifications for this project including General and Supplementary Conditions, Division 1, General Requirements, Instructions to Bidders, Addenda's, etc. apply to and are considered a part of Division 22 - Mechanical Work.
- B. Information in this division is intended to clarify or make additions to the requirements set forth in the General Conditions, Supplementary Conditions, and Division I of these specifications. Any conflict between this Division 22 and other sections or divisions of the specifications or drawings shall be brought to the attention of the Architect/Engineer in writing as a request for addendum prior to the bid opening.
- C. Furnish all equipment, materials, articles, items, operations or methods listed, mentioned or scheduled on drawings, these specifications, manufacturer's installation instructions and include all labor, materials, equipment and incidentals necessary for their complete installation and operation.
- D. All information contained in this section applies to all sections within Division 22 as if it was part of each section.

1.2 DRAWINGS AND SPECIFICATIONS

- A. The drawings and these specifications are intended to supplement each other and any material or labor called for in one shall be furnished even if not specifically mentioned in both. Any material or labor which is neither shown on the drawings nor listed in this specification, but is normally incurred or required for completion of work shall be furnished. If there is a discrepancy between the drawings and specifications, the more stringent of the two shall be followed.
- B. Drawings are diagrammatic and are intended to show approximate location and general arrangement of systems and equipment. No attempt has been made to show every ell, tee, etc. Drawings shall not be scaled for location of systems, equipment, etc. All dimensions whether given on drawings or scaled shall be verified in field and coordinated with all other trades and existing field conditions. Some plumbing, piping, equipment, etc. locations may require changes in location due to field conditions and coordination with other trades will be made with no additional cost to the Owner. Failure to check will be no reason for additional compensation.
- C. These drawings and the associated specifications are intended to provide complete furnishing, installation and operational plumbing systems as specified under Division 22 and as called for on the drawings. If these drawings and associated specifications have information omitted that would not allow a completely operational system as is the intent of the Engineer, the bidder shall notify the Engineer a minimum one week prior to the bid date to allow for addenda. Once bids have been received, the Contractor shall be responsible for material, labor, etc., to furnish and install a completely operational plumbing system as is the intent of these drawings and associated specification.

- D. The installation of all systems, equipment, etc., is subject to clarification with submitted shop drawings and field coordination requirements. Equipment outlines shown on drawings or dimensioned on drawings are limiting dimensions. Any equipment that reduces the indicated clearances or exceeds specified or scheduled equipment dimensions shall not be used.
- E. The Architect/Engineer and Owner reserve the right to make minor changes in the location of equipment, piping, ductwork, etc. at the time of rough-in without additional cost to the Owner.
- F. The Mechanical Trades Contractor shall have completed for his portion of work, at least one installation of size and type comparable to this project and has been in satisfactory operation for at least two complete years. The Mechanical Trades Contractor shall also have a developed service department capable of negotiating service contracts with the Owner for systems herein specified.

1.3 AUTOCAD BACKGROUND FILES

- A. The Contractor shall include in their bid any cost for requesting AutoCAD backgrounds for their use from the Architect or Engineer. The cost will be \$150.00 for the first plan, and \$50.00 for each additional plan that may be requested for AutoCAD use. A waiver of responsibility for the Architect and Engineer related to Contractor use of the CAD files shall be signed by the Contractor.

1.4 MANUFACTURER'S SPECIFICATIONS AND CAPACITIES

- A. Some equipment, plumbing fixtures, materials, etc. that are scheduled on the drawings or listed in any addenda may not be specified in this specification. The manufacturer's specification and capacities shall be considered included and part of this specification whether it is specified in this specification or noted or scheduled on the drawings. The contractor shall remove and replace any "substituted" equipment or material, which has been installed or is on site, which in the opinion of the Architect/Engineer does not meet the scheduled equipment or materials, manufacturer's capacities or specification at no additional cost to the Owner.

1.5 DEFINITIONS

- A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct shafts, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspaces, and tunnels.
- B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.
- C. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions.
- D. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and in pipe shafts.

- E. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.
- F. The following are industry abbreviations for plastic materials:
 - 1. ABS: Acrylonitrile-butadiene-styrene plastic.
 - 2. CPVC: Chlorinated polyvinyl chloride plastic.
 - 3. PE: Polyethylene plastic.
 - 4. PVC: Polyvinyl chloride plastic.
- G. The following are industry abbreviations for rubber materials:
 - 1. EPDM: Ethylene-propylene-diene terpolymer rubber.
 - 2. NBR: Acrylonitrile-butadiene rubber.

1.6 LOCAL CONDITIONS

- A. Before submitting proposals, each contractor shall examine these specifications and associated drawings, addenda, etc. and shall examine the site of the project. The bidder shall fully investigate the site of this project, investigate coordination of his work with all other trades and existing conditions and completely satisfy himself as to the conditions to which the work is to be performed before submitting his/her bid. No allowances or considerations will be given at a later date for alleged misunderstanding as to the requirements of the work, materials to be furnished, or conditions required by the nature of this project site and coordination by the neglect on the bidder's part to make such an examination and coordination.
- B. Drawings show approximate location of existing services. The mechanical and electrical trades shall check with local utility companies or municipal agencies for exact location of services which they expect to encounter. The Mechanical Trades Contractor shall be responsible for hiring a company such as "Miss Dig" to stake out and locate all utilities in areas of excavation before commencing any work. The Mechanical Trades Contractor shall verify all elevations and locations of existing underground lines which are to be connected into or routed over or under. This verification shall be done prior to beginning work at this project.

1.7 QUALITY ASSURANCE

- A. All work shall be performed in accordance with all local and state codes, laws and regulations applicable to the work for this project. The contractor shall be responsible for all permits and costs for inspections, etc., and for checking with each utility company supplying service to this project and shall determine from them all, any changes in boxes, meters, valves, service, etc., and shall include all cost for inspections, revisions to services, etc. in his bid as required by local agencies, utilities, etc. No extra payment will be made for such items after the contractor submits his bid.
- B. In addition to all applicable Federal, State and local codes, the standards and codes listed below shall apply to all mechanical work. The reference to codes and standards shall be referenced to the latest edition or revision.
 - 1. American Gas Association (AGA)

2. American National Standard Institute (ANSI)
3. American Society of Mechanical Engineers (ASME)
4. American Society for Testing materials (ASTM)
5. American Water Works Association (AWWA)
6. American Welding Society
7. ANSI code of Pressure Piping and Unified Pressure Vessels
8. Cast Iron Soil Pipe Institute
9. National Electrical Manufacturer's Association (NEMA)
10. Standards of the Hydraulic Institute
11. Underwriters' Laboratories (UL)
12. Williams-Steiger Occupational Safety & Health Act (OSHA)

- C. In the event of conflict between drawings, codes, standards or specifications, the most stringent requirement shall apply

1.8 SUBMITTALS AND SHOP DRAWINGS

- A. Submit electronic sets of complete shop drawings for all plumbing equipment and materials associated with Division 22 and associated drawings to the Architect/Engineer for review before fabrication of work or ordering of equipment. Shop drawings shall be submitted at the earliest possible time.
- B. Shop drawings shall be first reviewed by the contractor. Inaccurate shop drawings shall be corrected by the contractor to meet specifications and schedules for this project. The contractor shall then initial the shop drawings as having been reviewed before submitting to the Architect/Engineer. Shop drawings shall have, in addition to the mechanical information, the electrical requirements for minimum circuit amperes and maximum fuse size ratings of the equipment.
- C. Drawings which are rejected must be corrected and returned for Architect/Engineer review before ordering.
- D. Furnish to the job site copies or prints of shop drawings that have been reviewed by the Engineer as soon as possible.
- E. Include a copy of each shop drawing in the Operation and Maintenance Manual.
- F. The checking and reviewing of shop drawings by the Architect/Engineer shall be construed as assisting the contractor and the Architect/Engineer's action does not relieve the contractor from the responsibility for errors or omissions which may exist thereon. The contractor shall be held responsible for errors or omissions that are discovered after approval process and must be made good by the contractor.

1.9 PERMITS, INSPECTIONS AND TESTS

- A. The Mechanical Trades Contractor shall take out all permits and arrange for necessary inspections and shall pay all assessments, fees and costs, etc., and make all tests as required by applicable codes. At the completion of the project, the Mechanical Trades Contractor shall furnish certificates of inspection and approval and secure final occupancy permit. Record copies shall be included in the Operation and Maintenance manuals.

1.10 RECORD DRAWINGS

- A. Maintain an up-to-date set of "record" drawings showing actual equipment, plumbing piping, etc. installation locations. Exact dimensions from column lines for all concealed work and tie-ins with elevations noted shall be included.
- B. Include a set of reproducible drawings and a set of prints in each Operation and Maintenance Manual.
- C. The Engineer reserves the right to request and be furnished any additional information he deems necessary to be shown on the record drawings.

1.11 OWNER'S INSTRUCTIONS

- A. Upon completion of the project, the contractor shall be responsible for instructing the Owner's operating staff, in the presence of the Architect/Engineer's representative, in the proper operation and maintenance of the mechanical systems and equipment. Include a statement signed by the Owner that instructions have been given for proper operation and maintenance of the mechanical systems and equipment.

1.12 GUARANTEES

- A. Furnish a written guarantee, to the Architect/Engineer, that will make the contractor responsible at his own expense for any imperfections in material and/or workmanship which may develop under ordinary use within a period of one (1) year from final Owner's acceptance of the work.
- B. Furnish all written guarantees from equipment and/or material manufacturers which shall include the operating and performance conditions and capabilities upon which they are based.

1.13 PORTABLE AND DETACHABLE PARTS

- A. Retain all portable and detachable parts of installation such as keys, spare accessories, operating manuals, etc. include in the Operation and Maintenance Manual.

1.14 OPERATION AND MAINTENANCE MANUALS

- A. Furnish to the Architect/Engineer two (2) copies of an approved bound (3 ring binder) book with tabs for sections covering each item of equipment. These notebooks shall include shop drawings, maintenance manuals, operating manuals and parts lists to instruct the Owner on proper operation and use as well as maintenance for each piece of equipment. These books shall also include contractors', subcontractors' and manufacturers' names, telephone numbers and addresses.
- B. The manuals must be approved by the Architect/Engineer before final payment to the contractor. The Engineer reserves the right to request and be furnished any additional information that he deems necessary to be included in the manuals.

1.15 RESPONSIBILITIES FOR USE OF SUBSTITUTE MATERIALS

- A. Contractor shall notify Architect/Engineer in writing at least ten (10) calendar days before bids are due for approval to use materials and/or equipment other than that which has been specified or scheduled. If substitute materials and/or equipment are approved and used, it will be this contractor's responsibility to guarantee that the items will function as the specified equipment or materials, will in no way alter the design of the structure or system, and will not require any additional mechanical work such as piping, plumbing, etc. Any additional cost required by substitute materials will be the responsibility of the contractor.
- B. It will be the contractor's responsibility, at his own expense, to remove or replace any non-approved equipment or material or any approved equipment or materials not originally specified or scheduled if equipment and materials do not meet with the satisfaction of the Architect/Engineer.
- C. It shall be the Contractor's (Mechanical Trades) responsibility to coordinate and pay for any Electrical Contractor costs due to any changes in substitute materials and/or equipment's power requirements, which differ from that shown on the design documents.
- D. No consideration will be given to requests for substitute materials because of delivery problems unless the contractor can prove that orders were placed as soon as possible after contract was awarded and that delays were not caused by submittal of unscheduled or unspecified (substituted) materials to the Architect/Engineer.

1.16 COST BREAKDOWN AND EQUIPMENT LIST

- A. The successful bidder shall be responsible for submitting a cost breakdown to the Architect/Engineer and Owner within ten (10) calendar days after date of request of the breakdown. During progress of the work, if changes occur which cause additional cost, the price on such items shall be broken down in accordance with the items listed in the breakdown.
- B. The bidders shall be responsible for submitting a complete list of all equipment manufacturers, makes, models, etc. that will be used for this project with their proposal. The equipment list shall be typed on the contractor's letterhead and shall be signed by the authorized officer.

1.17 MATERIALS AND EQUIPMENT

- A. Materials and equipment furnished under this project shall have a minimum warrantee of one (1) year. All materials and equipment shall be new, of first class quality and shall be furnished, delivered, erected, installed and finished in every detail and shall be so selected and arranged as to fit into the building space. All material or equipment that is not specified but necessary for this project shall be subject to the approval of the Architect/Engineer.
- B. Any materials or equipment not specified or scheduled but similar to that which has had prior approval shall be listed as a substitution and noted on the proposal form as such.

- C. The contractor shall include all miscellaneous materials and labor required to completely install and operate the plumbing systems as is intended by these drawings and specification.

1.18 SCHEDULE, COORDINATION AND INSTALLATION OF WORK

- A. The contractor shall carry on work in such a manner as to meet the dates as scheduled by the General Contractor and shall work overtime at no expense to the Owner as required to comply with the schedule. This contractor shall schedule all work with Owner and Architect/Engineer and schedule shut down of systems with Owner.
- B. Examine the site and all drawings and specifications and coordinate work with all other trades before commencing work for this project. Arrange work essentially as shown with the exact layout to be made on the job to suit actual conditions. Precise locations of equipment and materials shall be coordinated and shall be the responsibility of this contractor. Should any conflicts in location occur, and necessary deviations from drawings are required as determined by the Architect/Engineer, the contractor shall make necessary adjustments without additional cost to the Owner.
- C. All equipment, plumbing piping, etc. shall be located and/or routed to allow for the most convenient access for servicing.
- D. Arrange for necessary access doors, panels, etc. to allow servicing of equipment, piping, valves, etc. Perform any cutting and patching as required, made necessary by failure to make proper arrangements.
- E. Indicated equipment connections, sizes and locations shall be verified and connected according to manufacturer's shop drawings and installation instructions. Thoroughly investigate the space provided for equipment and connections before ordering equipment. All equipment shall be selected to fit into the space allowed, including connections with adequate space allowed for operation and maintenance.
- F. All work shall be installed in a neat and workmanlike manner, using skilled personnel thoroughly qualified in the trade or duties that they are to perform. Rough work will be rejected.
- G. Coordinate all equipment deliveries and schedules to allow timely installation. Contractor shall separate equipment into sections and reassemble in building if required by the installation at no extra cost to the Owner.
- H. Furnish a superintendent approved by the Architect/Engineer to oversee and coordinate the work to be performed with all other trades.
- I. Coordinate location of pipes, plumbing, etc. with other building components such as structural components (beams, joists, columns, etc.), electrical components (lighting, conduits, etc.) and architectural components (walls, ceilings, floors, pipe chases, roof, etc.).
- J. Before starting work, Contractor shall verify that available space for proposed pipes, equipment etc. is adequate for the intended purpose and will result in a first class

installation. Regardless of drawings, responsibility for first class operating systems rests with the Contractor.

- K. Arrange for chases, slots, openings, etc. and other building components to allow for plumbing systems installation. Coordinate cutting and patching of these components to accommodate installation. This contractor shall be responsible for accurately locating for the general trades all chases, shafts, etc. and shall be responsible for all cutting and patching if these chases were not accurate or not coordinated in time with the general trades. Coordinate installation of all sleeves in walls, floors or other structural or architectural components.
- L. Sequence, coordinate and integrate installation of equipment and materials for efficient work flow during the project. Particular attention should be spent on larger pieces of equipment.
- M. Install equipment and materials with provisions for necessary access for service and maintenance. Allow space for removal of all parts that may require replacement or servicing.
- N. Coordinate installation of required supporting devices and set sleeves in poured-in-place concrete and other structural components as they are constructed.
- O. Coordinate requirements for access panels and doors for mechanical items requiring access that are concealed behind finished surfaces. When access panels are required, valves and equipment components requiring access shall be located to minimize the number of panels.
- P. Examine the work as it progresses and alert the Architect/Engineer in writing of any instances or obstructions that will prevent this contractor from performing his/her work.
- Q. The Mechanical Trade shall be responsible for all coordination of all site utilities, the gas company, etc. including coordination of all new and existing natural gas loads.

1.19 DELIVERY, STORAGE, AND HANDLING

- A. Deliver pipes and tubes with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe end damage and to prevent entrance of dirt, debris, and moisture.
- B. Store plastic pipes protected from direct sunlight. Support to prevent sagging and bending.
- C. Furnish and maintain a weatherproof storage facility on the site of adequate size to store miscellaneous equipment and/or materials to prevent exposure to the weather. Location of shed shall be determined by the Owner and Architect/Engineer. The Owner reserves the right to deny storage of materials or equipment in any existing or new buildings.

1.20 COOPERATION WITH ARCHITECT/ENGINEER AND OTHERS

- A. Coordinate all aspects of the plumbing system installation with all other trades, existing conditions, etc.

- B. If the bidder believes that changes in design are required to meet intended design capacities and operation or material and/or equipment is obviously omitted from these specifications and drawings, the bidder shall contact the Architect/Engineer in writing at least ten (10) days before bid date. The acceptance of a bid by the Owner shall be binding and shall indicate that the bidder does not require any changes in design nor additional costs in order to meet the design and performance of the mechanical system as indicated in these specifications and drawings.

1.21 WORK INVOLVING OTHER TRADES

- A. Equipment or materials specified in Division 22 may have to be installed by other trades (such as electrical trades or architectural trades) due to code requirements or union jurisdictional requirements. Where this occurs, this contractor shall include all costs required by other trades to complete the work and hire the respective trade to perform this work.

1.22 PERFORMANCE DATA AND ACCESSIBILITY

- A. All performance data specified in this specification or scheduled on drawings shall be considered actual performance of the equipment after installation. The supplier and installer shall be responsible for suitable allowances to adjust equipment to design capacities when actual operating and installation conditions differ from drawings.
- B. All equipment and materials shall be installed to allow access for servicing and maintenance. Coordinate final location of such equipment and materials that are concealed with required access doors on panels. Allow ample space for replacement or servicing.

1.23 CUTTING AND PATCHING

- A. Unless noted otherwise, the Mechanical Trades shall be responsible for all cutting, patching and associated work required under Division 22. This work shall be performed by trades normally performing this type of work except drilling of holes shall be done by the contractor requiring same. This includes replacing areas of cutting required by this work with proper reinforcing, termite shielding, materials, finishing, etc. to restore the areas to their original condition, and filling all openings around ducts, piping, etc. with approved fire retardant materials. Regardless, all drilling of holes shall be the responsibility of the Contractor requiring same.
- B. If noted on drawings that the General Trades will be responsible for all cutting and patching, it will be the Mechanical Trades responsibility to notify all General Trades during bidding of all areas requiring cutting and patching. Regardless, all drilling of holes shall be the responsibility of the contractor requiring same.

1.24 WORK IN EXISTING BUILDINGS

- A. Coordinate and schedule all work in existing building with Owner and Architect/Engineer. Systems shall be kept in operation at all times if at all possible. If a system shut-down is required, the contractor shall schedule with the Owner, the time

and length of shut-down. A system shall not be shut down without written permission from the Owner.

- B. All existing equipment, plumbing, piping, etc. that is to be removed shall remain the property of the Owner. The contractor shall remove and locate this material that remains the property of the Owner to a location determined by the Owner somewhere on site. If the Owner does not want to maintain possession of the removed material, the contractor shall be responsible for removing material from the site and disposing of this material as necessary to meet all codes and requirements and shall pay all costs as required for any disposal fees, inspections, permits, etc.
- C. All existing piping, equipment, etc. whether shown on drawings or not that is to be removed and/or abandoned and does not remain property of the Owner shall be removed from site.
- D. Any existing plumbing, piping, valves, mechanical equipment, etc. serving the existing building which are shown or not shown on drawings and are required for systems operation shall remain in use. If these systems require relocation to allow installation of new systems, the contractor shall be responsible for relocating to an Owner and Architect/Engineer approved location. The contractor shall pay all cost for this work and include such cost in his/her bid. (As specified previously, contractor shall be responsible for examining site and include all cost for work required to complete this project.)
- E. When active services, etc. are encountered in this project, the contractor shall furnish and install bracing, support, etc. as required to protect and keep these services active. (As specified previously, these drawings are diagrammatical. The contractor shall be responsible for verification of all existing services, piping, equipment, etc.).

1.25 ACCESS TO EQUIPMENT, VALVES, ETC.

- A. Coordinate access panels with type of construction and furnish access panels in areas that are non-accessible. Access panels shall be furnished by this contractor and installed by the General Contractor. The access panels shall be all approved, UL labeled and fire rated and shall be located and sized to allow access to equipment, valves, etc.
- B. Where access panels are required, valves, equipment etc. shall be located as to require the least number of access panels.

1.26 EQUIPMENT CONNECTIONS

- A. Connections to equipment, plumbing fixtures, etc. shall be made in accordance with shop drawings, rough-in dimensions furnished by the manufacturer, codes, etc. and may vary with connections shown on drawings. The contractor shall be responsible for making connections and number of connectors as per shop drawings, codes, etc. at no additional cost to the Owner.

1.27 ELECTRICAL CONNECTIONS

- A. The Electrical Trades shall be responsible for furnishing and installing all electrical equipment, wiring, etc. required for operation of mechanical equipment unless otherwise

noted on the drawings. The Mechanical Trades shall furnish detailed information and wiring diagrams to the Electrical Trades for all equipment specified and/or scheduled for this project. In the event that the Mechanical Trades furnishes an "approved equal" or "alternate" that require changes in the original electrical design, the Mechanical Trades shall pay all costs to the Electrical Trades as required to make satisfactory adjustments. All electrical work shall be done in accordance with the latest edition of the National Electric Code.

1.28 MOTORS, MOTOR STARTERS AND DISCONNECTS

- A. Unless otherwise noted on drawings, motors shall be of constant speed 1750 rpm, new NEMA Design B, 40°C rise, horse power rated, open drip-proof except TEFC in dirty atmosphere, induction type motor with service factor of 1.15 and be of sufficient capacity to continuously operate the apparatus to which it is connected under all conditions of operation without exceeding nameplate ratings.
- B. Motors shall be premium efficiency as calculated using IEEE test method 112B.
- C. Motors ½ Hp. or larger shall be three phase; motors under ½ Hp. shall be 115 volt, 60 cycle, single phase. Before ordering the motors, the contractor shall verify correct motor voltage with the Electrical Trades and field conditions.
- D. The Mechanical Trades shall furnish, for equipment under Division 22, all special switches, disconnects, starters, alternators, etc. as specified or scheduled to be factory furnished and/or factory installed with the equipment including wiring diagrams, etc. whether it is to be factory installed or field wired. All other motor starters, disconnects, etc. not noted as factory furnished shall be furnished and installed by the Electrical Trades.
- E. Starters that are to be factory furnished with equipment shall be of the combination type and shall be as specified under Electrical Trades Division. Furnish overload protection for each phase.
- F. All wiring methods and materials shall meet NEMA, National Electric Code and State of Michigan Code requirements.
- G. All displays on control panels shall be on face of the panels.

1.29 EXCAVATION AND BACKFILLING

- A. Furnish all excavation, backfilling and removal of excess dirt to accomplish installation of Division 22 mechanical work unless otherwise noted on drawings.
- B. All excavation shall be by open cut from the surface. Contractor shall determine whether excavation shall be by machine or by hand except where existing utilities may be located where excavation shall be by hand. Contractor shall be responsible for all damage to existing facilities and services. Excavation shall be to a depth of at least 6" to allow granular bedding below pipe or duct.
- C. If for any reason the work is suspended, the contractor shall properly protect the excavation and leave the areas unobstructed.

- D. Trench width shall allow sufficient width at centerline of pipe to allow at all times a first class construction/installation method but in no case should be less than 12" larger than the nominal pipe or duct size. This shall especially be true in areas that joints must be connected. Joint holes may have to be made with overhanging sides to make installation safe for workmen.
- E. The excavation shall be at all times finished and backfilled to the required grade after completion and approval of work. Not more than 100 feet of trench shall be excavated and open unless written approval is given by the Architect/Engineer.
- F. The subgrade shall be 4" to 6" below the pipe of granular bedding graded and tamped by hand or mechanical means to the exact elevation required at the bottom of the pipe. Granular materials shall be approved fine aggregate meeting MDOT #2NS specifications. This material shall pass a 1/2" sieve but will be retained on a #4 sieve. If poor soil conditions exist which will not give proper support to the pipe, duct or structure, furnish granular fill as required to remedy this situation and give proper support.
- G. Furnish and install properly sloped sheet piled, shored and braced in areas that the soil requires this to maintain a proper excavation and prevent any movement of earth which could in any way damage the work under construction. When removing the sheeting and bracing, special care should be taken to prevent any caving of the sides of the excavation and injury to the completed work or adjacent property.
- H. Take all necessary action to keep trenches and other excavation areas free from water at all times. Use such methods as pumping, ditching, well pointing, etc. to prevent water in trench or excavation. Dewatering of trench shall have constant supervision.
- I. Backfill excavation and trenches with approved granular material around sides of pipe and at least 12 inches above the top of the pipe laid not more than in 6 inch layers that are thoroughly tamped to 95% of its maximum density. There shall be no backfilling by any mechanical means until the granular material has been firmly tamped around the entire pipe to 12 inches above the pipe. All material used for backfilling shall be approved by the Architect/Engineer. Wherever trenching crosses walks or roadways or isolated inside of building, backfill top 6'-0" of trench with sand or bank run gravel in layers not to exceed 6 inches in depth and carefully compact by hand or machine. Do not backfill with frozen materials.
- J. No piping shall be covered until it has been tested, inspected and approved. Upon completion of backfilling, grade shall be restored in indicated elevation and left in reasonable condition for finish grade by others unless otherwise noted on drawings.
- K. Before final acceptance of work, all disturbed streets, drives, curbs, walks, parking areas, etc. shall be paved, graveled or other to as near their original condition as possible. All unused excavated material shall be removed from site if directed by the Architect/Engineer.

1.30 BASES AND SUPPORTS

- A. This contractor shall be responsible for furnishing all equipment pads and supports for equipment and materials required by Division 22 unless otherwise noted on drawings.

- B. All floor mounted mechanical equipment shall have a reinforced concrete pad furnished unless otherwise noted on drawings. The concrete pads shall be tied to the building floor with expansion bolts located maximum of 4'-0" on centers with a minimum of four (4) bolts, set before pouring and concealed within the pad. The Mechanical Trades shall verify exact pad or support size with the equipment manufacturer and shall size pad with adequate area to allow sufficient room for equipment mounting hardware, etc. Concrete pads shall have a 45 degree bevel at the top edge. The contractor shall verify exact location of concrete pads.
- C. Furnish all steel, hanging material, rods, etc. for suspending equipment off floor unless otherwise noted on drawings for equipment to be furnished under Division 22. This includes all structural steel for supporting between beams.
- D. All support structure shall be of strength to safely withstand all stresses and loads to which they will be subjected and shall distribute load properly over the building area. Supports shall be designed to avoid undue strain to equipment and to avoid interference with piping, pipe connections, service and maintenance clearances, etc.
- E. Where equipment is to be floor mounted and requires legs, this contractor shall furnish and install structural steel members or steel pipe and fittings for legs. Fasten and brace to equipment and furnish flange at base to allow bolting to floor.
- F. Where equipment is to be ceiling or wall mounted, furnish necessary platform, structural steel, hardware, etc. as is most suitable for support of this equipment.
- G. All supports shall be approved by the Architect/Engineer.
- H. All piping, plumbing, etc. shall be suspended from structural steel members utilizing rods and approved hanger devices. Do not use metal deck for support. Beam clamps such as the Grinnell Fig. 260 or approved equal shall be used. Sheet metal "straps" shall not be used in place of rods.
- I. The mechanical trades shall be responsible for furnishing and setting in place all mechanical equipment, roof curbs and plumbing, piping roof curbs. The general trade shall be responsible for the roof work and associated flashing. The mechanical trade shall furnish and install treated wood base blocking as required to level curb and to match roof insulation thickness. Curb shall be as specified, or if not specified should be similar to Pate or Thy-curb with heavy gauge galvanized steel, insulated and with wood nailer. Height of curb scheduled or specified shall be height required to top of curb above finished roof. If height is not specified or noted, a minimum 12" high above finished roof will be required. (pipe support units shall be at height required).

1.31 SLEEVES, PLATES AND COLLARS

- A. Furnish all sleeves, plates and collars for plumbing piping, etc. passing through walls, floor ceilings, foundations, etc. Coordinate with the General Contractor the exact location and size of required openings. No pipe shall pass through a wall, floor ceiling, etc. without a sleeve. This contractor shall be responsible for sleeve locations and securing sleeves before concrete is formed.

- B. Sleeves for steel pipe shall be standard weight black steel pipe. For walls, foundations and ceilings, sleeve shall be kept flush with finished surfaces. For floors, the sleeve shall be set flush with bottom of concrete construction and be extended up ¼" above concrete floor. Sleeves shall be set in place before construction of walls, floors, ceilings, etc.
- C. Sleeves for copper pipe shall be type "M" hard copper tubing installed typical to that of steel pipe sleeves.
- D. Sleeves for piping shall be sized to allow insulation to run continuous through sleeve whenever possible and to allow not less than ¼" all around bare pipe or insulation.
- E. Where insulated piping passes through walls or floor sleeves, furnish 22 gauge galvanized band around insulation of same length as the sleeve length. Band shall fit snugly over insulation and be held in place by steel metal collars all around insulation to cover openings.
- F. All penetration voids shall be sealed smoke tight with non-combustible materials similar to 3M or Hilti firestop systems to maintain the integrity of the fire rated structure. In a non-rated assembly, seal all voids with non-hardening sealant.
- G. Where bare piping 2" and smaller pass through wall or floors, furnish polished chrome plated brass escutcheons, split type. Bare piping 2½" and larger that pass through walls or floor, furnish 22 gauge galvanized steel metal collars so as to cover opening.
- H. Where piping penetrates an outside wall, below grade, utilize a mechanical sleeve, similar to Link-Seal, with stainless steel nuts and bolts on fasteners.

1.32 RIGGING AND HOISTING

- A. Perform all required rigging, hoisting, transportation, moving, etc. of all equipment, materials, etc. to be furnished and/or installed under Division 22 whether furnished by this contractor or by the Owner or other trades.

1.33 STORAGE FACILITY

- A. Furnish and maintain a weatherproof storage facility on the site of adequate size to store miscellaneous equipment and/or materials to prevent exposure to the weather. Location of shed shall be determined by the Owner and Architect/Engineer. The Owner reserves the right to deny storage of materials or equipment in any existing or new buildings.

1.34 PROTECTION FROM DAMAGE

- A. The contractor shall be responsible for all materials, equipment, etc. and all work installed by himself and shall protect it from damage until final acceptance of this project by the Owner.
- B. Furnish all coverings and protection from dirt, dust, rain, storm, heat, traffic, wear, etc. and all possible injury including that by other workmen. Any equipment, workmanship, materials, etc. damaged prior to final acceptance by the Owner of this project shall be properly repaired at no expense to the Owner.

- C. Protect all plumbing fixtures and other equipment from damage by covering or coating. Any dented, scratched, rusted or marred surface finishes will not be accepted.
- D. Protect all equipment, materials, etc. from freezing.

1.35 COMMON PIPE MATERIALS AND INSTALLATION INSTRUCTIONS

- A. Refer to individual Division 22 piping Sections for pipe, tube, and fitting materials and joining methods.
- B. Pipe Threads: ASME B1.20.1 for factory-threaded pipe and pipe fittings.
- C. Refer to individual Division 22 piping Sections for special joining materials not listed below.
 - 1. Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.
 - a. ASME B16.21, nonmetallic, flat, asbestos-free, 1/8-inch (3.2-mm) maximum thickness unless thickness or specific material is indicated.
 - 1) Full-Face Type: For flat-face, Class 125, cast-iron and cast-bronze flanges.
 - 2) Narrow-Face Type: For raised-face, Class 250, cast-iron and steel flanges.
 - b. AWWA C110, rubber, flat face, 1/8 inch thick, unless otherwise indicated; and full-face or ring type, unless otherwise indicated.
 - 2. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.
 - 3. Plastic, Pipe-Flange Gasket, Bolts, and Nuts: Type and material recommended by piping system manufacturer, unless otherwise indicated.
 - 4. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.
 - 5. Brazing Filler Metals: AWS A5.8, BCuP Series, copper-phosphorus alloys for general-duty brazing, unless otherwise indicated; and AWS A5.8, BAg1, silver alloy for refrigerant piping, unless otherwise indicated.
 - 6. Welding Filler Metals: Comply with AWS D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.
 - 7. Solvent Cements for Joining Plastic Piping:
 - a. ABS Piping: ASTM D 2235.
 - b. CPVC Piping: ASTM F 493.
 - c. PVC Piping: ASTM D 2564. Include primer according to ASTM F 656.
 - d. PVC to ABS Piping Transition: ASTM D 3138.
 - 8. Fiberglass Pipe Adhesive: As furnished or recommended by pipe manufacturer.

1.36 PIPE HANGERS AND SUPPORTS

- A. Hangers and saddles shall be Modern Pipe Support Corp., Grinnel/Anvil, Autogrip, or M-CO. Inserts shall be of the type to receive a machine bolt head or nut after installation, permit horizontal adjustment, and shall be flush with the surface. For copper pipe with steel hangers, clean and wrap pipe with two layers of plastic insulating tape at point of contact. Roller supports shall be adjustable type with insulated standoff. Rods shall be used for suspended installation. Sheet metal "straps" shall not be used in place of rods.
- B. Hangers for piping with vapor barrier sealed insulation shall be multipurpose pipe saddles fitting over the insulation. Wire or perforated strap iron will not be permitted for pipe supports. Do not support hangers from roof deck. Furnish and install all support steel as required to suspend from structural steel joist or beams. Hangers shall be clevis or split ring type with vertical adjustment and beam clamp similar to Grinnell/Anvil Fig. 260, with maximum spacing per ASHRAE Standards:

Pipe Size	Steel Pipe	Copper Pipe	PVC Pipe	Rod Size
½ to ¾ inch	6 feet	5 feet	4 feet	3/8"
1 inch	7 feet	5 feet	4 feet	3/8"
1 ¼ inch	7 feet	7 feet	4 feet	3/8"
1½ inch	7 feet	7 feet	4 feet	1/2"
2 inch	10 feet	8 feet	4 feet	1/2"
2½ inch	11 feet	9 feet	4 feet	5/8"
3 inch	11 feet	9 feet	4 feet	5/8"
3 ½ inch	13 feet	11 feet	4 feet	5/8"
4 inch	14 feet	12 feet	4 feet	3/4"
5 inch	14 feet	12 feet	4 feet	3/4"
6 inch	14 feet	--	4 feet	3/4"
8 inch	16 feet	--	4 feet	7/8"
10 inch	16 feet	--	4 feet	7/8"
12 inch	20 feet	--	4 feet	1"

- C. Conform to ASME B31.9, ASTM F708, MSS SP58, MSS SP69 and MSS SP89.
- D. Hangers for Pipe Sizes ½ to 1½ Inch: Malleable iron, adjustable swivel, split ring.
- E. Hangers for Pipe Sizes 2 Inches and Over: Carbon steel, adjustable, clevis.
- F. Hangers for Hot Pipe Sizes thru 4 Inches: Carbon steel, adjustable, clevis.
- G. Hangers for Hot Pipe Sizes 5 Inches and Over: Adjustable steel yoke, cast iron roll, double hanger.
- H. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.
- I. Wall Support for Pipe Sizes up thru 3 Inches: Cast iron hook.
- J. Wall Support for Pipe Sizes 4 Inches and Over: Welded steel bracket and wrought steel clamp.
- K. Vertical Support: Steel riser unistrut clamps at high, mid, and low locations.

- L. Floor Support for Cold Pipe all sizes and Hot Pipe Sizes up thru 4 Inches: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
- M. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.
- N. Hanger Rods: Mild steel threaded both ends, threaded one end, or continuous threaded.
- O. Inserts: Malleable iron case of steel shell and expander plug for threaded connection with lateral adjustments, top slot for reinforcing rods, lugs for attaching to forms, size inserts to suit threaded hanger rods.

1.37 PLUMBING, PIPING, AND EQUIPMENT SUPPORT

- A. Attachments of mechanical equipment to structural members are the responsibility of the installing trade. Structural members shall not be field cut, welded or otherwise modified without approval of the Architect/Engineer. Attachment to steel joist shall be made at panel points. When routing piping or ductwork perpendicular to joist, a support shall be provided at every steel joist; when parallel to joist, a support shall be provided at no more than 6' on centers or two panel bays. Structural members shall not be overloaded as a result of attachments. Attachment/equipment loading for all trades resulting in total load greater than an equivalent uniform 5 psf for any member shall be submitted to the Architect/Engineer for review. Mechanical Trades may contact the project Structural Engineer as required for panel point location assistance and welder certification requirements. Electrical Trades are still responsible for design, layout, and fabrication and installation of electrical supports and support attachment methods. Mechanical Trades shall submit attachment methods to the Structural Engineer for review.
- B. Install products in accordance with manufacturer's instructions.
- C. Do not fasten supports to pipes, ducts, mechanical equipment, and conduit.
- D. Do not use spring steel clips and clamps.
- E. Do not use powder-actuated anchors.
- F. Do not drill or cut structural members without permission from Architect/Engineer.
- G. Fabricate supports from structural steel or steel channel. Rigidly weld members or use hexagon head bolts to present neat appearance with adequate strength and rigidity. Use spring lock washers under all nuts.

1.38 PIPING SYSTEMS SHUT OFF VALVES

- A. Shut off valves shall be installed at all branch lines off main piping, or where mains divide/separate to serve different areas, to allow isolation of all branch piping and systems they serve such as toilet rooms, areas or wings of the building, etc.

1.39 CLEANING AND FINISHING

- A. During construction period, remove all debris, rubbish, tools, equipment, unused materials, etc. as required or requested by the Architect/Engineer. All cost for cleanup and removal will be the responsibility of the contractor.
- B. Upon completion of the project and before final acceptance by the Owner, the entire installation shall be thoroughly cleaned, all rubbish and unused material removed to the satisfaction of the Architect/Engineer. All dust and dirt shall be removed from all equipment, piping, ductwork, etc.
- C. Thoroughly clean all floor drains, cleanouts, and plumbing fixtures. Clean all trays and strainers.
- D. Finish paint all equipment, materials, piping, etc. as noted on drawings or listed in this specification. Match Owner's existing color scheme. Any Division 22 equipment which has been scratched or damaged shall be finished equal to the original finish.

1.40 EQUIPMENT/SYSTEMS START-UP

- A. Furnish and schedule manufacturer's start-up service for all equipment and systems. These start-up services shall be performed in the presence of, and to the satisfaction of the Owner and Architect/Engineer.

1.41 EQUIPMENT/SYSTEMS SIGN-OFF

- A. The Mechanical Trades shall furnish written sign-offs on all systems stating that the equipment and systems have been checked, tested, started and that their operation has been verified correct through the entire range of operation that can be expected through the seasons.

1.42 SUBSTANTIAL COMPLETION

- A. Contractor shall submit a letter to the Architect/Engineer advising that all work has been completed in accordance with plans and specifications and the project is ready for a final walk-thru.

A. END OF SECTION

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SECTION 22 05 10 - PLUMBING SYSTEMS TESTING, CLEANING, WATER TREATMENT & STARTUP

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Testing of piping systems.
- B. Cleaning of piping systems.
- C. Chemical treatment.
- D. Substantial completion check list and sign-off forms.

1.2 RELATED SECTIONS

- A. All drawings and specification sections apply to work in this section. Furnish all items, articles, materials, equipment, operations or methods that are mentioned, listed or scheduled on drawings or are in this specification including all labor, equipment, materials and miscellaneous incidentals necessary and/or required for the completion of this project. The work covered under this section of the specifications is in no way complete within itself, but is supplementary to the entire specification and drawings.

1.3 SCOPE OF WORK

- A. The work covered by this specification consists of furnishing all labor, equipment, material, chemicals or methods that are mentioned, listed or scheduled on drawings or are in this specification. This includes all labor, equipment, materials and miscellaneous incidentals necessary and/or required for the cleaning, flushing, testing and chemical treatment of the piping systems for this project. The work covered under this section of the specification is in no way complete within itself, but is supplementary to the entire specification and drawings.
- B. The substantial completion forms shall be required to be signed and submitted to the Architect/Engineer for approval prior to any insulation of piping systems or installation of ceiling tiles. The person that signs the substantial completion forms shall witness the testing, flushing and chemical treatment of the systems. The signature person's company shall be responsible for all cost incurred with future work by the Architect/Engineer or Owner due to inadequate testing, cleaning, operation or chemical treatment of the piping systems.

1.4 SUBMITTALS

- A. Submit electronic copies of the completed and signed substantial completion forms included in this section. Submit to the Architect/Engineer as system flushing, testing, and chemical treatment occurs. The Mechanical Trade shall maintain one set of substantial completion forms and submit them to the Architect/Engineer prior to the Architect/Engineer final project walk-through.

- B. Submit electronic copies of all equipment, chemicals and product data being furnished to this project for approval.
- C. Submit electronic copies of manufacturer's installation instructions, including placement of equipment in systems, piping configuration, and connection requirements.
- D. Submit certificate of compliance from authority having jurisdiction, indicating approval of systems that require review by local and state authorities.

1.5 PROJECT RECORD DOCUMENTS

- A. Record actual installation locations of piping and equipment including sampling points and location of chemical injectors.

1.6 REGULATORY REQUIREMENTS

- A. Conform to applicable code for addition of non-potable chemicals to building mechanical systems, and for public sewage systems.
- B. Products requiring electrical connection and listed and classified by UL as suitable for the purpose specified and indicated.

1.7 MAINTENANCE SERVICE

- A. Furnish service and maintenance of treatment systems and system water for one year from date of substantial completion.
- B. Provide monthly technical service visits to perform field inspections and make water analysis on site. Detail findings in writing on proper practices, chemical treating requirements, and corrective actions needed. Submit two copies of field service report to Owner after each visit.
- C. Provide laboratory and technical assistance services during this maintenance period.
- D. Provide training course for Owner's personnel, instructing them on installation, care, maintenance, testing, and operation of the water treatment systems. Arrange course at startup of systems.
- E. Provide on-site inspections of equipment during scheduled or emergency shutdown to properly evaluate success of water treatment program, and make recommendations in writing based on these inspections.

1.8 MAINTENANCE MATERIALS

- A. Provide sufficient chemicals for treatment and testing during warranty period.

PART 2 PRODUCTS

2.1 WATER METER

- A. Displacement type cold water meter with sealed, tamper-proof magnetic drive, impulse contact register, single pole, double throw dry contact switch.

2.2 WATER SOFTENERS

- A. Softener Tank: Glass fiber reinforced plastic tank.
- B. Brine Tank: Glass fiber reinforced plastic tank.
- C. Control: Brass control valve cycled to regenerate from one to twelve day period.

PART 3 - EXECUTION

3.1 SANITARY AND STORM PIPING SYSTEMS

- A. Testing
 - 1. Conduct a water, air or peppermint test on the entire system in accordance with the State Plumbing Code. Test underground sanitary, storm and vent piping with at least a 10 foot head of water.

3.2 DOMESTIC COLD WATER, HOT WATER & HOT WATER RETURN PIPING SYSTEMS

- A. Testing
 - 1. Before any fixtures are connected, hydrostatically test piping system at 1.5 times the maximum system pressure, but not less than 100 psig in excess of working pressure for (4) hours. This pressure to be on piping only, not equipment.
- B. Cleaning, flushing and disinfection.
 - 1. All domestic water piping and equipment shall be completely flushed out and disinfected before placing system in service. Disinfection procedure and results shall be in accordance with all applicable codes and State Department of Public Health. (Piping shall be flushed until water is clear).
 - 2. Ensure pH of water to be used as treatment is between 7.4 and 7.6 by adding alkali (caustic soda or soda ash) or Acid (hydrochloric).
 - 3. Inject disinfectant, free chlorine in liquid, powder, tablet or gas form, throughout system to obtain 50 to 80 mg/L (50ppm) minimum residual.
 - 4. Bleed water from outlets to ensure distribution and test for disinfectant residual at minimum 15 percent of outlets.
 - 5. Maintain disinfectant in system for 2 hours.
 - 6. If final disinfectant residual tests less than 25 mg/L, repeat test.
 - 7. Flush disinfectant from system until residual equal to that of incoming water or 1.0 mg/L or 0.5 ppm maximum.
 - 8. Take samples no sooner than 24 hours after flushing, from 10 percent of outlets and water entry, and analyze in accordance with AWWA-C51.
 - 9. Verify that all tests and results are in accordance with local and state health codes and regulations.

3.3 NATURAL GAS PIPING SYSTEMS

A. Pressure Test

1. Pressure test shall be per the current adopted edition of the International Fuel Gas Code.
2. The test pressure shall not be less than 1.5 times the working pressure but not less than 3 PSIG. Where the test pressure exceeds 125 psig, the test pressure shall not exceed a value that produces a hoop stress in the piping greater than 50 percent of the specified minimum yield strength of the pipe. The test duration shall be not less than ½ hour for each 500 FT³ of pipe volume. If testing a system with less than 10 FT³ of pipe volume the test shall not be less than 10 minutes.
3. The test medium shall be air, nitrogen, carbon dioxide or an inert gas. Oxygen shall not be used.

3.4 SYSTEM COMPLETION CHECKLIST

- A. The checklist which follows this specification section is to be considered part of the specifications.
- B. The checklist is to be completed by the Installing Contractor and the prime Mechanical Contractor for each item as directed.

A. END OF SECTION

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**SYSTEMS COMPLETION
CHECKLIST**

Inspection/Review Item	Notice Required	Installing Contractor		Date	Owner's Representative Signature	Remarks
		Name	Signature			
Plumbing Systems						
Testing of Sanitary and Storm Systems	48 hours					Tested per specification
Testing of Domestic CW, HW and HWR Piping.	48 hours					Tested per specification
Disinfection of Domestic CW, HW & HWR Piping.	48 hours					Disinfect per specification and all applicable codes.
Domestic Water Sample and Approval	When submitted					Submit sample for review and approval by local authorities.
Natural Gas Piping	7 days					Tested per specifications.
Domestic water heater system, completely installed, checked, tested and started	7 days					Verify system installation complete, operation correct. Includes verification of hot water recirculating pump system and flow balance. Check, test and startup by Manufacturer's Rep.
Valving	When completed					Verify that valves have been installed at all branch piping locations
Piping and Fitting Insulation	When Completed					Verify all piping and fitting are insulated per specification.
Reduced Pressure Backflow Preventer Tested	48 hours					Verify Reduced Pressure Backflow Preventer installed and completely operational.
Sump Pumps and Sewage Ejectors	48 hours					Verify system installation complete and operational.

By signing this form, the Contractor is certifying that he has personally witnessed completion of that item, and it is complete and complies with all respects to the drawings and specifications.

All items are to be signed off on and submitted to MacMillan Associates Inc. before a final project walk-thru by the Engineer is requested. If the Engineer discovers items incomplete and/or not in accordance with this checklist, the drawings, or the specifications, the Contractor will be backcharged for the Engineer's time and expenses.

HS/MS Addition & Secure Vestibule
Freeland Schools

**SYSTEMS COMPLETION
CHECKLIST**

Inspection/Review Item	Notice Required	Installing Contractor		Date	Owner's Representative Signature	Remarks
		Name	Signature			
Plumbing Systems, Continued						
Pipe Labeling and Valve Tagging Identification	When completed					Verify system identification is complete per specification and valve chart submitted.
Owner's Training	7 days					Verify that Owner has been instructed on operation and maintenance of systems.

By signing this form, the Contractor is certifying that he has personally witnessed completion of that item, and it is complete and complies with all respects to the drawings and specifications.

All items are to be signed off on and submitted to MacMillan Associates Inc. before a final project walk-thru by the Engineer is requested. If the Engineer discovers items incomplete and/or not in accordance with this checklist, the drawings, or the specifications, the Contractor will be backcharged for the Engineer's time and expenses.

SECTION 22 05 53 - PLUMBING SYSTEM IDENTIFICATION

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Nameplates.
- B. Tags.
- C. Stencils.
- D. Pipe Markers.

1.2 PRODUCTS INSTALLED BUT NOT FURNISHED UNDER THIS SECTION

- A. Medical Gas Systems: Supply of pipe labels for placement by this Section.

1.3 REFERENCES: Material and/or equipment specified in this section shall meet or exceed one or more of the property requirements or installation requirements of the following specifications/publications as applicable to the specific product or end use:

- A. ANSI or equal standards for the Identification of Piping Systems.

1.4 SUBMITTALS

- A. Submit list of working, symbols, letter size, and color coding for mechanical identification.
- B. Submit valve chart and schedule, including valve tag number, location, function, and valve manufacturer's name and model number.
- C. Product Data: Provide manufacturers catalog literature for each product required.
- D. Manufacturer's Installation Instructions: Indicate special procedures, and installation.

PART 2 PRODUCTS

2.1 NAMEPLATES

- A. Description: Laminated three-layer plastic with engraved black letters on light contrasting background color. Furnish and install on all mechanical equipment.

2.2 TAGS

- A. Metal Tags: Brass with stamped letters; tag size minimum 1½ inch diameter with smooth edges.
- B. Chart: Typewritten letter size list in anodized aluminum frame.

2.3 STENCILS

- A. Stencils: With clean cut symbols and letters of following size:
1. $\frac{3}{4}$ to $1\frac{1}{4}$ inch Outside Diameter of Insulation or Pipe: 8 inch long color field, $\frac{1}{2}$ inch high letters.
 2. $1\frac{1}{2}$ to 2 inch Outside Diameter of Insulation or Pipe: 8 inch long color field, $\frac{3}{4}$ inch high letters.
 3. $2\frac{1}{2}$ to 6 inch Outside Diameter of Insulation or Pipe: 12 inch long color field, $1\frac{1}{4}$ inch high letters.
 4. 8 to 10 inch Outside Diameter of Insulation or Pipe: 24 inch long color field, $2\frac{1}{2}$ inch high letters.
 5. Over 10 inch Outside Diameter of Insulation or Pipe: 32 inch long color field, $3\frac{1}{2}$ inch high letters.
 6. Ductwork and Equipment: $2\frac{1}{2}$ inch high letters.
- B. Stencil Paint shall be semi-gloss enamel, colors conforming to ASME A13.1.

2.4 PIPE MARKERS

- A. Color: Match existing or conform to ANSI/OSHA standards.
- B. Plastic Pipe Markers: Factory fabricated, flexible, semi-rigid plastic, preformed to fit around pipe or pipe covering; minimum information indicating flow direction arrow and identification of fluid being conveyed.
- C. Plastic Tape Pipe Markers: Flexible, vinyl film tape with pressure sensitive adhesive backing and printed markings.
- D. Underground Plastic Pipe Markers: Bright colored continuously printed plastic ribbon tape, minimum 6 inches wide by 4 mil thick, manufactured for direct burial service.

2.5 CEILING TACKS

- A. Description: Steel with $\frac{3}{4}$ inch diameter color coded head.
- B. Color code as follows:
1. Green - Plumbing valves

PART 3 EXECUTION

3.1 PREPARATION

- A. Degrease and clean surfaces to receive adhesive for identification materials.
- B. Prepare surfaces as required by manufacturer's installations for stencil painting.

3.2 INSTALLATION

- A. Install plastic nameplates with corrosive-resistant mechanical fasteners, or adhesive. Apply with sufficient adhesive to ensure permanent adhesion and seal with clear lacquer.
- B. Install tags with corrosion resistant chain.

- C. Install plastic pipe markers in accordance with manufacturer's instructions.
- D. Install plastic tape pipe markers complete around pipe in accordance with manufacturer's instructions.
- E. Install underground plastic pipe markers 6 to 8 inches below finished grade, directly above buried pipe.
- F. Identify each piece of equipment with plastic nameplates. Small devices, such as in-line pumps, may be identified with tags.
- G. Identify valves in main and branch piping with tags.
- H. Identify piping, concealed or exposed, with plastic tape pipe markers or stenciled painting. Identify service, flow direction, and pressure. Install in clear view and align with axis of piping. Locate identification not to exceed 10 feet on straight runs including risers and drops, adjacent to each valve and tee, at each side of penetration of structure or enclosure, and at each obstruction.
- I. Provide ceiling tacks to locate valves above T-bar type panel ceilings. Locate in corner of panel closest to equipment.

A. END OF SECTION

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SECTION 22 06 00 - PLUMBING SPECIALTIES

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. General information for piping systems, plumbing fixtures, backflow preventers, water heaters, sump and sewage pumps, etc. and general installation information.

1.2 FIELD MEASUREMENTS

- A. Field verify all equipment and fixture locations.
- B. Confirm that mill work is constructed with adequate provisions for the installation of countertop plumbing fixtures.
- C. Confirm all mounting heights and locations of plumbing fixtures to meet all barrier free and American Disabilities Act codes and regulations.

1.3 EQUIPMENT, FIXTURE & MISCELLANEOUS SPECIFICATIONS

- A. All equipment, plumbing fixtures, specialties, etc. that have been scheduled on drawings shall have the manufacturer's specification automatically included as part of this specification. All "approved substitute" or "voluntary alternate" equipment fixtures, etc. shall meet the capacities, quality, etc. of the scheduled items specification and capacities.

PART 2 PRODUCTS

2.1 PIPE AND PIPE FITTINGS

- A. See Section 22 10 00 for Plumbing Piping.

2.2 MATERIALS AND FINISH

- A. Fixtures shall be of best quality vitreous china, acid resisting enameled cast iron or stainless steel, free from discoloration, chips, dents, warps, flaws, cracks, scratches, etc. or other blemishes. All vitreous china and enamel shall be white unless otherwise noted. Fixtures shall have manufacturer's guarantee label or trademark indicating first quality.
- B. All exposed pipe, fittings, traps, wastes, faucets, valves, handles, escutcheons, bolts, screws and accessories shall be polished chrome plated brass unless noted otherwise. Exposed traps shall be chrome plated brass, adjustable with cleanout plug and escutcheon.

2.3 PLUMBING FIXTURES - GENERAL

- A. Furnish all fixtures as shown and scheduled on drawings.

- B. Unless noted as “no substitutions”, similar fixtures by the following manufacturers with equal or better qualities will be accepted as equal for:
1. Drainage Specialties - Josam, Sioux Chief, Smith, Wade, Watts, Zurn
 2. Plumbing Fixtures - American Standard, Bradley, Crane, Elkay, Fiat, Florestone, Just, Kohler, Mansfield, Moen Commercial, ProFlo, Sloan, Stern-Williams, Zurn.
 3. Plumbing Specialties – Schier, Watts, Wilkins, Zurn.
 4. Flush Valves - Delany, Delta, Sloan (Royal), Zurn, American Standard.
 5. Faucets - American Standard, Chicago, Delta, Sloan, T & S, Woodford, Zurn.
 6. Toilet Seats - Bemis, Centoco, Church, Olsonite, Kohler.
 7. Mixing Valves and Accessories - Powers, Symmons, Watts, Zurn, Reliance, Conbraco Appollo.
 - a. See 2.22 (this section) for emergency showers and eyewash stations.
 8. Electric Water Coolers and Drinking Fountains: Elkay, Halsey Taylor, Haws, Oasis.
- C. Provide all chair carriers, mounting hardware, etc. as required by the plumbing fixtures and wall construction. Where fixtures are located on walls, furnish and install suitable steel shapes well anchored in place and supported from floor as necessary to support fixtures. Each fixture shall be supported solidly and shall be sufficiently strong to withstand severe usage.
- D. Where plumbing fixtures occur in walls with pipe spaces in back of same, the supports for fixtures shall consist of chair carriers built into the wall with bolt projecting through face of wall for attachments of fixture brackets.

2.4 BACKFLOW PREVENTER

- A. Furnish and install type and quantity as shown on drawings or required by code. The Mechanical Trades shall furnish certification of all backflow preventers.
- B. Reduced Pressure Backflow Preventers: ANSI/ASSE 1013 and AWWA C506; bronze body with bronze and plastic internal parts and stainless steel springs; two independently operating, spring loaded check valves; diaphragm type differential pressure relief valve located between check valves; third check valve which opens under back pressure in case of diaphragm failure; non-threaded vent outlet; assembled with two gate valves, strainer and four test cocks.
- C. Double Check Valve Assemblies: ANSI/ASSE 1012 and AWWA C506; Bronze body with corrosion resistant internal parts and stainless steel springs; two independently operating check valves with intermediate atmospheric vent.

2.5 WATER HAMMER ARRESTORS

- A. Furnish and install on systems as required by local and state plumbing codes, latest edition.
- B. ANSI A112.26.1; sized in accordance with PDI WH-201, precharged suitable for operation in temperature range -100 to 300 degrees F and maximum 250 psig working pressure.

2.6 DOMESTIC WATER HEATER

- A. Refer to drawings and furnish all.

2.7 NATURAL GAS FIRED DOMESTIC HOT WATER HEATER

- A. Tank construction shall be of multi-flue design and shall have an approved working pressure of 150 psig.
- B. The Tank shall be glass-lined and fired to 1600°F for complete fusion of glass to steel and shall have two or more magnesium anodes to provide electrolytic protection.
- C. The entire water heater shall be AGA approved and shall meet or exceed the ASHRAE Standard for energy efficiency. Insulation shall be foam type.
- D. Controls shall consist of an operational thermostat, automatic reset high limit, secondary overheat control, and gas valve with 100% safety feature.
- E. Water heaters up to 400,000 BTUH shall have self-generating controls and require no external power source. Water heaters over 400,000 BTUH shall be provided with a flame safeguard pilot supervision providing for second gas shut-down on pilot failure (in accordance with AGA).
- F. Water heaters shall have hand hole cleanouts and slide-out burner tray to allow inspection cleaning and servicing.
- G. Water heater shall have a 3 year limited warranty.
- H. Domestic hot water heaters shall be Lochinvar Charger commercial gas water heaters or approved equal. See drawing schedules for capacities.

2.8 DOMESTIC WATER HEATER

- A. A domestic hot water supply shall be provided by a Lochinvar Efficiency-Pac Packaged Water System. The system shall consist of an Efficiency+ EW Series Water Heater, a jacketed and insulated Lock-Temp Storage Tank and a bronze fitted circulating pump. The components shall be factory assembled as a unit with the water heater mounted on top of the tank, pre-piped, pressure tested and ready for installation. See drawing schedule for model numbers and capacities.
- B. The water containing section shall be of a "Fin Tube" design, with straight copper tubes having extruded integral fins spaced seven (7) fins per inch. The tubes shall terminate

into a one piece, lined, cast iron header. There shall be no bolts, gaskets or "O" rings in the header configuration. There shall be access to the front header of the heat exchanger for the purposes of inspection, cleaning or repair. The heat exchanger shall be mounted in a stress free jacket assembly in order to provide a "free floating design" able to withstand the effects of thermal shock. The assembled heat exchanger shall be hydrostatically tested to 240 psi water pressure. The water heater shall bear the ASME "H" stamp for 160 psi working pressure and shall be National Board listed. The complete heat exchanger assembly shall carry a five (5) year limited warranty. The heat exchanger shall be equipped with an outlet thermometer to monitor discharge water temperature.

- C. The combustion chamber shall be sealed and completely enclosed with "Loch-Heat" ceramic fiberboard insulation. A burner/flame observation port shall be provided. The burners shall be a premix design, constructed of high temperature stainless steel and fire on a horizontal plane. The water heater shall have an integral combustion air blower to precisely control the fuel/air mixture for maximum efficiency.
- D. The water heater shall be constructed with a heavy gauge galvanized steel jacket assembly. All steel jacket components must be galvanized on both sides. The exterior of the jacket assembly shall be finished in a 3-coat acrylic enamel finish. The jacket design shall allow single unit venting connection without the use of external draft hood devices.
- E. The water heater shall be certified and listed by the American Gas Association under the latest edition of the applicable ANSI test standard. The water heater shall comply with the energy efficiency requirements of the latest edition of the ASHRAE 90.1 Standard. The water heater shall be certified and listed in Canada by the Canadian Gas Association under the latest edition of applicable CGA Standards. The water heater shall operate at a minimum of 85% thermal efficiency.
- F. Standard operating controls shall include an immersion type operating aquastat and high limit control. The control panel shall have a master power switch. The ignition control shall have four LED lights to indicate sequential operation and diagnostics on control sensed malfunctions. The control panel shall have a terminal strip for easy field connection of remote temperature controls and field installed safety controls.
- G. The standard control system shall include a hot surface ignition system with full flame monitoring capability. The main combination gas valve shall have redundant valve seats and a built in low gas pressure regulator as standard. The gas pressure regulator portion of the main gas valve shall be referenced to the combustion air fan. Additional standard controls shall include a combination low air and blocked flue pressure switch to monitor fan operation, low voltage transformer for the control circuit and an ASME temperature and pressure relief valve. The manufacturer shall verify proper operation of the burners, all controls and the heat exchanger by connection to water and venting for a factory fire test prior to shipping. A quality test report shall be shipped with each unit.
- H. A 24 VAC control circuit and components shall be used. All components shall be easily accessed and serviceable from the front of the jacket. Access to the controls shall be provided by a quick access, quarter turn knob on the control panel cover.

- I. The water heater shall be installed and vented with a E+ vent system with a conventional negative draft stack terminating at the rooftop and a separate pipe to supply combustion air directly to the heater from the outside. The vent pipe and all accessories shall be Type "B" double wall material. The air inlet pipe may be PVC, CPVC, ABS, dryer vent or sealed Type "B" or galvanized vent pipe. The air inlet may terminate on the (rooftop) (sidewall) with the manufacturers specified air inlet cap assembly. Direct Vent system with sidewall termination of both the vent and combustion air. The flue shall be an AL29-4C sealed vent material and accessories terminating at the sidewall with the manufacturers specified vent cap. A separate pipe shall supply combustion air directly to the heater from the outside. The air inlet pipe may be PVC, CPVC, ABS, dryer vent or sealed Type "B" or galvanized vent pipe. The air inlet must terminate on the sidewall with the manufacturers specified air inlet cap; (d) Direct Vent system with vertical rooftop termination of both the vent and combustion air. The flue shall be AL29-4C sealed vent material, cap and accessories terminating at the rooftop. A separate pipe shall supply combustion air directly to the heater from the outside. The air inlet pipe may be PVC, CPVC, ABS or sealed Type "B" or galvanized vent pipe. The air inlet must terminate on the rooftop with the manufacturers specified air inlet cap assembly.
- J. The water heater shall be certified for low emissions of oxides of nitrogen (NOX).
- K. The water heater shall be mounted on top of the storage tank, pre-piped to the tank with copper pipe and equipped with a factory installed 1/6 hp circulating pump to insure scale-free heater performance. The pump shall be bronze-fitted and provided for operation on 120 volt, 60 cycle, 1 phase power supply. The assembled heater shall have a 2" copper cold water inlet connection and a 1½" copper outlet connection. The water heater will have a 150 psi pressure only relief valve and the storage tank will have a 150 psi temperature and pressure relief valve. All relief valves are sized per ASME requirements and factory installed.
- L. The storage tank shall be a vertical Lochinvar Lock-Temp "Energy Saver" tank having a storage capacity OF (85) (100). The tank shall be constructed with a baffled inlet, designed to receive all circulation from the water heater and eliminate turbulence in the tank. The baffled tank shall supply 80% of tank capacity without a drop in outlet temperature, regardless of rate of draw.
- M. The storage tank shall be constructed in accordance with standard construction requirements. The tank shall be designed to withstand a hydrostatic test pressure of two times the working pressure without leakage. The storage tank shall be independently tested and certified by a nationally recognized test agency and shall have a working pressure of 150 psi. The tank shall be furnished with the following connections, two circulating connections pre-piped to the water heater, one 1½" copper hot water outlet, one relief valve connection, one ¾" NPT aquastat opening and one ¾" NPT drain connection. The tank shall be furnished with a handhole for ease of inspection, clean out and service. The interior of the storage tank shall be glass lined and fired to 1600°F to insure a molecular fusing of glass and steel, furnished with a magnesium anode and carry a five (5) year limited warranty.
- N. The Lock-Temp storage tank shall be furnished with a factory installed heavy gauge steel jacket finished with three coats of acrylic enamel. The storage tank shall be completely encased in a minimum of 2" thick, high density polyurethane R-16 foam

insulation to meet the energy efficiency requirements of the latest edition of the ASHRAE 90.1 Standard.

The (Optional) Firing Control System shall be M-9 electronic control with hot surface ignition with Two-Stage Firing.

2.9 DOMESTIC WATER HEATER AND STORAGE TANK

- A. Refer to drawings and furnish all. Water heater shall be a Lochinvar Copper-fin II Model 990,000-2,070,000 BTU.
1. The water containing section shall be of a "Fin Tube" design, with straight copper tubes having extruded integral fins spaced seven (7) fins per inch. The tubes shall terminate into a one piece, glass-lined, cast iron header. There shall be no bolts, gaskets or "O" rings in the head configuration. There shall be access to the front header of the heat exchanger for the purposes of inspection, cleaning or repair. The heat exchanger shall be mounted in a stress free jacket assembly in order to provide a "free floating design" able to withstand the effects of thermal shock. The water heater shall bear the ASME "HLW" stamp for 160 psi working pressure and shall be National Board listed. The complete heat exchanger assembly shall carry a five (5) year warranty.
 2. The combustion chamber shall be sealed and completely enclosed with "Loch-Heat™" ceramic fiberboard insulation. A burner/flame observation port shall be provided. The burners shall be constructed of a high temperature stainless steel and fire on a horizontal plane. The water heater shall have multiple combustion air blower to precisely control the fuel/air mixture for maximum efficiency.
 3. The water heater shall be constructed with a heavy gauge galvanized steel jacket assembly. All steel jacket components must be galvanized on both sides. The exterior of the jacket assembly shall be finished in a 3-coat acrylic enamel finish. The jacket design shall allow single unit venting connection without the use of external draffhood devices.
 4. The water heater shall be certified and listed by The American Gas Association under the latest edition of the applicable ANSI test standard. It shall comply with the energy efficiency requirements of the latest edition of the ASHRAE Standard and shall operate at a minimum of 85% thermal efficiency.
 5. Standard operating controls shall include a 4 stage digital temperature controller with an LCD display to control water temperatures and a safety high limit control. The digital temperature control shall display water inlet temperature and heater outlet temperature as well as individual stage set points and differentials. The digital controller shall have a +/-1°F accuracy. The control panel shall have a master switch with an indicating light and sequential and diagnostic indicator lights.
 6. The water heater shall provide 4 individual stages of control. Each stage shall provide for on/off control of individual valves and combustion air fans to maintain maximum efficiency at all stages of operation.

7. The standard control system shall include redundant Proven Pilot Ignition systems with full flame monitoring capability. Each Ignition system shall be able to function independently in the event of a failure in one system. Multiple main gas valves with redundant valve seats and built in low gas pressure regulators shall be supplied as standard. Additional standard controls shall include a flow switch, blocked flue pressure switch, low air pressure switch for each fan, low voltage transformer for the control circuit, 7 amp circuit breaker and an ASME temperature and pressure relief valve. The manufacturer shall verify proper operation of the burners, all controls and the heat exchanger by connection to water and venting for a factory fire test prior to shipping. A quality test report shall be shipped with each unit.
8. A 24 VAC control circuit and components shall be used. All components shall be easily accessed and serviceable. All components shall have multi-pin plug in type connectors to ease service, troubleshooting and lower removal and replacement cost. The water heater must be able to maintain a minimum of 50% operating capacity in the event of a failure of any one (1) gas control component, ie: gas valve, combustion air fan, igniter or pressure switch.
9. The units control panel shall contain the controllers LCD display and Diagnostic Information Center containing 14 individual indicators of current unit status.
10. The water heater shall be approved for indoor or outdoor installation. It shall be approved for side-wall, DirectAire Vertical, DirectAire Horizontal and conventional venting (see mechanical detail). Venting shall be classified Category I, negative draft, non-condensing, to use type "B" double wall venting materials.
11. The water heater shall have an independent laboratory rating for Oxides of Nitrogen (NOx) of less than 9.9 ppm corrected to 3% O².
12. The Firing Control System shall be F14. Prefix "F" denotes Standard On-Off Firing. The F14 firing control system provides acceptable safety controls and gas train components to meet the requirements of Industrial Risk Insurers (IRI). All additional components added to the standard M-9 C.G.A./ANSI certified control system. Water heaters with inputs greater than 400,000 Btu/hr are provided with all additional components listed for M-13 controls plus an IRI acceptable safety shutoff gas valve, a normally open vent valve piped between the main gas valves and high and low gas pressure switches. All components factory mounted and wired.
13. Temperature gauge shall be mounted on the front of the cabinet with tank mounted remote sensor to register water temperature in the tank.
14. Pressure gauge shall be mounted on the front of the cabinet with tank mounted remote sensor to register the water pressure within the tank.
15. Water heater shall be furnished with:
 - a. Alarm bell
 - b. Solid state intermittent pump controller. Stops tank/heater water circulation during periods of no hot water demand.

- c. Manual reset high limit.
 - d. Pump delay.
 - e. Low water cutoff
 - f. Contacts for any failure.
 - g. Vertical DirectAire venting kit including adaptor flange and inlet air weather cap.
 - h. Outdoor vent cap.
- C. Storage Tank - shall be a Lochinvar Lock-Temp "Energy Saver" tank. The tank shall be constructed with an inner chamber designed to receive all circulation to and from the water heater to eliminate turbulence in the tank. The baffled tank shall supply 80% of tank capacity without a drop in outlet temperature, regardless of rate draw.
- 1. The storage tank shall be constructed in accordance with ASME requirements stamped and registered with the National Board of Boiler and Pressure Vessel Inspectors. It shall have a working pressure of 150 psi. and shall be cement lined and carry a five (5) year limited warranty.
 - 2. The storage tank shall have 316SS top outlet flange, 12"x16" manhole, lifting lugs, magnesium anodes, base ring, and tappings as indicated on drawings. The temperature gauge shall be mounted on the front of the cabinet with tank mounted remote sensor to register water temperature in the tank. Pressure gauge shall be mounted on the front of the cabinet with tank mounted remote sensor to register the water pressure within the tank. Solid state intermittent pump controller. Stops tank/heater water circulation during periods of no hot water demand.

2.10 ELECTRIC DOMESTIC HOT WATER HEATER

- A. Tank shall be 300 psi test pressure, 150 psi W.P. approved.
- B. Tank shall be lined glass lined and have 1.315" diameter "Dow" magnesium tank saver.
- C. Heating element shall be copper sheath, tin coated immersion type, maximum 75 watts per square inch.
- D. Water heater shall have an energy cut-off shut down power if tank water temperature reached 205°F.
- E. Water heater shall have all elements and controls fused in accordance with UL requirements.
- F. Water heater shall be approved for 180° outlet temperature. See drawings for operating temperature.
- G. Water heater shall have a factory installed ASME temperature and pressure relief valve.
- H. Furnish hand hole cleanout.
- I. Tank shall have factory installed 3" thick insulation to meet ASHRAE 90.1B energy efficiency standards with heavy gauge steel jacket with baked-on enamel finish.

- J. Water heater shall have a hinged access door to electric controls.
- K. Water heater shall have surface mounted thermostat.
- L. Internal wiring shall be composed of solid copper wire having insulation material rated at 600 volt, 200°C.
- M. Water heater shall have Underwriter's Laboratories, Inc. approval.
- N. Furnish 3 year limited warranty.
- O. Domestic hot water heaters shall be Lochinvar hi-power commercial electric water heater or approved equal. See drawings schedules for capacities.

2.11 DOMESTIC HOT WATER STORAGE TANK

- A. Tank shall be constructed with an inner chamber from which all circulation to and from the water heater shall be done.
- B. Tank manufacturer shall guarantee the tank to deliver 80% of tank capacity without a drop in outlet temperature, regardless of rate of draw.
- C. The tank shall be constructed in accordance to ASME requirements and so labeled with a working pressure of 150 psig.
- D. The tank lining shall be glass-lined with a 5 year guarantee.
- E. Tanks larger than 42" diameter shall have a 11"x15" manhole.
- F. Furnish V-line insulating couplings at all tank inlets and outlets.
- G. See drawings for sizes and capacities and furnish inlet and outlet tapplings to meet pipe sizes and all code required connections. Furnish base ring for tank support when vertical tanks are scheduled on drawings.
- H. Domestic hot water storage tanks shall be Lochinvar lock-temp glass lined or approved equal.

2.12 NATURAL GAS DOMESTIC WATER HEATER

- A. Water heater shall have the following features:
 - 1. Factory installed nipples with dielectric connectors.
 - 2. Magnesium tank saver anodes.
 - 3. Glass lined tank.
 - 4. 300 psi tested tank for 150 psi working pressure.
 - 5. Heavy steel jacket with acrylic paint finish.
 - 6. Robert Shaw adjustable thermostat with automatic overheat safety device.
 - 7. Energy saving pilot.
 - 8. Vent cap.
 - 9. Relief valve tapping.

10. Dip tube.
11. Heat hoarder flue baffle.
12. Polyurethane closed cell foam insulation.
13. Access door.
14. Radial port burner.
15. Water heater leg supports.
16. 5 year warrantee.
17. AGA design certified.

B. Water heater shall meet or exceed ASHRAE and other energy efficiency requirements.

2.13 DOMESTIC WATER HEATER

- A. Water heater shall utilize power venting with PVC pipe. Use 2" PVC up to 20 foot lengths, 3" PVC pipe 20 feet to 40 feet.
- B. Water heater shall have intermittent pilot ignition, factory installed dielectric nipples, glass lined tank, non-CFC foam insulation, temperature and pressure relief valve opening on side of tank and flue baffle.
- C. Design of water heater shall be certified by A.G.A.
- D. Include five year warrantee.
- E. Domestic water heaters shall be Lochinvar Direct Vent Residential Water Heater or equal. See drawing schedules for capacities.

2.14 DOMESTIC WATER HEATER

- A. Three year limited warranty against tank leakage, on commercial applications.
- B. Steel Jacket - Almond color acrylic finish with accenting trim color.
- C. 98% Efficient Immersion Type Heating Element - copper sheathed, tin coated.
- D. Thermostat - Adjustable, set at 110°F. Controls provide automatic overheat safety control with manual reset.
- E. 300 psi Tested Tank - Permits 150 psi working pressure.
- F. Glasslined Tank - glass lining bonded to tank interior, protects against rust and corrosion.
- G. Self draining cold water inlet.
- H. Separate relief valve topping.
- I. All models U.L. Listed.
- J. All models feature two factory installed heat traps.

- K. Domestic water heaters shall be Lochinvar Junior models or equal. See drawing schedules for capacities.

2.15 DOMESTIC WATER HEATER

- A. Three year limited warranty against tank leakage, on commercial applications.
- B. Compact Size - 12½" x 9" x 10¼".
- C. Mounts easily under sinks, inside cabinets, etc.
- D. Glass lined storage tank, fully encapsulated in polyurethane foam.
- E. Deep draw steel tank.
- F. Operates on standard household current - 110-120V-1500W.
- G. Temperature range - 110°F - 170°F.
- H. Rustproof PVC jacket.
- I. ¾" pipe thread nipple for easy installation.
- J. ¾" relief valve fitting.
- K. Standard power cord connection.
- L. 300 psi tested tank - working pressure 150 psi.
- M. High efficiency and low operating cost.
- N. Light weight - less than 12 pounds.
- O. Domestic water heaters shall be Lochinvar Mighty - 2 Model or equal. See drawing schedules for capacities.

2.16 DOMESTIC WATER HEATER

- A. Manufacturer: Teledyne Laars Mighty Therm.
- B. Heater shall be atmospheric draft, copper finned water tube factory packaged water heater complete with natural gas burning equipment, safety controls and appurtenances as hereinafter specified.
- C. The water tube heat exchanger shall be a straight tube design with no blind pockets, with 7/8" I.D. integral finned copper tube of .33" minimum fin height. The tubes shall be rolled directly into ASME headers rated for 160 psi working pressure. The heat exchanger shall be of low water volume explosion proof design. All gaskets shall be nonmetallic, outside the jacket and separated from the combustion chamber by at least 3½" to eliminate deterioration from heat. Headers shall have covers permitting visual inspection and cleaning of internal surfaces.

- D. The piping side header shall have removable flanges to facilitate maintenance and permit vertical removal of complete heat exchanger for service or replacement.
- E. A flow sensing device shall be factory mounted as an integral part of the heat exchanger assembly to stop the flow of gas to the burners whenever water flow is inadequate or interrupted.
- F. All gas manifolds shall be outside the combustion chamber and all primary combustion air shall be drawn directly from outside the heater, to prevent derating due to excessive heating of gas and air entering the burners.
- G. Burners shall be of the atmospheric type and constructed of stainless steel.
- H. The combustion chamber shall be lined with a cast refractory of at least two inches in thickness to retain heat and approved for service temperatures of not less than 2000°F. The outer jacket shall be a unitized shell, finished with acrylic thermoset paint baked at not less than 325°F. The frame shall be constructed of galvanized steel for strength and protection.
- I. Heater shall have an integral draft diverter for gas-tight connection. Installer to provide draw band connection.
- J. Firing mode shall be standard 2-stage.
- K. Ignition safeguard system shall be intermittent electronic supervision with electronic flame supervision to respond to flame failure in less than 0.8 seconds.
- L. Controls shall meet requirements of ANSI Standard 721.13 and ASME CSD-1b standards and include ignition safeguard, high water temperature limit, operating temperature control, gas pressure regulator, redundant electric gas valve water flow sensing and manual shut off gas valve. Standard control system operates on 24 VAC power from class 2 transformer.

2.17 DOMESTIC WATER HEATER

- A. Storage heater shall be Cemline Series SWH; factory assembled and packaged. Water heater shall be constructed in accordance with ASME code for a working pressure of 125 psig. The packaged water heater shall be with a vertical steel tank, cement lined with an 11"x 15" manhole, with stainless threaded opening, Cu (in) + Cu (out) tubing, ¾" O.D. tubes, copper lined tube sheet, and steel or cast iron coil head.
- B. Heater shall be mounted on a steel support skid and shall have concealed lifting lugs. Heater shall be insulated with 3" fiberglass protected by an enameled metal jacket, 20 gauge minimum thickness, with access panel to the manhole. Heater shall be factory assembled and piped including incoming steam strainer, pilot operated temperature regulator, main and auxiliary float and thermostatic steam traps, and condensate strainer. Coil shall have copper wrapper, shall be baffled and shall have an integral valved circulator to circulate the water across the coil into the bottom of the tank.
- C. Heater shall be provided with a field programmable digital electronic limit control with LCD readout and digital thermometer.

- D. Heater shall be furnished with a water pressure gauge and ASME pressure temperature relief valve of sufficient size to relieve total BTU input of the coil.
- E. Furnish water heater with additional safety system designed to relieve excessively heated water from the vessel. The safety system shall be field programmable for set point and differential and shall be of the electronic type.
- F. Heater shall be provided with a vacuum breaker.
- G. Manufacturer shall assume responsibility for correct sizing of components to assure performance designated in design criteria.
- H. See drawings for capacities and schedule.

2.18 SUMP AND SEWAGE PUMPS

- A. Refer to drawings and furnish all.

2.19 SUMP PUMP

- A. Furnish and install a duplex sump pump system as shown and scheduled on drawings. The pumps shall be stainless steel fitted and furnished for a pit depth as scheduled on drawings and furnished with an above cover discharger terminating connections. Unless otherwise noted on drawings.
- B. The pumps casing shall have an integrally cast discharge flange. The suction strainer shall be fabricated 304 stainless steel with iron bottom plate. The impeller shall be semi-open, and capable of passing solids. The impeller shall contain a balancing ring and be cast 316 stainless steel and be secured to shaft by tape fit, with Woodruff key, castellated nut, washer and cotter pin. All shafting shall be 316 stainless steel and shall be a minimum of 1¼" diameter between the coupling and impeller. Column pipe shall be steel with welded flanges machined for registered fit. The pump bearing shall be of bronze. Bearing housing shall be of 316 stainless steel.
- C. An intermediate bearing of the same materials as the pump bearing must be provided on pumps in excess of 6'-0" in length. One intermediate bearing for each additional 5'-0" of pump length shall be furnished. Pump and intermediate bearing(s) shall be water lubricated through separate lubrication lines terminating at the cover plate. The motor support shall be of cast iron, machined to assure positive alignment of motor and pump shaft, fitted with a high thrust angular contact bearing with moisture-proof enclosure and grease seals. External impeller and shaft axial adjustment shall be provided. Pump operation shall be controlled by a mechanical alternator and float switch combination.
- D. Float rod shall be 304 stainless steel. Float shall be 304 stainless steel. Float stops shall be 304 stainless steel. The flexible coupling between the motor and pump shafts shall be Woods Sure-Flex spacer type coupling.
- E. Pumps shall be driven by a standard "C" face vertical electric motor.
- F. Pump basin and control panels shall be as scheduled on drawings.

- G. Pumps shall be Series 1540 as manufactured by ITT Bell and Gossett.

2.20 SEWAGE EJECTOR

- A. Furnish and install a duplex sewage ejector system as shown and scheduled on drawings. The pumps shall be capable of handling solids, constructed of iron construction, and designed for a pit depth as scheduled on drawings. Furnish with an above cover discharge terminating connection unless otherwise noted on drawings.
- B. The pump casing shall have an integrally cast discharge flange. The impeller shall be enclosed, non-clog and capable of passing solids. The impeller shall be cast in iron and be secured to shaft by taper fit, with Woodruff key, castellated nut, washer and cotter pin. All 1¼" diameter between the coupling and the impeller. Column pipe shall be Schedule 40 steel with welded flanges
- C. An intermediate bearing of the same materials as the pump bearing must be provided on pumps in excess of 6'-0" in length. One intermediate bearing for each additional 5'-0" of pump length shall be furnished. Pump and intermediate bearing(s) shall be water lubricated through separate lubrication lines terminating at the cover plate. The motor support shall be of cast iron, machined to assure positive alignment of motor and pump shaft, fitted with a high thrust angular contact bearing with moisture-proof enclosure and grease seals. External impeller and shaft axial adjustment shall be provided. Pump operation shall be controlled by mechanical alternator and float switch with combination enclosure.
- D. Float rod shall be 304 stainless steel. Float shall be 304 stainless steel. Float stops shall be 304 stainless steel. The flexible coupling between the motor and pump shafts shall be Woods Sure-Flex spacer type coupling, protected by a coupling guard. Pumps shall be driven by a standard "C" face, vertical electric motor.
- E. Pump basin and control panel shall be as scheduled on drawings.
- F. Pumps shall be Series 1545 as manufactured by ITT Bell and Gossett.

2.21 ACID WASTE DILUTION TANK

- A. Manufacturers: Orion, Zurn, Schier.

2.22 EMERGENCY SHOWERS AND EYEWASH STATIONS

- A. Emergency showers and eyewash stations shall conform to ISEA Z358.1.
- B. Flushing fluids must be of tepid temperatures (between 60°F and 100°F).
- C. Wash connections shall not be required for emergency showers and eyewash stations.
- D. Fixtures shall be installed with emergency rated thermostatic mixing valves to achieve tepid water temperature supply.

PART 3 EXECUTION

3.1 PREPARATION

- A. Coordinate cutting and forming of roof and floor construction to receive drains to required invert and rim elevations.
- B. Coordinate all rough-in and/or final connections to equipment and plumbing fixtures. Plumbing fixtures shall be located as required to meet all barrier free and American Disabilities Act codes and regulations.
- C. Coordinate all piping invert elevations, location, routing, etc. to allow proper drainage from all plumbing fixtures to sewer mains. Verify all services existing and new for elevations, locations, etc. before commencing installation.

3.2 FIXTURE CONNECTIONS

- A. In general, unless otherwise noted on the drawings, the sizes of all the branch connections to fixtures shall be no smaller than those listed in the following schedule and as required by local and state plumbing codes, latest edition:

Fixture	Waste	Vent	C.W.	H.W.
Lavatory	1¼"	1¼"	½"	½"
Sinks (General)	1½"	1½"	½"	½"
Janitor's Service Sink	3"	2"	½"	½"
Water Closet-Flush Valve	4"	2"	1¼"	---
Urinal-Flush Valve	2"	2"	1"	---
Wall Hydrants (Hose Bibb)	---	---	¾"	---
Drinking Fountain	1½"	1½"	½"	---
Showers	2"	2"	¾"	¾"

3.3 INSTALLATION

- A. Plumbing fixtures and trim shall be protected against damage during construction. Fixtures damaged during this period shall be replaced.
- B. All valves, waste and water supply piping servicing fixtures exposed beyond face of finished walls shall be brass, nickel, and chromium plated. Where fixtures are mounted in countertops and cabinet work concealing valves and piping, chrome plated brass finishes are not required.
- C. All fixtures shall be independently valved with either integral stops or brass stops.
- D. Waste connections to floor or wall outlet fixtures shall be gas and water-tight; fastened with an approved setting compound, gasket or washer. Rubber gaskets or putty are not acceptable. The fixture shall be set the proper distance from the wall or floor.
- E. Where flush valves are specified with fixtures, supply to valve in each room shall be set at same height for that type of fixture, and valve shall be set in place so that center line of valve discharge is directly above center line of fixture spud. Bending of nipple between valve and spud to achieve connection will not be permitted.

- F. All brackets, cleats, plates, anchors, etc. required to support fixtures or piping rigidly in place shall be provided as work of this section and shall be installed behind finished walls.
- G. Provide and install basic fixtures from one major fixture manufacturer. Also, accessories such as faucets, strainers, stops, traps, etc. shall be manufactured by one major company where possible.
- H. All fixtures shall be set rigid, tight, plumb, level and true to assure rigidity and permanence. Provide chair carriers as manufactured by Wade, Josam, Zurn, or J.R. Smith for wall mounted fixtures. Carriers for wall mounted lavatories, drinking fountains, water coolers, and urinals shall have dual foot supports, tubular uprights, adjustable headers, alignment trusses, and all necessary accessories. Lavatory carriers shall be with concealed arms. Urinal carriers shall be with bearing plate. Water cooler and drinking fountain carriers shall be as required for proper support.
- I. All wall mounted fixtures shall be tested by bearing the weight of 500 pounds without sagging or pulling away from the wall. Damage resulting from this test shall be made good by this contractor. All other piping and fixtures shall be secured to walls with wall plates, wall hangers and approved expansion shields and bolts.
- J. Connections between earthenware fixtures and soil pipe flanges shall be made gas and water tight with closet setting compound or approved Neoprene gaskets, without use of putty. Hold down bolts shall be brass, not less than 1/4" in diameter, and shall be equipped with nuts and washers.
- K. Provide each fixture with an approved compression service stop. Exposed stops shall be either loose key or screwdriver type.
- L. Caulk joint between wall and fixture at wall mounted lavatories, water closets, urinals, drinking fountains and service sinks with Silicone Sealant, white.
- M. Conductors:
 - 1. All inside conductors, except as otherwise specified, shall be caulked water tight and supported so as to provide for contraction, expansion and settlement of the building.
 - 2. All connections between outlet at roof drains and conductors shall be made and caulked watertight. Install all inside conductors and cooperate with the roofing contractor to properly install connections to the roof drains.
- N. Cleanouts:
 - 1. All soil, waste and drain pipes shall have cleanout at foot of stacks, outside near wall where line leaves building, at every change in the direction of run, at upper end of all horizontal runs, at intervals of not more than 100'-0" in straight runs of sanitary sewers and as required by code. All outlets shall be accessible so that drain line may be readily cleaned with a snake or other rodding tool. Extend cleanouts to finished floor or finished wall.
- O. Floor Drains

1. Floor drain pans shall be furnished and installed for all floor drains (except when floor drain is located in floors on fill) and be made of lead sheets weighting 4 lbs. per square foot or of an approved material, extending a minimum of 12" beyond lip of the flashing ring with outer edges turned up. All floor drains, floor sinks, etc. shall have deep traps installed.
 2. All fixtures shall be trapped if required by local or state plumbing codes.
 3. All trap seals that are subject to loss by evaporation shall have a trap seal primer valve installed as required by Local or State Plumbing Codes. A trap seal primer valve shall conform to ASSE 1018 or ASSE 1044.
- P. Flashings: Vent pipe flashings shall be by roofing contractor. Provide lead sleeves for vents.
- Q. Roof Drains: Furnish roof drains as scheduled on drawings, and all other accessories as required for installation and as recommended by the drain manufacturer. The General Contractor will be responsible for roof openings, roof opening supports and flashings.
- R. Roof drain pans shall be furnished and installed for each roof drain and overflow roof drain. Pans shall be pre-cut 30"x30" and shall be recessed 1½" deep. Deliver pan to general contractor for installation by roof deck trades.
- S. Pipe relief from backflow preventer to nearest drain.
- T. Install water hammer arrestors as required by Code, complete with means for access if so required by the Plumbing Inspector.
- U. Cold water supply branch to each toilet room shall be provided with shock absorbers designed and sized as recommended by the manufacturer to eliminate water hammer.
- V. All exposed supplies and valves in finished areas shall be brass chrome plated. Supply lines to all hanging fixtures shall be from the wall, unless otherwise noted on drawings.
- W. Install shutoff valves on all branches. All water supplies to fixtures shall have valve on supply line to the fixture.
- X. All plumbing fixtures shall be installed, vented, piped, trapped, etc. in accordance with all codes and regulations pertaining to this projects location.
- Y. Provide access to all thermostatic mixing valves and trap primer valves. If necessary, provide flush mounted stainless steel valve box with hinged cover and key lock.
- Z. All fixtures supplied for bathing shall be supplied with a temperature control valve that conforms to ASSE 1016. All fixtures for hand washing shall be supplied with a temperature control valve that conforms to ASSE 1070.
- A. END OF SECTION**

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SECTION 22 07 00 - PLUMBING PIPE INSULATION

PART 1 GENERAL

1.1 SECTION INCLUDES PIPE INSULATION FOR:

- A. Domestic water piping system including cold water, hot water and hot water return.
- B. Horizontal rain water conductors.
- C. Horizontal and vertical overflow rain water conductors.
- D. Underside of roof drains.
- E. Outdoor piping.
- F. Valves and fittings.
- G. Miscellaneous.

1.2 REFERENCES

- A. Thermal insulation materials shall meet the property requirements of the following specifications as applicable to the specific product or end use:
- B. American Society for Testing of Materials Specifications:
 - 1. ASTM C547, "Standard Specification for Mineral Fiber Preformed Pipe Insulation"
 - 2. ASTM C533, "Standard Specification for Calcium Silicate Pipe & Block Insulation"
 - 3. ASTM C585, "Recommended Practice for Inner and Outer Diameters of Rigid Pipe Insulation for Nominal Sizes of Pipe and Tubing (NPS System)"
 - 4. ASTM C1136, "Standard Specification for Barrier Material, Vapor," Type 1 or 2 (jacket only)
- C. Insulation materials, including all water and vapor barrier materials, closures, hangers, supports, fitting covers, and other accessories, shall be furnished and installed in strict accordance with project drawings, plans, and specifications.

1.3 SCOPE

- A. The work covered by this specification consists of furnishing all labor, equipment, materials and accessories, and performing all operations required, for the correct fabrication and installation of thermal insulation applied to the following commercial piping systems, in accordance with the applicable project specifications and drawings, subject to the terms and conditions of the contract:
 - 1. Hot Piping – Piping system with fluids 105°F and higher.
 - 2. Cold Piping – Piping systems with fluids below 105°F. (Includes storm water systems)

- B. Insulation, vapor barriers, jacketing, hangers, supports, accessory materials, etc. shall be installed according to manufacturers recommendations.

1.4 DEFINITIONS

- A. The term "mineral fiber" as defined by the above specifications includes fibers manufactured of glass, rock, or slag processed from a molten state, with or without binder.

1.5 SYSTEM PERFORMANCE

- A. Insulation material furnished and installed hereunder shall meet the minimum thickness requirements of Standard 90.1 (12007), "Energy Efficient Design of new Buildings" of the American Society of Heating, Refrigeration, and Air-Conditioning Engineers (ASHRAE) except minimum thickness shall be 1". However, if other factors such as condensation control or personnel protection are to be considered, the selection of the thickness of insulation should satisfy the controlling factor.
- B. Insulation materials furnished and installed hereunder shall be Class A maximum of 25 flame spread, 35 fuel contributed and 50 smoke developed rating and shall meet the fire hazard requirements of each of the following specifications:
 - 1. American Society for Testing of Materials ASTM E84
 - 2. Underwriters' Laboratories, Inc. UL 723
 - 3. National Fire Protection Associations NFPA 255
- C. Calcium silicate products shall include a visual identification system to permit positive field determination of their asbestos-free characteristic.

1.6 QUALITY ASSURANCE

- A. The contractor shall use whatever means are necessary to protect the insulation materials and accessories before, during and after installation. No insulation material shall be installed that has become damaged in any way. The contractor shall also use all means necessary to protect work and materials installed by other trades.
- B. If any insulation material has become wet because of transit or job site exposure to moisture or water, the contractor shall not install such material, and shall remove it from the job site. An exception may be allowed in cases where the contractor is able to demonstrate that wet insulation when fully dried out (either before installation, or afterward following exposure to system operating temperatures) will provide installed performance that is equivalent in all respects to new, completely dry insulation. In such cases, consult the insulation manufacturer for technical assistance.

PART 2 PRODUCTS

2.1 PIPE INSULATION ON INDOOR SYSTEMS

- A. Molded pipe insulation shall be manufactured to meet ASTM C585 for sizes required in the particular system.

- B. Molded fibrous glass pipe insulation shall comply with the requirements of ASTM C547. Heavy density Fiberglas pipe insulation with factory applied all-service jacket (ASJ) and Doublesure* two-component adhesive closure system, or Fiberglas Pipe and Tank Insulation, heavy density fiberglass insulation with end grain adhered to ASJ all service jacket. Joints shall be sealed by butt strips having a two-component sealing system or by applying staples and pressure sensitive tape. When self-sealing lap systems are used, sufficient thickness of insulation shall be used to maintain the outer surface temperature of the operating system below +150°F. Manufacturer's data regarding thickness constraints in relation to operating temperature shall be followed. When multiple layers are required, all inner layer(s) shall be unjacketed.
- C. Fittings and valves shall be insulated with preformed fiberglass fittings, fabricated sections of fiberglass pipe insulation, fiberglass pipe and tank insulation, fiberglass blanket insulation, or insulating cement. Thickness shall be equal to adjacent pipe insulation. Finish shall match that used on straight sections.
- D. Flanges, couplings, chilled water pump impeller housings, valve bonnets etc, shall be covered with an oversized pipe insulation section sized to provide the same insulation thickness as on the main pipe section. An oversized insulation section shall be used to form a collar between the two insulation sections with sections of insulation being used to fill gaps. Jacketing shall match that used on straight pipe sections. Rough cut ends shall be coated with a suitable vapor resistant mastic.
- E. On cold systems, vapor barrier performance is extremely important. Particular care must be given to vapor sealing the fitting cover or finish to the pipe insulation vapor barrier. Valve stems shall be sealed with caulking to allow free movement of the stem but provide a seal against moisture incursion. All penetrations of the ASJ and exposed ends of insulation shall be sealed with vapor barrier mastic.
- F. On hot systems where fittings are to be left exposed, insulation ends should be beveled away from bolts for easy access.
- G. All insulated, exposed piping inside the building within 8'-0" above the floor shall be additionally jacketed with a multi-ply, fabric reinforced, self adhesive insulation cladding material with a vapor barrier and a thickness of 0.015". Jacketing system shall be Venture Clad Plus #1579CW-E or equal.

2.2 PIPE INSULATION ON OUTDOOR SYSTEMS

- A. Piping located outdoors, with installation temperature above 40°F, shall be painted, insulated and covered with a weatherproof metal jacket as per the following:
 - 1. All existing and new surfaces shall be cleaned and free of dirt, dust, grease, rust or any other debris build-up on the piping. After proper cleaning, the surface shall be primed with Devoe Pre-Prime® 167 penetrating sealer and finished with a coat of Devoe Bar-Rust® 235 surface tolerant coating per the manufacturer's recommendations. The primer and finisher shall be applied and cured per the manufacturer's recommendations. Contractor shall protect all piping from elements during paint cure times.
 - 2. Insulation material shall be an EPDM rubber, flexible, closed-cell elastomeric

insulation in tubular or sheet form: Aerocel Aerocel-SSPT with Cel-Link II, Aerocel W/G-SSPT with Cel-Link II for piping or Aerocel AC Sheet or Aerocel SA pressure sensitive adhesive sheet for duct and equipment. The product will be tested for and meet or exceed the requirements defined in ASTM C 534 for Type I and II, Grade 1. EPDM elastomeric insulation material shall be manufactured without the use of CFC's, HFC's or HCFC's. EPDM elastomeric insulation shall have a flame-spread index of 25 or less and a smoke-developed index of 50 or less when tested in accordance with ASTM E 84, for all products through 2" thickness. This requirement applies to Cel-Link II closure, also. Product to be suitable for use from -297°F to 257°F continuous service temperature, per ASTM C 411. EPDM elastomeric insulation shall have a maximum thermal conductivity of 0.245 Btu-in./h-ft²-°F at a 75°F mean temperature when tested in accordance with ASTM C 177 or ASTM C 518. EPDM elastomeric insulation shall have a maximum water vapor transmission of 0.03 perm-inches when tested in accordance with ASTM E 96, Procedure A, latest revision. Product must exhibit long-term UV resistance, when unfinished in outdoor installations, per ASTM G 7 and ASTM G 90. EPDM elastomeric insulation must not contribute to external stress corrosion cracking as when tested by ASTM C 692.

3. Longitudinal seam closure is to be Stay-Seal with Protape and butting sections are to be joined with Cel-Link II pressure-sensitive closures. Closures must provide water and water vapor tight seal when tested in accordance with ASTM D 3816. VOC content must be no more than 1.3% when tested in accordance with ASTM D 3960. Closures must be capable of being sealed at a low temperature of 0°F. Closures must be kept free of dust, dirt, moisture, lubricants and other contaminants. Adhesive for fabrication work such as field-fabricated fittings and sheet seams shall be the insulation manufacturers recommended contact adhesive: Aerocel Aero seal Adhesive or Aero seal LVOC Adhesive. Optional insulation finish shall be the insulation manufacturer's recommended finish: Aerocel Aero coat. Seaming tape to be 15-mil EPDM rubber with acrylic adhesive: Aerocel Protape. Elbows, suction line "P" traps, Tees and mechanical grooved pipe fittings are to be insulated with factory fabricated insulation fittings of EPDM flexible elastomeric, color matched to pipe insulation. Aerofit Insulating Fitting Covers. Accessories such as adhesives, mastics and cements shall not detract from any of the system ratings as specified above.
4. Insulated pipe support inserts will be high-density insulation with an inner lining of EPDM rubber insulating tape and an EPDM rubber exterior jacket: Aerocel Aerofix-U Pipe Hanger Inserts. Density of insulation is to be a minimum of 10 lbs./cu. ft., with a compressive strength of 284 P.S.I. or greater, and a k-value of .312 or lower, usage temperature range of -297°F to 257°F, water absorption of 5% or less. Exterior jacket is to be 15-mil thick EPDM rubber.
5. Insulating fitting covers for copper sweat x sweat 90 degree elbows, tee's and 45 degree elbows, and mechanical grooved fittings will be factory-fabricated insulating fitting covers. The insulating fitting covers are to be made of EPDM rubber, with inside diameter and insulation thickness to match material on straight run piping. Aeroflex USA Aerofit insulating fitting covers.

6. All piping, valves, fittings, duct, and equipment scheduled to be insulated shall be insulated in strict accordance with manufacturer's installation instructions, and practices described in the National Commercial and Industrial Insulation Standards Manual. Manufacturer's installation guidelines and instructions will be used if conflicts exist.
7. Insulating pipe saddles are to be installed at all pipe hanger and clamp locations. Saddles are to be installed at the time that piping is being installed, so that insulation system can be installed in a continuous manner through the pipe support system.
8. On outdoor cold pipes, the insulation system shall be completely vapor sealed before the weather-resistant jacket is applied. The outer jacket shall not compromise the vapor barrier by penetration of fasteners, etc.
9. Jacketing shall be a multi-ply, fabric reinforced, self adhesive insulation cladding material with a vapor barrier and a thickness of 0.015". Jacketing system shall be Venture Clad Plus #1579CW-E or equal with moisture barrier, installed in accordance with the jacket manufacturer's recommendations. Each section of jacketing shall overlap the adjoining section by 3". All seams shall be taped with Venture Clad joining/seaming tape. Place the wrap so that the edge of the sealing flap faces down.

2.3 REFRIGERANT PIPING AND COOLING COIL DRAIN WITH INSTALLATION TEMPERATURE ABOVE 40°F

- A. Insulate piping with ¾" Armstrong Armaflex type AP insulation. Insulation shall be flexible elastomeric thermal insulation, black in color, flame-spread rating of 25 or less and a smoke developed rating of 50 or less as tested by ASTM E84-91A "Method of Test Surface Burning Characteristics of Building Materials".
- B. Fitting elbow covers shall be fabricated from miter-cut tabular form. In all cases, butt joints and seams are to be sealed with Armstrong 520 adhesive. 520 adhesive is a contact adhesive; therefore, in all cases, both surfaces to be joined are to be coated with adhesive with installation temperature above 40°F.
- C. Where piping is located outdoors, cover Armaflex insulation with PVC jacketing installed with a glued application.

2.4 SUPPORT FOR PIPE WITH INSULATION

- A. All piping shall be supported in such a manner that neither the insulation nor the vapor/weather barrier is compromised by the hanger or the effects of the hanger. In all cases, hanger spacing shall be such that butt joints may be made outside the hanger.
 1. On all size piping of cold systems, the pipe hanger saddles shall be separated away from the pipe by utilizing inserts. The vapor barrier shall be continuous, including material covered by the hanger saddle.

2. On warm water piping systems 3" in diameter or less, insulated with Fiberglas insulation, may be supported by placing saddles of the proper length and spacing, as designated in Owens-Corning Pub. 1-IN-12534, under the insulation.
3. For hot or cold piping systems larger than 3" in diameter, Owens-Corning Calcium Silicate pipe insulation shall be used for high density inserts. Piping saddles for piping larger than 3" shall not be in contact with the piping.
4. Owens-Corning Calcium Silicate pipe insulation may be used to support the entire weight of the piping system provided the hanger saddle is designed so the maximum compressive load does not exceed 100 psi.
5. Where pipe shoes and roller supports are required, insulation shall be inserted in the pipe shoe to minimize pipe heat loss. Where possible, the pipe shoe shall be sized to be flush with the outer pipe insulation diameter.
6. Thermal expansion and contraction of the piping and insulation system can generally be taken care of by utilizing double layers of insulation and staggering both longitudinal and circumferential joints. Where long runs are encountered, expansion joints may be required where single layers of the insulation are being used.
7. On vertical runs, insulation support rings shall be used.

2.5 ACCESSORY MATERIALS

- A. Accessory materials installed as part of insulation work under this section shall include (but not be limited to):
 1. Closure Materials - Butt strips, bands, wires, staples, mastics, adhesives; pressure-sensitive tapes.
 2. Field-applied jacketing materials - Sheet metal, plastic, canvas, fiberglass cloth, insulating cement; PVC fitting covers.
 3. Support materials - Hanger straps, hanger rods, saddles.
- B. All accessory materials shall be installed in accordance with project drawings and specifications, manufacturer's instructions, and/or in conformance with the current edition of the Midwest Insulation Contractors Association (MICA) "Commercial & Industrial Insulation Standards".

2.6 INSULATION THICKNESSES

- A. Fittings, including valves, flanges, unions, etc. shall be insulated with the same thickness as the required pipe insulation and covered with PVC fitting cover as specified.
- B. Pipe insulation thickness shall be as follows unless noted otherwise on drawings:

Insulation

<u>Piping System</u>	<u>Pipe Size</u>	<u>Insulation Thickness</u>	<u>Conductivity BTU-in H-FT²-F</u>
Domestic cold water	All sizes	1"	0.28
Horizontal rain conductor piping	All sizes	1"	0.28
Horizontal and vertical overflow rain water conductors	All sizes	1"	0.28
Underside of roof drains	All sizes	1"	0.28
Domestic hot water and hot water return (140°F and under)	Up thru 1¼ " 1½" and larger	1" 1½"	0.28
Domestic hot water and Hot water return (140°F to 200°F)	Up to 1¼" 1½" and larger	1 ½" 2"	0.28

PART 3 EXECUTION

3.1 SITE INSPECTION

- A. Before starting work under this section, carefully inspect the site and installed work of other trades and verify that such work is complete to the point where installation of materials and accessories under this section can begin.
- B. Verify that all materials and accessories can be installed in accordance with project drawings and specifications and material manufacturers' recommendations.
- C. Verify by inspecting product labeling, submittal data, and/or certifications which may accompany the shipments that all materials and accessories to be installed on the project may comply with applicable specifications and standards and meet specified thermal and physical properties.

3.2 PREPARATION

- A. Ensure that all pipe and fitting surfaces over which insulation is to be installed are clean and dry.
- B. Ensure that insulation is clean, dry, and in good mechanical condition with all factory-applied vapor or weather barriers intact and undamaged. Wet, dirty, or damaged insulation shall not be acceptable for installation. All damaged insulation installed will be removed and replaced by the Contractor at no extra cost to the Owner.
- C. Ensure that pressure testing of piping and fittings has been completed prior to installing insulation.

3.3 INSTALLATION

- A. General

1. Install all insulation materials and accessories in accordance with manufacturer's published instructions and recognized industry practices to ensure that it will serve its intended purpose.
2. Install insulation on piping subsequent to installation of heat tracing, painting, testing, and acceptance tests.
3. Install insulation materials with smooth and even surfaces. Insulate each continuous run of piping with full-length units of insulation, with single cut piece to complete run. Do not use cut pieces or scraps abutting each other. Butt insulation joints firmly to ensure complete, tight fit overall piping surfaces.
4. Maintain the integrity of factory-applied vapor barrier jacketing on all pipe insulation, protecting it against puncture, tears or other damage. All staples used on cold pipe insulation shall be coated with suitable sealant to maintain vapor barrier integrity.

B. Fittings

1. Cover valves, fittings, and similar items in each piping system using one of the following:
 - a. Mitered sections of insulation equivalent in thickness and composition to that installed on straight pipe runs.
 - b. Insulation cement equal in thickness to the adjoining insulation.
 - c. PVC fitting covers insulated with material equal in thickness and composition to adjoining insulation.

C. Penetrations

1. Extend piping insulation without interruption through walls, floors, and similar piping penetrations, except where otherwise specified.

D. Joints

1. Butt pipe insulation against hanger inserts. For hot pipes, apply 3" wide vapor barrier tape or band over butt joints. For cold piping apply wet coat of vapor barrier lap cement on butt joints, and seal joints with 3" wide vapor barrier tape or band.
2. All pipe insulation ends shall be tapered and sealed, regardless of service.

3.4 FIELD QUALITY ASSURANCE

- A. Upon completion of all insulation work covered by this specification, visually inspect the work and verify that it has been correctly installed. This may be done while work is in progress, to assure compliance with requirements herein to cover and protect insulation materials during installation.

3.5 PROTECTION

- A. Replace damaged insulation which cannot be satisfactorily repaired, including insulation with vapor barrier damage and moisture-saturated insulation.

- B. The insulation contractor shall advise the general and/or the mechanical contractor as to requirements for protection of the insulation work during the remainder of the construction period, to avoid damage and deterioration of the finished insulation work.

3.6 SAFETY PRECAUTIONS

- A. Insulation contractor's employees shall be properly protected during installation of all insulation. Protection shall include proper attire when handling and applying insulation materials, and shall include (but not be limited to) disposable dust respirators, gloves, hard hats, and eye protection.
- B. The insulation contractor shall conduct all job site operations in compliance with applicable provisions of the Occupational Safety and Health Act, as well as with all state and/or local safety and health codes and regulations that may apply to the work.

3.7 ASBESTOS INSULATION

- A. Any existing asbestos insulation on existing piping, valves, equipment, etc. where tie-ins are required, shall be removed by the Owner at Owner's expense. The contractor and Architect/Engineer shall not be responsible for any cost or work involved with removal or encapsulation of asbestos insulation.

A. END OF SECTION

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SECTION 22 10 00 - PLUMBING PIPING

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Sanitary and storm piping system.
- B. Domestic water piping system
- C. Natural gas piping system.
- D. Valves.
- E. Acid waste and vent piping (plastic)
- F. Above ground acid waste drain and vent piping system (glass)
- G. Underground acid waste drain and vent piping system (glass)

1.2 REFERENCES: Material and/or equipment specified in this section shall meet or exceed one or more of the property requirements or installation requirements of the following specifications/publications as applicable to the specific product or end use:

- A. ANSI B31.1 - Power Piping.
- B. ANSI B31.2 - Fuel Gas Piping.
- C. ANSI B31.4 - Liquid Petroleum Transportation Piping Systems.
- D. ANSI B31.9 - Building Service Piping.
- E. ASME - Boiler and Pressure Vessel Code.
- F. ASME Sec. 9 - Welding and Brazing Qualifications.
- G. ASME B16.1 - Cast Iron Pipe Flanges and Flanged Fittings Class 25, 125, 250 and 800.
- H. ASME B16.3 - Malleable Iron Threaded Fittings.
- I. ASME B16.4 - Cast Iron Threaded Fittings Class 125 and 250.
- J. ASME B16.18 - Cast Bronze Solder-Joint Pressure Fittings.
- K. ASME B16.22 - Wrought Copper and Bronze Solder-Joint Pressure Fittings
- L. ASME B16.23 - Cast Copper Alloy Solder-Joint Drainage Fittings - DWV.
- M. ASME B16.26 - Cast Bronze Fittings for Flared Copper Tubes.

- N. ASME B16.29 - Wrought Copper and Wrought Copper Alloy Solder Joint Drainage Fittings - DWV.
- O. ASTM A47 - Ferritic Malleable Iron Castings.
- P. ASTM A53 - Pipe, Steel, Black and Hot-Dipped Zinc Coated, Welded.
- Q. ASTM A74 - Cast Iron Soil Pipe and Fittings.
- R. ASTM A106 - Carbon Steel Seamless Pipe.
- S. ASTM A234 - Pipe Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and Elevated Temperatures.
- T. ASTM A536 – Ductile Iron Castings.
- U. ASTM B32 - Solder Metal.
- V. ASTM B42 - Seamless Copper Pipe.
- W. ASTM B43 - Seamless Red Brass Pipe.
- X. ASTM B75 - Seamless Copper Tube.
- Y. ASTM B88 - Seamless Copper Water Tube.
- Z. ASTM B251 - Wrought Seamless Copper and Copper-Alloy Tube.
- AA. ASTM B302 - Threadless Copper Pipe (TP).
- AB. ASTM B306 - Copper Drainage Tube (DWV).
- AC. ASTM C14 - Concrete Sewer, Storm Drain, and Culvert Pipe.
- AD. ASTM C425 - Compression Joints for Vitrified Clay Pipe and Fittings.
- AE. ASTM C443 - Joints for Circular Concrete Sewer and Culvert Pipe, Using Rubber Gaskets.
- AF. ASTM C564 - Rubber Gaskets for Cast Iron Soil Pipe and Fittings.
- AG. ASTM C700 - Vitrified Clay Pipe, Extra Strength, Standard Strength, and Perforated.
- AH. ASTM D1785 - Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120.
- AI. ASTM D2235 - Solvent Cement for Acrylonitrile - Butadiene - Styrene (ABS) Plastic Pipe and Fittings.
- AJ. ASTM D2241 - Poly (Vinyl Chloride) (PVC) Plastic Pipe (SDR-PR).

- AK. ASTM D2466 - Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40.
- AL. ASTM D2513 - Thermoplastic Gas Pressure Pipe, Tubing and Fittings.
- AM. ASTM D2564 - Solvent Cements for Poly (Vinyl Chloride) (PVC) Plastic Pipe and Fittings.
- AN. ASTM D2680 - Acrylonitrile-Butadiene-Styrene (ABS) Composite-Sewer Piping.
- AO. ASTM D2683 - Socket-Type Polyethylene Fittings for Outside Diameter-Controlled Polyethylene Pipe.
- AP. ASTM D2729 - Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
- AQ. ASTM D2751 - Acrylonitrile-Butadiene-Styrene (ABS) Sewer Pipe and Fittings.
- AR. ASTM D2846 - Chlorinated Polyvinyl Chloride (CPVC) Pipe, Fittings, Solvent Cements and Adhesives for Potable Hot Water Systems.
- AS. ASTM D2855 - Making Solvent-Cemented Joints with Poly (Vinyl Chloride) (PVC) Pipe and Fittings.
- AT. ASTM D3033 - Type PSP Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
- AU. ASTM D3034 - Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
- AV. ASTM D3309 - Polybutylene (PB) Plastic Hot Water Distribution System.
- AW. ASTM F477 - Elastomeric Seals (Gaskets) for Joining Plastic Pipe.
- AX. ASTM F493 - Solvent Cements for Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe and Fittings.
- AY. ASTM F891, Schedule 40 Cellular Core PVC-DWV Pipe.
- AZ. AWS A5.8 - Brazing Filler Metal.
- BA. AWWA C105 - Polyethylene Encasement for Ductile Iron Piping for Water and Other Liquids.
- BB. AWWA C110 - Ductile - Iron and Gray - Iron Fittings 3 in. through 48 in., for Water and Other Liquids.
- BC. AWWA C111- Rubber-Gasket Joints for Ductile Iron and Gray-Iron Pressure Pipe and Fittings.
- BD. AWWA C151 - Ductile-Iron Pipe, Centrifugally Cast in Metal Molds or Sand-Lined Molds, for Water or Other Liquids.
- BE. AWWA C606 – Grooved and Shouldered Joints.

- BF. AWWA C651 - Disinfecting Water Mains.
- BG. CISPI 301 - Cast Iron Soil Pipe and Fittings for Hubless Cast Iron Sanitary Systems.
- BH. CISPI 310 - Joints for Hubless Cast Iron Sanitary Systems.
- BI. CAN-3 B281 - Aluminum Drain, Waste, and Vent Pipe and Components.
- BJ. NCPWB - Procedure Specifications for Pipe Welding.
- BK. NFPA 54 - National Fuel Gas Code.
- BL. NFPA 58 - Storage and Handling of Liquefied Petroleum Gases.

1.3 QUALITY ASSURANCE

- A. Valves: Manufacturer's name and pressure rating marked on valve body.
- B. Welding Materials and Procedures: Conform to ASME Code and applicable state labor regulations.
- C. Welders Certification: In accordance with ASME Sec 9.
- D. All grooved joint couplings, fittings, valves, and specialties shall be the products of a single manufacturer. Grooving tools shall be of the same manufacturer as the grooved components.
- E. All castings used for coupling housings, fittings, valve bodies, etc. shall be date stamped for quality assurance and traceability.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, protect and handle products to site.
- B. Accept valves on site in shipping containers with labeling in place. Inspect for damage.
- C. Provide temporary protective coating on cast iron and steel valves.
- D. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.
- E. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

PART 2 PRODUCTS

2.1 UNDERGROUND ACID WASTE PIPING (GLASS)

- A. Excavation – shall conform to National Plumbing Code A40.8 Section 2.7.

1. Bottom of trench shall be properly compacted, graded, and the pipe supported throughout its entire length.
 2. A minimum of 4" properly compacted rock-free sand or soil shall be used directly under the pipe.
- B. Buried Pipe
1. Pipe shall be 6502 series – 5 ft. lengths covered with expanded polystyrene.
 2. All underground fittings shall be protected prior to back-filling by wrapping in polyvinyl film (5 mil), Scotch Wrap or J.M. Trans-Tex or approved equal.
- C. Backfill
1. Pipe trench shall be back-filled and tamped with rock-free sand or soil to 12" above top of pipe. Where space does not permit, a minimum 12" cover, additional protection must be provided to protect pipe against crushing loads, except when buried under protective concrete slab.
- 2.2 ACID WASTE AND VENT PIPING, ABOVE GRADE** (Must be approved by governing authorities) (Plastic)
- A. Orion Blue Line or Zurn Corrosive Waste Schedule 40 fire retardant pipe grade polypropylene pipe, supplied in 10 foot lengths, conforming to ASTM D4101.
- B. Fittings shall be Orion Blue Line or Zurn Corrosive Waste Schedule 40 pipe grade polypropylene, conforming to ASTM D4101.
- C. Joints shall be mechanically fastened by the use of Riontite or Zurn mechanical joint having a corrosion resistance equal to pipe and fittings. Each Riontite coupling assembly shall be of 300 series stainless steel with outer band, with 5/16" bolts, nuts and washers.
- 2.3 SANITARY AND STORM SEWER PIPING, BURIED BEYOND 5 FEET OF BUILDING** (Must be approved by governing authorities)
- A. Piping up thru 8": Cast iron ASTM A74 service weight with cast iron fittings ASTM C564 neoprene gasket system joints.
- B. Piping 10" and above: Reinforced concrete pipe with ASTM C-76 Class III specification when piping is located below a paved surface. All other pipe shall be reinforced concrete pipe with ASTM C-76 Class II specification. Joints shall be bell and spigot pattern with "Tylex" gasket material on sanitary piping or cemented joints with "Dewitt" No. 10 caulking around compound on storm piping. Joints shall conform to ASTM V-443.
- C. Schedule 40 PVC Pipe: ASTM D2729 and ASTM F891 DWV non-pressure cellular core.
1. Fittings: PVC
 2. Joints: ASTM D2855, solvent weld with ASTM D2564 solvent cement.
- D. Dual wall corrugated polyethylene pipe may be used for storm when approved in writing by the Engineer, pipe sizes thru 10" shall meet AASHTO M252S, pipe sizes 12" thru 36"

shall meet AASHTO M294S. Corrugated pipe shall have smooth inner liner. Acceptable manufacturers shall be Hancor or ADS.

2.4 SANITARY, STORM AND VENT SEWER PIPING, BURIED WITHIN 5 FEET OF BUILDING (Must be approved by governing authorities)

- A. Gravity Cast Iron Pipe: ASTM A74 service weight.
 - 1. Fittings: Cast iron.
 - 2. Joints: Hub-and-spigot, CISPI HSN compression type with ASTM C564 neoprene gaskets.
- B. Gravity Cast Iron Pipe: CISPI 301, hubless, service weight
 - 1. Fittings: Cast iron.
 - 2. Joints: ASTM C564, neoprene gasket system.
- C. Gravity Schedule 40 PVC Pipe: ASTM D2729 and ASTM F891 DWV non-pressure cellular core.
 - 1. Fittings: PVC.
 - 2. Joints: ASTM D2855, solvent weld with ASTM D2564 solvent cement.
- D. Gravity 10" and larger. Schedule 40 PVC gravity sewer pipe with integral bell and spigot joints.
 - 1. Fittings: PVC
 - 2. Joints: ASTM D3212 flexible elastomeric seals.
- E. Forced PVC Pipe:
 - 1. 4" and Larger - ASTM D2241, DR18-Class 150 AWWA C900.
 - 2. Fittings: ASTM D2466 PVC
 - 3. Joints: ASTM D3139, integral bell and gasket seal installed with concrete thrust block or ASTM D2855, solvent weld with ASTM D2564 solvent cement.

2.5 SANITARY, STORM AND VENT PIPING, ABOVE GRADE (Must be approved by governing authorities)

- A. Gravity Cast Iron Pipe: ASTM A74, service weight.
 - 1. Fittings: Cast iron.
 - 2. Joints: ASTM C564, hub and spigot, neoprene gasket system.
- B. Gravity Cast Iron Pipe: CISPI 301, hubless, service weight.
 - 1. Fittings: Cast iron.
 - 2. Joints: Neoprene gaskets and stainless steel clamp-and-shield assemblies.
- C. Gravity Steel Pipe: ASTM A53 Schedule 40, galvanized.
 - 1. Cast Iron Fittings: ASME B16.1, flanges and fittings; ASME B16.4, screwed fittings.
 - 2. Malleable Iron Fittings: ASME B16.3, screwed type. ASTM A47.
 - 3. Ductile Iron Fittings: Grooved end, ASTM A536.
 - 4. Mechanical Grooved Couplings: Ductile iron, galvanized. (as specified for Forced Drains)
- D. PVC Pipe: ASTM D2729 (when approved by the Architect/Engineer).

1. Fittings: PVC.
 2. Joints: ASTM D2855, solvent weld with ASTM D2564 solvent cement.
- E. CPVC Pipe: ASTM D2846 (When approved by the Architect/Engineer).
1. Fittings: ASTM D2846, CPVC
 2. Joints: ASTM D2846, solvent weld with ASTM F493 solvent cement.
- F. Forced larger than 3": Steel Pipe: ASTM A53, Schedule 40 , galvanized.
1. Fittings: Galvanized steel.
 2. Joints: Grooved mechanical couplings.
 3. IPS Grooved Piping System.
 - a. Victaulic mechanical pipe couplings, fitting, valves and other grooved components may be used as an option to welding, threading or flanged methods. All grooved components shall be of one manufacturer and shall conform to local code approval and/or as listed by ANSI B31.1, B31.9, ASME UL/FM IAPMO or BOC. Grooved end product manufacturer to be ISO-9001 certified.
 - b. Roll or cut grooved ends as appropriate to pipe material, wall thickness, pressures, size and method of joining. Pipe ends shall be grooved in accordance with manufacturer's current listed standards conforming to ANSI/AWWA C-606.
 - c. Mechanical couplings shall be Victaulic style 107H "Installation-Ready" or approved manufacturer, rigid coupling. Victaulic style 177 "Installation-Ready", and style 77 or 75 or equal coupling shall be used where system flexibility is desired at pumps and other mechanical equipment to reduce noise and vibration. Noise and vibration reduction is achieved by installing (3) style 77 or 75 or equal flexible couplings near the vibration source. Couplings shall be of cast ductile iron conforming to ASTM A536, grade 65-45-12.

2.6 DOMESTIC WATER PIPING, BURIED BEYOND 5 FEET OF BUILDING (Must be approved by governing authorities)

- A. Ductile Iron Pipe: ANSI/AWWA C151/A21.51 rated 350 psi with Class 350 fittings.
1. ANSI thickness Class 50 minimum, nominal pipe wall thickness .27" minimum, rated 350 psi at laying condition Type 1.
 2. Cement lined as per AWWA C104 (ANSI A21.4)
 3. Pipe Joints: Push on, ANSI/AWWA C1533/A21.53, with Tyton gaskets.
 4. Fitting Joints: Mechanical, compact, ANSI/AWWA C153/A21.53, with stainless steel or Corten anti-rotation bolts and sacrificial zinc anode cap on each bolt.
 5. Coating: Exterior of pipe and fittings, asphaltic coating as per ANSI/AWWA.
 6. Polyethylene encasement as per ANSI/AWWA C105/A21.5.
 7. Concrete thrust blocks, installation, etc. as per published engineering and construction standards of Michigan Department of Transportation and local codes.
 8. All material and installation shall be in accordance with manufacturer's recommendations.
- B. Copper Tubing: 2" and smaller - ASTM B88, Type K soft temper.

1. Fittings: ASME B16.18 cast bronze or ASME B16.22 wrought copper and bronze.
2. Joints: AWS A5.8, BCuP silver braze if allowed by code, otherwise ASTM B32 solder, lead free Grade 95-5 tin-antimony or tin-silver, with melting range of 430 to 535 degrees F.

C. Polyethylene Pipe 1½" or smaller

1. Pipe - Polyethylene (PE) flexible plastic, ASTM D2239 rated 160 psi minimum.
2. Fittings - PE barbed insert fittings.
3. Joints - Stainless steel clamps over barbed insert fittings.

D. PVC Pipe:

1. 2½" and 3" - ASTM D2241, SDR 21 - Class 200 AWWA C900.
2. 4" and Larger - ASTM D2241, DR18-Class 150 AWWA C900.
3. Fittings: ASTM D2466, PVC
4. Joints: ASTM D3139, integral bell and gasket seal installed with concrete thrust block or ASTM D2855, solvent weld with ASTM D2564 solvent cement.

2.7 SANITARY FORCE MAIN PIPING, BURIED WITHIN 5 FEET OF BUILDING

A. Ductile Iron Pipe: AWWA C151. Bituminous outside coating AWWA C151. Cement Mortar Lining AWWA C104.

1. Pipe Thickness Class: 50
2. Pipe Pressure Rating: 350 psi minimum for 8" through 12", 250 psi minimum for 14" and larger.
3. Fittings: Ductile iron, standard size, AWWA C110; compact size, AWWA C153.
 - a. Coating: Bituminous Coating, AWWA C110.
 - b. Lining: Cement Mortar Lining, AWWA C104.
4. Joints: Tied restrained joints.
5. Concrete thrust blocks, installation, etc. as per published Engineering and Construction Standards of Michigan Department of Transportation, and local codes.

2.8 DOMESTIC WATER PIPING, BURIED WITHIN 5 FEET OF BUILDING (Must be approved by governing authorities)

A. Ductile Iron Pipe: ANSI/AWWA C151/A21.51 rated 350 psi. with Class 350 fittings.

1. ANSI thickness Class 50 minimum, nominal pipe wall thickness .27" minimum, rated 350 psi at laying condition Type 1.
2. Cement lined as per AWWA C104 (ANSI A21.4)
3. Pipe Joints: Push on, ANSI/AWWA C1533/A21.53, with Tyton gaskets.
4. Fitting Joints: Mechanical, compact, ANSI/AWWA C153/A21.53, with stainless steel or Corten anti-rotation bolts and sacrificial zinc anode cap on each bolt.
5. Coating: Exterior of pipe and fittings, asphaltic coating as per ANSI/AWWA.
6. Polyethylene encasement as per ANSI/AWWA C105/A21.5.
7. Concrete thrust blocks, installation, etc. as per published engineering and construction standards of Michigan Department of Transportation and local codes.

8. All material and installation shall be in accordance with manufacturers recommendations.
- B. Copper Tubing: 2" and smaller - ASTM B88, Type K, soft temper.
1. Fittings: ASME B16.18 cast bronze or ASME B16.22 wrought copper and bronze.
 2. Joints: AWS A5.8, BCuP silver braze.
 3. No joints shall be located under floor unless standard pipe lengths are not long enough for the entire length of bury, then joints shall be kept to a minimum.
- C. PVC Pipe
1. 3" - ASTM D2241, SDR 21- Class 200 AWWA C900.
 2. 4" thru 12" - ASTM D2241, DR18 - Class 150, DR18 - AWWA C900.
 3. Fittings ASTM D2466, PVC.
 4. Joints: ASTM D2855, solvent weld with ASTM D2564 solvent cement.

2.9 DOMESTIC WATER PIPING, ABOVE GRADE INSIDE BUILDING (Must be approved by governing authorities)

- A. Domestic water piping 6" and smaller shall be: Copper tubing: ASTM B88, Type L, hard drawn, seamless.
1. Fittings: ASME B16.18 cast bronze tee tap or ASME B16.22 wrought copper and bronze.
 2. Fittings 1-1/2" and smaller: ASME B16.18 cast bronze or ASME B16.22 wrought copper, with 301 stainless steel internal components, EPDM seals, and push-to-connect ends. Victaulic Permalynx.
 3. Joints: ASTM B32, solder, Lead free Grade 95-A tin - antimony or tin and silver with melting range 430 to 535 degrees F or AWS A5BcuP silver braze.
 4. Fittings 2" and smaller: At the Contractor's option, Schedule 10S stainless steel pipe with Vic-Press 304 fittings and couplings may be used in lieu of soldered copper. The seal material shall be UL classified in accordance with ANSI/NSF61 for Potable Water service.
 5. Joints 2" thru 8" may be mechanical pipe couplings of a bolted type with a central cavity design pressure-responsive gasket along with grooved end copper or bronze fittings as available, as manufactured by Victaulic.
 - a. Copper Tube, ASTM B-88 (Type K or L) - Roll grooved only, at copper-tube dimensions. (Flaring to accommodate alternate sized couplings is not permitted).
 - b. Mechanical Couplings - Shall be Victaulic Style 607H "Installation-Ready" rigid couplings for copper consisting of a ductile iron cast housing, with offsetting angle-pattern bolt pads, a synthetic rubber gasket of a central cavity pressure-responsive design, with ASTM A449 plated nuts and bolts to secure unit together.
 - c. Coupling Housings - Shall be cast of ductile iron conforming to ASTM A-536 (Grade 65-45-12), with a copper colored enamel paint coating.
 - d. Gaskets - Shall be molded of synthetic rubber in a Flush-Seal configuration conforming to the copper tube size (CTS) outside diameter and coupling housing, of elastomers having properties as designated in ASTM D-2000.

Reference shall always be made to the latest published Selection Guide for Gaskets for proper gasket selection for the intended service.

- e. Water Service - Gasket supplied for water services from -30°F to +230°F Grade "E" EPDM compound molded of materials conforming to ASTM D-2000, designation 2CA615A25B24F17Z, recommended for hot water service within the specified temperature range, plus a variety of dilute acids, oil-free air, and many chemical services. Not recommended for petroleum services.
 - 1) Gaskets supplied with Style 607H couplings shall be grade EHP for water services from -30°F to +250°F.
 - 2) Gaskets shall be UL classified in accordance with ANSI/NSF61 for Potable Water service.
 - 3) Meets the low lead requirements of NSF-372.
 - f. Flange Adapters - Shall be Victaulic Style 641 Vic-Flange or equal adapters 2"-6", ductile iron ASTM A-536, engaging directly into roll grooved copper tube and fittings and bolting directly to ANSI Class 125 cast iron and Class 150 steel flanged components; installer to supply standard flange bolts. Flange casting shall have a corresponding gasket.
 - g. Fittings - Fittings shall be full flow (smooth turn elbows) copper fittings conforming with ASME B16.22 or cast bronze to ASME B16.18; with grooves designed to accept grooved end couplings at copper-tube dimensions. (Flaring to accommodate alternate sized couplings is not permitted). Victaulic Copper-Connection.
- B. Domestic water piping larger than 6" shall be: Steel pipe: ASTM A53, Schedule 40, galvanized.
- 1. Fittings: Galvanized steel.
 - 2. Joints: Grooved mechanical couplings.
 - 3. IPS Grooved Piping System
 - a. Victaulic mechanical pipe couplings, fitting, valves and other grooved components may be used as an option to welding, threading or flanged methods. All grooved components shall be of one manufacturer and shall conform to local code approval and/or as listed by ANSI B31.1, B 31.9, ASME, UL/FM IAPMO or BOC. Grooved end product manufacturer to be ISO-9001 certified.
 - b. Roll or cut grooved ends as appropriate to pipe material, wall thickness, pressures, size and method of joining. Pipe ends shall be grooved in accordance with manufacturer's current listed standards conforming to ANSI/AWWA C-606.
 - c. Mechanical couplings shall be Victaulic style 107H "Installation Ready" or 07 (zero-flex) or equal, rigid coupling or style HP-70 or equal rigid coupling for high pressure service. Victaulic style 177 "Installation Ready" and style 77 or 75 or equal coupling shall be used where system flexibility is desired at pumps and other mechanical equipment to reduce noise and vibration.

Noise and vibration reduction is achieved by installing (3) style 77 or 75 or equal flexible couplings near the vibration source. Couplings shall be of cast ductile iron conforming to ASTM A536, grade 65-45-12.

- d. Mechanical reducing couplings shall be Victaulic style 750 or equal for pipe runs for reduction on pipe sizes 4" thru 8".
- e. Meets the low lead requirements of NSF-372.

2.10 NATURAL GAS PIPING BURIED (Must be approved by governing authorities and local gas utility company)

- A. Approval must be given in writing by the local gas company for type of material to be used and the proposed installation method
- B. Polyethylene Pipe: ASTM D2513, SDR 11.5.
 - 1. Joints and Fittings: Plastic pipe and fittings shall be joined in accordance with manufacturer's instructions. Piping shall be allowed to be joined by methods of heat fusion, or mechanical fittings designed for pipe made to ASTM D 2513 Standards.
 - a. Heat fusion joints shall be made in accordance with manufacturer's recommendations and shall be made by certified personnel in accordance with qualified procedures proven to make gas tight joints as strong as the pipe or tubing being joined.
 - b. Mechanical joints shall be compatible with the plastic piping and gas in the system. A stiffener should be inserted when using OD compression type fittings. The stiffener should be sized specifically for the pipe being installed and should equal the insertion depth of the pipe. Split tubular stiffeners shall not be used.
 - 2. Continuous insulated No. 14 copper tracer wire shall be installed with and attached to underground non-metallic gas piping and shall terminate above grade at each end.
 - 3. Install polyethylene pipe a minimum of 24" below grade, backfill with clean yellow sand to 6" below grade, and install yellow plastic warning tape 6" below grade above the pipe.
 - 4. Polyethylene pipe entering or emerging from the ground at locations exterior from the building shall be additionally protected by encasing with ASTM A53, Schedule 40 black steel pipe to a height of, if practical, 18" below to 6" above the ground.
 - 5. Piping penetrating below grade through a foundation or basement wall shall be encased with steel, wrought iron, PVC or ABS Schedule 40 piping. The circular space behind the piping and the sleeve shall be sealed.

2.11 NATURAL GAS PIPING, ABOVE GRADE INSIDE OF BUILDING OR OUTDOORS EXPOSED

- A. Steel Pipe: ASTM A53, Schedule 40 black.
 - 1. Fittings: ASME B16.3, malleable iron or ASTM A234, forged steel welding type.
 - 2. Joints: NFPA 54, threaded or welded to ANSI B31.1, ANSI B31.2, ANSI B31.9, ASME Sec. 9.

3. If both ends of the pipe sleeve within the same building terminate indoors, the pipe sleeve shall not be sealed or vented.
4. If one end of the pipe sleeve terminates outdoors and the other terminates indoors, the pipe sleeve shall be sealed and vented.
5. Exterior piping shall be painted with paint for steel pipe and outdoor rated.

2.12 NATURAL GAS PIPING INSIDE BUILDING, BELOW GROUND, INSIDE SOLID WALLS OR SOLID FLOORS

- A. Steel pipe, ASTM A53, Schedule 80, black iron with welded joints, encased in a Schedule 40 steel, wrought iron, PVC or ABS pipe sleeve. The sleeve shall be sealed and capable of containing full gas pressure in the event of a leak in the gas pipe. The sleeve shall be vented to a vent located 12" min. above the roof with a cap to prevent the entrance of water and insects. All gas piping shall be in conformance with the National Fuel Gas Code NFPA 54, the requirements of the State Building Code, the local Fire Marshal and the Office of Fire Safety (OFS).
 1. The gas shutoff valves serving the Science Rooms shall be made accessible from the Corridor. Each shutoff valve shall be located in a recessed box furnished and installed by the General Contractor. Each shutoff valve shall serve to shut off all gas outlets in the one adjacent room only.
 2. All gas piping located below the floor shall be located under the concrete, not in the concrete, and shall be located a minimum of 12" below the top of the floor.

2.13 NATURAL GAS PIPING IN CONCEALED LOCATIONS

- A. Steel pipe, ASTM A53, Schedule 80, black iron with welded joints.
 1. A concealed location is a location that cannot be accessed without damaging permanent parts of the building structure or finish surface. Spaces above, below or behind removable panels or doors shall not be considered concealed.

2.14 GENERATOR EXHAUST PIPING

- A. Steel Pipe ASTM A 312 seamless welded austenitic intended for high temperature and generally corrosive service.
- B. Fittings: Long radius, welded.

2.15 PIPE HANGERS AND SUPPORTS

- A. Refer to Section 22 05 00.

2.16 FLANGES, UNIONS, AND COUPLINGS

- A. Pipe Size 2 Inches and Under:
 1. Ferrous pipe: 150 psig malleable iron threaded unions.
 2. Copper tube and pipe: 150 psig bronze unions with soldered joints. (Solder shall be lead free.)

- B. Pipe Size Over 2 Inches:
 - 1. Ferrous pipe: 150 psig forged steel slip-on flanges; 1/16 inch thick preformed neoprene gaskets.
 - 2. Copper tube and pipe: 150 psig slip-on bronze flanges; 1/16 inch thick preformed neoprene gaskets.

- C. Grooved and Shouldered Pipe End Couplings:
 - 1. Unions and flanges for servicing and disconnect are not required in installations using grooved joint couplings. (The couplings shall serve as disconnect points.)
 - 2. Housing: Two ductile iron clamps to engage and lock, designed to permit some angular deflection, contraction, and expansion where required; electroplated steel bolts, nuts, and washers conforming with ASTM A449; galvanized for galvanized pipe.
 - 3. Sealing gasket: "C" shape or FlushSeal composition sealing gasket.
 - 4. Gaskets shall be UL classified in accordance with ANSI/NSF-61 for Potable water service.
 - 5. Basis of Design: Victaulic Company, Style 607H (Installation-Ready for Copper Tubing) and Style 107H or 177 (Installation-Ready for Steel Piping).

- D. Dielectric Connections: Dielectric nipples shall be non-conducting for connection of dissimilar materials. Dielectric nipples shall be similar to Victaulic Style 647 or Style 47. A brass adapter dielectric union is not acceptable.

2.17 GATE VALVES

- A. Up to and including 3 Inches: Bronze body, bronze trim, non-rising stem, handwheel, inside screw, single wedge or disc, solder or threaded ends.

- B. Over 3 Inches: Iron body, bronze trim, rising stem, handwheel, OS&Y, single wedge, flanged or grooved ends. Basis of Design: Victaulic Series 771V.

2.18 GLOBE VALVES

- A. Up to and including 3 Inches: Bronze body, bronze trim, rising stem, handwheel, inside screw, renewable composition disc, solder or screwed ends, with back seating capacity (repackable under pressure).

- B. Over 3 Inches: Iron body, bronze trim, rising stem, handwheel, OS&Y, plug-type disc, flanged ends, renewable seat and disc.

2.19 BALL VALVES

- A. Up to and including 3 Inches:
 - 1. Bronze one piece body, stainless steel ball, Teflon seats and stuffing box ring, lever handle and balancing stops, solder or threaded ends with union.

 - 2. Brass two piece body, chrome plated brass ball and stem, PTFE seats and seals, lever handle, and Vic-Press ends. Victaulic Series P589.

- B. Over 1-1/2 Inches: Cast ductile iron steel body, chrome plated steel ball, teflon seat and stuffing box seals, lever handle, or gear drive handwheel for sizes 10 inches and over, flanged or grooved ends. Basis of Design: Victaulic Series 726.

2.20 PLUG VALVES

- A. Up to and including 3 Inches:
 - 1. Elastomer coated ductile iron disc with integrally cast stem, copper-tube dimensioned grooved ends, lever handle or gear operator. Basis of Design: Victaulic Series 608.
 - 2. Bronze body, bronze tapered lubricated plug, teflon packing, threaded ends.
- B. Over 3 Inches:
 - 1. Cast iron body and lubricated plug, flanged ends.
 - 2. Elastomer coated ductile iron plug with integrally cast stem, ductile iron body and bonnet, welded-in nickel seat, lever handle or gear operator. Basis of Design: Victaulic Series 377.
 - a. For installation on IPS / Steel pipe sizes with Victaulic Style 307 transition coupling.

2.21 BUTTERFLY VALVES

- A. Bronze body
 - 1. Elastomer coated ductile iron disc with integrally cast stem, copper-tube dimensioned grooved ends, lever handle or gear operator. Basis of design: Victaulic Series 608.
 - 2. Stainless steel disc, resilient replaceable seat, threaded ends, extended neck, 10 position lever handle.
- B. Cast or ductile iron body, chrome plated ductile iron disc, resilient replaceable pressure responsive EPDM seat, wafer or lug ends or grooved ends if Victaulic grooved fittings are used, with extended neck and 10 position lever handle. (Stem shall be offset from the disc centerline to provide full 360-degree circumferential seating). Sizes 6" and larger furnish gear drive handwheel. Basis of Design: Victaulic MasterSeal™.

2.22 FLOW CONTROL VALVES

- A. Construction: DZR brass (Ametal) or bronze body with union on inlet and outlet, temperature and pressure test plug on inlet and outlet with blowdown/backflush drain.
 - 1. Body material shall be ISO 6509 compliant.
- B. Calibration: Control flow within 3.5 percent of selected rating, over operating pressure range of 10 times minimum pressure required for control.

- C. Manual (Multiple Turn Balancing Valves): Victaulic Series 786/787/78K circuit balancing valve.
- D. If called for on drawings, furnish Victaulic or Griswold flow control valve. Flow control valve shall automatically control flow rates with $\pm 5\%$ accuracy. Valve control mechanism shall consist of a stainless steel cartridge with a ported cup and coil/helical spring to avoid corrosion. Four operating ranges shall be available with minimum range requiring less than 2 psig to actuate the mechanism. Manufacturer shall provide independent laboratory tests verifying accuracy and performance. Griswold flow control valve shall have a 5 year warrantee to guarantee all materials and workmanship. See drawings for flow rate of valve.

2.23 SWING CHECK VALVES

- A. Up to and including 3 Inches: Bronze swing disc, solder or screwed ends.
- B. Over 3 Inches: Iron body, stainless steel or bronze trim, swing disc, renewable disc and seat, grooved or flanged ends. Basis of Design: Victaulic Series 712.

2.24 SPRING LOADED CHECK VALVES

- A. Iron body, bronze trim, stainless steel spring, renewable composition disc, screwed, wafer, or flanged ends.
- B. Ductile iron body, stainless steel spring and shaft aluminum-bronze disc with elastomer seal or elastomer coated ductile iron disc with welded-in nickel seat, grooved ends. Basis of Design: Victaulic Series 716.

2.25 WATER PRESSURE REDUCING VALVES

- A. Up thru 3 Inches: Bronze body, stainless steel and thermoplastic internal parts, fabric reinforced diaphragm, strainer, double union ends.
- B. Over 3 Inches: Cast iron body, bronze fitted, elastomeric diaphragm and seat disc, flanged.
- C. Valve shall be as manufactured by Bell and Gossett.

2.26 RELIEF VALVES

- A. Furnish and install as shown on plans a diaphragm-assist operated bronze body ASME rated and nameplated safety relief valve with fail-safe disc to assure normal operation under emergency conditions. The valve shall have a low blowdown differential and shall be designed to relief system pressure in excess of the operating pressure specified for the system, within the maximum operating limitations of the valve. The ASME safety relief valve shall be engineered to prevent the system fluid from entering the spring chamber under normal operating conditions. The permanent valve nameplate shall display the BTUH and relief pressure ratings certified by the National Board of Boiler and Pressure Vessel Inspectors. Valve shall be as manufactured by Bell and Gossett.

2.27 STRAINERS

- A. Size 3 inch and Under: Screwed brass body for 175 psig working pressure, Y pattern with 1/32 inch stainless steel perforated screen.
- B. Size 4 inch: Flanged iron body for 175 psig working pressure, Y pattern with 3/64 inch stainless steel perforated screen.
- C. Size 5 inch and Larger: Flanged iron body for 175 psig working pressure, basket pattern with 1/8 inch stainless steel perforated screen.
- D. Grooved-End Strainers: Size 2 inch through 12 inch, 300 psig working pressure, Y-pattern with 1/16 or 1/8 inch stainless steel perforated screen. Victaulic Series 732.

2.28 INSERTS

- A. Inserts: Malleable iron case of steel shell and expansion plug for threaded connection with lateral adjustment, top slot for reinforcing rods, lugs for attaching to forms; size inserts to suit threaded hanger rods.

2.29 CONCRETE FOR THRUST RESTRAINT AND COLLARS

- A. Concrete: Class A Concrete conforming to Divisions 500 and 700 of the SCDOT Standard Specifications.
 - 1. Compressive strength of 3,000 psi at 28 days.
 - 2. Air entrained.
 - 3. Water cement ratio of 0.488 with rounded aggregate and 0.532 with angular aggregate.
 - 4. Maximum slump of 3.5 inch for vibrated concrete and 4 inch for non-vibrated concrete.
 - 5. Minimum cement content of 564 pounds per cubic yard for vibrated concrete and 602 pounds per cubic yard for non-vibrated concrete.

2.30 ACID WASTE AND VENT PIPING, BURIED WITHIN 5 FEET OF BUILDING (Must be approved by governing authorities) (Plastic)

- A. Orion Blue Line or Zurn Corrosive Waste Schedule 40 fire retardant pipe grade polypropylene pipe, supplied in 10 foot lengths, conforming to ASTM D4101.
- B. Fittings shall be Orion Blue Line or Zurn Corrosive Waste Schedule 40 pipe grade polypropylene, conforming to ASTM D4101.
- C. Joints shall be fusion type made by Orion Heat Tool or Zurn Fusion-Lock joining machine, conforming to ASTM D2657.

2.31 ABOVE GROUND ACID WASTE DRAIN AND VENT PIPING SYSTEM (Glass)

- A. General
 - 1. Contractor shall furnish and install a complete acid waste drain and vent system as indicated. This system shall be made of U.L. Classified borosilicate glass conforming to ASTM Specification C 1053-90, Federal Specification DD-G-541 B as manufactured under the trade name "KIMAX" by SCHOTT.

2. This system shall include all glass straight lengths, fittings, and traps, compression type tetra-fluoroethylene lined couplings, and padded hanger supports. IT shall also include protected pipe for underground burial and recommended adapter couplings to connect other piping material, where applicable.
 3. All pipe shall be installed free of strain, in a manner to permit limited movement. Padded pipe hangers shall be used on horizontal runs 8' to 10' on centers. Vertical risers shall be supported by padded riser clamps designed to restrict lateral and downward movement. Vertical risers up to 3" I.D. may be supported at every other floor level. Three-inch I.D. and greater shall be supported at every floor level.
- B. Connections
1. Glass-to-glass connections shall be made with KIMAX compression type bead-to-bead and bead-to-plain end couplings – article numbers 6650 and 6661 respectively. Coupling's outer shell, bolt and nut to be made from 3009 series stainless steel. Bead-to-plain end coupling outer shell must encapsulate compression liner to prevent cold flow and ensure leak-free joint. Coupling compression liner to be made from Buna-N-Rubber. Seal ring gasket to be made of tetra-fluoro ethylene. When installed according to the manufacturer's recommendations, they shall provide a leak-free joint when deflected up to 4".
 2. Joints between glass and other types of piping material shall be made with KIMAX adapters, and/or according to manufacturer's recommendations.
- C. Floor and wall penetrations
1. Glass pipe passing through non-fire rated walls or floor slabs shall be fitted with pipe sleeves a minimum of 2" greater diameter than the pipe O.D. Space between pipe and sleeve shall be packed with fiberglass, glass wool and/or a non-hardening approved caulking material.
 2. Glass pipe passing through fire-rated walls or floor slabs shall be installed in accordance with Underwriters Laboratory fire penetration systems for KIMAX Glass Pipe. System numbers listed in the U.L. Fire Resistance Directory include: C-AJ-2006, 2014, 2019, 2039, 2079, 2094, 2118, 2144, 8005, 8035; W-J-2032; W-L-2006, 2112, 2114.
 3. Glass pipe shall not be installed in direct contact with concrete. Fiberglass insulation or other type padding as approved by the pipe manufacturer shall be used to insulate between the two materials.
 4. Glass pipe shall be protected against all weld spatter.
- D. Laboratory sink connection
1. Sink outlets, tailpieces, trap sand cup sinks shall be KIMAX Borosilicate Glass.
- E. Installation and testing
1. Install and test in accordance with manufacturer's recommendations and national and/or local code requirements.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that excavations are to required grade, dry, and not over-excavated.

3.2 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. Prepare piping connections to equipment with flanges or unions.
- D. Unions and flanges for servicing and disconnect are not required in installations using grooved joint couplings. (The couplings shall serve as disconnect points.)

3.3 PLUMBING PIPING INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Dielectric nipples for connection of dissimilar materials. A brass adaptor dielectric union is not acceptable.
- C. Route piping in orderly manner and maintain gradient.
- D. Install piping to conserve building space and not interfere with use of space.
- E. Group piping whenever practical at common elevations.
- F. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.
 - 1. For water systems, use adequate numbers of Victaulic Style 77 flexible couplings in header piping to accommodate thermal growth and contraction, and for the elimination of expansion loops. (In accordance with Victaulic instructions and as approved by the engineer). Where expansion loops are required, use Victaulic Style 77 couplings on the loops.
- G. Provide clearance for installation of insulation and access to valves and fittings.
- H. Provide access where valves and fittings are not exposed. Coordinate size and location of access doors.
- I. Establish elevations of buried piping outside the building to ensure not less than 4'-0" of cover for sewers and not less than 5'-6" of cover for domestic water piping.
- J. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to weld.
- K. Provide support for utility meters in accordance with requirements of utility companies.
- L. Prepare pipe, fittings, supports, and accessories not prefinished, ready for finish painting.

- M. Underground sewers shall be a minimum of 3" in diameter. Sewers located within building shall have a minimum slope of ¼" per foot for piping 3" and smaller and a minimum slope of 1/8" per foot for piping 4" and larger.
- N. All junctions of drainage piping shall be made with combination "Y" and 1/8 bend fittings.
- O. Install bell and spigot pipe with bell end upstream.
- P. Terminate plumbing vents 12" minimum above roof. Furnish and install weather cap on top of all vent pipes.
- Q. Install valves with stems upright or horizontal, not inverted.
- R. Solder or "sweat" joints shall be used for all copper and brass fittings, valves and tubing, using the soldering flux and methods recommended by the manufacturer of the tubing and fittings. Solder shall be silver solder for buried piping. No lead solder shall be used on any potable water piping.
- S. Pipe vents from gas pressure reducing valves to outdoors and terminate in weather proof hood.
- T. Equipment using gas and related piping shall be installed in compliance with NFPA 54 and 58, as applicable.
- U. Install ductile iron pipe and fittings in accordance with AWWA C600 and manufacturer's instructions.
- V. Steel Rods, Bolt, Lugs, and Brackets: Coat buried steel with one coat of coal tar coating before backfilling.
- W. Maintain minimum 10-foot horizontal separation and 18 inch vertical separation of water main from sewer piping or as required by local code.

3.4 PLUMBING PIPING APPLICATION

- A. Use grooved mechanical couplings and fasteners in accessible locations, risers and pipe chases with Architect/Engineer's approval.
 - 1. Grooved joints shall be installed in accordance with the manufacturer's latest published installation instructions. Grooved ends shall be clean and free from indentations, projections, and roll marks in the area from pipe end to groove. Gaskets shall be of an elastomer grade suitable for the intended service, and shall be molded and produced by the coupling manufacturer. The grooved coupling manufacturer's factory trained representative shall provide on-site training for contractor's field personnel in the use of grooving tools and installation of grooved joint products. The representative shall periodically visit the jobsite and review contractor is following best recommended practices in grooved product installation. (A distributor's representative is not considered qualified to conduct the training or jobsite visit(s).)

- B. Install unions downstream of valves and at equipment or apparatus connections. Unions are not required in installations using grooved mechanical joint couplings. (The couplings shall serve as unions and disconnect points).
- C. Install brass male adapters each side of valves in copper piped system. Sweat solder adapters to pipe.
- D. Install gate, ball, or butterfly valves for shut-off and to isolate equipment, part of systems, or vertical risers. All branch piping take-offs from mains, risers, or branch piping shall have valves installed to allow isolation of branch piping.
- E. Install globe, ball, or butterfly valves for throttling, bypass, or manual flow control services.
- F. Provide spring loaded check valves on discharge of water pumps.
- G. Provide plug valves in gas systems for shut-off service. Provide removable or fixed handle for each plug valve.
- H. Provide flow controls in water recirculating systems where indicated.

3.5 INSTALLATION OF INSERTS

- A. Install in accordance with manufacturer's instructions.
- B. Provide inserts for placement in concrete formwork.
- C. Provide inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.
- D. Provide hooked rod to concrete reinforcement section for inserts carrying pipe over 4 inches.
- E. Where concrete slabs form finished ceiling, locate inserts flush with slab surface.
- F. Where inserts are omitted, drill through concrete slab from below and provide through-bolt with recessed square steel plate and nut flush with top of slab.

3.6 PIPE HANGERS AND SUPPORTS

- A. Support horizontal piping as scheduled.
- B. Install hangers to provide minimum ½ inch space between finished covering and adjacent work.
- C. Place hangers within 12 inches of each horizontal elbow.
- D. Use hangers with 1½ inch minimum vertical adjustment.
- E. Support horizontal cast iron pipe adjacent to each hub, with 5 feet maximum spacing between hangers.

- F. Support vertical piping at every floor. Support vertical cast iron pipe at each floor at hub.
- G. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.
- H. Support riser piping independently of connected horizontal piping.
- I. Provide copper plated hangers and supports for copper piping.
- J. Design hangers for pipe movement without disengagement of supported pipe.
- K. Prime coat and finish paint exposed steel hangers and supports. Hangers and supports located in crawl spaces, pipe shafts, and suspended ceiling spaces are not considered exposed. Hangers and supports located in mechanical spaces are considered exposed.

3.7 ERECTION TOLERANCES

- A. Establish invert elevations, slopes for drainage to minimum 1/8 inch per foot for piping 4" and larger, 1/4" per foot for piping 3" and smaller. Maintain gradients.
- B. Slope water piping and arrange to drain at low points.

3.8 SERVICE CONNECTIONS

- A. Provide new sanitary and storm sewer services. Before commencing work, check invert elevations required for sewer connections, confirm inverts and ensure that these can be properly connected with slope for drainage and cover to avoid freezing. Contractor shall pay all fees, cost, etc. to local authorities for tap-ins, inspections, etc. as required.
- B. Provide new water service complete with reduced pressure backflow preventer, double check valve assembly or water meter with by-pass valves as required by the local authorities.
- C. Provide sleeve in wall for service main and support at wall with reinforced concrete bridge. Caulk enlarged sleeve and make watertight with pliable material. Anchor service main inside to concrete wall.
- D. Contractor shall pay all fees, costs, etc. to local authorities for tap-ins, inspections, etc. as required.
- E. Provide new gas service complete with gas meter and regulators. Provide regulators on each line serving gravity type appliances, sized in accordance with equipment. Gas company is responsible for installation of gas service and meter. Contractor shall be responsible for all coordination, etc. Contractor shall inform the gas company of gas load for service for the building and meter size by the gas company. Owner shall pay all gas company charges for gas service directly to the gas company.

3.9 NATURAL GAS PIPING

- A. Natural gas piping located outdoors shall be prime painted and finish painted with rust prohibitor paint that includes zinc. Color shall be selected by the Architect.

- B. Natural gas piping supports shall occur on 8'-0" centers and at changes in direction.
- C. Natural gas piping installed outdoors on the roof shall be supported at a minimum of 3½" above roof level.
- D. Roof supports shall be a manufactured support similar to PHP-SS8 or equal by Miro.

3.10 POLYETHYLENE ENCASEMENT

- A. Encase Ductile Iron piping in polyethylene where indicated on drawings to prevent contact with surrounding backfill material.
- B. Install in accordance with AWWA C105, Method A.
- C. Terminate encasement 3 to 6 inches above ground where pipe is exposed.

3.11 CONCRETE THRUST RESTRAINT

- A. Provide valves, tees, bends, caps, plugs and dead ends with concrete thrust blocks as indicated on drawings.
- B. Pour concrete thrust blocks against undisturbed earth. Locate thrust blocks at each elbow or change of pipe direction to resist resultant force and so pipe and fitting joints will be accessible for repair.
- C. Do not encase fitting joints and flanges.

A. END OF SECTION

MAI: 2024-9506

SECTION 23 05 00 - HVAC REQUIREMENTS

PART 1 GENERAL

1.1 RELATED SPECIFICATIONS AND DOCUMENTS

- A. Drawings and related specifications for this project including General and Supplementary Conditions, Division 1, General Requirements, Instructions to Bidders, Addenda's, etc. apply to and are considered a part of Division 23 - Mechanical Work.
- B. Information in this division is intended to clarify or make additions to the requirements set forth in the General Conditions, Supplementary Conditions, and Division I of these specifications. Any conflict between this Division 23 and other sections or divisions of the specifications or drawings shall be brought to the attention of the Architect/Engineer in writing as a request for addendum prior to the bid opening.
- C. Furnish all equipment, materials, articles, items, operations or methods listed, mentioned or scheduled on drawings, these specifications, manufacturer's installation instructions and include all labor, materials, equipment and incidentals necessary for their complete installation and operation.
- D. All information contained in this section applies to all sections within Division 23 as if it was part of each section.

1.2 DRAWINGS AND SPECIFICATIONS

- A. The drawings and these specifications are intended to supplement each other and any material or labor called for in one shall be furnished even if not specifically mentioned in both. Any material or labor which is neither shown on the drawings nor listed in this specification, but is normally incurred or required for completion of work shall be furnished. If there is a discrepancy between the drawings and specifications, the more stringent of the two shall be followed.
- B. Drawings are diagrammatic and are intended to show approximate location and general arrangement of systems and equipment. No attempt has been made to show every ell, tee, etc. Drawings shall not be scaled for location of systems, equipment, etc. All dimensions whether given on drawings or scaled shall be verified in field and coordinated with all other trades and existing field conditions. Some ductwork, piping, equipment, etc. locations may require changes in location due to field conditions and coordination with other trades will be made with no additional cost to the Owner. Failure to check will be no reason for additional compensation.
- C. These drawings and the associated specifications are intended to provide complete furnishing, installation and operational HVAC systems as specified. If these drawings and associated specifications have information omitted that would not allow a completely operational system as is the intent of the Engineer, the bidder shall notify the Engineer a minimum one week prior to the bid date to allow for addenda. Once bids have been received, the Contractor shall be responsible for material, labor, etc., to furnish and install a completely operational mechanical system as is the intent of these drawings and associated specification.

- D. The installation of all systems, equipment, etc., is subject to clarification with submitted shop drawings and field coordination requirements. Equipment outlines shown on drawings or dimensioned on drawings are limiting dimensions. Any equipment that reduces the indicated clearances or exceeds specified or scheduled equipment dimensions shall not be used.
- E. The Architect/Engineer and Owner reserve the right to make minor changes in the location of equipment, piping, ductwork, etc. at the time of rough-in without additional cost to the Owner.
- F. The Mechanical Trades Contractor shall have completed for his portion of work, at least one installation of size and type comparable to this project and has been in satisfactory operation for at least two complete years. The Mechanical Trades Contractor shall also have a developed service department capable of negotiating service contracts with the Owner for systems herein specified.

1.3 AUTOCAD BACKGROUND FILES

- A. The Contractor shall include in their bid any cost for requesting AutoCAD backgrounds for their use from the Architect or Engineer. The cost will be \$150.00 for the first plan, and \$50.00 for each additional plan that may be requested for AutoCAD use. A waiver of responsibility for the Architect and Engineer related to Contractor use of the CAD files shall be signed by the Contractor.

1.4 MANUFACTURER'S SPECIFICATIONS AND CAPACITIES

- A. Some equipment, materials, etc. that are scheduled on the drawings or listed in any addenda may not be specified in this specification. The manufacturer's specification and capacities shall be considered included and part of this specification whether it is specified in this specification or noted or scheduled on the drawings. The contractor shall remove and replace any "substituted" equipment or material that has been installed or is on site, which in the opinion of the Architect/Engineer does not meet the scheduled equipment or materials manufacturer's capacities or specification at no additional cost to the Owner.

1.5 DEFINITIONS

- A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct shafts, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspaces, and tunnels.
- B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.
- C. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.
- D. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and in duct shafts.

- E. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.

1.6 LOCAL CONDITIONS

- A. Before submitting proposals, each contractor shall examine these specifications and associated drawings, addenda, etc. and shall examine the site of the project. The bidder shall fully investigate the site of this project, investigate coordination of his work with all other trades and existing conditions and completely satisfy himself as to the conditions to which the work is to be performed before submitting his/her bid. No allowances or considerations will be given at a later date for alleged misunderstanding as to the requirements of the work, materials to be furnished, or conditions required by the nature of this project site and coordination by the neglect on the bidder's part to make such an examination and coordination.
- B. Drawings show approximate location of existing services. The mechanical and electrical trades shall check with local utility companies or municipal agencies for exact location of services which they expect to encounter. The Mechanical Trades Contractor shall be responsible for hiring a company such as "Miss Dig" to stake out and locate all utilities in areas of excavation before commencing any work. The Mechanical Trades Contractor shall verify all elevations and locations of existing underground lines which are to be connected into or routed over or under. This verification shall be done prior to beginning work at this project.

1.7 QUALITY ASSURANCE

- A. All work shall be performed in accordance with all local and state codes, laws and regulations applicable to the work for this project. The contractor shall be responsible for all permits and costs for inspections, etc., and for checking with each utility company supplying service to this project and shall determine from them all, any changes in boxes, meters, valves, service, etc., and shall include all cost for inspections, revisions to services, etc. in his bid as required by local agencies, utilities, etc. No extra payment will be made for such items after the contractor submits his bid.
- B. In addition to all applicable Federal, State and local codes, the standards and codes listed below shall apply to all mechanical work. The reference to codes and standards shall be referenced to the latest edition or revision.
 - 1. Air Diffusion Council (ADC)
 - 2. Air Moving and Conditioning Assoc., Inc. (AMCA)
 - 3. American Boiler Manufacturer's Association (ABMA)
 - 4. American Gas Association (AGA)
 - 5. American National Standard Institute (ANSI)
 - 6. American Refrigeration Institute (ARI)
 - 7. American Society of Heating, Refrigeration, and Air Conditioning Engineers (ASHRAE)
 - 8. American Society of Mechanical Engineers (ASME)
 - 9. American Society for Testing materials (ASTM)
 - 10. American Welding Society
 - 11. ANSI code of Pressure Piping and Unified Pressure Vessels

12. ASME Boiler and Pressure Vessel Code
13. Institute of Boiler and Radiator Manuf. (IBR)
14. National Electrical Manufacturer's Association (NEMA)
15. Sheet Metal & Air Conditioning contractors National Association (SMACNA)
16. Standards of the Hydraulic Institute
17. Underwriters' Laboratories (UL)
18. Williams-Steiger Occupational Safety & Health Act (OSHA)

- C. In the event of conflict between drawings, codes, standards or specifications, the most stringent requirement shall apply

1.8 SUBMITTALS AND SHOP DRAWINGS

- A. Submit electronic sets of complete shop drawings for all mechanical equipment and materials associated with Division 23 and associated drawings to the Architect/Engineer for review before fabrication of work or ordering of equipment. Shop drawings shall be submitted at the earliest possible time.
- B. Shop drawings shall be first reviewed by the contractor. Inaccurate shop drawings shall be corrected by the contractor to meet specifications and schedules for this project. The contractor shall then initial the shop drawings as having been reviewed before submitting to the Architect/Engineer. Shop drawings shall have, in addition to the mechanical information, the electrical requirements for minimum circuit amperes and maximum fuse size ratings of the equipment.
- C. Drawings which are rejected must be corrected and returned for Architect/Engineer review before ordering.
- D. Furnish to the job site copies or prints of shop drawings that have been reviewed by the Engineer as soon as possible.
- E. Include a copy of each shop drawing in the Operation and Maintenance Manual.
- F. The checking and reviewing of shop drawings by the Architect/Engineer shall be construed as assisting the contractor and the Architect/Engineer's action does not relieve the contractor from the responsibility for errors or omissions which may exist thereon. The contractor shall be held responsible for errors or omissions that are discovered after approval process and must be made good by the contractor.
- G. The Sheet Metal Contractor, etc. shall include in their bid any cost for requesting AutoCAD backgrounds for their use from the Architect or Engineer at a minimum \$100.00 for the first file, and \$50.00 for each additional file that may be requested for AutoCAD use.

1.9 PERMITS, INSPECTIONS AND TESTS

- A. The Mechanical Trades Contractor shall take out all permits and arrange for necessary inspections and shall pay all assessments, fees and costs, etc., and make all tests as required by applicable codes. At the completion of the project, the Mechanical Trades Contractor shall furnish certificates of inspection and approval and secure final

occupancy permit. Record copies shall be included in the Operation and Maintenance manuals.

1.10 RECORD DRAWINGS

- A. Maintain an up-to-date set of "record" drawings showing actual equipment, piping, duct, etc. installation locations. Exact dimensions from column lines for all concealed work and tie-ins with elevations noted shall be included.
- B. Include a set of reproducible drawings and a set of prints in each Operation and Maintenance Manual.
- C. The Engineer reserves the right to request and be furnished any additional information he deems necessary to be shown on the record drawings.

1.11 OWNER'S INSTRUCTIONS

- A. Upon completion of the project, the contractor shall be responsible for instructing the Owner's operating staff, in the presence of the Architect/Engineer's representative, in the proper operation and maintenance of the mechanical systems and equipment. Include a statement signed by the Owner that instructions have been given for proper operation and maintenance of the mechanical systems and equipment.

1.12 GUARANTEES

- A. Furnish a written guarantee, to the Architect/Engineer, that will make the contractor responsible at his own expense for any imperfections in material and/or workmanship which may develop under ordinary use within a period of one (1) year from final Owner's acceptance of the work.
- B. Furnish all written guarantees from equipment and/or material manufacturers which shall include the operating and performance conditions and capabilities upon which they are based.
- C. Permanent equipment that is used for temporary heat or cooling shall be guaranteed for one (1) year from the date of final acceptance of the project.

1.13 PORTABLE AND DETACHABLE PARTS

- A. Retain all portable and detachable parts of installation such as keys, spare accessories, operating manuals, etc. include in the Operation and Maintenance Manual.

1.14 OPERATION AND MAINTENANCE MANUALS

- A. Furnish to the Architect/Engineer two (2) copies of an approved bound (3 ring binder) book with tabs for sections covering each item of equipment. These notebooks shall include shop drawings, maintenance manuals, operating manuals and parts lists to instruct the Owner on proper operation and use as well as maintenance for each piece of equipment. These books shall also include contractors', subcontractors' and manufacturers' names, telephone numbers and addresses.

- B. Manuals shall also include sequence of operation, control equipment literature, wiring and control diagrams, certificates of guarantees, certificates of inspection, mechanical system test and balancing reports. The contractor shall accumulate and summarize the control and maintenance sequence in a typewritten sheet to be included in the report.
- C. The manuals must be approved by the Architect/Engineer before final payment to the contractor. The Engineer reserves the right to request and be furnished any additional information that he deems necessary to be included in the manuals.

1.15 RESPONSIBILITIES FOR USE OF SUBSTITUTE MATERIALS

- A. Contractor shall notify Architect/Engineer in writing at least ten (10) calendar days before bids are due for approval to use materials and/or equipment other than that which has been specified or scheduled. If substitute materials and/or equipment are approved and used, it will be this contractor's responsibility to guarantee that the items will function as the specified equipment or materials, will in no way alter the design of the structure or system, and will not require any additional mechanical work such as piping, ductwork, etc. Any additional cost required by substitute materials will be the responsibility of the contractor.
- B. It will be the contractor's responsibility, at his own expense, to remove or replace any non-approved equipment or material or any approved equipment or materials not originally specified or scheduled if equipment and materials do not meet with the satisfaction of the Architect/Engineer.
- C. It shall be the Contractor's (Mechanical Trades) responsibility to coordinate and pay for any Electrical Contractor costs due to any changes in substitute materials and/or equipment's power requirements, which differ from that shown on the design documents.
- D. No consideration will be given to requests for substitute materials because of delivery problems unless the contractor can prove that orders were placed as soon as possible after contract was awarded and that delays were not caused by submittal of unscheduled or unspecified (substituted) materials to the Architect/Engineer.

1.16 COST BREAKDOWN AND EQUIPMENT LIST

- A. The successful bidder shall be responsible for submitting a cost breakdown to the Architect/Engineer and Owner within ten (10) calendar days after date of request of the breakdown. During progress of the work, if changes occur which cause additional cost, the price on such items shall be broken down in accordance with the items listed in the breakdown.
- B. The bidders shall be responsible for submitting a complete list of all equipment manufacturers, makes, models, etc. that will be used for this project with their proposal. The equipment list shall be typed on the contractors letterhead and shall be signed by the authorized officer.

1.17 MATERIALS AND EQUIPMENT

- A. Materials and equipment furnished under this project shall have a minimum warrantee of one (1) year. All materials and equipment shall be new, of first class quality and shall be

furnished, delivered, erected, installed and finished in every detail and shall be so selected and arranged as to fit into the building space. All material or equipment that is not specified but necessary for this project shall be subject to the approval of the Architect/Engineer.

- B. Any materials or equipment not specified or scheduled but similar to that which has had prior approval shall be listed as a substitution and noted on the proposal form as such.
- C. The contractor shall include all miscellaneous materials and labor required to completely install and operate the mechanical systems as is intended by these drawings and specification.

1.18 TEMPORARY HEATING OR COOLING OF SPACE/BUILDING DURING CONSTRUCTION

- A. It is not recommended to use HVAC equipment being furnished for the project for temporary heating and cooling of the space/building during construction. If it is necessary to utilize the HVAC equipment for tempering air, filters shall be placed at face of each return diffuser or grille. Mechanical Contractor shall be responsible for removing temporary; filters at each return diffuser, cleaning return air ductwork and installing new filters within the HVAC equipment before space/building is turned over to the Owner.

1.19 SCHEDULE, COORDINATION AND INSTALLATION OF WORK

- A. The contractor shall carry on work in such a manner as to meet the dates as scheduled by the General Contractor and shall work overtime at no expense to the Owner as required to comply with the schedule. This contractor shall schedule all work with Owner and Architect/Engineer and schedule shut down of systems with Owner.
- B. Examine the site and all drawings and specifications and coordinate work with all other trades before commencing work for this project. Arrange work essentially as shown with the exact layout to be made on the job to suit actual conditions. Precise locations of equipment and materials shall be coordinated and shall be the responsibility of this contractor. Should any conflicts in location occur, and necessary deviations from drawings are required as determined by the Architect/Engineer, the contractor shall make necessary adjustments without additional cost to the Owner. Any damage to HVAC equipment due to HVAC equipment operation during construction shall be paid for by the Mechanical Contractor.
- C. All equipment, piping, ductwork, etc. shall be located and/or routed to allow for the most convenient access for servicing.
- D. Arrange for necessary access doors, panels, etc. to allow servicing of equipment, piping, valves, fire dampers, etc. Perform any cutting and patching as required, made necessary by failure to make proper arrangements.
- E. Indicated equipment connections, sizes and locations shall be verified and connected according to manufacturer's shop drawings and installation instructions. Thoroughly investigate the space provided for equipment and connections before ordering equipment. All equipment shall be selected to fit into the space allowed, including connections with adequate space allowed for operation and maintenance.

- F. All work shall be installed in a neat and workmanlike manner, using skilled personnel thoroughly qualified in the trade or duties that they are to perform. Rough work will be rejected.
- G. Coordinate all equipment deliveries and schedules to allow timely installation. Contractor shall separate equipment into sections and reassemble in building if required by the installation at no extra cost to the Owner.
- H. Furnish a superintendent approved by the Architect/Engineer to oversee and coordinate the work to be performed with all other trades.
- I. Coordinate location of pipes, ductwork, etc. with other building components such as structural components (beams, joists, columns, etc.), electrical components (lighting, conduits, etc.) and architectural components (walls, ceilings, floors, pipe chases, roof, etc.).
- J. Before starting work, Contractor shall verify that available space for proposed pipes, ducts, equipment etc. is adequate for the intended purpose and will result in a first class installation. Irregardless of drawings, responsibility for first class operating systems rests with the Contractor.
- K. Arrange for chases, slots, openings, etc. and other building components to allow for mechanical systems installation. Coordinate cutting and patching of these components to accommodate installation. This contractor shall be responsible for accurately locating for the general trades all chases, shafts, etc. and shall be responsible for all cutting and patching if these chases were not accurate or not coordinated in time with the general trades. Coordinate installation of all sleeves in walls, on floors or other structural or architectural components.
- L. Sequence, coordinate and integrate installation of equipment and materials for efficient work flow during the project. Particular attention should be spent on larger pieces of equipment.
- M. Install equipment and materials with provisions for necessary access for service and maintenance. Allow space for removal of all parts that may require replacement or servicing.
- N. Coordinate installation of required supporting devices and set sleeves in poured-in-place concrete and other structural components as they are constructed.
- O. Coordinate requirements for access panels and doors for mechanical items requiring access that are concealed behind finished surfaces. When access panels are required, valves and equipment components requiring access shall be located to minimize the number of panels.
- P. Examine the work as it progresses and alert the Architect/Engineer in writing of any instances or obstructions that will prevent this contractor from performing his/her work.

1.20 DELIVERY, STORAGE, AND HANDLING

- A. Deliver pipes and tubes with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe end damage and to prevent entrance of dirt, debris, and moisture.
- B. Furnish and maintain a weatherproof storage facility on the site of adequate size to store miscellaneous equipment and/or materials to prevent exposure to the weather. Location of shed shall be determined by the Owner and Architect/Engineer. The Owner reserves the right to deny storage of materials or equipment in any existing or new buildings.

1.21 COOPERATION WITH ARCHITECT/ENGINEER AND OTHERS

- A. Coordinate all aspects of the mechanical system installation with all other trades, existing conditions, etc.
- B. If the bidder believes that changes in design are required to meet intended design capacities and operation or material and/or equipment is obviously omitted from these specifications and drawings, the bidder shall contact the Architect/Engineer in writing at least ten (10) days before bid date. The acceptance of a bid by the Owner shall be binding and shall indicate that the bidder does not require any changes in design nor additional costs in order to meet the design and performance of the mechanical system as indicated in these specifications and drawings.

1.22 WORK INVOLVING OTHER TRADES

- A. Equipment or materials specified in Division 23 may have to be installed by other trades (such as electrical trades or architectural trades) due to code requirements or union jurisdictional requirements. Where this occurs, this contractor shall include all costs required by other trades to complete the work and hire the respective trade to perform this work.

1.23 PERFORMANCE DATA AND ACCESSIBILITY

- A. All performance data specified in this specification or scheduled on drawings shall be considered actual performance of the equipment after installation. The supplier and installer shall be responsible for suitable allowances to adjust equipment to design capacities when actual operating and installation conditions differ from drawings.
- B. All equipment and materials shall be installed to allow access for servicing and maintenance. Coordinate final location of such equipment and materials that are concealed with required access doors on panels. Allow ample space for replacement or servicing. Extend all grease fittings to an accessible location.

1.24 CUTTING AND PATCHING

- A. Unless noted otherwise, the Mechanical Trades shall be responsible for all cutting, patching and associated work required under Division 23. This work shall be performed by trades normally performing this type of work except drilling of holes shall be done by the contractor requiring same. This includes replacing areas of cutting required by this work with proper reinforcing, termite shielding, materials, finishing, etc. to restore the areas to their original condition, and filling all openings around ducts, piping, etc. with

approved fire retardant materials. Regardless, all drilling of holes shall be the responsibility of the Contractor requiring same.

- B. If noted on drawings that the General Trades will be responsible for all cutting and patching, it will be the Mechanical Trades responsibility to notify all General Trades during bidding of all areas requiring cutting and patching. Regardless, all drilling of holes shall be the responsibility of the contractor requiring same.

1.25 WORK IN EXISTING BUILDINGS

- A. Coordinate and schedule all work in existing building with Owner and Architect/Engineer. Systems shall be kept in operation at all times if at all possible. If a system shut-down is required, the contractor shall schedule with the Owner, the time and length of shut-down. A system shall not be shut down without written permission from the Owner.
- B. All existing equipment, piping, ductwork, etc. that is to be removed shall remain the property of the Owner. The contractor shall remove and locate this material that remains the property of the Owner to a location determined by the Owner somewhere on site. If the Owner does not want to maintain possession of the removed material, the contractor shall be responsible for removing material from the site and disposing of this material as necessary to meet all codes and requirements and shall pay all costs as required for any disposal fees, inspections, permits, etc.
- C. All existing piping, equipment, etc. whether shown on drawings or not that is to be removed and/or abandoned and does not remain property of the Owner shall be removed from site.
- D. Any existing piping, valves, mechanical equipment, etc. serving the existing building which are shown or not shown on drawings and are required for systems operation shall remain in use. If these systems require relocation to allow installation of new systems, the contractor shall be responsible for relocating to an Owner and Architect/Engineer approved location. The contractor shall pay all cost for this work and include such cost in his/her bid. (As specified previously, contractor shall be responsible for examining site and include all cost for work required to complete this project.)
- E. When active services, etc. are encountered in this project, the contractor shall furnish and install bracing, support, etc. as required to protect and keep these services active. (As specified previously, these drawings are diagrammatical. The contractor shall be responsible for verification of all existing services, piping, equipment, etc.).

1.26 ACCESS TO EQUIPMENT, HEATING COILS, VALVES, ETC.

- A. Coordinate access panels with type of construction and furnish access panels in areas that are non-accessible. Access panels shall be furnished by this contractor and installed by the General Contractor. The access panels shall be all approved, UL labeled and fire rated and shall be located and sized to allow access to equipment, heating coils, valves, fire dampers, etc.
- B. Where access panels are required, valves, equipment etc. shall be located as to require the least number of access panels.

1.27 EQUIPMENT GUARDS

- A. All rotating or moving parts of equipment that are located so as to be a hazard shall be fully enclosed or properly guarded as to meet or exceed all regulations and OSHA requirements.

1.28 EQUIPMENT CONNECTIONS

- A. Connections to equipment, plumbing fixtures, etc. shall be made in accordance with shop drawings, rough-in dimensions furnished by the manufacturer, codes, etc. and may vary with connections shown on drawings. The contractor shall be responsible for making connections and number of connectors as per shop drawings, codes, etc. at no additional cost to the Owner.

1.29 ELECTRICAL CONNECTIONS

- A. The Electrical Trades shall be responsible for furnishing and installing all electrical equipment, wiring, etc. required for operation of mechanical equipment unless otherwise noted on the drawings. The Mechanical Trades shall furnish detailed information and wiring diagrams to the Electrical Trades for all equipment specified and/or scheduled for this project. In the event that the Mechanical Trades furnishes an "approved equal" or "alternate" that require changes in the original electrical design, the Mechanical Trades shall pay all costs to the Electrical Trades as required to make satisfactory adjustments. All electrical work shall be done in accordance with the latest edition of the National Electric Code.
- B. See the temperature control or building automation system specification (if applicable) for description of electrical contractor work and Division 23 temperature control work.

1.30 MOTORS, MOTOR STARTERS AND DISCONNECTS

- A. Unless otherwise noted on drawings, motors shall be of constant speed 1750 rpm, new NEMA Design B, 40°C rise, horse power rated, open drip-proof except TEFC in dirty atmosphere, induction type motor with service factor of 1.15 and be of sufficient capacity to continuously operate the apparatus to which it is connected under all conditions of operation without exceeding nameplate ratings.
- B. Motors shall be premium efficiency as calculated using IEEE test method 112B.
- C. Motors ½ Hp. or larger shall be three phase; motors under ½ Hp. shall be 115 volt, 60 cycle, single phase. Before ordering the motors, the contractor shall verify correct motor voltage with the Electrical Trades and field conditions.
- D. The Mechanical Trades shall furnish, for equipment under Division 23, all special switches, disconnects, starters, alternators, etc. as specified or scheduled to be factory furnished and/or factory installed with the equipment including wiring diagrams, etc. whether it is to be factory installed or field wired. All other motor starters, disconnects, etc. not noted as factory furnished shall be furnished and installed by the Electrical Trades.

- E. Starters that are to be factory furnished with equipment shall be of the combination type and shall be as specified under Electrical Trades Division. Furnish overload protection for each phase.
- F. All wiring methods and materials shall meet NEMA, National Electric Code and State of Michigan Code requirements.
- G. All displays on control panels shall be on face of the panels.
- H. Motors having V-belt shall be furnished with base slide rails or other form of adjustment.

1.31 LUBRICATION AND MAINTENANCE

- A. Contractor shall maintain, oil, lubricate, etc. all equipment furnished under Division 23 until final acceptance by the Owner. Protect all bearings and shafts during installation and thoroughly grease the steel shafts to prevent corrosion. The contractor shall be responsible for any and all damage to bearings, shaft, etc. of Division 23 equipment operated or not until final acceptance by the Owner.

1.32 EXCAVATION AND BACKFILLING

- A. Furnish all excavation, backfilling and removal of excess dirt to accomplish installation of Division 23 mechanical work unless otherwise noted on drawings.
- B. All excavation shall be by open cut from the surface. Contractor shall determine whether excavation shall be by machine or by hand except where existing utilities may be located where excavation shall be by hand. Contractor shall be responsible for all damage to existing facilities and services. Excavation shall be to a depth of at least 6" to allow granular bedding below pipe or duct.
- C. If for any reason the work is suspended, the contractor shall properly protect the excavation and leave the areas unobstructed.
- D. Trench width shall allow sufficient width at centerline of pipe to allow at all times a first class construction/installation method but in no case should be less than 12" larger than the nominal pipe or duct size. This shall especially be true in areas that joints must be connected. Joint holes may have to be made with overhanging sides to make installation safe for workmen.
- E. The excavation shall be at all times finished and backfilled to the required grade after completion and approval of work. Not more than 100 feet of trench shall be excavated and open unless written approval is given by the Architect/Engineer.
- F. The subgrade shall be 4" to 6" below the pipe of granular bedding graded and tamped by hand or mechanical means to the exact elevation required at the bottom of the pipe. Granular materials shall be approved fine aggregate meeting MDOT #2NS specifications. This material shall pass a 1/2" sieve but will be retained on a #4 sieve. If poor soil conditions exist which will not give proper support to the pipe, duct or structure, furnish granular fill as required to remedy this situation and give proper support.
- G. Furnish and install properly sloped sheet piling, shored and braced in areas that the soil requires this to maintain a proper excavation and prevent any movement of earth which

could in any way damage the work under construction. When removing the sheeting and bracing, special care should be taken to prevent any caving of the sides of the excavation and injury to the completed work or adjacent property.

- H. Take all necessary action to keep trenches and other excavation areas free from water at all times. Use such methods as pumping, ditching, well pointing, etc. to prevent water in trench or excavation. Dewatering of trench shall have constant supervision.
- I. Backfill excavation and trenches with approved granular material around sides of pipe and at least 12 inches above the top of the pipe laid not more than in 6 inch layers that are thoroughly tamped to 95% of its maximum density. There shall be no backfilling by any mechanical means until the granular material has been firmly tamped around the entire pipe to 12 inches above the pipe. All material used for backfilling shall be approved by the Architect/Engineer. Wherever trenching crosses walks or roadways or isolated inside of building, backfill top 6'-0" of trench with sand or bank run gravel in layers not to exceed 6 inches in depth and carefully compact by hand or machine. Do not backfill with frozen materials.
- J. No piping shall be covered until it has been tested, inspected and approved. Upon completion of backfilling, grade shall be restored in indicated elevation and left in reasonable condition for finish grade by others unless otherwise noted on drawings.
- K. Before final acceptance of work, all disturbed streets, drives, curbs, walks, parking areas, etc. shall be paved, graveled or other to as near their original condition as possible. All unused excavated material shall be removed from site if directed by the Architect/Engineer.

1.33 BASES AND SUPPORTS

- A. This contractor shall be responsible for furnishing all equipment pads and supports for equipment and materials required by Division 23 unless otherwise noted on drawings.
- B. All floor mounted mechanical equipment shall have a reinforced concrete pad furnished unless otherwise noted on drawings. The concrete pads shall be tied to the building floor with expansion bolts located maximum of 4'-0" on centers with a minimum of four (4) bolts, set before pouring and concealed within the pad. The Mechanical Trades shall verify exact pad or support size with the equipment manufacturer and shall size pad with adequate area to allow sufficient room for installation of vibration isolators, equipment mounting hardware, etc. Concrete pads shall have a 45 degree bevel at the top edge. The contractor shall verify exact location of concrete pads.
- C. Furnish all steel, hanging material, rods, etc. for suspending equipment off floor unless otherwise noted on drawings for equipment to be furnished under Division 23. This includes all structural steel for supporting between beams.
- D. All support structure shall be of strength to safely withstand all stresses and loads to which they will be subjected and shall distribute load properly over the building area. Supports shall be designed to avoid undue strain to equipment and to avoid interference with piping, pipe connections, service and maintenance clearances, etc.

- E. Where equipment is to be floor mounted and requires legs, this contractor shall furnish and install structural steel members or steel pipe and fittings for legs. Fasten and brace to equipment and furnish flange at base to allow bolting to floor.
- F. Where equipment is to be ceiling or wall mounted, furnish necessary platform, structural steel, hardware, etc. as is most suitable for support of this equipment.
- G. All supports shall be approved by the Architect/Engineer.
- H. All piping, ductwork, etc. shall be suspended from structural steel members utilizing rods and approved hanger devices. Do not use metal deck for support. Beam clamps such as the Grinnell Fig. 260 or approved equal shall be used. Sheet metal "straps" shall not be used in place of rods.
- I. The mechanical trades shall be responsible for furnishing and setting in place all mechanical equipment, roof curbs and piping/duct roof curbs. The general trade shall be responsible for the roof work and associated flashing. The mechanical trade shall furnish and install treated wood base blocking as required to level curb and to match roof insulation thickness. Curb shall be as specified, or if not specified should be similar to Pate or Thy-curb with heavy gauge galvanized steel, insulated and with wood nailer. Height of curb scheduled or specified shall be height required to top of curb above finished roof. If height is not specified or noted, a minimum 12" high above finished roof will be required. (pipe support units shall be at height required). Rooftop units will be shipped knocked down with the mechanical trade responsible for assembly on site. Roof curb shall mate with unit and provide support and a watertight installation.

1.34 SLEEVES, PLATES AND COLLARS

- A. Furnish all sleeves, plates and collars for piping, ductwork, etc. passing through walls, floor ceilings, foundations, etc. Coordinate with the General Contractor the exact location and size of required openings. No pipe or duct shall pass through a wall, floor ceiling, etc. without a sleeve. This contractor shall be responsible for sleeve locations and securing sleeves before concrete is formed.
- B. Sleeves for steel pipe shall be standard weight black steel pipe. For walls, foundations and ceilings, sleeve shall be kept flush with finished surfaces. For floors, the sleeve shall be set flush with bottom of concrete construction and be extended up ¼" above concrete floor. Sleeves shall be set in place before construction of walls, floors, ceilings, etc.
- C. Sleeves for copper pipe shall be type "M" hard copper tubing installed typical to that of steel pipe sleeves.
- D. Sleeves for piping shall be sized to allow insulation to run continuous through sleeve whenever possible and to allow not less than ¼" all around bare pipe or insulation.
- E. Sleeves for ducts passing through floors shall be 14 gauge black steel for ducts up to 24" maximum dimension, and 12 gauge black steel for ducts 25" and over maximum dimension. Sleeves shall be kept flush with the finished wall surface.

- F. Where insulated piping passes through walls or floor sleeves, furnish 22 gauge galvanized band around insulation of same length as the sleeve length. Band shall fit snugly over insulation and be held in place by steel metal collars all around insulation to cover openings.
- G. All penetration voids shall be sealed smoke tight with non-combustible materials similar to 3M or Hilti firestop systems to maintain the integrity of the fire rated structure. In a non-fire rated assembly, seal all voids with non-hardening sealant.
- H. Where bare piping 2" and smaller pass through wall or floors, furnish polished chrome plated brass escutcheons, split type. Bare piping 2½" and larger that pass through walls or floor, furnish 22 gauge galvanized steel metal collars so as to cover opening.
- I. Where piping penetrates an outside wall, below grade, utilize a mechanical sleeve, similar to link-seal, with stainless steel nuts and bolts on fasteners.

1.35 RIGGING AND HOISTING

- A. Perform all required rigging, hoisting, transportation, moving, etc. of all equipment, materials, etc. to be furnished and/or installed under Division 23 whether furnished by this contractor or by the Owner or other trades.

1.36 STORAGE FACILITY

- A. Furnish and maintain a weatherproof storage facility on the site of adequate size to store miscellaneous equipment and/or materials to prevent exposure to the weather. Location of shed shall be determined by the Owner and Architect/Engineer. The Owner reserves the right to deny storage of materials or equipment in any existing or new buildings.

1.37 PROTECTION FROM DAMAGE

- A. The contractor shall be responsible for all materials, equipment, etc. and all work installed by himself and shall protect it from damage until final acceptance of this project by the Owner.
- B. Furnish all coverings and protection from dirt, dust, rain, storm, heat, traffic, wear, etc. and all possible injury including that by other workmen. Any equipment, workmanship, materials, etc. damaged prior to final acceptance by the Owner of this project shall be properly repaired at no expense to the Owner.
- C. Protect all plumbing fixtures and other equipment from damage by covering or coating. Any dented, scratched, rusted or marred surface finishes will not be accepted.
- D. Protect all equipment, materials, etc. from freezing.

1.38 COMMON PIPE MATERIALS AND INSTALLATION INSTRUCTIONS

- A. Refer to individual Division 23 piping Sections for pipe, tube, and fitting materials and joining methods.
- B. Pipe Threads: ASME B1.20.1 for factory-threaded pipe and pipe fittings.

- C. Refer to individual Division 23 piping Sections for special joining materials not listed below.
1. Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.
 - a. ASME B16.21, nonmetallic, flat, asbestos-free, 1/8-inch (3.2-mm) maximum thickness unless thickness or specific material is indicated.
 - 1) Full-Face Type: For flat-face, Class 125, cast-iron and cast-bronze flanges.
 - 2) Narrow-Face Type: For raised-face, Class 250, cast-iron and steel flanges.
 2. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.
 3. Plastic, Pipe-Flange Gasket, Bolts, and Nuts: Type and material recommended by piping system manufacturer, unless otherwise indicated.
 4. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.
 5. Brazing Filler Metals: AWS A5.8, BCuP Series, copper-phosphorus alloys for general-duty brazing, unless otherwise indicated; and AWS A5.8, BAg1, silver alloy for refrigerant piping, unless otherwise indicated.
 6. Welding Filler Metals: Comply with AWS D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.
 7. Solvent Cements for Joining Plastic Piping:
 - a. ABS Piping: ASTM D 2235.
 - b. CPVC Piping: ASTM F 493.
 - c. PVC Piping: ASTM D 2564. Include primer according to ASTM F 656.
 - d. PVC to ABS Piping Transition: ASTM D 3138.
 8. Fiberglass Pipe Adhesive: As furnished or recommended by pipe manufacturer.

1.39 PIPE HANGERS AND SUPPORTS

- A. Hangers and saddles shall be Modern Pipe Support Corp., Grinnel/Anvil, Autogrip, or M-CO. Inserts shall be of the type to receive a machine bolt head or nut after installation, permit horizontal adjustment, and shall be flush with the surface. For copper pipe with steel hangers, clean and wrap pipe with two layers of plastic insulating tape at point of contact. Roller supports shall be adjustable type with insulated standoff. Rods shall be used for suspended installation. Sheet metal "straps" shall not be used in place of rods.
- B. Hangers for piping with vapor barrier sealed insulation shall be multipurpose pipe saddles fitting over the insulation. Wire or perforated strap iron will not be permitted for pipe supports. Do not support hangers from roof deck. Furnish and install all support steel as required to suspend from structural steel joist or beams. Hangers shall be clevis or split ring type with vertical adjustment and beam clamp similar to Grinnell/Anvil Fig. 260, with maximum spacing per ASHRAE Standards:

Pipe Size	Steel Pipe	Copper Pipe	PVC Pipe	Rod Size
½ to ¾ inch	6 feet	5 feet	4 feet	3/8"
1 inch	7 feet	5 feet	4 feet	3/8"
1 ¼ inch	7 feet	7 feet	4 feet	3/8"
1½ inch	7 feet	7 feet	4 feet	1/2"
2 inch	10 feet	8 feet	4 feet	1/2"
2½ inch	11 feet	9 feet	4 feet	5/8"
3 inch	11 feet	9 feet	4 feet	5/8"
3 ½ inch	13 feet	11 feet	4 feet	5/8"
4 inch	14 feet	12 feet	4 feet	3/4"
5 inch	14 feet	12 feet	4 feet	3/4"
6 inch	14 feet	--	4 feet	3/4"
8 inch	16 feet	--	4 feet	7/8"
10 inch	16 feet	--	4 feet	7/8"
12 inch	20 feet	--	4 feet	1"
14 inch	20 feet	--	4 feet	1¼"
16 inch	20 feet	--	4 feet	1¼"
18 inch	20 feet	--	4 feet	1¼"

- C. Conform to ASME B31.9, ASTM F708, MSS SP58, MSS SP69 and MSS SP89.
- D. Hangers for Hot Pipe Sizes ½ to 1½ Inch: Malleable iron, adjustable swivel, split ring.
- E. Hangers for Cold Pipes sizes ½" to 1½" and Hot and Cold Pipe Sizes 2 Inches and Over: Carbon steel, adjustable, clevis.
- F. Hangers for Hot Pipe Sizes thru 4 Inches: Carbon steel, adjustable, clevis.
- G. Hangers for Hot Pipe Sizes 5 Inches and Over: Adjustable steel yoke, cast iron roll, double hanger.
- H. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.
- I. Multiple or Trapeze Hangers for Hot Pipe Sizes 6 Inches and Over: Steel channels with welded spacers and hanger rods, cast iron roll.
- J. Wall Support for Pipe Sizes up thru 3 Inches: Cast iron hook.
- K. Wall Support for Pipe Sizes 4 Inches and Over: Welded steel bracket and wrought steel clamp.
- L. Wall Support for Hot Pipe Sizes 6 Inches and Over: Welded steel bracket and wrought steel clamp with adjustable steel yoke and cast iron roll.
- M. Vertical Support: Steel riser unistrut clamps at high, mid, and low locations.
- N. Floor Support for Cold Pipe all sizes and Hot Pipe Sizes up thru 4 Inches: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.

- O. Floor Support for Hot Pipe Sizes 5 Inches and Over: Adjustable cast iron roll and stand, steel screws, and concrete pier or steel support.
- P. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.
- Q. Hanger Rods: Mild steel threaded both ends, threaded one end, or continuous threaded.
- R. Inserts: Malleable iron case of steel shell and expander plug for threaded connection with lateral adjustments, top slot for reinforcing rods, lugs for attaching to forms, size inserts to suit threaded hanger rods.

1.40 PIPING, DUCTWORK AND EQUIPMENT SUPPORT

- A. Attachments of mechanical equipment to structural members are the responsibility of the installing trade. Structural members shall not be field cut, welded or otherwise modified without approval of the Architect/Engineer. Attachment to steel joist shall be made at panel points. When routing piping or ductwork perpendicular to joist, a support shall be provided at every steel joist; when parallel to joist, a support shall be provided at no more than 6' on centers or two panel bays. Structural members shall not be overloaded as a result of attachments. Attachment/equipment loading for all trades resulting in total load greater than an equivalent uniform 5 psf for any member shall be submitted to the Architect/Engineer for review. Mechanical Trades may contact the project Structural Engineer as required for panel point location assistance and welder certification requirements. Electrical Trades are still responsible for design, layout, and fabrication and installation of electrical supports and support attachment methods. Mechanical Trades shall submit attachment methods to the Structural Engineer for review.
- B. Install products in accordance with manufacturer's instructions.
- C. Do not fasten supports to pipes, ducts, mechanical equipment, and conduit.
- D. Do not use spring steel clips and clamps.
- E. Do not use powder-actuated anchors.
- F. Do not drill or cut structural members without permission from Architect/Engineer.
- G. Fabricate supports from structural steel or steel channel. Rigidly weld members or use hexagon head bolts to present neat appearance with adequate strength and rigidity. Use spring lock washers under all nuts.

1.41 PIPING SYSTEMS SHUT OFF VALVES

- A. Shut off valves shall be installed at all branch lines off main piping, or where mains divide/separate to serve different areas, to allow isolation of all branch piping and systems they serve such as air handling units, areas or wings of the building, etc.

1.42 CLEANING AND FINISHING

- A. During construction period, remove all debris, rubbish, tools, equipment, unused materials, etc. as required or requested by the Architect/Engineer. All cost for cleanup and removal will be the responsibility of the contractor.
- B. Upon completion of the project and before final acceptance by the Owner, the entire installation shall be thoroughly cleaned, all rubbish and unused material removed to the satisfaction of the Architect/Engineer. All dust and dirt shall be removed from all equipment, piping, ductwork, etc.
- C. Thoroughly clean all heating units, fans and fan wheels, diffusers and grilles, air handler plenums and air filter frames, etc. using compressed air if necessary.
- D. Finish paint all equipment, materials, piping, etc. as noted on drawings or listed in this specification. Match Owner's existing color scheme. Any Division 23 equipment which has been scratched or damaged shall be finished equal to the original finish.

1.43 DUCTWORK MANUAL BALANCING DAMPERS

- A. All duct branch take off's to diffusers, grilles, regulators, etc. shall have manual balancing dampers installed to allow balancing of outlets.

1.44 EQUIPMENT/SYSTEMS START-UP

- A. Furnish and schedule manufacturer's start-up service for all equipment and systems. These start-up services shall be performed in the presence of, and to the satisfaction of the Owner and Architect/Engineer.

1.45 EQUIPMENT/SYSTEMS SIGN-OFF

- A. The Mechanical Trades shall furnish written sign-offs on all systems stating that the equipment and systems have been checked, tested, started and that their operation has been verified correct through the entire range of operation that can be expected through the seasons.

1.46 SUBSTANTIAL COMPLETION

- A. Contractor shall submit a letter to the Architect/Engineer advising that all work has been completed in accordance with plans and specifications and the project is ready for a final walk-thru.

A. END OF SECTION

MAI: 2024-9506

SECTION 23 05 16 - PIPING EXPANSION COMPENSATION

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Flexible pipe connectors.
- B. Expansion joints and compensators.
- C. Pipe loops, offsets, and swing joints.

1.2 REFERENCES: Material and/or equipment specified in this section shall meet or exceed one or more of the property requirements or installation requirements of the following specifications/publications as applicable to the specific product or end use:

- A. MIL-E-17813D - Expansion Joints, Pipe, Bellows.

1.3 SCOPE

- A. The work covered by this specification consists of furnishing all labor, equipment, materials and performing all operations required, for the correct and complete fabrication and installation of piping expansion compensation systems in accordance with the applicable project specifications, drawings, codes, regulations and standards. Expansion compensators, joints, or expansion loops may be used. Expansion loops are required unless installation area does not allow them or it is not practical.

1.4 PERFORMANCE REQUIREMENTS

- A. Provide structural work and equipment required to control expansion and contraction of piping. Verify that anchors, guides, and expansion joints provided, adequately protect system. Calculations and details shall be provided to the Engineer, if requested, that verify systems expansion compensation has been properly furnished and installed.
- B. Expansion Calculations:
 - 1. Installation Temperature: 50 degrees F.
 - 2. Hot Water Heating: 210 degrees F.
 - 3. Domestic Hot Water: 140 degrees F.
 - 4. Safety Factor: 30 percent.

1.5 SUBMITTALS

- A. Product Data:
 - 1. Flexible Pipe Connectors: Indicate maximum temperature and pressure rating, face-to-face length, live length, hose wall thickness, hose convolutions per foot (meter) and per assembly, fundamental frequency of assembly, braid structure, and total number of wires in braid.
 - 2. Expansion Joints: Indicate maximum temperature and pressure rating, and maximum expansion compensation.

- B. Manufacturer's Installation Instructions: Indicate special procedures, and external controls.

1.6 WARRANTY

- A. Provide five year warranty.
- B. Warranty: Include coverage for leak free performance of expansion joints.

PART 2 PRODUCTS

2.1 FLEXIBLE PIPE CONNECTORS

- A. Steel Piping:
 - 1. Inner Hose: Stainless Steel.
 - 2. Exterior Sleeve: stainless steel.
 - 3. Pressure Rating: 125 psig WSP and 450 degrees F.
 - 4. Joint: As specified for pipe joints.
 - 5. Size: Use pipe sized units.
 - 6. Maximum offset: $\frac{3}{4}$ inch on each side of installed center line.
 - 7. Three Victaulic flexible couplings may be used in lieu of flexible connectors for vibration attenuation. The couplings shall be placed in close proximity to the source of the vibration.
- B. Copper Piping:
 - 1. Inner Hose: Bronze
 - 2. Exterior Sleeve: Braided bronze.
 - 3. Pressure Rating: 125 psig WSP and 450 degrees F.
 - 4. Joint: As specified for pipe joints.
 - 5. Size: Use pipe sized units.
 - 6. Maximum offset: $\frac{3}{4}$ inch on each side of installed center line.

2.2 EXPANSION JOINTS

- A. Stainless Steel Bellows Type:
 - 1. Pressure Rating: 125 psig WSP and 400 degrees F.
 - 2. Maximum Compression: $1\frac{3}{4}$ inch.
 - 3. Maximum Extension: $\frac{1}{4}$ inch.
 - 4. Joint: As specified for pipe joints.
 - 5. Size: Use pipe sized units.
 - 6. Application: Steel piping 3 inch and under.
- B. External Ring Controlled Stainless Steel Bellows Type:
 - 1. Pressure Rating: 125 psig and 400 degrees F.
 - 2. Maximum Compression: $1\frac{1}{4}$ inch.
 - 3. Maximum Extension: $\frac{3}{8}$ inch.
 - 4. Maximum Offset: $\frac{5}{16}$ inch.
 - 5. Joint: Flanged.
 - 6. Size: Use pipe sized units.
 - 7. Application: Steel piping over 3 inch.

- C. Single Sphere, Flexible Compensator:
1. Body: Teflon.
 2. Working Pressure: 150 psi.
 3. Maximum Temperature: 400 degrees F.
 4. Maximum Compression: $\frac{3}{4}$ inch.
 5. Maximum Elongation: $\frac{5}{8}$ inch.
 6. Maximum Offset: $\frac{1}{2}$ inch.
 7. Maximum Angular Movement: 15 degrees.
 8. Joint: Tapped steel flanges.
 9. Size: Use pipe sized units.
 10. Accessories: Control rods.
 11. Application: Steel piping 2 inch and over.
- D. Two-ply Bronze Bellows Type:
1. Construction: Bronze with anti-torque device, limit stops, internal guides.
 2. Pressure Rating: 125 psig WSP and 400 degrees F.
 3. Maximum Compression: $1\frac{3}{4}$ inch.
 4. Maximum Extension: $\frac{1}{4}$ inch.
 5. Joint: As specified for pipe joints.
 6. Size: Use pipe sized units.
 7. Application: Copper piping.
- E. Low Pressure Compensator with Two-Ply Bronze Bellows:
1. Working Pressure: 75 psig.
 2. Maximum Temperatures: 250 degrees F.
 3. Maximum Compression: $\frac{1}{2}$ inch.
 4. Maximum Extension: $\frac{5}{32}$ inch.
 5. Joint: Soldered.
 6. Size: Use pipe sized units.
 7. Application: Copper or steel piping 2 inch and under.
- F. Grooved end Expansion Joints:
1. Packless, gasketed, Type: 350-psig maximum, grooved ends, telescoping type expansion joint consisting of a ductile iron housing, carbon steel ends, with POPS modified PTFE slide section coating. Suitable for axial end movement to $3\frac{7}{8}$ inch. Basis of design: Victaulic Style 150.
 2. Expansion fitting consisting of a series of grooved end nipple sections joined in tandem with Victaulic flexible type couplings. Pressure rating and total joint movement dependent on pipe size and the number of couplings used in the joint. Basis of design: Victaulic Series 155.

2.3 EXPANSION LOOPS

- A. Piping expansion loops shall be sized and installed in accordance with standards and codes for amount of piping expansion required by the piping system. The Mechanical Trades will be responsible for calculations, detailing and installation of loops, guides and anchors.
- B. For water systems, Victaulic flexible couplings may be used on header piping to accommodate thermal growth and contraction, and for the elimination of expansion loops (as approved by the engineer). Where loops are required, install loops in grooved-end steel piping systems consisting of (8) Victaulic flexible couplings, (4) 90 degree

elbows, and (3) grooved end pipe spools in accordance with Victaulic recommendations for expansion compensation

2.4 ACCESSORIES

- A. Pipe Alignment Guides:
 - 1. Two piece welded steel with enamel paint, bolted, with spider to fit standard pipe, frame with four mounting holes, clearance for minimum 1 inch thick insulation, minimum 3 inch travel.
- B. Swivel Joints:
 - 1. Bronze body, double ball bearing race, field lubricated, with rubber (Buna-N) o-ring seals.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Construct spool pieces to exact size of flexible connection for future insertion.
- C. Install flexible pipe connectors on pipes connected to equipment supported by vibration isolation. Provide line size flexible connectors.
- D. Install flexible connectors at right angles to displacement. Install one end immediately adjacent to isolated equipment and anchor other end. Install in horizontal plane unless indicated otherwise.
- E. Rigidly anchor pipe to building structure where necessary. Provide pipe guides so movement is directed along axis of pipe only. Erect piping such that strain and weight is not on cast connections or apparatus.
- F. Provide support and equipment required to control expansion and contraction of piping. Provide loops, pipe offsets, and swing joints, or expansion joints where required.
- G. If Victaulic pipe system is used, provide pipe guides as recommended by expansion joint manufacturer, or four (4) pipe diameters from the expansion joint to the first guide and fourteen (14) pipe diameters between guides to the second joint.
- H. Provide Victaulic piping with minimum one joint per (inch) pipe diameter instead of flexible connector supported by vibration isolation. Victaulic piping need not be anchored.
- I. Provide expansion loops as indicated on drawings and as required to compensate for piping expansion.

3.2 MANUFACTURER'S FIELD SERVICES

- A. Provide inspection services by flexible pipe manufacturer's representative for final installing and certify installation is in accordance with manufacturer's recommendations and connectors are performing satisfactorily.

A. END OF SECTION

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SECTION 23 05 19 - GAGES AND METERS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Positive displacement meters.
- B. Flow meters.
- C. Pressure gages and Pressure gage taps.
- D. Thermometers and thermometer wells.
- E. Static pressure gages.
- F. Filter gages.

1.2 REFERENCES: Material and/or equipment specified in this section shall meet or exceed one or more of the property requirements or installation requirements of the following specifications/publications as applicable to the specific product or end use:

- A. ASME - B40.1 - Gages - Pressure Indicating Dial Type - Elastic Element.
- B. ASME MFC-3M - Measurement of Fluid Flow in Pipes Using Orifice, Nozzle and Venturi.
- C. ASTM D2458 - Method of Flow Measurement by The Venturi Motor Tube.
- D. ASTM E1 - Specification for ASTM Thermometers.
- E. ASTM E77 - Verification and Calibration of Liquid-in-Glass Thermometers.
- F. AWWA C700 - Cold Water Meters - Displacement Type.
- G. AWWA C701 - Cold Water Meters - Turbine Type for Customer Service.
- H. AWWA C702 - Cold Water Meters - Compound Type.
- I. AWWA C706 - Direct Reading Remote Registration System for Cold Water Meters.
- J. AWWA M6 - Water Meters - Selection, Installation, Testing, and Maintenance.
- K. ISA RP 3.2 - Flange Mounted Sharp Edged Orifice Plates for Flow Measurement.
- L. UL 404 - Gages, Indicating Pressure, for Compressed Gas Service.

1.3 SCOPE

- A. The work covered by this specification consists of furnishing all labor, equipment, materials and performing all operations required, for the correct and complete

fabrication and installation of gages and meters in accordance with the applicable project specifications, drawings, codes, regulations and standards.

1.4 ENVIRONMENTAL REQUIREMENTS

- A. Do not install instrumentation when areas are under construction, except for required rough-in, taps, supports and test plugs.

PART 2 PRODUCTS

2.1 POSITIVE DISPLACEMENT METERS (LIQUID)

- A. AWWA C700, positive displacement disc type suitable for fluid with bronze case and cast iron frost-proof, breakaway bottom cap, hermetically sealed register.
 - 1. Meter: Brass body turbine meter with magnetic drive register.
 - 2. Service: cold water, 122 degrees F hot water, 200 degrees F.
 - 3. Accuracy: 1½ percent.
 - 4. Maximum Counter Reading: 10 million gallons (liters).
 - 5. Size: ¾ inch.

2.2 HEAT CONSUMPTION METERS

- A. Meter: Brass body turbine meter with magnetic drive register, platinum temperature sensors.
 - 1. Maximum Service Temperature: 200 degrees F.
 - 2. Accuracy 1½ percent.
 - 3. Maximum Counter Reading: 1 million BTUH.
 - 4. Size: ¾ inch.
 - 5. Power 24 volt converter.

2.3 LIQUID FLOW METERS

- A. ASME MFC-3M, calibrated venturi orifice plate and flanges with valved taps, chart for conversion of differential pressure readings to flow rate, with pressure gage in case.

2.4 PRESSURE GAGES

- A. Gage: ASME B40.1, UL 393 drawn steel case, phosphor bronze bourdon tube, rotary brass movement, brass socket, with front recalibration adjustment, black scale on white background.
 - 1. Case: Steel with brass bourdon tube.
 - 2. Size: 4½ inch diameter.
 - 3. Mid-Scale Accuracy: One percent.
 - 4. Scale: psi.

2.5 PRESSURE GAGE ACCESSORIES

- A. Gage Cock: Ball valve.
- B. Pulsation Damper: Pressure snubber, brass with 1/4 inch connection.

- C. Siphon: ¼ inch angle or straight pattern.

2.6 STEM TYPE THERMOMETERS

- A. Thermometer: ASTM E1, adjustable angle, liquid-in-glass, lens front tube, cast aluminum case with enamel finish, cast aluminum adjustable joint with positive locking device.
 1. Size: 9 inch scale.
 2. Window: Acrylic.
 3. Stem: die-cast zinc, length to suit.
 4. Accuracy: ASTM E77 1 percent.
 5. Calibration: Both degrees F and degrees C.
 6. Tube: Non-toxic, blue-reading organic filled, magnifying lens front.

2.7 DIAL THERMOMETERS

- A. Thermometer: ASTM E1, stainless steel case, vapor or liquid actuated with brass or copper bulb, copper or bronze braided capillary, white with black markings and black pointer glass lens.
 1. Size: 4½ inch.
 2. Lens: Clear glass Lexan.
 3. Length of Capillary: Minimum 5 feet.
 4. Accuracy: 2 percent.
 5. Calibration: Both degrees F and degrees C.

2.8 THERMOMETER SUPPORTS

- A. Socket: Brass separable sockets for thermometer stems with or without extensions as required, and with cap and chain.
- B. Flange: 3 inch outside diameter reversible flange, designed to fasten to sheet metal air ducts, with brass perforated stem.

2.9 TEST PLUGS

- A. Test Plug: Similar to Petes Plug, ¼ inch or ½ inch brass fitting and cap for receiving 1/8 inch outside diameter pressure or temperature probe with Nordel or Viton core for temperatures up to 275 degrees F.
- B. Test Kit: Carrying case, internally padded and fitted containing two 3 ½ inch diameter pressure gages, two gage adapters with 1/8 inch probes, two 1 ½ inch dial thermometers.

2.10 STATIC PRESSURE GAGES

- A. 3½ inch diameter dial in metal case, diaphragm actuated, black figures on white background, front recalibration adjustment, 2 percent of full scale accuracy.
- B. Inclined manometer, red liquid on white background with black figures, front recalibration adjustment, 3 percent of full scale accuracy.

- C. Accessories: Static pressure taps with compression fittings for bulkhead mounting, ¼ inch diameter tubing.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install positive displacement meters with isolating valves on inlet and outlet to AWWA M6. Provide full line size valved bypass with globe valve for liquid service meters.
- C. Provide one pressure gage per pump, installing taps on suction and discharge of pump. Pipe to gage.
- D. Install pressure gages with pulsation dampers. Provide gage cock to isolate each gage. Provide siphon on gages in steam systems. Extend nipples and siphons to allow clearance from insulation.
- E. Install thermometers in piping systems in sockets in short couplings. Enlarge pipes smaller than 2½ inch for installation of thermometer sockets. Ensure sockets allow clearance from insulation.
- F. Install thermometers in air duct systems on flanges.
- G. Install thermometer sockets adjacent to controls systems thermostat, transmitter, or sensor sockets, where thermometers are provided on local panels.
- H. Locate duct mounted thermometers minimum 10 feet downstream of mixing dampers, coils, or other devices causing air turbulence.
- I. Coil and conceal excess capillary on remote element instruments.
- J. Provide instruments with scale ranges selected according to service with largest appropriate scale.
- K. Install gages and thermometers in locations where they are easily read from normal operating level. Install vertical to 45 degrees off vertical.
- L. Adjust gages and thermometers to final angle, clean windows and lenses, and calibrate to zero.
- M. Locate test plugs adjacent to thermometers and thermometer sockets, adjacent to pressure gages and pressure gage taps, and adjacent to control device sockets.

A. END OF SECTION

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SECTION 23 05 48 - VIBRATION ISOLATION

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Vibration isolation.

1.2 PRODUCTS FURNISHED BUT NOT INSTALLED UNDER THIS SECTION

- A. Placement of isolators in floating floor slabs.

1.3 CONCRETE FURNISHED AND INSTALLED BY OTHERS

- A. All concrete shall be furnished and installed by the General Contractor unless otherwise noted on drawings.
- B. This contractor shall be responsible for coordinating all concrete work with the general trades during bidding (includes equipment, pads, etc.).

1.4 PERFORMANCE REQUIREMENTS

- A. Provide vibration isolation on motor driven equipment over 0.5 HP, plus connected piping and ductwork.
- B. Provide minimum static deflection of isolators for equipment as indicated.
 - 1. Basement, Under 20 hp
 - a. Under 400 rpm: 1 inch
 - b. 400 - 600 rpm: 1 inch
 - c. 600 - 800 rpm: 0.5 inch
 - d. 800 - 900 rpm: 0.2 inch
 - e. 1100 - 1500 rpm: 0.14 inch
 - f. Over 1500 rpm: 0.1 inch
 - 2. Basement, Over 20 hp
 - a. Under 400 rpm: 2 inch
 - b. 400 - 600 rpm: 2 inch
 - c. 600 - 800 rpm: 1 inch
 - d. 800 - 900 rpm: 0.5 inch
 - e. 1100 - 1500 rpm: 0.2 inch
 - f. Over 1500 rpm: 0.15 inch
 - 3. Upper Floors, Normal
 - a. Under 400 rpm: 3.5 inch
 - b. 400 - 600 rpm: 3.5 inch
 - c. 600 - 800 rpm: 2 inch
 - d. 800 - 900 rpm: 1 inch
 - e. 1100 - 1500 rpm: 0.5 inch
 - f. Over 1500 rpm: 0.2 inch
 - 4. Upper Floors, Critical
 - a. Under 400 rpm: 3.5 inch
 - b. 400 - 600 rpm: 3.5 inch
 - c. 600 - 800 rpm: 3.5 inch

- d. 800 - 900 rpm: 2 inch
 - e. 1100 - 1500 rpm: 1 inch
 - f. Over 1500 rpm: 0.5 inch
- C. Upper floor locations shall be considered critical unless otherwise indicated.
- D. Use concrete inertia bases for fans having static pressure in excess of 3.5 inch WC or motors in excess of 40 HP, and on base mounted pumps over 10 HP.

PART 2 PRODUCTS

2.1 VIBRATION ISOLATORS

- A. Open Spring Isolators:
- 1. Spring Isolators:
 - a. For Exterior and Humid Areas: Provide hot dipped galvanized housings and neoprene coated springs.
 - b. Code: Color code springs for load carrying capacity.
 - 2. Springs: Minimum horizontal stiffness equal to 75 percent vertical stiffness, with working deflection between 0.3 and 0.6 of maximum deflection.
 - 3. Spring Mounts: Provide with leveling devices, minimum 0.25 inch thick neoprene sound pads, and zinc chromate plated hardware.
 - 4. Sound Pads: Size for minimum deflection of 0.05 inch; meet requirements for neoprene pad isolators.
- B. Restrained Spring Isolators:
- 1. Spring Isolators:
 - a. For Exterior and Humid Areas: Provide hot dipped galvanized housings and neoprene coated springs.
 - b. Code: Color code springs for load carrying capacity.
 - 2. Springs: Minimum horizontal stiffness equal to 75 percent vertical stiffness, with working deflection between 0.3 and 0.6 of maximum deflection.
 - 3. Spring Mounts: Provide with leveling devices, minimum 0.25 inch thick neoprene sound pads, and zinc chromate plated hardware.
 - 4. Sound Pads: Size for minimum deflection of 0.05 inch; meet requirements for neoprene pad isolators.
 - 5. Restraint: Provide heavy mounting frame and limit stops.
- C. Closed Spring Isolators:
- 1. Spring Isolators:
 - a. For Exterior and Humid Areas: Provide hot dipped galvanized housings and neoprene coated springs.
 - b. Code: Color code springs for load carrying capacity.
 - 2. Type: Closed spring mount with top and bottom housing separated with neoprene rubber stabilizers.
 - 3. Springs: Minimum horizontal stiffness equal to 75 percent vertical stiffness, with working deflection between 0.3 and 0.6 of maximum deflection.
 - 4. Housings: Incorporate neoprene isolation pad meeting requirements for neoprene pad isolators, and neoprene side stabilizers with minimum 0.25 inch clearance.
- D. Restrained Closed Spring Isolators:

1. Spring Isolators:
 - a. For Exterior and Humid Areas: Provide hot dipped galvanized housings and neoprene coated springs.
 - b. Code: Color code springs for load carrying capacity.
 2. Type: Closed spring mount with top and bottom housing separated with neoprene rubber stabilizers.
 3. Springs: Minimum horizontal stiffness equal to 75 percent vertical stiffness, with working deflection between 0.3 and 0.6 of maximum deflection.
 4. Housings: Incorporate neoprene isolation pad meeting requirements for neoprene pad isolators, and neoprene side stabilizers with minimum 0.25 inch clearance and limit stops.
- E. Spring Hanger:
1. Spring Isolators:
 - a. For Exterior and Humid Areas: Provide hot dipped galvanized housings and neoprene coated springs.
 - b. Code: Color code springs for load carrying capacity.
 2. Springs: Minimum horizontal stiffness equal to 75 percent vertical stiffness, with working deflection between 0.3 and 0.6 of maximum deflection.
 3. Housings: Incorporate [neoprene isolation pad meeting requirements for neoprene pad isolators] [rubber hanger with threaded insert].
 4. Misalignment: Capable of 20 degree hanger rod misalignment.
- F. Neoprene Pad Isolators:
1. Rubber or neoprene waffle pads.
 - a. 30 durometer.
 - b. Minimum ½ inch thick.
 - c. Maximum loading 40 psi.
 - d. Height of ribs shall not exceed 0.7 times width.
- G. Configuration: ½ inch thick waffle pads bonded each side of ¼ inch thick steel plate.
- H. Rubber Mount or Hanger: Molded rubber designed for 0.5 inches deflection with threaded insert.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install in accordance with manufacturer's instructions. See drawings for types of vibration isolation required.
- B. Install isolation for motor driven equipment.
- C. Bases:
 1. Set steel bases for one inch clearance between housekeeping pad and base.
 2. Set concrete inertia bases for 2 inch clearance between housekeeping pad and base.
- D. Adjust equipment level.
- E. Install spring hangers without binding.

- F. On closed spring isolators, adjust so side stabilizers are clear under normal operating conditions.
- G. Prior to making piping connections to equipment with operating weights substantially different from installed weights, block up equipment with temporary shims to final height. When full load is applied, adjust isolators to load to allow shim removal.
- H. Provide pairs of horizontal limit springs on fans with more than 6.0 inch static pressure, and on hanger supported, horizontally mounted axial fans.
- I. Support piping connections to isolated equipment resiliently to nearest flexible pipe connector.
- J. Connect wiring to isolated equipment with flexible hanging loop.

3.2 MANUFACTURER'S FIELD SERVICES

- A. Inspect isolated equipment after installation and submit report. Include static deflections.

A. END OF SECTION

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SECTION 23 05 53 - HVAC IDENTIFICATION

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Nameplates.
- B. Tags.
- C. Stencils.
- D. Pipe Markers.

1.2 PRODUCTS INSTALLED BUT NOT FURNISHED UNDER THIS SECTION

- A. Medical Gas Systems: Supply of pipe labels for placement by this Section.

1.3 REFERENCES: Material and/or equipment specified in this section shall meet or exceed one or more of the property requirements or installation requirements of the following specifications/publications as applicable to the specific product or end use:

- A. ANSI or equal standards for the Identification of Piping Systems.

PART 2 PRODUCTS

2.1 NAMEPLATES

- A. Description: Laminated three-layer plastic with engraved black letters on light contrasting background color. Furnish and install on all mechanical equipment.

2.2 TAGS

- A. Metal Tags: Brass with stamped letters; tag size minimum 1½ inch diameter with smooth edges.
- B. Chart: Typewritten letter size list in anodized aluminum frame.

2.3 STENCILS

- A. Stencils: With clean cut symbols and letters of following size:
 1. ¾ to 1¼ inch Outside Diameter of Insulation or Pipe: 8 inch long color field, ½ inch high letters.
 2. 1½ to 2 inch Outside Diameter of Insulation or Pipe: 8 inch long color field, ¾ inch high letters.
 3. 2½ to 6 inch Outside Diameter of Insulation or Pipe: 12 inch long color field, 1¼ inch high letters.
 4. 8 to 10 inch Outside Diameter of Insulation or Pipe: 24 inch long color field, 2½ inch high letters.
 5. Over 10 inch Outside Diameter of Insulation or Pipe: 32 inch long color field, 3½ inch high letters.

6. Ductwork and Equipment: 2½ inch high letters.

B. Stencil Paint shall be semi-gloss enamel, colors conforming to ASME A13.1.

2.4 PIPE MARKERS

A. Color: Match existing or conform to ANSI/OSHA standards.

B. Plastic Pipe Markers: Factory fabricated, flexible, semi-rigid plastic, preformed to fit around pipe or pipe covering; minimum information indicating flow direction arrow and identification of fluid being conveyed.

C. Plastic Tape Pipe Markers: Flexible, vinyl film tape with pressure sensitive adhesive backing and printed markings.

D. Underground Plastic Pipe Markers: Bright colored continuously printed plastic ribbon tape, minimum 6 inches wide by 4 mil thick, manufactured for direct burial service.

2.5 CEILING TACKS

A. Description: Steel with ¾ inch diameter color coded head.

B. Color code as follows:

1. Yellow - HVAC equipment
2. Red - Fire dampers/smoke dampers
3. Green - Plumbing valves
4. Blue - Heating/cooling valves

PART 3 EXECUTION

3.1 PREPARATION

A. Degrease and clean surfaces to receive adhesive for identification materials.

B. Prepare surfaces as required by manufacturer's installations for stencil painting.

3.2 INSTALLATION

A. Install plastic nameplates with corrosive-resistant mechanical fasteners, or adhesive. Apply with sufficient adhesive to ensure permanent adhesion and seal with clear lacquer.

B. Install tags with corrosion resistant chain.

C. Install plastic pipe markers in accordance with manufacturer's instructions.

D. Install plastic tape pipe markers complete around pipe in accordance with manufacturer's instructions.

E. Install underground plastic pipe markers 6 to 8 inches below finished grade, directly above buried pipe.

- F. Identify each piece of equipment with plastic nameplates. Small devices, such as in-line pumps, may be identified with tags.
- G. Identify control panels and major control components outside panels with plastic nameplates.
- H. Identify thermostats relating to terminal boxes or valves with nameplates.
- I. Identify valves in main and branch piping with tags.
- J. Tag automatic controls, instruments, and relays. Key to control schematic.
- K. Identify piping, concealed or exposed, with plastic tape pipe markers or stenciled painting. Identify service, flow direction, and pressure. Install in clear view and align with axis of piping. Locate identification not to exceed 10 feet on straight runs including risers and drops, adjacent to each valve and tee, at each side of penetration of structure or enclosure, and at each obstruction.
- L. Identify ductwork with stenciled painting. Identify with air handling unit identification number and area served. Locate identification at air handling unit, at each side of penetration of structure or enclosure, and at each obstruction.
- M. Provide ceiling tacks to locate valves or dampers above T-bar type panel ceilings. Locate in corner of panel closest to equipment.
- N. Identify access points at the exterior of all fire, smoke, or combination fire/smoke dampers with a permanent label, having letters not less than 1/2" in height, reading fire damper, smoke damper or fire/smoke damper respectively.

A. END OF SECTION

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SECTION 23 05 93 - TESTING, ADJUSTING, AND BALANCING

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Testing, adjustment, and balancing of air systems.
- B. Testing, adjustment, and balancing of hydronic systems.
- C. Measurement of final operating condition of HVAC systems.

1.2 RELATED SECTIONS AND DRAWINGS

- A. All drawings and specification sections apply to work in this section. Furnish all items, articles, materials, equipment, operations or methods that are mentioned, listed or scheduled on drawings or are in this specification including all labor, equipment, materials and miscellaneous incidentals necessary and/or required for the completion of this project. The work covered under this section of the specifications is in no way complete within itself but is supplementary to the entire specification and drawings.

1.3 REFERENCES: Material and/or equipment specified in this section shall meet or exceed one or more of the property requirements or installation requirements of the following specifications/publications as applicable to the specific product or end use:

- A. AABC - National Standards for Total System Balance.
- B. ADC - Test Code for Grilles, Registers, and Diffusers.
- C. ASHRAE 111 - Practices for Measurement, Testing, Adjusting, and Balancing of Building Heating, Ventilation, Air-conditioning, and Refrigeration Systems.
- D. NEBB - Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems.
- E. SMACNA - HVAC Systems Testing, Adjusting, and Balancing.

1.4 SUBMITTALS

- A. Submit electronic draft copies of report for review prior to final acceptance of Project. Provide electronic final copies for Architect/Engineer review and for inclusion in operating and maintenance manuals.
- B. Provide reports in 3-ring binder manuals, complete with index page and indexing tabs, with cover identification at front and side. Include set of reduced drawings with air outlets and equipment identified to correspond with data sheets, and indicating thermostat locations. Binder shall be high quality hard cover type.
- C. Include detailed procedures, agenda, sample report forms and copy of NEBB Project Performance Guaranty prior to commencing system balance.

- D. Test Reports: Indicate data on AABC National Standards for Total System Balance forms or forms approved in writing by Architect/Engineer.

1.5 PROJECT RECORD DOCUMENTS

- A. Record actual locations of flow measuring stations and/or balancing valves and rough setting.

1.6 QUALITY ASSURANCE

- A. Perform total system balance in accordance with AABC National Standards for Field Measurement and Instrumentation, Total System Balance.
- B. Maintain one copy of each document on site.
- C. The final air balance report shall be approved by the Architect/Engineer prior to final payment to the Contractor. The Engineer reserves the right to ask for and be furnished any additional information he deems necessary to be shown on air/water balance report.

1.7 QUALIFICATIONS

- A. Agency: Independent company (not associated with the systems installing contractor) specializing in the testing, adjusting, and balancing of systems specified in this Section with minimum three years experience and NEBB certified. The test and balance agency selected by the Contractor shall be approved by the Engineer. The Mechanical Trades shall be responsible for any cost differences between the test and balance agency selected by the Contractor and the test and balance agency approved by the Engineer.

1.8 SEQUENCING AND SCHEDULING

- A. Sequence work to commence after completion of systems and schedule completion of work before Substantial Completion of Project. Coordinate project schedule with contractor. The Mechanical Trades shall coordinate and schedule the on-site balancing with the Engineer to allow the Engineer the ability to be at the project site during the time of the balancing. If the Engineer is not scheduled to oversee the balance of systems, the Mechanical Trades shall be responsible for rebalancing the system in the presence of the Engineer and be responsible for all costs for such.
- B. The Test and Balance Agency shall schedule/coordinate (through the Mechanical Contractor) with the Temperature Control Contractor. The Temperature Control Contractor should be on site during the air balance to verify proper operation of the system required for the air balance.
- C. Acceptable Test and Balance Contractors.
 1. HiTech Test and Balance (Freeland, MI)
 2. Absolute Balance Company (South Lyon, MI)
 3. Enviro-Aire/Total Balance Company (St Clair Shores, MI)
 4. Ener-Tech Testing (Holly, MI)
 5. International Test & Balance (Southfield, MI)

PART 2 PRODUCTS

Not used

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that systems are complete and operable before commencing work. Ensure the following conditions:
1. Systems are started and operating in a safe and normal condition.
 2. Temperature control systems are installed complete and operable.
 3. Proper thermal overload protection is in place for electrical equipment.
 4. Final filters are clean and in place. If required, install temporary media in addition to final filters.
 5. Duct systems are clean of debris.
 6. Fans are rotating correctly.
 7. Fire and volume dampers are in place and open.
 8. Air coil fins are cleaned and combed.
 9. Access doors are closed and duct end caps are in place.
 10. Air outlets are installed and connected.
 11. Duct system leakage is minimized.
 12. Hydronic systems are flushed, filled, and vented.
 13. Pumps are rotating correctly.
 14. Proper strainer baskets are clean and in place.
 15. Service and balance valves are open.
- B. Submit field reports. Report defects and deficiencies noted during performance of services which prevent system balance.
- C. Beginning of work means acceptance of existing conditions.

3.2 PREPARATION

- A. Provide a review of proposed design drawings and advise appropriate trades about additional balancing devices required to attain design conditions.
- B. Advise Engineer about additional balancing devices required to attain design conditions.
- C. Provide instruments required for testing, adjusting, and balancing operations. Make instruments available to Architect/Engineer to facilitate spot checks during testing.

3.3 INSTALLATION TOLERANCES

- A. Air Handling Systems: Adjust to within plus or minus 10 percent of design for supply, return and exhaust systems.
- B. Air Outlets and Inlets: Adjust to within plus 10 percent and minus 5 percent of design and to Owner's satisfaction. Respond to Owner complaints of unsatisfactory room temperatures by adjusting outlets and/or inlets to more or less air as required.
- C. Hydronic Systems: Adjust to within plus or minus 10 percent of design.

3.4 ADJUSTING

- A. Ensure recorded data represents actual measured or observed conditions.
- B. Permanently mark settings of adjustment devices allowing settings to be restored. Set and lock memory stops.
- C. After adjustment, take measurements to verify balance has not been disrupted or that such disruption has been rectified.
- D. Leave systems in proper working order, replacing belt guards, closing access doors, closing doors to electrical switch boxes, and restoring thermostats to specified settings.
- E. At final inspection, recheck random selections of data recorded in report. Recheck points or areas as selected and witnessed by the Owner.
- F. Check and adjust systems approximately six months after final acceptance and submit report.

3.5 AIR SYSTEM PROCEDURE

- A. Adjust air handling and distribution systems to provide required or design supply, return, and exhaust air quantities. The air balance agency shall be responsible for removing all adjustable motor pulleys and replacing them with fixed motor pulleys after air balancing the system. Include costs for all air systems to be readjusted to required air volumes. Pitot duct mains at supply air and return air ducts at air handling systems and exhaust fans to verify air quantity at units vs. at diffusers and grilles.
- B. Make air quantity measurements in ducts by Pitot tube traverse of entire cross sectional area of duct.
- C. Measure air quantities at air inlets and outlets.
- D. Adjust distribution system to obtain uniform space temperatures free from objectionable drafts and noise.
- E. Use volume control devices at outlets to regulate air quantities so that outlets do not create objectionable air motion or sound levels. Effect volume control by duct internal devices such as dampers in ducts.
- F. Vary total system air quantities by adjustment of fan speeds. Provide drive changes required. Vary branch air quantities by damper regulation.
- G. Provide system schematic with required and actual air quantities recorded at each outlet or inlet.
- H. Measure static air pressure conditions on air supply units, including filter and coil pressure drops, and total pressure across the fan. Make allowances for 50 percent loading of filters.

- I. Adjust outside air automatic dampers, outside air, return air, and exhaust dampers for design conditions.
- J. Measure temperature conditions across outside air, return air, and exhaust dampers to check leakage.
- K. Where modulating dampers are provided, take measurements and balance at extreme conditions. Balance variable volume systems at maximum air flow rate, full cooling, and at minimum air flow rate, full heating.
- L. Measure building static pressure and adjust supply, return, and exhaust air systems to provide required relationship between each to maintain approximately 0.05 inches positive static pressure near the building entries.
- M. Check units for motorized damper leakage. Adjust air quantities with mixing dampers set first for cooling, then heating, then modulating.
- N. For variable air volume units set volume controller to air flow setting indicated. Confirm connections properly made and confirm proper operation for automatic variable air volume temperature control.
- O. On VAV boxes, adjust for proper operation.
- P. Advise Mechanical Contractor about additional balancing devices required to attain design conditions.
- Q. Adjust adjustable pitch sheaves to setting as required by actual conditions. If sheave size or type changes are recommended, include the recommendation in the draft copy of the report to allow the Owner to be informed of, and be responsible for, the recommendation for the change.

3.6 WATER SYSTEM PROCEDURE

- A. Adjust water systems to provide required or design quantities.
- B. Use calibrated Venturi tubes, orifices, or other metered fittings and pressure gages to determine flow rates for system balance. Where flow metering devices are not installed, base flow balance on temperature difference across various heat transfer elements in the system.
- C. Adjust systems to provide specified pressure drops and flows through heat transfer elements prior to thermal testing. Perform balancing by measurement of temperature differential in conjunction with air balancing.
- D. Effect system balance with automatic control valves fully open to heat transfer elements.
- E. Effect adjustment of water distribution systems by means of balancing cocks, valves, and fittings. Do not use service or shut-off valves for balancing unless indexed for balanced point.

- F. Where available pump capacity is less than total flow requirements or individual system parts, full flow in one part may be simulated by temporary restriction of flow to other parts.
- G. Advise Mechanical Contractor about additional balancing devices required to attain design conditions.
- H. If pump impellor trimming or size change is recommended to improve reliability or reduce operating cost, include the recommendation in the draft copy of the report, to allow the Owner to be informed of, and be responsible for, the recommendation for the change.

3.7 SCHEDULES

- A. Equipment Requiring Testing, Adjusting, and Balancing shall include but not be limited to: Air moving equipment such as exhaust fans, air handlers, return fans, etc.; terminal devices such as grilles and diffusers, variable air volume boxes, etc.; all hydronic systems such as pumps, chillers, flow control valves, coils, etc. See drawings for equipment utilized for this project and submit applicable report forms for this project air and/or water system(s).
- B. Report Forms
 - 1. Title Page:
 - a. Name of Testing, Adjusting, and Balancing Agency
 - b. Address of Testing, Adjusting, and Balancing Agency
 - c. Telephone number of Testing, Adjusting, and Balancing Agency
 - d. Project name
 - e. Project location
 - f. Project Architect
 - g. Project Engineer
 - h. Project Contractor
 - i. Project altitude
 - j. Report date
 - 2. Summary Comments:
 - a. Design versus final performance
 - b. Notable characteristics of system
 - c. Description of systems operation sequence
 - d. Summary of outdoor and exhaust flows to indicate amount of building pressurization
 - e. Nomenclature used throughout report
 - f. Test conditions
 - 3. Instrument List:
 - a. Instrument
 - b. Manufacturer
 - c. Model number
 - d. Serial number
 - e. Range
 - f. Calibration date
 - 4. Electric Motors:
 - a. Manufacturer
 - b. Model/Frame

- c. HP/BHP
 - 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. Pump Data:
- a. Identification/number
 - b. Manufacturer
 - c. Size/model
 - d. Impeller
 - e. Service
 - f. Design flow rate, pressure drop, BHP
 - g. Actual flow rate, pressure drop, BHP
 - h. Discharge pressure
 - i. Suction pressure
 - j. Total operating head pressure
 - k. Shut off, discharge and suction pressures
 - l. Shut off, total head pressure
 - m. Heat output
7. Air Cooled Condenser:
- a. Identification/number
 - b. Location
 - c. Manufacturer
 - d. Model number
 - e. Serial number
 - f. Entering DB air temperature, design and actual
 - g. Leaving DB air temperature, design and actual
 - h. Number of compressors
8. Cooling Coil Data:
- a. Identification/number
 - b. Location
 - c. Service
 - d. Manufacturer
 - e. Air flow, design and actual
 - f. Entering air DB temperature, design and actual
 - g. Entering air WB temperature, design and actual
 - h. Leaving air DB temperature, design and actual
 - i. Leaving air WB temperature, design and actual
 - j. Water flow, design and actual
 - k. Water pressure drop, design and actual
 - l. Entering water temperature, design and actual
 - m. Leaving water temperature, design and actual

- n. Saturated suction temperature, design and actual
- o. Air pressure drop, design and actual
- 9. Heating Coil Data:
 - a. Identification/number
 - b. Location
 - c. Service
 - d. Manufacturer
 - e. Air flow, design and actual
 - f. Water flow, design and actual
 - g. Water pressure drop, design and actual
 - h. Entering water temperature, design and actual
 - i. Leaving water temperature, design and actual
 - j. Entering air temperature, design and actual
 - k. Leaving air temperature, design and actual
 - l. Air pressure drop, design and actual
- 10. Cooling Tower:
 - a. Tower identification/number
 - b. Manufacturer
 - c. Model number
 - d. Serial number
 - e. Rated capacity
 - f. Entering air WB temperature, specified and actual
 - g. Leaving air WB temperature, specified and actual
 - h. Ambient air DB temperature
 - i. Condenser water entering temperature
 - j. Condenser water leaving temperature
 - k. Condenser water flow rate
 - l. Fan RPM
- 11. Heat Exchanger:
 - a. Identification/number
 - b. Location
 - c. Service
 - d. Manufacturer
 - e. Model number
 - f. Serial number
 - g. Steam pressure, design and actual
 - h. Primary water entering temperature, design and actual
 - i. Primary water leaving temperature, design and actual
 - j. Primary water pressure drop, design and actual
 - k. Secondary water leaving temperature, design and actual
 - l. Secondary water flow, design and actual
 - m. Secondary water pressure drop, design and actual
- 12. Electric Duct Heater:
 - a. Manufacturer
 - b. Identification/number
 - c. Location
 - d. Model number
 - e. Design kW
 - f. Number of stages
 - g. Phase, voltage, amperage
 - h. Test voltage (each phase)
 - i. Test amperage (each phase)

- j. Air flow, specified and actual
- k. Temperature rise, specified and actual
- 13. Air Moving Equipment:
 - a. Location
 - b. Manufacturer
 - c. Model number
 - d. Serial number
 - e. Arrangement/Class/Discharge
 - f. Air flow, specified and actual per pitot readings at equipment and per totaled outlets.
 - g. Return air flow, specified and actual per pitot readings at equipment and per totaled inlets.
 - h. Outside air flow, specified and actual per pitot.
 - i. External and total static pressure, specified and actual
 - j. Inlet pressure
 - k. Discharge pressure
 - l. Sheave Make/Size/Bore
 - m. Number of Belts/Make/Size
 - n. Fan RPM
- 14. Return Air/Outside Air Data:
 - a. Identification/location
 - b. Design return air flow
 - c. Actual return air flow per pitot readings at equipment and per totaled grilles air flow measurement
 - d. Design outside air flow
 - e. Actual outside air flow per pitot readings
 - f. Return air temperature
 - g. Outside air temperature
 - h. Required mixed air temperature
 - i. Actual mixed air temperature
 - j. Design outside/return air ratio
 - k. Actual outside/return air ratio
- 15. Exhaust Fan Data:
 - a. Location
 - b. Manufacturer
 - c. Model number
 - d. Serial number
 - e. Air flow, specified and actual per pitot readings at exhaust fan and per totaled exhaust grilles or duct inlets.
 - f. Static pressure, specified and actual
 - g. Inlet pressure
 - h. Discharge pressure
 - i. Sheave Make/Size/Bore
 - j. Number of Belts/Make/Size
 - k. Fan RPM
- 16. Duct Traverse:
 - a. System zone/branch and at all equipment (AHUs, RTUs, EFs, etc.)
 - b. Duct size
 - c. Area
 - d. Design velocity
 - e. Design air flow
 - f. Test velocity

- g. Test air flow
- h. Duct static pressure
- i. Air temperature
- j. Air correction factor
- 17. Duct Leak Test:
 - a. Description of ductwork under test
 - b. Duct design operating pressure
 - c. Duct design test static pressure
 - d. Duct capacity, air flow
 - e. Maximum allowable leakage duct capacity times leak factor
 - f. Test apparatus
 - 1) Blower
 - 2) Orifice, tube size
 - 3) Orifice size
 - 4) Calibrated
 - g. Test static pressure
 - h. Test orifice differential pressure
 - i. Leakage
- 18. Air Monitoring Station Data:
 - a. Identification/location
 - b. System
 - c. Size
 - d. Area
 - e. Design velocity
 - f. Design air flow
 - g. Test velocity
 - h. Test air flow
- 19. Flow Measuring Station:
 - a. Identification/number
 - b. Location
 - c. Size
 - d. Manufacturer
 - e. Model number
 - f. Serial number
 - g. Design Flow rate
 - h. Design pressure drop
 - i. Actual/final pressure drop
 - j. Actual/final flow rate
 - k. Station calibrated setting
- 20. Terminal Unit Data:
 - a. Manufacturer
 - b. Type, constant, variable, single, dual duct
 - c. Identification/number
 - d. Location
 - e. Model number
 - f. Size
 - g. Minimum static pressure
 - h. Minimum design air flow
 - i. Maximum design air flow
 - j. Maximum actual air flow
 - k. Inlet static pressure
- 21. Air Distribution Test Sheet:

- a. Air terminal number
 - b. Room number/location
 - c. Terminal type
 - d. Terminal size
 - e. Area factor
 - f. Design velocity
 - g. Design air flow
 - h. Test (final) velocity
 - i. Test (final) air flow
 - j. Percent of design air flow
22. Sound Level Report:
- a. Location
 - b. Octave bands-equipment off
 - c. Octave bands-equipment on
23. Vibration Test:
- a. Location of points:
 - 1) Fan bearing, drive end
 - 2) Fan bearing, opposite end
 - 3) Motor bearing, center (if applicable)
 - 4) Motor bearing, drive end
 - 5) Motor bearing, opposite end
 - 6) Casing (bottom or top)
 - 7) Casing (side)
 - 8) Duct after flexible connection (discharge)
 - 9) Duct after flexible connection (suction)
 - b. Test readings:
 - 1) Horizontal, velocity and displacement
 - 2) Vertical, velocity and displacement
 - 3) Axial, velocity and displacement
 - c. Normally acceptable readings, velocity and acceleration
 - d. Unusual conditions at time of test
 - e. Vibration source (if non-complying)

A. END OF SECTION

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SECTION 23 07 13 - EXTERNAL DUCT INSULATION

PART 1 GENERAL

1.1 SECTION INCLUDES EXTERNAL INSULATION FOR:

- A. Supply air ducts. Note: See drawings for notes on whether the supply air ductwork downstream of VAV boxes is to be insulated. If drawings internal duct insulation, delete external duct insulation downstream of the VAV box, except for spiral ductwork.

1.2 RELATED SECTIONS

- A. All drawings and specification sections apply to work in this section. Furnish all items, articles, materials, equipment, operations or methods that are mentioned, listed or scheduled on drawings or are in this specification including all labor, equipment, materials and miscellaneous incidentals necessary and/or required for the completion of this project. The work covered under this section of the specifications is in no way complete within itself but is supplementary to the entire specification and drawings.

1.3 REFERENCES

- A. Thermal insulation materials shall meet the property requirements of one or more of the following specifications as applicable to the specific product or end use:
 - 1. American Society for Testing of Materials and Specifications:
 - a. ASTM C533, "Standard Specification for Calcium Silicate Pipe and Block Insulation"
 - b. ASTM C553, "Standard Specification for Mineral Fiber Blanket and Felt Insulation"
 - c. ASTM C612, "Standard Specification for Mineral Fiber Block and Board Thermal Insulation"
 - d. ASTM C1136, "Standard Specification for Barrier Material, Vapor," Type 1 or 2 (jacket only)
- B. Insulation materials, including all weather and vapor barrier material, closures, hangers, supports, fitting covers, and other accessories shall be furnished and installed in strict accordance with project drawings, plans and specifications.

1.4 SCOPE

- A. The work covered by this specification consists of furnishing all labor, equipment, materials and performing all operations required, for the correct fabrication and installation of thermal insulation applied to commercial ductwork systems in accordance with the applicable project specifications, and drawings, subject to the terms and conditions of the contract.
- B. The above temperature ranges are typical for these systems. However, if contract specifications call for service temperatures outside the above ranges, consult the manufacturer's published data to determine the operating temperature limitations of the insulation products or products under consideration.

1.5 DEFINITIONS

- A. The term "mineral fiber" as defined by the above specifications includes fibers manufactured of glass, rock, or slag processed from a molten state with or without binder.
- B. Exposed ductwork shall include ductwork installed in areas used by personnel in the normal use of the building, such as finished work rooms, offices, mechanical rooms, storage rooms, etc.
- C. Exposed finished areas include areas that normally have finished walls, ceilings, floors, etc. such as offices.
- D. Concealed ductwork shall include ductwork installed in areas similar to pipe tunnels, covered pipe trenches, spaces inside walls, duct or pipe shafts, spaces above dropped ceilings, unfinished attic spaces, crawl spaces, etc.

1.6 SYSTEM PERFORMANCE

- A. Insulation materials furnished and installed hereunder should meet the minimum economic insulation thickness requirements of the North American Insulation Manufacturer's Association (NAIMA) (Formerly known as TIMA), to ensure cost effective energy conservation performance. Alternatively, materials should exceed the minimum thickness requirements of National Voluntary Consensus Standard 90.1 (1989), energy Efficient Design of New Buildings", of the American Society of Heating, Refrigeration, and Air Conditioning Engineers (ASHRAE). However, if other factors such as condensation control or personnel protection are to be considered, the selection of the thickness of insulation should satisfy the controlling factor.
- B. Insulation materials furnished and installed hereunder shall be Class A, maximum of 25 flame spread, 35 fuel contributed and 50 smoke developed rating and shall meet the fire hazard requirements of the following specifications:
 - 1. American Society for Testing of Materials ASTM E84
 - 2. Underwriter's laboratories, Inc. UL 723
 - 3. National Fire Protection Association NFPA 255
- C. Calcium silicate products shall include a visual identification system to permit positive field determination of their asbestos-free characteristic.

1.7 QUALITY ASSURANCE

- A. Insulation materials and accessories furnished and installed hereunder shall, where required, be accompanied by manufacturers' current submittal or data sheets showing compliance with applicable specifications.
- B. Insulation materials and accessories shall be installed in a workmanlike manner by skilled and experienced workers who are regularly engaged in commercial insulation work.

1.8 DELIVERY AND STORAGE OF MATERIALS

- A. All of the insulation materials and accessories covered by this specification shall be delivered to the job site and stored in a safe, dry place with appropriate labels and/or other product identification.
- B. The contractor shall use whatever means are necessary to protect the insulation materials and accessories before, during and after installation. No insulation materials shall be installed that has become damaged in any way. The contractor shall also use all means necessary to protect work and materials installed by other trades.
- C. If any insulation material has become wet the contractor shall not install such material, and shall remove it from the job site. An exception may be allowed in cases where the contractor is able to demonstrate that wet insulation when fully dried out (either before installation, or afterward following exposure to system operating temperatures) will provide installed performance that is equivalent in all respects to new, completely dry insulation. In such cases, consult the insulation manufacturer for technical assistance.

PART 2 PRODUCTS

2.1 DUCTWORK AND STACKS LOCATED INDOORS

- A. Ductwork shall be externally insulated with Fiberglas insulation in blanket, batt or board form, selected to conform readily to the surface to which it will be applied. Vapor barrier shall be legibly printed by the manufacturer to indicate nominal thickness, R-value and type of insulation. External insulation shall be as follows:
 - 1. Concealed Ductwork
 - a. Rectangular, round or oval ductwork: Fiberglas All-Service duct wrap, light density glass fiber insulation in roll form, 1½" thick, 1.0 lb per cubic foot density, faced with a reinforced foil/kraft laminate vapor barrier. All joints shall be stapled with outward clinching staples and where a vapor barrier is required, sealed with pressure sensitive tape matching the facing, FRK backing stock or glass fabric and mastic. Adjacent sections shall be tightly butted with the 2" tape flap overlapping.
 - 2. Exposed Rectangular Ductwork
 - a. Rectangular: Fiberglas type 705, 2" thick, 3.0 lbs per cubic foot density insulation, heavy density glass fiber insulation in semi-rigid or rigid board form, faced with reinforced foil/kraft laminate vapor barrier. All joints shall be stapled with outward clinching staples and where a vapor barrier is required, sealed with pressure sensitive tape matching the facing, FRK backing stock or glass fabric and mastic. Adjacent sections shall be tightly butted with the 2" tape flap overlapping.
 - 3. Exposed Round or Oval Ductwork
 - a. Cross Section less than 10" diameter: Fiberglas all-service duct wrap, 1½" thick, 1.5 lb per cubic foot density, with FSK foil face. All joints shall be stapled with outward clinching staples and where a vapor barrier is required, sealed with pressure sensitive tape matching the facing, FRK

backing stock or glass fabric and mastic. Adjacent sections shall be tightly butted with the 2" tape flap overlapping. If installed in high abuse areas like gymnasiums or locker rooms, use 1" thick elastomeric with foil type wrap (similar to Venture Clad Plus).

- b. Cross section 10" or more in diameter: Fiberglass, Pipe and Tank Insulation, heavy density glass 1½" thick 4.5 lb per cubic foot density, semi-rigid insulation, end grain factory-adhered to ASJ all-service jacket. All joints shall be stapled with outward clinching staples where a vapor barrier is required, sealed with pressure sensitive tape matching the facing, FRK backing stock or glass fabric and mastic. Adjacent sections shall be tightly butted with the 2" tape flap overlapping.

4. Accessory Materials

- a. Accessory materials installed as part of insulation work under this section shall include (but not be limited to):
 - 1) Closure Materials - Butt strips, bands, wires, staples, mastics, adhesives; pressure sensitive tapes.
 - 2) Field-applied jacketing materials - Sheet metal, plastic, canvas, fiberglass cloth, insulating cement; PVC fitting covers.
 - 3) Support materials - Hanger straps, hanger rods, saddles.
 - 4) Fasteners, weld pins/studs, speed clips, insulation washers.
 - 5) Metal mesh or expanded metal lagging.
- b. All accessory materials shall be installed in accordance with project drawings and specifications, manufacturer's instructions and/or in conformance with the current edition of the Midwest insulation Contractors Association (MICA) "Commercial & Industrial Insulation Standards".

PART 3 EXECUTION

3.1 SITE INSPECTION

- A. Before starting work under this section, carefully inspect the site and installed work of other trades and verify that such work is complete to the point where installation of materials and accessories under this section can begin.
- B. Verify that all materials and accessories can be installed in accordance with project drawings and specifications and material manufacturers' recommendations.
- C. Verify by inspecting product labeling, submittal data, and/or certifications which may accompany the shipments that all materials and accessories to be installed on the project comply with applicable specifications and standards and meet specified thermal and physical properties.

3.2 PREPARATION

- A. Ensure that all seams and joints in ductwork have been sealed by the contractor responsible for duct systems.

- B. Ensure that pressure testing of duct systems has been completed prior to installing insulation.
- C. Ensure that all duct surfaces over which or within which insulation is to be installed are clean and dry.
- D. Ensure that insulation is clean, dry, and in good mechanical condition with all factory-applied vapor or weather barriers intact and undamaged. Wet, dirty, or damaged insulation shall not be acceptable for installation.

3.3 INSTALLATION

A. General

- 1. Install insulation in accordance with manufacturer's published instructions and recognized industry practice to ensure that it will serve its intended purpose.
- 2. Install insulation materials with smooth and even surfaces. Butt joints firmly together to ensure complete and tight fit over surfaces to be covered.
- 3. Maintain the integrity of factory-applied vapor barrier jacketing on all insulation, protecting it against puncture, tears or other damage. All staples used on ductwork insulation shall be coated with suitable sealant to maintain vapor barrier integrity.

B. Penetrations

- 1. Extend ductwork insulation without interruption through walls, floors etc., except at fire dampers or unless noted otherwise.

C. Duct Wrap Insulation

- 1. Insulation shall be applied to sheet metal ductwork or plenums with all joints butted firmly together, using manufacturer's recommended stretch-out tables (see Owens-Corning Pub. No. 3-MS-9266) to prevent excessive compression. Insulation shall be secured with mechanical fasteners spaced at 16" maximum centers on the bottom of 24" or wider ducts to prevent the insulation from sagging.
- 2. All joints shall be firmly butted together and where a vapor barrier is required, sealed with pressure sensitive tape matching the facing, FRK backing stock or glass fabric and mastic. Adjacent sections shall be tightly butted with the 2" tape flap overlapping.

D. Rigid Insulation

- 1. Board shall be secured to ductwork with adhesive or with mechanical fasteners with welded pins, secured with insulation caps and washers matching color of the vapor barrier facing. If used, mechanical fasteners shall be within 3" (max.) of board edges, 12" maximum on center.

2. All joints shall be firmly butted together and where a vapor barrier is required, sealed with pressure sensitive tape matching the facing, FRK backing stock or glass fabric and mastic. Adjacent sections shall be tightly butted with the 2" tape flap overlapping.
3. Corner angles shall be installed on all external corners of rigid duct insulation in exposed finished areas before jacketing, except kitchen hood exhaust duct insulation which shall have no corner angles.

3.4 FIELD QUALITY ASSURANCE

- A. Upon completion of all insulation work covered by this specification, visually inspect the work and verify that it has been correctly installed. This may be done while work is in progress, to assure compliance with requirements herein to cover and protect insulation materials during installation.

3.5 PROTECTION

- A. Replace damaged insulation which cannot be satisfactorily repaired, including insulation with vapor barrier damage and moisture-saturated insulation.
- B. Protect the insulation work during the remainder of the construction period to avoid damage and deterioration of the finished insulation work.

3.6 SAFETY PRECAUTIONS

- A. Insulation contractor's employees shall be properly protected during installation of all insulation. Protection shall include proper attire when handling and applying insulation materials, and shall include (but not be limited to) disposable dust respirators, gloves, hard hats, and eye protection.
- B. The insulation contractor shall conduct all job site operations in compliance with applicable provisions of the Occupational Safety and Health Act, as well as with all state and/or local safety and health codes and regulations that may apply to the work.

3.7 ASBESTOS INSULATION

- A. Any existing asbestos insulation on existing ductwork, equipment, etc. where tie-ins are required, shall be removed by the Owner at the Owner's expense. The Contractor and Architect/Engineer shall not be responsible for any cost or work involved with removal or encapsulation of asbestos insulation.

A. END OF SECTION

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SECTION 23 07 14 - INTERNAL ACOUSTICAL DUCT LINING

PART 1 GENERAL

1.1 SECTION INCLUDES INTERNAL ACOUSTICAL DUCT LINING FOR:

- A. Supply Air Duct
 - 1. Downstream of volume box (when noted on drawings).
 - 2. Within 20 feet of the rooftop unit.
- B. Return Air Duct
 - 1. Within 20 feet of the rooftop unit.
- C. Exhaust Air Duct
 - 1. Within 10' of the fan.

1.2 REFERENCES

- A. Acoustical duct lining materials shall meet the property requirements of the following specifications as applicable to the specific product or end use:
 - 1. Blanket and board
 - a. UL 723 and ASTM E84-75: Surface burning characteristics flame spread less than 25, smoke developed less than 50.
 - b. ASTM C518-70: Thermal Conductivity.
 - c. ASTM C423-66: Absorption Coefficients.
 - d. ASTM C1071.
 - e. NFPA 90A.
- B. Duct lining materials, including all accessories shall be furnished and installed in strict accordance with project drawings, plans and specifications.

1.3 DEFINITIONS

- A. The term "mineral fiber" as defined by the above specifications includes fibers manufactured of glass, rock, or slag processed from a molten state with or without binder.

1.4 SYSTEM PERFORMANCE

- A. Acoustical materials furnished and installed hereunder shall be Class A, maximum of 25 flame spread, 35 fuel contributed, and 50 smoke developed rating.

1.5 QUALITY ASSURANCE

- A. Materials and accessories furnished and installed hereunder shall, where required, be accompanied by manufacturers' current submittal or data sheets showing compliance with applicable specifications.
- B. Materials and accessories shall be installed in a workmanlike manner by skilled and experienced workers who are regularly engaged in commercial insulation work.

PART 2 PRODUCTS

2.1 ACOUSTICAL LINING

- A. Acoustical Lining shall be in blanket or board form, selected to conform readily to the surface to which it will be applied.
 - 1. Fiberglas duct liner in blanket or board form, 1" thick, 1.5 lb. density with a fire-resistant coating to bond the fibers of the airstream surface and rated for air velocity of 5,000 fpm minimum.

2.2 ACCESSORY MATERIALS

- A. Accessory materials installed as part of work under this section shall include (but not be limited to):
 - 1. Adhesives.
 - 2. Fasteners, weld pins/studs, speed clips, insulation washers.

PART 3 EXECUTION

3.1 SITE INSPECTION

- A. Before starting work under this section, carefully inspect the site and installed work of other trades and verify that such work is complete to the point where installation of materials and accessories under this section can begin.
- B. Verify that all materials and accessories can be installed in accordance with project drawings and specifications and material manufacturers' recommendations.
- C. Verify by inspecting product labeling, submittal data, and/or certifications which may accompany the shipments that all materials and accessories to be installed on the project comply with applicable specifications and standards and meet specified thermal and physical properties.

3.2 PREPARATION

- A. Ensure that all seams and joints in ductwork have been sealed by the contractor responsible for the duct systems.
- B. Ensure that pressure testing of duct systems has been completed prior to installing insulation.

- C. Ensure that all duct surfaces over which or within which insulation is to be installed are clean and dry.
- D. Ensure that material is clean, dry, in good mechanical condition, and undamaged. Wet, dirty, or damaged material shall not be acceptable for installation.

3.3 INSTALLATION

A. General

- 1. Install lining in accordance with manufacturer's published instructions and recognized industry practice to ensure that it will serve its intended purpose.

B. Duct Lining

- 1. All airstream surfaces of ducts, plenums, housings, and air shafts designated to receive lining shall be completely covered with lining adhered with 90% minimum coverage of adhesive meeting. All leading edges and transverse joints shall be adhesive-coated. If air velocities exceed 4000 FPM, metal nosing shall be used on all transverse leading edges. Transverse joints shall be neatly butted and there shall be no interruptions or gaps. Install lining with smooth and even surfaces. The duct liner shall be additionally secured with weld secured mechanical fasteners which shall compress the duct liner sufficiently to hold it firmly in place. Mechanical fasteners shall be spaced in accordance with manufacturer's published schedule for the applicable interior plenum, housing or shaft width.

3.4 FIELD QUALITY ASSURANCE

- A. Upon completion of all work covered by this specification, visually inspect the work and verify that it has been correctly installed.

3.5 PROTECTION

- A. Replace damaged work which cannot be satisfactorily repaired.
- B. Protect the work during the remainder of the construction period, to avoid damage and deterioration of the finished work.

3.6 SAFETY PRECAUTIONS

- A. Contractor's employees shall be properly protected during the course of all work. Protection shall include proper attire when handling and applying insulation materials, and shall include (but not be limited to) disposable dust respirators, gloves, hard hats, and eye protection.
- B. The contractor shall conduct all job site operations in compliance with applicable provisions of the Occupational Safety and Health Act, as well as with all state and/or local safety and health codes and regulations that may apply to the work.

3.7 ASBESTOS INSULATION

- A. Any existing asbestos insulation on existing ductwork, equipment, etc. where tie-ins are required, shall be removed by the Owner at the Owner's expense. The Contractor and Architect/Engineer shall not be responsible for any cost or work involved with removal or encapsulation of asbestos insulation.

A. END OF SECTION

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SECTION 23 07 19 - HVAC PIPE SYSTEM INSULATION

PART 1 GENERAL

1.1 SECTION INCLUDES PIPE INSULATION FOR:

- A. Heating hot water supply and return piping system.
- B. Refrigerant piping system.
- C. Cooling coil drain piping inside the building.
- D. Outdoor piping.
- E. Valves and fittings.

1.2 RELATED SECTIONS

- A. All drawings and specification sections apply to work in this section. Furnish all items, articles, materials, equipment, operations or methods that are mentioned, listed or scheduled on drawings or are in this specification, including all labor, equipment, materials and miscellaneous incidentals necessary and/or required for the completion of this project. The work covered under this section of the specifications is in no way complete within itself, but is supplementary to the entire specification and drawings.

1.3 REFERENCES

- A. Thermal insulation materials shall meet the property requirements of the following specifications as applicable to the specific product or end use:
- B. American Society for Testing of Materials Specifications:
 - 1. ASTM C547, "Standard Specification for Mineral Fiber Preformed Pipe Insulation"
 - 2. ASTM C533, "Standard Specification for Calcium Silicate Pipe & Block Insulation"
 - 3. ASTM C585, "Recommended Practice for Inner and Outer Diameters of Rigid Pipe Insulation for Nominal Sizes of Pipe and Tubing (NPS System)"
 - 4. ASTM C1136, "Standard Specification for Barrier Material, Vapor," Type 1 or 2 (jacket only)
- C. Insulation materials, including all water and vapor barrier materials, closures, hangers, supports, fitting covers, and other accessories, shall be furnished and installed in strict accordance with project drawings, plans, and specifications.

1.4 SCOPE

- A. The work covered by this specification consists of furnishing all labor, equipment, materials and accessories, and performing all operations required, for the correct fabrication and installation of thermal insulation applied to the following commercial piping systems, in accordance with the applicable project specifications and drawings, subject to the terms and conditions of the contract:

1. Hot Piping – Fluid temperature 105°F and up.
2. Cold Piping – Fluid temperature below 105°F.

B. Insulation, vapor barriers, jacketing, hangers, supports, accessory materials, etc. shall be installed according to manufacturer's recommendations.

1.5 DEFINITIONS

A. The term "mineral fiber" as defined by the above specifications includes fibers manufactured of glass, rock, or slag processed from a molten state, with or without binder.

1.6 SYSTEM PERFORMANCE

A. Insulation material furnished and installed hereunder shall meet the minimum thickness requirements of Standard 90.1 (2007), "Energy Efficient Design of new Buildings" of the American Society of Heating, Refrigeration, and Air-Conditioning Engineers (ASHRAE) except minimum thickness shall be 1". However, if other factors such as condensation control or personnel protection are to be considered, the selection of the thickness of insulation should satisfy the controlling factor.

B. Insulation materials furnished and installed hereunder shall be Class A maximum of 25 flame spread, 35 fuel contributed and 50 smoke developed rating and shall meet the fire hazard requirements of each of the following specifications:

1. American Society for Testing of Materials ASTM E84
2. Underwriters' Laboratories, Inc. UL 723
3. National Fire Protection Associations NFPA 255

C. Calcium silicate products shall include a visual identification system to permit positive field determination of their asbestos-free characteristic.

1.7 QUALITY ASSURANCE

A. The contractor shall use whatever means are necessary to protect the insulation materials and accessories before, during and after installation. No insulation material shall be installed that has become damaged in any way. The contractor shall also use all means necessary to protect work and materials installed by other trades.

B. If any insulation material has become wet because of transit or job site exposure to moisture or water, the contractor shall not install such material, and shall remove it from the job site. An exception may be allowed in cases where the contractor is able to demonstrate that wet insulation when fully dried out (either before installation, or afterward following exposure to system operating temperatures) will provide installed performance that is equivalent in all respects to new, completely dry insulation. In such cases, consult the insulation manufacturer for technical assistance.

PART 2 PRODUCTS

2.1 PIPE INSULATION ON INDOOR SYSTEMS

- A. Molded pipe insulation shall be manufactured to meet ASTM C585 for sizes required in the particular system.
- B. Molded fibrous glass pipe insulation shall comply with the requirements of ASTM C547. Heavy density Fiberglas pipe insulation with factory applied all-service jacket (ASJ) and Doublesure* two-component adhesive closure system, or Fiberglas Pipe and Tank Insulation, heavy density fiberglass insulation with end grain adhered to ASJ all service jacket. Joints shall be sealed by butt strips having a two-component sealing system or by applying staples and pressure sensitive tape. When self-sealing lap systems are used, sufficient thickness of insulation shall be used to maintain the outer surface temperature of the operating system below +150°F. Manufacturer's data regarding thickness constraints in relation to operating temperature shall be followed. When multiple layers are required, all inner layer(s) shall be unjacketed.
- C. Fittings and valves shall be insulated with preformed fiberglass fittings, fabricated sections of fiberglass pipe insulation, fiberglass pipe and tank insulation, fiberglass blanket insulation, or insulating cement. Thickness shall be equal to adjacent pipe insulation. Finish shall match that used on straight sections.
- D. Flanges, couplings, chilled water pump impeller housings, valve bonnets etc, shall be covered with an oversized pipe insulation section sized to provide the same insulation thickness as on the main pipe section. An oversized insulation section shall be used to form a collar between the two insulation sections with sections of insulation being used to fill gaps. Jacketing shall match that used on straight pipe sections. Rough cut ends shall be coated with a suitable vapor resistant mastic.
- E. On cold systems, vapor barrier performance is extremely important. Particular care must be given to vapor sealing the fitting cover or finish to the pipe insulation vapor barrier. Valve stems shall be sealed with caulking to allow free movement of the stem but provide a seal against moisture incursion. All penetrations of the ASJ and exposed ends of insulation shall be sealed with vapor barrier mastic.
- F. On hot systems where fittings are to be left exposed, insulation ends should be beveled away from bolts for easy access.
- G. All insulated, exposed piping inside the building within 8'-0" above the floor shall be additionally jacketed with a multi-ply, fabric reinforced, self adhesive insulation cladding material with a vapor barrier and a thickness of 0.015". Jacketing system shall be Venture Clad Plus #1579CW-E or equal.

2.2 PIPE INSULATION ON OUTDOOR SYSTEMS

- A. Piping located outdoors, with installation temperature above 40°F, shall be painted, insulated and covered with a weatherproof metal jacket as per the following:
 - 1. All existing and new surfaces shall be cleaned and free of dirt, dust, grease, rust or any other debris build-up on the piping. After proper cleaning, the surface shall be primed with Devoe Pre-Prime® 167 penetrating sealer and finished with a coat of Devoe Bar-Rust® 235 surface tolerant coating per the manufacturer's recommendations. The primer and finisher shall be applied and cured per the

manufacturer's recommendations. Contractor shall protect all piping from elements during paint cure times.

2. Insulation material shall be an EPDM rubber, flexible, closed-cell elastomeric insulation in tubular or sheet form: Aerocel Aerocel-SSPT with Cel-Link II, Aerocel W/G-SSPT with Cel-Link II for piping or Aerocel AC Sheet or Aerocel SA pressure sensitive adhesive sheet for duct and equipment. The product will be tested for and meet or exceed the requirements defined in ASTM C 534 for Type I and II, Grade 1. EPDM elastomeric insulation material shall be manufactured without the use of CFC's, HFC's or HCFC's. EPDM elastomeric insulation shall have a flame-spread index of 25 or less and a smoke-developed index of 50 or less when tested in accordance with ASTM E 84, for all products through 2" thickness. This requirement applies to Cel-Link II closure, also. Product to be suitable for use from -297°F to 257°F continuous service temperature, per ASTM C 411. EPDM elastomeric insulation shall have a maximum thermal conductivity of 0.245 Btu-in./h-ft²-°F at a 75°F mean temperature when tested in accordance with ASTM C 177 or ASTM C 518. EPDM elastomeric insulation shall have a maximum water vapor transmission of 0.03 perm-inches when tested in accordance with ASTM E 96, Procedure A, latest revision. Product must exhibit long-term UV resistance, when unfinished in outdoor installations, per ASTM G 7 and ASTM G 90. EPDM elastomeric insulation must not contribute to external stress corrosion cracking as when tested by ASTM C 692.
3. Longitudinal seam closure is to be Stay-Seal with Protape and butting sections are to be joined with Cel-Link II pressure-sensitive closures. Closures must provide water and water vapor tight seal when tested in accordance with ASTM D 3816. VOC content must be no more than 1.3% when tested in accordance with ASTM D 3960. Closures must be capable of being sealed at a low temperature of 0°F. Closures must be kept free of dust, dirt, moisture, lubricants and other contaminants. Adhesive for fabrication work such as field-fabricated fittings and sheet seams shall be the insulation manufacturers recommended contact adhesive: Aerocel Aero Seal Adhesive or Aero Seal LVOC Adhesive. Optional insulation finish shall be the insulation manufacturer's recommended finish: Aerocel Aero Coat. Seaming tape to be 15-mil EPDM rubber with acrylic adhesive: Aerocel Protape. Elbows, suction line "P" traps, Tees and mechanical grooved pipe fittings are to be insulated with factory fabricated insulation fittings of EPDM flexible elastomeric, color matched to pipe insulation. Aero Fit Insulating Fitting Covers. Accessories such as adhesives, mastics and cements shall not detract from any of the system ratings as specified above.
4. Insulated pipe support inserts will be high-density insulation with an inner lining of EPDM rubber insulating tape and an EPDM rubber exterior jacket: Aerocel Aero Fix-U Pipe Hanger Inserts. Density of insulation is to be a minimum of 10 lbs./cu. ft., with a compressive strength of 284 P.S.I. or greater, and a k-value of .312 or lower, usage temperature range of -297°F to 257°F, water absorption of 5% or less. Exterior jacket is to be 15-mil thick EPDM rubber.
5. Insulating fitting covers for copper sweat x sweat 90 degree elbows, tee's and 45 degree elbows, and mechanical grooved fittings will be factory-

fabricated insulating fitting covers. The insulating fitting covers are to be made of EPDM rubber, with inside diameter and insulation thickness to match material on straight run piping. Aeroflex USA Aerofit insulating fitting covers.

6. All piping, valves, fittings, duct, and equipment scheduled to be insulated shall be to have all insulation applied in strict accordance with manufacturer's installation instructions, and practices described in the National Commercial and Industrial Insulation Standards Manual. Manufacturer's installation guidelines and instructions will be used if conflicts exist.
7. Insulating pipe saddles are to be installed at all pipe hanger and clamp locations. Saddles are to be installed at the time that piping is being installed, so that insulation system can be installed in a continuous manner through the pipe support system.
8. On outdoor pipes, the insulation system shall be completely vapor sealed before the weather-resistant jacket is applied. The outer jacket shall not compromise the vapor barrier by penetration of fasteners, etc.
9. Jacketing shall be a multi-ply, fabric reinforced, self adhesive insulation cladding material with a vapor barrier and a thickness of 0.015". Jacketing system shall be Venture Clad Plus #1579CW-E or equal with moisture barrier, installed in accordance with the jacket manufacturer's recommendations. Each section of jacketing shall overlap the adjoining section by 3". All seams shall be taped with Venture Clad joining/seaming tape. Place the wrap so that the edge of the sealing flap faces down.

2.3 REFRIGERANT PIPING AND COOLING COIL DRAIN WITH INSTALLATION TEMPERATURE ABOVE 40°F

- A. Insulate piping with ¾" closed-cell, fiber-free elastomeric foam equal to Armaflex type AP insulation. Insulation shall be flexible elastomeric thermal insulation, black in color, flame-spread rating of 25 or less and a smoke developed rating of 50 or less as tested by ASTM E84-91A "Method of Test Surface Burning Characteristics of Building Materials".
- B. Fitting elbow covers shall be fabricated from miter-cut tabular form. In all cases, butt joints and seams are to be sealed with Armstrong 520 adhesive. 520 adhesive is a contact adhesive; therefore, in all cases, both surfaces to be joined are to be coated with adhesive with installation temperature above 40°F.
- C. Jacketing shall be a multi-ply, fabric reinforced, self adhesive insulation cladding material with a vapor barrier and a thickness of 0.015". Jacketing system shall be Venture Clad Plus #1579CW-E or equal with moisture barrier, installed in accordance with the jacket manufacturer's recommendations. Each section of jacketing shall overlap the adjoining section by 3". All seams shall be taped with Venture Clad joining/seaming tape. Place the wrap so that the edge of the sealing flap faces down.

2.4 SUPPORT FOR PIPE WITH INSULATION

- A. All piping shall be supported in such a manner that neither the insulation or the vapor/weather barrier is compromised by the hanger or the effects of the hanger. In all cases, hanger spacing shall be such that butt joints may be made outside the hanger.
1. On all size piping of cold systems, the pipe hanger saddles shall be separated away from the pipe by utilizing inserts. The vapor barrier shall be continuous, including material covered by the hanger saddle. Utilize a clevis style hanger with protective shield per MSS SP-69.
 2. On warm water piping systems 3" in diameter or less, insulated with Fiberglas insulation, may be supported by placing saddles of the proper length and spacing, as designated in Owens-Corning Pub. 1-IN-12534, under the insulation.
 3. For hot or cold piping systems larger than 2½" in diameter, Owens-Corning Calcium Silicate pipe insulation shall be used for high density inserts. Piping saddles for piping larger than 3" shall not be in contact with the piping. Vapor barrier shall cover inserts.
 4. Owens-Corning Calcium Silicate pipe insulation may be used to support the entire weight of the piping system provided the hanger saddle is designed so the maximum compressive load does not exceed 100 psi.
 5. Where pipe shoes and roller supports are required, insulation shall be inserted in the pipe shoe to minimize pipe heat loss. Where possible, the pipe shoe shall be sized to be flush with the outer pipe insulation diameter.
 6. Thermal expansion and contraction of the piping and insulation system can generally be taken care of by utilizing double layers of insulation and staggering both longitudinal and circumferential joints. Where long runs are encountered, expansion joints may be required where single layers of the insulation are being used.
 7. On vertical runs, insulation support rings shall be used.

2.5 ACCESSORY MATERIALS

- A. Accessory materials installed as part of insulation work under this section shall include (but not be limited to):
1. Closure Materials - Butt strips, bands, wires, staples, mastics, adhesives; pressure-sensitive tapes.
 2. Field-applied jacketing materials - Sheet metal, plastic, canvas, fiberglass cloth, insulating cement; PVC fitting covers.
 3. Support materials - Hanger straps, hanger rods, saddles.
- B. All accessory materials shall be installed in accordance with project drawings and specifications, manufacturer's instructions, and/or in conformance with the current edition of the Midwest Insulation Contractors Association (MICA) "Commercial & Industrial Insulation Standards".

2.6 INSULATION THICKNESSES

- A. Fittings, including valves, flanges, unions, etc. shall be insulated with the same thickness as the required pipe insulation and covered with PVC fitting cover as specified.
- B. Pipe insulation thickness shall be as follows unless noted otherwise on drawings:

<u>Piping System</u>	<u>Pipe Size</u>	<u>Insulation Thickness</u>	<u>Insulation Conductivity BTU in H-Ft²-F</u>
Heating hot water	Up thru 1¼" 1½" and larger	1½" 2"	0.29
Refrigerant piping (Armaflex insulation)	up to 1¼" 1 ½" and larger	¾" 1"	0.28

Note: piping located outdoors shall have the same insulation thickness as noted above.

PART 3 EXECUTION

3.1 SITE INSPECTION

- A. Before starting work under this section, carefully inspect the site and installed work of other trades and verify that such work is complete to the point where installation of materials and accessories under this section can begin.
- B. Verify that all materials and accessories can be installed in accordance with project drawings and specifications and material manufacturers' recommendations.
- C. Verify by inspecting product labeling, submittal data, and/or certifications which may accompany the shipments that all materials and accessories to be installed on the project may comply with applicable specifications and standards and meet specified thermal and physical properties.

3.2 PREPARATION

- A. Ensure that all pipe and fitting surfaces over which insulation is to be installed are clean and dry.
- B. Ensure that insulation is clean, dry, and in good mechanical condition with all factory-applied vapor or weather barriers intact and undamaged. Wet, dirty, or damaged insulation shall not be acceptable for installation. All damaged insulation installed will be removed and replaced by the Contractor at no extra cost to the Owner.
- C. Ensure that pressure testing of piping and fittings has been completed prior to installing insulation.

3.3 INSTALLATION

A. General

1. Install all insulation materials and accessories in accordance with manufacturer's published instructions and recognized industry practices to ensure that it will serve its intended purpose.
2. Install insulation on piping subsequent to installation of heat tracing, painting, testing, and acceptance tests.
3. Install insulation materials with smooth and even surfaces. Insulate each continuous run of piping with full-length units of insulation, with single cut piece to complete run. Do not use cut pieces or scraps abutting each other. Butt insulation joints firmly to ensure complete, tight fit overall piping surfaces.
4. Maintain the integrity of factory-applied vapor barrier jacketing on all pipe insulation, protecting it against puncture, tears or other damage. All staples used on cold pipe insulation shall be coated with suitable sealant to maintain vapor barrier integrity.

B. Fittings

1. Cover valves, fittings, and similar items in each piping system using one of the following:
 - a. Mitered sections of insulation equivalent in thickness and composition to that installed on straight pipe runs.
 - b. Insulation cement equal in thickness to the adjoining insulation.
 - c. PVC fitting covers insulated with material equal in thickness and composition to adjoining insulation.

C. Penetrations

1. Extend piping insulation without interruption through walls, floors, and similar piping penetrations, except where otherwise specified.

D. Joints

1. Butt pipe insulation against hanger inserts. For hot pipes, apply 3" wide vapor barrier tape or band over butt joints. For cold piping apply wet coat of vapor barrier lap cement on butt joints, and seal joints with 3" wide vapor barrier tape or band.
2. All pipe insulation ends shall be tapered and sealed, regardless of service.

3.4 FIELD QUALITY ASSURANCE

- A. Upon completion of all insulation work covered by this specification, visually inspect the work and verify that it has been correctly installed. This may be done while work is in progress, to assure compliance with requirements herein to cover and protect insulation materials during installation.

3.5 PROTECTION

- A. Replace damaged insulation which cannot be satisfactorily repaired, including insulation with vapor barrier damage and moisture-saturated insulation.
- B. The insulation contractor shall advise the general and/or the mechanical contractor as to requirements for protection of the insulation work during the remainder of the construction period, to avoid damage and deterioration of the finished insulation work.

3.6 SAFETY PRECAUTIONS

- A. Insulation contractor's employees shall be properly protected during installation of all insulation. Protection shall include proper attire when handling and applying insulation materials, and shall include (but not be limited to) disposable dust respirators, gloves, hard hats, and eye protection.
- B. The insulation contractor shall conduct all job site operations in compliance with applicable provisions of the Occupational Safety and Health Act, as well as with all state and/or local safety and health codes and regulations that may apply to the work.

3.7 ASBESTOS INSULATION

- A. Any existing asbestos insulation on existing piping, valves, equipment, etc. where tie-ins are required, shall be removed by the Owner at Owner's expense. The contractor and Architect/Engineer shall not be responsible for any cost or work involved with removal or encapsulation of asbestos insulation.

A. END OF SECTION

MAI: 2024-9506

SECTION 23 21 00 - HYDRONIC PIPING

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Pipe and pipe fittings.
- B. Valves.
- C. Heating hot water piping system.
- D. Equipment drains and overflows.

1.2 REFERENCES: Material and/or equipment specified in this section shall meet or exceed one or more of the property requirements or installation requirements of the following specifications/publications as applicable to the specific product or end use.

- A. ASME - Boiler and Pressure Vessel Codes, SEC 9 - Qualification Standard for Welding and Brazing Procedures, Welders, Brazers, and Welding and Brazing Operators.
- B. ASME B16.3 - Malleable Iron Threaded Fittings Class 150 and 300.
- C. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings.
- D. ASME B16.22 - Wrought Copper and Copper Alloy Solder Joint Pressure Fittings.
- E. ASME B31.5 - Refrigeration Piping.
- F. ASME B31.9 - Building Services Piping.
- G. ASTM A53 - Pipe, Steel, Black and Hot-Dipped, Zinc Coated Welded and Seamless.
- H. ASTM A234 - Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and Elevated Temperatures.
- I. ASTM A312 - Seamless and Welded Austenitic Stainless Steel Pipe.
- J. ASTM A395 - Ferritic Ductile Iron Pressure-Retaining Castings.
- K. ASTM A536 - Ductile Iron Castings.
- L. ASTM B32 - Solder Metal.
- M. ASTM B88 - Seamless Copper Water Tube.
- N. ASTM D3309 - Polybutylene (PB) Plastic Hot-and Cold-Water Distribution Systems.
- O. ASTM F708 - Design and Installation of Rigid Pipe Hangers.

- P. ASTM F1476 - Standard Specification for the Performance of Gasketed Mechanical Couplings for Use in Piping Applications.
- Q. AWS A5.8 - Brazing Filler Metal.
- R. AWS D1.1 - Structural Welding Code.
- S. MSS SP58 - Pipe Hangers and Supports - Materials, Design and Manufacture.
- T. MSS SP69 - Pipe Hangers and Supports - Selection and Application.
- U. MSS SP89 - Pipe Hangers and Supports - Fabrication and Installation Practices.
- V. ANSI/AWWA C606 - Grooved and Shouldered Joints.

PART 2 PRODUCTS

2.1 HEATING HOT WATER PIPING up to 230°F, ABOVE GRADE

- A. Heating hot water piping 3" and smaller shall be:
 - 1. Copper tubing: ASTM B88, Type L hard drawn.
 - a. Fittings: ASME B16.18 cast bronze, tee tap or ASME B16.22 solder wrought copper.
 - b. Joints: 95-5 tin-antimony or tin and silver with melting range 430 to 535 degrees F.
 - c. Heating hot water piping 2" thru 3" may be Victaulic 'CTS' grooved piping system using EPDM gasketing as an option to soldering.
 - 1) Roll grooved ends as appropriate to type L hard drawn tubing, pressures, size and method of joining, Tubing ends shall be grooved in accordance with manufacturer's current listed standards to copper tube dimensions. (Flaring of tubing ends to accommodate alternate sized couplings is not allowed.
 - 2) Victaulic Style 607H Installation-Ready couplings shall consist of ductile iron housings, conforming to ASTM A395 and A536, cast with offsetting, angle-pattern bolt pads, coated with grade EHP gasket suitable for water temperatures to +250 degrees F, copper colored alkyd enamel, complete with type synthetic rubber gasket.
 - a) Installation ready, for direct stab installation without field disassembly.
 - 3) Valves Victaulic Style 608 butterfly valve with grooved ends manufactured to copper tube dimensions.
 - 4) Victaulic 'CTS' Grooved End Fittings: ASME B16.18 bronze sand cast or ASME B16.22 wrought copper. Manufactured to copper tube dimensions. (Flaring of fitting end to IPS dimensions is not allowed).
 - 5) Gasketing shall be Grade "EHP" EPDM compound (red & green color coded) conforming to ASTM D-2000. Temperature operating range - 30°F to +250°F.
- B. Heating hot water piping 4" and larger shall be steel pipe: ASTM A53, Schedule 40, wall black steel, beveled ends for welding.

1. Fittings: ASTM B16.3, malleable iron or STM A234, forged steel welding type fittings.
 2. Joints: AWS D1.1, welded.
- C. Heating hot water piping ½" through 2" may be Victaulic Vic Press 304™ System using EPDM "E" O- ring seals.
1. Piping shall be stainless steel schedule 10S pipe conforming to ASTM A312, Type 304/304L [316/316L]. Working pressures to 500 psi.
 2. Coupling and fitting housings shall be Vic Press 304™ products formed of precision cold drawn stainless steel, with self contained O-ring seals in the coupling/fitting ends.
 3. O-Ring Seals - O-ring seals shall be molded of synthetic rubber, Grade "E" EPDM recommended for water services from -30°F to +230°F.
 4. Valves - Victaulic or equal Style P589 Vic Press 304™ end ball valve, 300 psi, ½" through 2" size range, forged brass body, ASTM B-16 chrome plated ASTM B283 brass ball and stem, TFE seats and stem washer, Fluoroelastomer O-ring.
 5. Assembly- Pipe ends must be marked according to instructions supplied and fully inserted into the coupling/fitting housing up to the pipe stop. Fitting ends shall be pressed onto the pipe using only a Pressfit Tool (PFT-510 series) equipped with the proper size pressing jaws in accordance with the latest Pressfit System Product Assembly and Tool Operation Manual.
 6. Pipe Preparation - Stainless steel pipe shall be square cut plus or minus 0.030", properly deburred and cleaned to ensure leak-tight O-ring seal, in accordance with latest Victaulic Vic Press 304™ System published information.
- D. Heating hot water piping 2½" and larger may be Victaulic grooved piping system using EPDM gasketing as an option to welding, threading or flanging.
1. Piping shall be ASTM A53, schedule 40 black steel with mechanical grooves.
 2. All grooved components shall be of one manufacturer and shall conform to local code approval and/or as listed by ANSI B31.1, B31.9, ASME, UL/FM IAMPO or BOCA. Grooved end product manufacturer to be ISO-9001 certified.
 3. Roll or cut grooved ends as appropriate to pipe material, wall thickness, pressures, size and method of joining. Pipe ends shall be grooved in accordance with manufacturers current listed standards conforming to ANSI/AWWA C606. Grooving tools shall be of the same manufacturer as the grooved components.
 4. Mechanical couplings shall consist of ductile iron housings, conforming to ASTM A395 and A536, complete with synthetic rubber gasket.
 - a. Victaulic style 07 (zero-flex) rigid coupling. Housings cast with offsetting, angle-pattern bolt pads to provide system rigidity for support and hanging

in accordance with ANSI B31.1, B31.9 and NFPA 13. Victaulic style HP-70 rigid coupling for high pressure service.

- 1) Installation ready, for direct stab installation without field disassembly, including grade EHP gasket. Victaulic Style 107.
 - b. Victaulic style 177 "Installation-Ready" and style 77 or 75 coupling shall be used where system flexibility is desired at pumps and other mechanical equipment to reduce noise and vibration. Noise and vibration reduction is achieved by installing (3) flexible couplings near the vibration source.
 - c. 14" and Larger: Victaulic AGS series two segment couplings with lead-in chamfer on housing key and wide width FlushSeal® gasket.
 - 1) Rigid Type: Housing key shall fill the wedge shaped AGS groove and provide rigidity and system support and hanging in accordance with ANSI B31.1 and B31.9. Victaulic Style W07.
 - 2) Flexible Type: Housing key shall fit into the wedge shaped AGS groove and allow for linear and angular pipe movement. Victaulic Style W77.
1. Mechanical reducing couplings shall be Victaulic Style 750 or equal for pipe runs for reducers.
 2. Victaulic grooved end fittings manufactured from ASTM A395 and A536, ductile iron; ASTM A234 forged steel; or factory-fabricated from carbon steel pipe conforming to ASTM A53. Grooved ends in accordance with ANSI/AWWA C606.
 3. Gasketing shall be grade EHP gasket suitable for water temperatures to +250°F or Grade "E" EPDM compound (green color coded) conforming to ASTM D-2000 designation 2CA615A25B24F17Z. Temperature operating range -30°F to +230°F.

2.2 EQUIPMENT DRAINS AND OVERFLOWS

- A. Equipment drains, cooling coil drains, overflows and piping from relief valves 1" and smaller shall be Copper Tubing: ASTM B88, Type L, hard drawn.
 1. Fittings: ASME B16.18 cast brass tee tap or ASME B16.22 solder wrought copper.
 2. Joints: Solder, lead free, 95-5 tin-antimony, or tin and silver, with melting range 430 to 535 degrees F.
- B. Equipment drains, cooling coil drains, overflows and piping from relief valves 1¼" thru 2" shall be ASTM A53, schedule 40 black steel with threaded joints.

2.3 PIPE HANGERS AND SUPPORTS

- A. Refer to Section 23 05 00.

2.4 UNIONS, FLANGES, AND COUPLINGS

- A. Unions for Pipe 3 Inches and Under:
 1. Copper Pipe: Bronze, soldered joints.
 2. Stainless Steel Pipe: Type 304/304L stainless steel, threaded-type, with Vic Press 304™ ends. Victaulic Style P584.

3. On piping systems where grooved joint mechanical couplings are used, unions are not required. (Couplings shall serve as unions).
- B. Flanges for Pipe 4 Inches and Larger:
1. Ferrous Piping: 150 psig forged steel, slip-on.
 2. Gaskets: 1/16 inch thick preformed neoprene.
- C. Flange Adapters for Grooved Pipe and Fittings 2 ½ Inches and Larger:
1. Ferrous Piping: Class 125/150 for use with grooved end pipe and fittings. Victaulic Style 741/W741.
- D. Grooved and Shouldered Pipe End Couplings when approved by Architect/Engineer:
1. Housing Clamps: Two ductile iron to engage and lock, designed to permit some angular deflection, contraction, and expansion where required.
 2. Sealing Gasket: C-shape elastomer composition for operating temperature range from -30 degrees F to 230 degrees F for EPDM Grade E gaskets, and EPDM-HP for operating temperature range from -30 degrees F to 250 degrees F.
 3. Accessories: Electroplated steel bolts, nuts, and washers conforming with ASTM A449.
 4. Basis of Design: Victaulic Style 47.
- E. Dielectric Connections
1. Dielectric nipples shall be non-conducting for connection of dissimilar piping materials. Dielectric nipples shall be similar to Victaulic Style 647 or Style 47. A brass adaptor dielectric union is not acceptable.

2.8 GLOBE OR ANGLE VALVES

- A. Up To and Including 3 Inches:
1. Bronze body, bronze trim, screwed bonnet, rising stem and handwheel, inside screw with backseating stem, renewable composition disc and bronze seat solder ends.
- B. Over 3 Inches:
1. Iron body, bronze trim, bolted bonnet, rising stem, handwheel, outside screw and yoke, rotating plug-type disc with renewable seat ring and disc, flanged ends.

2.9 BALL VALVES

- A. Up To and Including 2 Inches:
1. Bronze one piece body, stainless steel ball, teflon seats and stuffing box ring, lever handle with balancing stops, solder ends.
 2. Forged brass, two piece body, chrome plated brass ball and stem, PTFE seats and stem washer, lever handle, Vic Press 304™ ends. Victaulic Series P589.
- B. Over 2½ Inches:
1. Cast steel body, chrome plated steel ball, teflon seat and stuffing box seals, lever handle, or gear drive handwheel for sizes 10 inches and over, flanged.
 2. Ductile iron body, chrome plated carbon steel ball and stem, TFE seats, lever handle or gear operator, grooved ends. Victaulic Series 726.

2.10 PLUG VALVES

- A. Up To and Including 3 Inches:
 - 1. Bronze body, bronze tapered plug, full port opening, non-lubricated, teflon packing, threaded ends.
 - 2. Operator: One plug valve wrench for every ten plug valves minimum of one.
- B. Over 3 Inches:
 - 1. Cast iron body and plug, full port opening, pressure lubricated, teflon packing, flanged ends or grooved ends if Victaulic grooved end fittings are used.
 - 2. Ductile iron body and plug, standard port opening, non-lubricated eccentric-type, welded-in nickel seat, grooved ends. Victaulic Series 377.
 - 3. Operator: Each plug valve shall have a wrench handle with set screw.

2.12 SWING CHECK VALVES

- A. Up To and Including 3 Inches:
 - 1. Bronze body, bronze trim, bronze rotating swing disc, with composition disc, solder ends.
- B. Over 3 Inches:
 - 1. Iron body, bronze trim, bronze or bronze faced rotating swing disc, renewable disc and seat, flanged ends or grooved ends if Victaulic grooved end fittings are used.

2.13 SPRING LOADED CHECK VALVES

- A. Iron body, bronze trim, split plate, hinged with stainless steel spring, resilient seal bonded to body, wafer or threaded lug ends.
- B. Ductile iron body, stainless steel spring and shaft, aluminum-bronze disc with elastomer seal or elastomer coated ductile iron disc with welded-in nickel seat, grooved ends. Basis of Design: Victaulic Series 716.
- C. 14" through 24" Sizes: Ductile iron body, stainless steel spring, shaft, and dual disc(s), with EPDM seat, and AGS grooved ends. Victaulic Series W715.

PART 3 EXECUTION

3.1 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. 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.

3.2 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install piping to ASME B31.5 and B31.9.
- C. Route piping in orderly manner, parallel to building structure, and maintain gradient.
- D. Install piping to conserve building space, and not interfere with use of space.
- E. Group piping whenever practical at common elevations.
- F. Sleeve pipe passing through partitions, walls and floors.
- G. Slope piping and arrange to drain at low points. Use eccentric reducers to maintain top of pipe level.
- H. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.
 - 1. For water systems, use adequate numbers of Victaulic Style 77 flexible couplings in header piping to accommodate thermal growth and contraction, and for the elimination of expansion loops. (In accordance with Victaulic instructions and as approved by the engineer). Where expansion loops are required, use Victaulic Style 77 couplings on the loops.
- I. Where more than one piping system material is specified, ensure system components are compatible and joined to ensure the integrity of the system is not jeopardized. Provide necessary joining fittings. Ensure flanges, union and couplings for servicing are consistently provided.
- J. Grooved ends shall be clean and free from indentations, projections, and roll marks in the area from pipe end to groove.
- K. The grooved coupling manufacturer's factory trained representative shall provide on-site training for contractor's field personnel in the use of grooving tools and installation of grooved joint products. The representative shall periodically visit the jobsite and review contractor is following best recommended practices in grooved product installation. (A distributor's representative is not considered qualified to conduct the training or jobsite visit(s)).
- L. Use grooved mechanical couplings and fasteners as approved by the Architect/Engineer.
- M. Use unions, flanges, and couplings downstream of valves and at equipment or apparatus connections. Do not use direct welded or threaded connections to valves, equipment or other apparatus.
- N. Use non-conducting dielectric nipples or couplings, whenever joining dissimilar metals.
- O. Provide pipe hangers and supports in accordance with ASTM B31.9 unless indicated otherwise.

- P. Use gate, ball or butterfly valves for shut-off and to isolate equipment, part of systems, or vertical risers. All branch piping take-offs from mains, risers or branch piping shall have valves installed to allow isolation of branch piping and equipment/areas being served.
- Q. Use globe, ball or butterfly valves for throttling, bypass, or manual flow control services.
- R. Use butterfly valves interchangeably with gate and globe valves.
- S. Use only butterfly valves in chilled and condenser water systems for throttling and isolation service.
- T. Use lug or grooved end butterfly valves to isolate equipment.
- U. Use check valves or triple duty valves on discharge of pumps where shown on drawings.
- V. Use plug cocks for throttling service. Use non-lubricated plug cocks only when shut-off or isolating valves are also provided.
- W. Use $\frac{3}{4}$ inch ball valves with cap for drains at main shut-off valves, low points of piping, bases of vertical risers, and at equipment. Pipe to nearest floor drain.
- X. Inserts:
 - 1. Provide inserts for placement in concrete formwork.
 - 2. Provide inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.
 - 3. Provide hooked rod to concrete reinforcement section for inserts carrying pipe over 4 inches.
 - 4. Where concrete slabs form finished ceiling, locate inserts flush with slab surface.
 - 5. Where inserts are omitted, drill through concrete slab from below and provide through-bolt with recessed square steel plate and nut flush with top of slab.
- Y. Pipe Hangers and Supports:
 - 1. Install in accordance with ASTM B31.9, ASTM F708 and MSS SP89.
 - 2. Support horizontal piping as scheduled.
 - 3. Install hangers to provide minimum $\frac{1}{2}$ inch space between finished covering and adjacent work.
 - 4. Place hangers within 12 inches of each horizontal elbow.
 - 5. Use hangers with $1\frac{1}{2}$ inch minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.
 - 6. Support vertical piping at every floor. Support riser piping independently of connected horizontal piping.
 - 7. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.
 - 8. Provide copper plated hangers and supports for copper piping.
 - 9. Prime coat exposed steel hangers and supports. Hangers and supports located in crawl spaces, pipe shafts, and suspended ceiling spaces are not considered exposed.

- Z. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings.
- AA. Provide access where valves and fittings are not exposed. Coordinate size and location of access doors.
- BB. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welds.
- CC. Apply one coat of primer and one coat of paint to all unfinished exposed pipe, fittings, supports and accessories. For example, unfinished piping exposed within a mechanical room, outdoors, within any room shall be primed and painted.
- DD. Install valves with stems upright or horizontal, not inverted.
- EE. Provide balancing devices where indicated on drawings, as required to attain design quantities, and as recommended by balancing agency.
- FF. After filling system, check for leaks and repair to leak-tight condition.
- GG. After completion, clean strainers, flush and fill systems and test system to be sure all air is eliminated from piping, coils, etc.

3.3 TESTING

- A. Hydrostatically test at 100 psi in excess of the working pressure for four (4) hours. This pressure to be on piping only, not on equipment.

A. END OF SECTION

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SECTION 23 21 16 - HYDRONIC SPECIALTIES

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Air vents.
- B. Strainers.
- C. Flow indicators, controls, meters.
- D. Temperature control valves.
- E. Glycol specialties.

1.2 REFERENCES: Material and/or equipment specified in this section shall meet or exceed one or more of the property requirements or installation requirements of the following specifications/publications as applicable to the specific product or end use.

- A. ASME - Boilers and Pressure Vessel Codes, SEC 8-D-Rules for Construction of Pressure Vessels.

PART 2 PRODUCTS

2.1 AIR VENTS

- A. Manual Type: Short vertical sections of 2 inch diameter pipe to form air chamber, with ball valve and Bell & Gossett #87 or equal automatic air vent piped to accessible location.

2.2 STRAINERS

- A. Size 2 inch and Under:
 - 1. Screwed brass body for 175 psig working pressure, Y pattern with 1/32 inch stainless steel perforated screen.
- B. Size 2½ inch to 4 inch:
 - 1. Flanged or grooved ductile iron body for 300 psig working pressure, Y pattern with 3/64, 1/16, or 1/8 inch stainless steel perforated screen. Basis of Design: Victaulic Style 732.
- C. Size 5 inch and Larger:
 - 1. Flanged iron body for 175 psig working pressure, basket pattern with 1/8 inch stainless steel perforated screen.
 - 2. Grooved end ductile iron body for 300 psig working pressure, wye-pattern with 1/16 or 1/8 inch stainless steel frame and mesh. Basis of Design: Victaulic Style 732.

3. AGS grooved end factory-fabricated steel body with T-bolt hinged closure for 300 psig working pressure with 4x4 or 6x6 mesh stainless steel frame and mesh basket. Basis of Design: Victaulic Style W730.

2.10 TEMPERATURE CONTROL VALVES

- A. Control valves shall be furnished by Temperature Control Contractor and installed by Mechanical Contractor. See Temperature Control System section for requirements.

2.12 GLYCOL SOLUTION

- A. Contractor shall fill the glycol piping systems and the glycol feed tank with a mixture of ethylene glycol and water. Mixture shall be 33% glycol for chilled water systems and 40% glycol for snow melt systems. Glycol shall be Dowtherm as manufactured by the Dow Chemical Co. or equal, with annual testing service offered by the manufacturer. System and feed tank shall be full at completion of project. A pressure relief valve shall be furnished with the feed unit and installed by the Contractor. Relief valve discharge shall be piped into the top of the glycol feed tank.
- B. If glycol/water mixture is required, clean and flush glycol system before adding glycol solution. Feed glycol solution to system through make-up line with pressure regulator, venting system high points. Perform tests determining strength of glycol and water solution and submit written test results.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install specialties in accordance with manufacturer's instructions.
- B. Grooved end installations
 1. All grooved couplings, fittings, valves, and specialties shall be the products of a single manufacturer. Grooving tools shall be of the same manufacturer as the grooved components.
 2. All castings used for coupling housings, fittings, valve bodies, etc. shall be date stamped for quality assurance and traceability.
 3. Grooved ends shall be clean and free from indentations, projections, and roll marks in the area from pipe end to groove.
- C. Where large air quantities can accumulate, provide enlarged air collection standpipes.
- D. Provide manual air vents at system high points that could "trap" air in piping system and as indicated.
- E. For automatic air vents in ceiling spaces or other concealed locations, provide vent tubing to nearest drain.
- F. Provide air separator on suction side of system circulation pump and connect to expansion tank.

- G. Provide valved drain and hose connection on strainer blow down connection.
- H. Provide pump suction fitting on suction side of base mounted centrifugal pumps where indicated. Remove temporary strainers after cleaning systems.
- I. Provide combination pump discharge valve on discharge side of base mounted centrifugal pumps where indicated.
- J. Support pump fittings with floor mounted pipe and flange supports.
- K. Provide relief valves on pressure tanks, low pressure side of reducing valves, heat exchangers, and expansion tanks.
- L. Select system relief valve capacity so that it is greater than make-up pressure reducing valve capacity. Select equipment relief valve capacity to exceed rating of connected equipment.
- M. Where one line vents several relief valves, make cross sectional area equal to sum of individual vent areas.
- N. After completion, clean strainers, flush and fill systems.

3.2 TESTING

- A. Hydrostatically test piping at 100 psi for four (4) hours. This pressure to be on piping only, not on equipment.

A. END OF SECTION

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SECTION 23 25 00 - HVAC SYSTEMS TESTING, CLEANING, WATER TREATMENT & STARTUP

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Testing of piping systems.
- B. Cleaning of piping systems.
- C. Chemical feeder equipment.
- D. Chemical treatment.
- E. Substantial completion check list and sign-off forms.

1.2 PRODUCTS FURNISHED, BUT NOT INSTALLED, UNDER THIS SECTION

- A. Chemical shot feeder, glycol feed system, placement of water coupon rack, etc. shall be furnished by the contractor responsible for chemical treatment of the systems, installed by the Mechanical Trade. Shot feeder shall be installed at a serviceable, low height.

1.3 QUALIFICATIONS

- A. The chemical treatment company shall specialize in water treatment of mechanical systems. The company shall have local representatives with water analysis laboratories and full time service personnel.

1.4 REGULATORY REQUIREMENTS

- A. Conform to applicable code for addition of non-potable chemicals to building mechanical systems, and for public sewage systems.
- B. Products requiring electrical connection and listed and classified by UL as suitable for the purpose specified and indicated.

1.5 MAINTENANCE SERVICE

- A. Furnish service and maintenance of treatment systems and system water for one year from date of substantial completion.
- B. Provide monthly technical service visits to perform field inspections and make water analysis on site. Detail findings in writing on proper practices, chemical treating requirements, and corrective actions needed. Submit two copies of field service report to Owner after each visit.
- C. Provide laboratory and technical assistance services during this maintenance period.

- D. Provide training course for Owner's personnel, instructing them on installation, care, maintenance, testing, and operation of the water treatment systems. Arrange course at startup of systems.
- E. Provide on-site inspections of equipment during scheduled or emergency shutdown to properly evaluate success of water treatment program, and make recommendations in writing based on these inspections.

1.6 MAINTENANCE MATERIALS

- A. Provide sufficient chemicals for treatment and testing during warranty period.

PART 2 PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 HEATING HOT WATER PIPING SYSTEMS

- A. Testing
 - 1. Before equipment is connected, hydrostatically test at 1.5 times the maximum system pressure, but not less than 100 psig in excess of the working pressure for four hours. This pressure to be on piping only, not equipment.
- B. Cleaning and Flushing
 - 1. Systems shall be operational, filled, started and vented prior to cleaning. Use water meter and record capacity in system.
 - 2. Place terminal control valves in open position during cleaning.
 - 3. Verify that electric power is available and of the correct characteristics.
 - 4. Install cleaning chemicals. Concentration shall be one pound per 100 gallons of water or as recommended by manufacturer of chemicals.
 - a. Utilize liquid alkaline compound with emulsifying agents and detergents to remove grease and petroleum products.
 - b. Utilize biocide; chlorine release agents such as sodium hypochlorate or calcium hypochlorite, or micro biocides such as quarteratany ammonial compounds, tributyl tin oxide, emthlene bis (thiocyanate), or isothiazolones.
 - 5. Apply heat where circulating, slowly raising water temperature to 160°F and maintain for 12 hours minimum.
 - 6. Remove heat and circulate until water temperature is 100°F or less. Drain system as quickly as possible and refill with clean water.
 - 7. Circulate for 6 hours at design temperature, then drain. Flush with clean water for one hour. Refill with clean water and repeat until system cleaner and all material is removed. Water shall be clear upon last drain.
 - 8. Use neutralizer agents as recommended by the system cleaner supplier.
 - 9. Remove, clean and replace strainer screens.
 - 10. Inspect, remove sludge, and flush low points of piping system with clean water after cleaning process is completed. Include disassembly of components as required.
 - 11. Install sequestering agent to reduce deposits and adjust pH. Install corrosion inhibitors and conductivity enhancers. All chemical treatment shall be as

recommended by manufacturers and chemical treatment contractor. If system is to utilize a glycol water mixture, the glycol shall contain the sequestering agent and corrosion inhibitors.

- C. System Water Treatment
 - 1. Provide one bypass feeder on each system. Install isolating and drain valves and necessary piping. Install around balancing valve downstream of circulating pumps unless indicated otherwise.
 - 2. Introduce chemicals through bypass feeder when required or indicated by a test.
 - 3. Provide ¾" water coupon rack around circulating pumps with space for four test specimens.

3.6 SYSTEM COMPLETION CHECKLIST

- A. The checklist which follows this specification section is to be considered part of the specifications.
- B. The checklist is to be completed by the Installing Contractor and the prime Mechanical Contractor for each item as directed.

A. END OF SECTION

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SYSTEMS COMPLETION CHECKLIST						
Inspection/Review Item	Notice Required	Installing Contractor		Date	Owner's Representative Signature	Remarks
		Name	Signature			
Air Handling Units						
Coils	When Completed					Verify coils have been piped properly per drawings and thoroughly cleaned of all construction dust and debris.
Spring Isolators	When Completed					Verify all shipping blocking has been removed.
Duct Connectors	When Completed					Verify all duct connections to unit are complete and that flex duct connections were used.
Motorized Dampers	When Completed					Verify linkages are free to operate and temperature control operation is correct.
Control Valves	When Completed					Verify correct 2-way or 3-way valves have been installed per drawing details and temperature control operation is correct.
Duct Smoke Detector	When Completed					Verify duct smoke detectors have been installed and are operational.
Temperature Controls	When Completed					Verify all temperature control points have been installed and are operational.
Identification	When Completed					Verify AHU properly identified and labeled per specification.
Cooling Coil Condensate Drain	When Completed					Verify P-trap on drain is piped correctly with minimum depth of seal greater than total static pressure possible by AHU. Verify drain pipe extended to floor drain.
Gages and Thermometers	When Completed					Verify coil piping have gauges, thermometers and "petes plug" installed per piping details.

By signing this form, the Contractor is certifying that he has personally witnessed completion of that item, and it is complete and complies with all respects to the drawings and specifications.

All items are to be signed off on and submitted to MacMillan Associates Inc. before a final project walk-thru by the Engineer is requested. If the Engineer discovers items incomplete and/or not in accordance with this checklist, the drawings, or the specifications, the Contractor will be backcharged for the

Engineer's time and expenses.

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Steam Traps	When Completed					Verify steam traps are piped with adequate "pipe drop" from coil connection to trap.
SYSTEMS COMPLETION CHECKLIST						
Inspection/Review Item	Notice Required	Installing Contractor		Date	Owner's Representative Signature	Remarks
		Name	Signature			
Air Handling Units, Continued						
Filters	When Completed					Verify prefilters and final filters are clean and ready for final air balance.
Supply Fans	When Completed					Verify proper rotation and operation.

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**SYSTEMS COMPLETION
CHECKLIST**

Inspection/Review Item	Notice Required	Installing Contractor		Date	Owner's Representative Signature	Remarks
		Name	Signature			
Rooftop Units						
Gas Heat Exchanger	When Completed					Verify heat exchangers have been piped properly per drawings and thoroughly cleaned of all construction dust and debris.
Spring Isolator Roof Curb	When Completed					Verify all shipping blocking has been removed and curb has been flashed properly.
Duct Connectors	When Completed					Verify all duct connections to unit are complete and that flex duct connections were used.
Motorized Dampers	When Completed					Verify linkages are free to operate and temperature control operation is correct.
Duct Smoke Detectors	When Completed					Verify duct smoke detectors have been installed and are operational.
Temperature Controls	When Completed					Verify all temperature control points have been installed and are operational.
Identification	When Completed					Verify AHU properly identified and labeled per specification.
Cooling Coil Condensate Drain	When Completed					Verify P-trap on drain is piped correctly with minimum depth of seal greater than total static pressure possible by RTU. Verify drain pipe extended to roof drain.
Filters	When Completed					Verify prefilters and final filters are clean and ready for final air balance.
Supply Fans	When Completed					Verify proper rotation and operation.

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Engineer's time and expenses.

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**SYSTEMS COMPLETION
CHECKLIST**

Inspection/Review Item	Notice Required	Installing Contractor		Date	Owner's Representative Signature	Remarks
		Name	Signature			
HVAC Ductwork Systems						
Ductwork Inspection	When Completed					Verify all joints have been sealed, connectors made, etc.
Balance Dampers	When Completed					Verify balance dampers are installed at each duct branch and duct take-off.
Fire and Smoke Dampers	When Completed					Verify dampers are operational and open prior to air handling system operation.
Louvers, Hoods, Exhaust Fans	When Completed					Verify installation is complete, all caulking, roofing etc. has been completed.
Flexible Ductwork	When Completed					Verify flex duct installed without "kinks" and have maximum 5'-0" length.
Duct Insulation	When Completed					Verify all insulation has been installed and sealed on duct systems as specified.
Duct Cleaning	When Completed					Verify all dust, dirt and debris are removed from ducts.
Diffusers and Registers	When Completed					Verify installation is complete and properly supported.

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Engineer's time and expenses.

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**COMPLETION
SYSTEMS CHECKLIST**

Inspection/Review Item	Notice Required	Installing Contractor		Date	Owner's Representative Signature	Remarks
		Name	Signature			
HVAC Piping and Circulating Pump Systems						
Flushing and testing of heating hot water piping system	48 hours					Flushed and tested per specification.
Flushing and testing of chilled water piping system	48 hours					Flushed and tested per specification.
Flushing and testing of cooling tower water system	48 hours					Flushed and tested per specification.
Flushing and testing of refrigerant piping system	48 hours					Flushed and tested per specification.
Valving	When completed					Verify that all valves have been installed at all branch locations.
Pipe and Fitting Insulation	When Completed					Verify all piping and fittings are per specification.
Circulating pumps installation complete, check, tested and started	7 days					Verify circulating pump rotation, operation and control are correct. Verify check, test and start-up of circulating pumps by manufacturer's representative.
Circulating pump V.F.D. System	7 days					Verify installation complete for all control components, system check tested and started by manufacturer's representative.
Glycol feed unit	7 days					Verify installation complete, system check, test and startup by manufacturer's representative.

By signing this form, the Contractor is certifying that he has personally witnessed completion of that item, and it is complete and complies with all respects to the drawings and specifications.

All items are to be signed off on and submitted to MacMillan Associates Inc. before a final project walk-thru by the Engineer is requested. If the Engineer discovers items incomplete and/or not in accordance with this checklist, the drawings, or the specifications, the Contractor will be backcharged for the

Engineer's time and expenses.

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**SYSTEMS COMPLETION
CHECKLIST**

Inspection/Review Item	Notice Required	Installing Contractor		Date	Owner's Representative Signature	Remarks
		Name	Signature			
HVAC Piping and Circulating Pump Systems, Continued						
Air Vents	When completed					Verify air vents at all high points of hydronic piping systems and all air bled from system.
Labeling and valve tagging identification	When completed					Verify system identification is complete per specification.
Owner's training	When completed					Verify that Owner has been instructed on operation and maintenance of systems.

By signing this form, the Contractor is certifying that he has personally witnessed completion of that item, and it is complete and complies with all respects to the drawings and specifications.

All items are to be signed off on and submitted to MacMillan Associates Inc. before a final project walk-thru by the Engineer is requested. If the Engineer discovers items incomplete and/or not in accordance with this checklist, the drawings, or the specifications, the Contractor will be backcharged for the

Engineer's time and expenses.

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**SYSTEMS COMPLETION
CHECKLIST**

Inspection/Review Item	Notice Required	Installing Contractor		Date	Owner's Representative Signature	Remarks
		Name	Signature			
Miscellaneous Requirements						
As-built drawings of all systems	At completion of installation					Per specification
Operation and Maintenance manuals	At completion of installation					Per specification
Air Balance Report	At completion of installation					Per specification
Water Balance Report	At completion of installation					Per specification
One complete set of shop drawings for Owner	At completion of project					Per specification
Inspection, local authority approvals, etc.	At completion of project					

By signing this form, the Contractor is certifying that he has personally witnessed completion of that item, and it is complete and complies with all respects to the drawings and specifications.

All items are to be signed off on and submitted to MacMillan Associates Inc. before a final project walk-thru by the Engineer is requested. If the Engineer discovers items incomplete and/or not in accordance with this checklist, the drawings, or the specifications, the Contractor will be backcharged for the

Engineer's time and expenses.

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By signing this form, the Contractor is certifying that he has personally witnessed completion of that item, and it is complete and complies with all respects to the drawings and specifications.

All items are to be signed off on and submitted to MacMillan Associates Inc. before a final project walk-thru by the Engineer is requested. If the Engineer discovers items incomplete and/or not in accordance with this checklist, the drawings, or the specifications, the Contractor will be backcharged for the Engineer's time and expenses.

SC-3

SECTION 23 30 00 - AIR DISTRIBUTION

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Metal ductwork
- B. Single wall spiral duct and fittings
- C. Dampers.
- D. Duct cleaning.
- E. Roof hoods, exhaust fans, grilles and louvers.

1.2 REFERENCES: Material and/or equipment specified in this section shall meet or exceed one or more of the property requirements or installation requirements of the following specifications/publications as applicable to the specific product or end use:

- A. ASTM A36 - Structural Steel.
- B. ASTM A90 - Weight of Coating on Zinc-Coated (Galvanized) Iron or Steel Articles.
- C. ASTM A167 - Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.
- D. ASTM A366 - Steel, Sheet, Carbon, Cold Rolled, Commercial Quality.
- E. ASTM A480 - General Requirements for Flat-Rolled Stainless and Heat Resisting Steel Plate, Sheet, and Strip.
- F. ASTM A525 - General Requirements for Steel Sheet.
- G. ASTM A527 - Steel Sheet, Zinc Coated (Galvanized) by Hot Dip Process, Lock Forming Quality.
- H. ASTM A568 - Steel, Sheet, Carbon, and High-Strength, Low Alloy, Hot-Rolled and Cold-Rolled.
- I. ASTM A569 - Steel, Carbon (0.15 Maximum, Percent), Hot-Rolled Sheet and Strip, Commercial Quality.
- J. ASTM B209 - Aluminum and Aluminum-Alloy Sheet and Plate.
- K. AWS D9.1 - Welding of Sheet Metal.
- L. NBS PS 15 - Voluntary Product Standard for Custom Contact-Molded Reinforced-Polyester Chemical Resistant Process Equipment.
- M. NFPA 54 - National Fuel Gas Code.

- N. NFPA 70 - National Electric Code.
- O. NFPA 90A - Installation of Air Conditioning and Ventilating Systems.
- P. NFPA 90B - Installation of Warm Air Heating and Air Conditioning Systems.
- Q. NFPA 91 - Installation of Blower and Exhaust Systems for Dust, Stock and Vapor Removal or Conveying.
- R. NFPA 96 - Installation of Equipment for the Removal of Smoke and Grease-Laden Vapors from Commercial Cooking Equipment.
- S. SMACNA - HVAC Air Duct Leakage Test Manual.
- T. SMACNA - HVAC Duct Construction Standards - Metal and Flexible.
- U. SMACNA - Fibrous Glass Duct Construction Standards.
- V. UL 33 - Heat Responsive Links for Fire Protection Systems.
- W. UL 181 - Factory-Made Air Ducts and Connectors.
- X. UL 555 - Fire Dampers and Ceiling Dampers.

1.3 SCOPE

- A. The work covered by this specification consists of furnishing all labor, equipment, materials and performing all operations required, for the correct and complete fabrication and installation of ductwork in accordance with the applicable project specifications, drawings, codes, regulations and standards.

1.4 PERFORMANCE REQUIREMENTS

- A. No variation of duct configuration or sizes will be permitted except by written permission from the Engineer. Size round ducts installed in place of rectangular ducts in accordance with ASHRAE table of equivalent rectangular and round ducts.

1.5 QUALITY ASSURANCE

- A. Perform Work in accordance with SMACNA - HVAC Duct Construction Standards - Metal and Flexible as a minimum. Where requirements are specified in this specification, or noted on drawings above the minimum SMACNA Standards, the more stringent specified and noted requirements and practices shall be followed.
- B. Maintain one copy of document on site.

1.6 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum three years experience.

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

1.7 REGULATORY REQUIREMENTS

- A. Construct ductwork to NFPA 90A and SMACNA standards, latest edition.

1.8 ENVIRONMENTAL REQUIREMENTS

- A. Do not install duct sealants when temperatures are less than those recommended by sealant manufacturers.
- B. Maintain temperatures during and after installation of duct sealants.

PART 2 PRODUCTS

2.1 DUCT - SHEET METAL HVAC DUCTWORK

- A. Galvanized Steel Ducts: ASTM A525 and ASTM A527 galvanized steel sheet, lock-forming quality, having G60 zinc coating in conformance with ASTM A90.
- B. Fasteners: Rivets, bolts, or sheet metal screws.
- C. Sealant:
 - 1. Non-hardening, water resistant, fire resistive, compatible with mating materials; liquid used alone or with tape, or heavy mastic. All ductwork joints, connections, etc. shall be sealed.
- D. Duct Hangers: Rod and trapeze duct support shall be used for all ductwork with one dimension 18" or larger. Smaller duct may be installed with strap hanger system using SMACNA Standard as minimum.
 - 1. Hanger Rod: ASTM A36; steel; threaded both ends, threaded one end, or continuously threaded, with steel angle trapeze and non-eccentric beam clamps.
 - 2. Hanger rods, angles trapeze sizing and spacing shall meet SMACNA standards, and local and state building codes for duct sizes being supported.
 - 3. Straps and hanger attachment system sizing, spacing, and installation shall meet SMANCA Standards, local and state building codes, etc. for duct size and supports.
 - 4. Duct hangers shall not be supported from metal deck. Furnish and install all support steel as required to suspend with beam clamps similar to Grinnell Fig. 260 from structural steel joists or beams.

2.2 DUCTWORK FABRICATION

- A. Fabricate and support in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible as a minimum. Where requirements are specified in this

specification, or noted on drawings above the minimum SMACNA Standards, the more stringent specified and noted requirements and practices shall be followed. Provide duct material, gages, reinforcing, and sealing for operating pressures not less than 6" w.c. on upstream side (higher pressure side) of variable air volume boxes. Return air duct, exhaust air duct and downstream side of variable air volume boxes (low pressure side) shall be constructed to not less than 2" w.c.

- B. Construct T's, bends, and elbows with radius of not less than 1½ times width of duct on centerline. Where not possible, and engineer's written approval is obtained, rectangular elbows may be used, provided turning vanes are utilized. Where acoustical lining is indicated, provide turning vanes of perforated metal with glass fiber insulation.
- C. Increase duct sizes gradually, not exceeding 15 degrees divergence wherever possible; maximum 30 degrees divergence upstream of equipment and 45 degrees convergence downstream.
- D. Fabricate continuously welded round and oval duct fittings two gages heavier than duct gages indicated in SMACNA Standard. Joints shall be minimum 4 inch cemented slip joint, brazed or electric welded. Prime coat welded joints.
- E. Provide standard 45 degree lateral wye takeoffs unless otherwise indicated where 90 degree conical tee connections may be used.
- F. Duct Sealant
 - a. All ductwork including supply air, outside air, return air, exhaust air and relief air ductwork shall have joints sealed.
 - b. Ductwork designed at SMACNA 6" pressure shall meet SMACNA Class "A" seal requirements.
 - c. Ductwork designed at SMACNA 2" pressure shall meet SMACNA Class "C" seal requirements.

2.3 MANUFACTURED DUCTWORK AND FITTINGS

- A. Manufacture in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible as a minimum. Where requirements are specified in this specification, or noted on drawings above the minimum SMACNA Standards, the more stringent specified and noted requirements and practices shall be followed. Provide duct material, gages, reinforcing, and sealing for operating pressures not less than 6" w.c. unless otherwise noted on drawings.
 - 1. Flat Oval Ducts:
 - a. Machine made from round spiral lockseam duct with light reinforcing corrugations; fittings manufactured of at least two gages heavier metal than duct.
 - 2. Double Wall Insulated Flat Oval Ducts:

- a. Machine made from round spiral lockseam duct with light reinforcing corrugations, galvanized steel outer wall, 1 inch (25 mm) thick fiberglass insulation, perforated galvanized steel inner wall; fittings manufactured with solid inner wall.
- 3. PVC Coated Steel Ducts:
 - a. UL 181, Class 1, galvanized steel duct coated with polyvinyl chloride plastic, 4 mil (0.1 mm) thick on outside and 2 mil (0.05 mm) thick on inside.
- 4. Double Wall Insulated Round Ducts:
 - a. Round spiral lockseam duct with galvanized steel outer wall, 1 inch (25 mm) thick fiberglass insulation, perforated galvanized steel inner wall; fitting with solid inner wall.
- 5. Transverse Duct Connection System:
 - a. SMACNA rated rigidly class connection, interlocking angle and duct edge connection system with sealant, gasket, cleats, and corner clips for not less than 6" w.c. operating pressure unless otherwise noted on drawings.

2.4 SINGLE WALL SPIRAL DUCT AND FITTINGS

A. General

- 1. All round and/or flat oval spiral duct and fittings shall be manufactured by a company whose primary business is the manufacture of spiral duct and fittings and who has been in business for at least ten (10) years. All spiral duct and fittings shall be manufactured by the same firm and shall be as shown on the contract drawings.
- 2. All spiral duct and fittings shall be manufactured from G-60 galvanized steel meeting ASTM A924 and A653 requirements, with a prime coat finish.

B. Construction

- 1. Branch connections shall be made with 90° conical and 45° straight taps as shown on the drawings. All branch connections shall be made as a separate fitting. Factory or field installation of taps to spiral duct shall not be allowed without written approval of the engineer. Manufacturer's published individual fitting performances shall be on file with the design engineer ten (10) days prior to bid.
- 2. All elbows shall be fabricated with a centerline radius of 1.5 times the diameter. 90° and 45° elbows in diameters 3" round through 10" round shall be stamped or pleated elbows. All other elbows shall be of the gored type, fabricated in accordance with the following:

<u>DEGREE OF ELBOW</u>	<u>NUMBER OF GORES</u>
less than 36°	2
37° thru 71°	3
72° thru 90°	5

Where it is necessary to use two-piece mitered elbows, they shall have a minimum number of vanes in accordance with the following:

<u>DUCT DIAMETER</u>	<u>NUMBER OF VANES</u>
3" thru 9"	2
10" thru 20"	3
21" and up	5

3. Circumferential and longitudinal seams of all fittings shall be a continuous weld or spot welded and sealed with mastic. All welds shall be painted to prevent corrosion.
4. All field joints up to and including 60" shall be made with a 2" slip-fit or slip coupling. Diameters 62" round and larger shall be joined with 2"x2"x3/16" Vanstone flanges for fittings and solid welded flanges for spiral duct.
5. Proprietary connectors such as manufactured by Ductmate or AccuFlange may also be used in lieu of slip connections or angle flanges.
6. Access doors shall be supplied by the duct manufacturer at all fire and/or smoke dampers.
7. All flanges and access doors shall be factory installed. Shipments of loose flanges, access doors or taps for field installation into spiral duct will not be allowed.

C. Metal Gauges

1. Metal gauges for single wall round ducts shall be as follows:

- a. Round ducts with maximum 2" W.G. positive static pressure:

<u>DUCT DIAMETER</u>	<u>SPIRAL DUCT</u>	<u>FITTINGS AND LONGITUDINAL SEAM DUCT</u>
3" thru 26"	26	24
28" thru 36"	24	22
38" thru 50"	22	20
52" thru 60"	20	18
62" thru 78"	18	16

- b. Round ducts with maximum 2" W.G. negative static pressure:

<u>DUCT DIAMETER</u>	<u>SPIRAL DUCT</u>	<u>FITTINGS AND LONGITUDINAL SEAM DUCT</u>
3" thru 17"	26	24
18" thru 20"	24	22
21" thru 22"	24	20
24" thru 26"	22	20

28" thru 30"	22	18
32" thru 34"	20	18
36" thru 42"	20	16
44" thru 48"	20	18(note 1 & 3)
50" thru 60"	18	18(note 2 & 3)

Notes:

1. Reinforce with 1"x1"x1/8" girth rings every 6 feet.
2. Reinforce with 1 1/4" x 1 1/4" x 3/16" girth rings every 4 ft.
3. When companion flange joints are used as reinforcement, 44" to 48" diameter shall be 2"x2"x3/16" and 50" to 60" diameter shall be 2 1/2"x2 1/2" x 3/16".

D. Manufacturers

1. All spiral duct fittings shall be as manufactured by SEMCO Incorporated or approved equal.

2.8 DUCT ACCESS DOORS

- A. Fabricate in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible as a minimum. Where requirements are specified in this specification, or noted on drawings above the minimum SMACNA Standards, the more stringent specified and noted requirements and practices shall be followed.
- B. Fabrication: Rigid and close-fitting of galvanized steel with sealing gaskets and quick fastening locking devices. For insulated ductwork, install minimum one inch thick insulation with sheet metal cover.
 1. Less Than 12 Inches Square: Secure with sash locks.
 2. Up to 18 Inches Square: Provide two hinges and two sash locks.
 3. Up to 24 x 48 Inches: Three hinges and two compression latches with outside and inside handles.
 4. Larger Sizes: Provide an additional hinge.
- C. Access doors with sheet metal screw fasteners are not acceptable.

2.9 DUCT TEST HOLES

- A. Temporary Test Holes: Cut or drill in ducts as required. Cap with neat patches, neoprene plugs, threaded plugs, or threaded or twist-on metal caps.
- B. Permanent Test Holes: Factory fabricated, air tight flanged fittings with screw cap. Provide extended neck fittings to clear insulation.

2.10 EQUIPMENT FLEXIBLE DUCT CONNECTIONS (To air moving equipment.)

- A. Fabricate in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible as a minimum. Where requirements are specified in this specification, or noted on drawings above the minimum SMACNA Standards, the more stringent specified and noted requirements and practices shall be followed.
- B. Connector: Fabric crimped into metal edging strip.

1. Fabric: UL listed fire-retardant neoprene coated woven glass fiber fabric to NFPA 90A, minimum density 30 oz per sq yd.
2. Net Fabric Width: Approximately 3 inches wide.
3. Metal: 3 inch wide 24 gage galvanized steel.

2.11 FLEXIBLE INSULATED DUCTS

- A. All flexible ducts used to connect diffuser, grilles, etc. shall be similar to Flexmaster USA, Inc.; Type #3. Flex duct shall be insulated type consisting of a factory fabricated assembly of a trilaminate of aluminum foil, fiberglass and polyester. It shall be mechanically locked without adhesive into a formed aluminum helix on the ducts outside surface and shall withstand a minimum 6" w.c. operating pressure. The duct material shall be factory wrapped in a thick blanket of fiberglass insulation with a "C" factor of .25 or less. The insulation shall be encased in a fire retardant polyethylene protective vapor barrier with a perm rating of not over 0.1 grains per square foot per hour per inch of mercury. The flexible duct shall be constructed in accordance with and be listed as UL 181 Class I air duct and comply with NFPA 90A and 90B and have a flame spread of not over 25 and a smoke developed of not over 50. The flexible duct shall have a minimum pressure rating of 12" w.c. through a temperature range of -20°F to 250°F. Flexible duct shall be UL rated.
- B. Maximum length of flexible duct shall be 5'-0" to each outlet unless indicated otherwise on drawing.
- C. Flexible duct shall be installed without bends unless so indicated on drawing.

2.12 DUCT SPIN-IN FITTINGS

- A. Low pressure spin-in fittings (take-offs from main duct to flexible duct) shall be similar to Flexmaster USA, Inc. Model CB-D conical bellmouth fitting with damper and positive locking wing nut. Edges of the take-off opening in the duct shall be sealed with fire retardant duct sealer.

2.13 AIR TURNING DEVICES/EXTRACTORS

- A. Multi-blade device with blades aligned in short dimension, steel construction, with individually adjustable blades and mounting straps.

2.14 BACKDRAFT DAMPERS.

- A. Gravity Backdraft Dampers, Size 18 x 18 inches or Smaller, Furnished with Air Moving Equipment: Air moving equipment manufacturers standard construction.
- B. Multi-Blade, Parallel Action Gravity Balanced Backdraft Dampers: 16 gage thick galvanized steel with center pivoted blades of maximum 6 inch width, with felt or flexible vinyl sealed edges, linked together in rattle-free manner with 90 degree stop, steel ball bearings, and plated steel pivot pin; adjustment device to permit setting for varying differential static pressure.

2.15 FIRE, SMOKE AND COMBINATION FIRE/SMOKE DAMPERS

- A. Fire dampers shall be fabricated in accordance with NFPA 90A and UL 555. They shall have a minimum rating of 1½ hour, have a dynamic closure rating of 3,000 fpm and 6” wg and be so identified with a UL label. Smoke dampers shall be fabricated in accordance with NFPA 90A and UL 555S with same rating as fire damper and be so identified with a UL label. Smoke damper shall be opposed blade type, normal functions to close automatically and opened by a factory installed electric actuator. A smoke damper may also be a fire damper if it’s location lends itself to the multiple functions and it meets the requirements of both.
- B. Provide factory sleeve and collar for each damper.
- C. Operators: Factory installed UL listed and labeled spring closed motorized open, electric type suitable for 120 volts, single phase, 60 Hz. Provide end switches to indicate damper position. Locate damper operator on exterior of duct and link to damper operating shaft.
- D. Normally Closed Smoke Responsive Fire Dampers: Curtain type, opening by gravity upon actuation of electro-thermal link, flexible stainless steel blade edge seals to provide constant sealing pressure.
- B. Normally Open Smoke Responsive Fire Dampers: Curtain type, closing upon actuation of electro-thermal link, flexible stainless steel blade edge seals to provide constant sealing pressure, stainless steel springs with locking devices to ensure positive closure for units mounted horizontally.
- F. Ceiling Dampers: Galvanized steel, 22 gage frame and 16 gage flap, two layers 0.125 inch ceramic fiber on top side with locking clip.
- G. Horizontal Dampers: Galvanized steel, 22 gage frame, stainless steel closure spring, and lightweight, heat retardant non-asbestos fabric blanket.
- H. Curtain Type Dampers: Galvanized steel with interlocking blades. Provide stainless steel closure springs and latches for horizontal installations and closure under air flow conditions. Configure with blades out of air stream.
- I. Fusible Links: Listed for 165 degrees F unless higher or lower temperature rating is required. Contractor shall verify usages and ratings for fusible link temperature rating.

2.16 VOLUME CONTROL DAMPERS.

- A. Provide balancing dampers on all duct take-offs to diffusers, grilles and registers; at points on supply, return and exhaust systems where branches take off from larger ducts, as required for air balancing (install damper a minimum of 2 duct widths from take-off; as required by balancing agency; and where indicated on drawings. Where access to dampers cannot be achieved, access panels shall be installed. If access panels are not preferred, remote dampers shall be installed. Fabricate in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible as a minimum. Where requirements are specified in this specification, or noted on drawings above the minimum SMACNA Standards, the more stringent specified and noted requirements and practices shall be followed. All dampers shall have a locking device per SMACNA Standards, to hold the damper in a fixed position without vibrating.

- B. Splitter Dampers:
 - 1. Material: Same gage as duct to 24 inches size in either direction, and two gages 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 ¼ inch diameter rod in self aligning, universal joint action, flanged bushing with set screw.
- C. Single Blade Dampers: Fabricate for duct sizes up to 6 x 30 inch.
- D. Multi-Blade Damper: Fabricate of opposed blade pattern with maximum blade sizes 8 x 72 inch. Assemble center and edge crimped blades in prime coated or galvanized channel frame with suitable hardware.
- E. End Bearings: Except in round ductwork 12 inches and smaller, provide end bearings. On multiple blade dampers, provide oil-impregnated nylon or sintered bronze bearings.
- F. Quadrants:
 - 1. Provide locking, indicating quadrant regulators on single and multi-blade dampers.
 - 2. On insulated ducts mount quadrant regulators on stand-off mounting brackets, bases, or adapters.
 - 3. Where rod lengths exceed 30 inches provide regulator at both ends.

2.18 ROOF CURBS

- A. The mechanical trades shall be responsible for furnishing and setting in place all mechanical equipment, roof curbs and piping/duct roof curbs. The general trade shall be responsible for the roof work and associated flashing. The mechanical trade shall furnish and install treated wood base blocking as required to level curb and to match roof insulation thickness. Curb shall be as specified, or if not specified should be similar to Pate or Thy-curb with heavy gauge galvanized steel, insulated and with wood nailer. Height of curb scheduled or specified shall be height required to top of curb above finished roof. If height is not specified or noted, a minimum 12" high above finished roof will be required. (pipe support units shall be at height required). Rooftop units will be shipped knocked down with the mechanical trade responsible for assembly on site. Roof curb shall mate with unit and provide support and a watertight installation.

2.20 EXHAUST FANS

- A. See schedules on drawings and furnish all.

2.21 DIFFUSERS AND GRILLES

- A. See schedules on drawings and furnish all.

2.22 LOUVERS

- A. See schedule on drawings and furnish all.

PART 3 EXECUTION

3.1 DUCT INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install and seal ducts in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible as a minimum. Where requirements are specified in this specification, or noted on drawings above the minimum SMACNA Standards, the more stringent specified and noted requirements and practices shall be followed. Note: All ductwork joints, fittings, etc. shall be sealed.
- C. Duct Sizes are inside clear dimensions. For lined ducts, maintain sizes inside lining.
- D. Provide openings in ductwork for pitot tube where required for testing of systems, complete with metal can with spring device or screw to ensure against air leakage. Where openings are provided in insulated ductwork, install insulation material inside a metal ring.
- E. Locate ducts with sufficient space around equipment to allow normal operating and maintenance activities.
- F. Use crimp joints with bead for joining round duct sizes 8 inch and smaller with crimp in direction of air flow.
- G. Use double nuts and lock washers on threaded rod supports.
- H. Connect flexible ducts to metal ducts mechanically without adhesives. Connect outlets to low pressure ducts with flexible duct held in place with strap or clamp.
- I. Coordinate duct locations with available space, route ducts around obstructions as required, and review duct changes with Engineer, all before starting construction.
- J. During construction provide temporary closures of metal or taped polyethylene on open ductwork to prevent construction dust from entering ductwork system.
- K. Install manual balancing dampers in ductwork at all branch take-offs, all diffuser and grille take offs, etc.
- L. Install roof exhaust fans on minimum 18" high roof curbs but not less than 12" higher than parapet walls within 10'-0" of fan.

3.2 DUCT CLEANING

- A. Clean duct system and force air at high velocity through duct to remove accumulated dust. To obtain sufficient air, clean half the system at a time. Protect equipment which may be harmed by excessive dirt with temporary filters, or bypass during cleaning.

3.3 SMOKE AND FIRE DAMPER PREPARATION

- A. Verify that electric power is available and of the correct characteristics.

3.4 FIRE DAMPER, ACCESS DOOR AND FLEXIBLE DUCT INSTALLATION

- A. Install accessories in accordance with manufacturer's instructions, NFPA 90A, and follow SMACNA HVAC Duct Construction Standards - Metal and Flexible for 6" pressure duct system as a minimum. Where requirements are specified in this specification, or noted on drawings above the minimum SMACNA Standards, the more stringent specified and noted requirements and practices shall be followed.
- B. Provide backdraft dampers on exhaust fans or exhaust ducts nearest to outside and where indicated.
- C. Provide duct access doors for inspection and cleaning before and after filters, coils, fans, automatic dampers, at fire dampers, combination fire and smoke dampers, and elsewhere as indicated. Provide for cleaning kitchen exhaust ductwork in accordance with NFPA 96. Provide minimum 12x12 inch size for hand access, 18 x 18 inch size for shoulder access, and as indicated unless limited by duct size.
- D. Provide duct test holes where indicated and required for testing and balancing purposes.
- E. Provide fire dampers, combination fire and smoke dampers and smoke dampers at locations indicated, where ducts and outlets pass through fire rated components, and where required by authorities having jurisdiction. Install with required perimeter mounting angles, sleeves, breakaway duct connections, corrosion resistant springs, bearings, bushings and hinges in accordance with NFPA 92A and the latest edition of "SMACNA State Fire Marshal, Fire and Smoke Damper Clarification" manual as published by SMACNA.
- F. Demonstrate re-setting of fire dampers to Owner's representative.
- G. Provide flexible connections immediately adjacent to equipment in ducts associated with fans and motorized equipment.
- H. Provide balancing dampers at points on supply, return, and exhaust systems where branches are taken from larger ducts as required for air balancing. Install minimum 2 duct widths from duct take-off.
- I. Use splitter dampers only where indicated.
- J. Provide balancing dampers on duct take-off to diffusers, grilles, and registers, regardless of whether dampers are specified as part of the diffuser, grille, or register assembly.
- K. Provide balancing dampers where recommended by balancing agency.

3.5 DIFFUSER AND GRILLE INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Check location of outlets and inlets and make necessary adjustments in position to conform with architectural features, symmetry, and lighting arrangement.

- C. Install diffusers to ductwork with air tight connection.
- D. Provide balancing dampers on duct take-off to diffusers, grilles and registers, whether dampers are specified as part of the diffuser, grille or register assembly.
- E. Paint ductwork visible behind air outlets and inlets matte black.
- F. Diffuser/grille color shall be selected from the full range of manufacturer available colors and finishes.

A. END OF SECTION

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SECTION 23 74 00 - ROOFTOP HVAC UNIT

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Rooftop HVAC unit and accessories.

1.2 REFERENCES: Material and/or equipment specified in this section shall meet or exceed one or more of the property requirements or installation requirements of the following specifications/publications as applicable to the specific product or end use:

- A. ARI 210 - Unitary Air-Conditioning Equipment.
- B. ARI 270 - Sound Rating of Outdoor Unitary Equipment.
- C. NFPA 70 - National Electric Code
- D. NFPA 90A - Installation of Air Conditioning and Ventilation Systems.
- E. ANSI/ASHRAE 90A - Energy Conservation in New Building Design
- F. ARI 370 - Sound Rating of Large Outdoor Refrigerating and Air Conditioning Equipment.

1.3 QUALITY ASSURANCE

- A. Air Handling Units: Product of manufacturer regularly engaged in production of components who issues complete catalog data on product offering.
- B. ISO 9001 Certification. The air handling manufacturer shall be ISO 9001 Certified by a third party registrar, such as HSB Registration Services, that is accredited by an accreditation body such as ANSI-RAB and / or RvC Dutch Council for Accreditation.
- C.
- D. Variable Air Volume Air Handling Units with Variable Inlet Vanes: Certify air volume, static pressure, fan speed, brake horsepower and selection procedures in accordance with ARI 430. Certify units with inlet vanes in wide-open position. If air handling units are not certified in accordance with ARI 430, contractor shall be responsible for expenses associated with testing of units after installation to verify performance of fan(s). Any costs incurred to adjust fans to meet scheduled capacities shall be the sole responsibility of the contractor.
- E. Air Coils: Certify capacities, pressure drops and selection procedures in accordance with ARI 410-91.

1.4 ENVIRONMENTAL REQUIREMENTS

- A. Do not operate units for any purpose, temporary or permanent, until ductwork is clean, filters are in place, bearings lubricated, and fan has been test run under observation.

1.5 ACOUSTICS

- A. Manufacturer of packaged rooftop equipment shall provide Noise Criteria (NC) sound level data across all octave band center frequencies for cataloged operating range of unit at gross cooling capacity range. Data shall be obtained in conformance with ANSI S1.32-1980, American National Standard Methods for the Determination of Sound Power Levels of Discrete Frequency and Narrow Band Noise Sources in Reverberation Rooms and per AMCA Standard 300-85 test code "Sound Rating Air Moving Devices".

1.6 REGULATORY REQUIREMENTS

- A. Unit shall conform to ANSI/UL 465 for construction of packaged air conditioner and shall have U.L. label affixed to rooftop unit package. In the event the unit is not UL approved, the manufacturer shall, at his expense, provide for a field inspection by a UL representative to verify conformance to UL standards. If necessary, contractor shall perform required modifications to the unit to comply with UL, as directed by the UL representative, at no additional expense to the Owner.

1.7 EXTRA MATERIALS

- A. Install new clean filters at end of project. Provide one extra set of filters for future use by Owner at completion of project.
- B. Furnish one extra complete set of fan motor drive belts.

1.8 WARRANTY

- A. A parts warranty for one year from date of start-up or 18 months from date of shipment, whichever comes first, shall be provided at no additional cost.

PART 2 PRODUCTS

- A. Refer to schedule on drawings.

PART 3 EXECUTION

3.2 EXAMINATION

- A. Verify that roof is ready to receive work and opening dimensions are as indicated on shop drawings.
- B. Verify that proper power supply is available.

3.3 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Mount units on factory built roof mounting frame providing watertight enclosure. Install roof mounting curb level.

3.4 MANUFACTURER'S FIELD SERVICES & WARRANTY

- A. Manufacturer shall furnish a factory trained service engineer without additional charge to start the unit.
- B. The manufacturer shall furnish complete submittal wiring diagrams of the package unit as applicable for field maintenance and service.
- C. Furnish complete service and maintenance of units for one year from date of substantial completion.
- D. Furnish initial start-up and shut-down during first year of operation, including routine servicing and check-out. Furnish Owner's personnel training on operation and maintenance of rooftop unit.
- E. Provide a full parts warranty for one year from start-up or 18 months from shipment, whichever occurs first.
- F. Submit copy of service call work order on report to the Owner, and include description of work performed.
- G. The Sheetmetal Trade shall be responsible for installation and wiring of all rooftop unit manufacturer furnished accessories such as the economizer, power exhaust fan, roof curb, etc. The Sheetmetal Trade shall verify all work required during bidding and include all costs in their bid.

A. END OF SECTION

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SECTION 23 82 00 - LIQUID HEAT TRANSFER EQUIPMENT

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Cabinet unit heaters
- B. Variable air volume box with hot water heating coil.
- C. Rooftop HVAC unit with hot water heating and refrigerant cooling coil.

1.2 REGULATORY REQUIREMENTS

- A. Conform to applicable code for internal wiring of factory wired equipment.

PART 2 PRODUCTS

2.1 CABINET UNIT HEATERS

- A. Coils: Evenly spaced aluminum fins mechanically bonded to copper tubes, designed for 100 psi and 200 degrees F.
- B. Cabinet: 16 gage steel with exposed corners and edges rounded, easily removed panels, glass fiber insulation, and integral air outlet and inlet grilles.
- C. Finish: Factory applied baked enamel of color as selected by Architect/Engineer on visible surfaces of enclosure or cabinet.
- D. Fans: Centrifugal forward-curved double width wheels, statically and dynamically balanced, direct driven.
- E. Motor: Sleeve bearings, resiliently mounted.
- F. Control: Multiple speed switch, factory wired, located in cabinet.
- G. Filter: Easily removed one inch thick glass fiber throw-away type, located to filter air before coil.
- H. Mixing Dampers: Where indicated, mixing sections with dampers.
- I. See schedules and drawings.

2.12 VARIABLE AIR VOLUME BOXES WITH HOT WATER HEATING COIL

- A. Manufacturers - Trane, Titus or Price.
- B. Casing - 22 gauge galvanized steel.
- C. Insulation - The interior surface of the unit casing is acoustically and thermally lined with a 1-inch, 1.55 lb/cubic foot density glass fiber with high density facing. The insulation R-value is 3.8. The insulation is UL listed and meets NFPA-90A and UL 181 standards. The insulation is covered by an interior liner made of 26-gauge galvanized steel. All

wire penetrations are covered by grommets. There are no exposed edges of insulation (complete metal encapsulation).

- D. Primary Air Valve: Nominal sizes 300, 600, 1100, 1700, 2400, 3200, and 4200 CFM on all unit types. The air valve is a cylindrical flow control device with an integral electric actuator. Valve inlet is die cast aluminum and tapered to fit standard round ductwork. Maximum leak rate is 1 percent at 4 inches wg. inlet static pressure. Integral multiple point, averaging flow sensing ring to provide primary air flow measurement within ± 5 percent of unit rated airflow with 1 1/2 diameters of straight duct upstream of unit. Integral flow taps and calibration chart provided on each unit.
- E. Access Panel - Furnish an access panel in the bottom of the unit to provide access to the air valve.
- F. Outlet Connection - Straight flange, flanged, slip and drive, or integral outlet - Sheet metal connection at unit discharge to facilitate ductwork installation. Straight flange outlet connection.
- G. Agency Listing - All units are UL Listed and CSA approved.
- H. Hot Water Coil - Standard and high capacity hot water coils are factory mounted. Full fin collars provided for accurate fin spacing and maximum fin-tube contact. 3/8 inches O.D. seamless copper tubes mechanically expanded into the fin collars. Coils are leak tested at 300 psig air pressure under water. Female sweat-type water connections provided. Available as right or left hand connections with all coils having same end water connections.
- I. Monitoring - VAV boxes shall be monitored and controlled by the B.A.S. control system. CFM readings shall be monitored and changed through the B.A.S. control system.
- J. Each VAV box shall have a flow sensor/ring to allow reading of cfm through the B.A.S.
- K. The volume box shall be selected with a maximum air pressure drop of 0.4" w.c. No volume boxes with a higher APD of greater than 0.4" will be accepted.

2.15 ROOFTOP HVAC UNIT WITH HOT WATER HEATING & REFRIGERANT COOLING COIL

- A. See schedule on drawings.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that surfaces are ready to receive work and opening dimensions are as indicated on shop drawings and instructed by the manufacturer.
- B. Verify that required utilities are available, in proper location, and ready for use.
- C. Beginning of installation means installer accepts existing surfaces.

3.2 INSTALLATION

- A. Install all equipment and accessories in accordance with manufacturer's instructions.
- B. Install cabinet unit heaters, fan-coil units as indicated. Coordinate to assure correct recess size for recessed units.
- C. Protect units with protective covers during balance of construction.
- D. Provide hydronic units with shut-off valve on supply and lockshield balancing valve on return piping. If not easily accessible, extend vent to exterior surface of cabinet for easy servicing. For cabinet unit heaters, fan coil units, and unit heaters, provide float operated automatic air vents with stop valve.

A. END OF SECTION

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SECTION 26 00 00 - BASIC ELECTRICAL REQUIREMENTS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Basic electrical Requirements specifically applicable to Division 26, 27 & 28 Sections, in addition to Division 1 - General Requirements.
- B. Information in this section is intended to clarify or make additions to the requirements set forth in the General Conditions, Supplementary Conditions and Division 1 of these specifications. Any conflict between Division 26, 27 & 28 and those in the General Conditions or within the Division 26 drawings, Supplementary Conditions and Division 1 shall be brought to the attention of the Architect/Engineer in writing as a request for addendum prior to the bid opening.
- C. Furnish all equipment, materials, articles, items, operations or methods listed, mentioned or scheduled on drawings, these specifications, manufacturer's installation instructions and include all labor materials, equipment and incidentals necessary for complete installation and operation.
- D. All information contained in this section applies to all sections within Division 26 as it was part of each section.
- E. Final walk-thru. Electrical Contractor shall submit in writing to the Architect's office or the Construction Manager advising that all of the Division 26, 27 & 28 work has been completed in accordance with the plans and specifications. The intent is to acknowledge the Contractor is ready for a walk-thru. Open items that are part of the required construction work should be completed prior to the final walk-thru to avoid developing a so called construction completion list. The engineer reserves the right to reschedule the final walk-thru as determined accordingly.
- F. Pre-bid questions. All pre-bid questions, clarifications, etc. must be submitted in writing to the Architect Office or the Construction Manager. All phone calls, faxes or e-mails from bidders and manufacturers, etc. directly received by the Engineers office during the bidding phase will be deferred back to the Architect Office or the Construction Manager.
- G. Electrical Contractor shall review all of the project plans and specifications and not rely solely on the electrical drawings to establish a project bid. Refer to the structural and mechanical drawings for final mechanical equipment locations. Mechanical drawings shall govern over the electrical drawing locations.
- H. Unit Pricing: Contractor shall furnish pricing as listed in the Bid Proposal Forms.
- I. The Contractor shall include in their bid any cost for requesting AutoCAD backgrounds for their use from the Architect or Engineer. The cost will be \$150.00 for the first plan, and \$50.00 for each additional plan that may be requested for AutoCAD use. A waiver of responsibility for the Architect and Engineer related to Contractor use of the CAD files shall be signed by the Contractor.

1.2 LAYOUT OF THE WORK

- A. Examine the site and all the drawings before proceeding with the layout and installation of this work. Verify all door swings and clearances to cabinets, etc., before locating switch and outlet boxes. Locate conduit, boxes, etc., essentially as shown on the drawings but in exact layout determined on the job to suit actual conditions. Confer and cooperate with the other trades on the job so all parts will be installed in proper relationship. Precise locations of parts to coordinate with other work is the responsibility of the Contractor.
- B. The Electrical Trades shall complete all cutting and patching for the electrical work, unless noted or specified otherwise. Division 26, 27 & 28 Contractor shall be responsible to coordinate with the site Restoration Contractor for the new underground electrical work.
- C. Arrange exposed work as closely as practicable to wall or ceiling surfaces in an accurate alignment. Locate concealed work so fittings, connectors and other projections will clear surfaces. Exposed work is defined as non-finished spaces, such as mechanical/electrical rooms or as indicated on architectural room schedules. All finished spaces, installation shall be concealed. Refer to Architectural drawing for room finish schedules.
- D. During the bidding phase, if any design or discrepancy issues are discovered between the electrical drawings, specifications and other project plans, the contractor shall notify the Architect/Engineer. The intent is to resolve any issues during the bidding phase. For pertinent issues, addendums will be issued accordingly. After entering into a contract, it shall be considered there are no identified conflicts.

1.3 INTERFERENCES

- A. The Electrical Contractor shall examine the plans of mechanical trades, the architectural and structural drawings and shall notify the Architect/Engineer to resolve such interference or discrepancy. The Electrical Contractor bid shall not be based solely on the Electrical Plans and Specifications. Contractor shall obtain and review all project documents. The Contractor, when directed, shall make such changes or off-sets as required so that the work shall be properly located and coordinated with the other trades. Failure to comply with the foregoing will not relieve contractor's responsibilities of making such changes. Such changes shall be completed at no additional cost to the Owner.
- B. All changes in location of equipment, fixtures, distribution equipment, receptacles, etc., from those shown on plans, shall be made without charge when directed by the Architect/Engineer before installation. At this time, an agreement shall be made if such a change is an additional cost to the owner.
- C. The Electrical Contractor shall confer with other trades regarding location and size of pipes, equipment, fixtures, conduit, duct openings, switches, outlets, etc., in order that there may be no interference in the installation of the work of any trades or delay in the progress of any work.

- D. The Electrical Contractor shall be responsible for confirming final receptacle, data, and switch heights at countertop and casework locations with the architectural details. Architectural details shall govern final locations and mounting heights. Failure to coordinate will not relieve the contractor of making changes as required, at no cost to the owner.
- E. Any changes made, necessary through failure to make proper arrangement to avoid interference, shall not be considered as extra.
- F. The Electrical Contractor shall cooperate with those performing work under other divisions in his preparation of interference drawings, to the extent that the location of plumbing piping, heating piping, and/or ventilation ducts, with respect to the installation of other trades, shall be mutually agreed on by those performing work under other divisions.
- G. In the event the described work on the drawings doesn't match requirements described in the specification, the more stringent shall be provided.
- H. Electrical Contractor shall review the Architectural drawings for work station, casework details and section drawings that show raceway details. Furnish the raceway as noted and detailed.
- I. Contractor shall carefully review the Code sections pertaining to safe working clearances to avoid piping, ducts interferences and other equipment. Install the electrical equipment to meet Code requirements. Adjust the locations shown as required.

1.4 TRENCHING AND RELATED UNDERGROUND WORK

- A. The Electrical Contractor shall contact "811" 72 hours prior to any excavation to locate existing underground utilities. Pay all costs to obtain the services of a specialty utility service company to locate all private utilities as required.
- B. Prior to any actual trenching, Electrical Contractor shall review the utility maps; shall visually observe and review the intended routing for above and below ground obstruction; shall confer with the appointed field representative, and shall establish preliminary location for trenching.
- C. After this routing is established, Contractor shall hand dig in areas of obstructions where powered equipment is non-accessible.

1.5 MATERIALS AND WORKMANSHIP

- A. All materials and equipment furnished for installation on this project shall be new and in strict accordance with this specification. All packaged materials shall be delivered in the original containers which show the manufacturer's name and the identifying designations as to size, quality, etc. Materials delivered to the job in unmarked or mutilated packages will be immediately inspected by the Contractor. Materials or equipment judged as "damaged" by the Contractor's own inspection shall be immediately addressed with the supplier. All electrical equipment shall bear the Underwriter's Label.

- B. All work shall be performed in a professional manner under the supervision of the electrical project manager. The project manager shall be considered the main point of contact for the Architect/Owner's daily communication.
- C. Should any dispute arise as to the quality or fitness of the materials or workmanship, Architect, Owner, Engineer and Electrical Contractor shall mutually agree work is non-acceptable and shall be reworked at no additional cost to the Owner.
- D. Division 26, 27 & 28 equipment schedule descriptions shall govern if it is found that the manufacturer's catalog numbering shown on the drawing is not current, or changed by the manufacturer without notification. Division 26, 27 & 28 Contractor shall notify the Architect/Engineer with any conflicts during the bidding phase to get clarifications. After entering into a Contract, it shall be considered the equipment schedules provide the information to meet the intended specifications for quality and performance.

1.6 GUARANTEES

- A. All equipment and work performed under Division 26, 27 & 28 shall be guaranteed for one (1) year from time of substantial completion of project, unless directed otherwise in Division 1.

1.7 VOLUNTARY ALTERNATES

- A. The Architect/Engineer will only accept voluntary alternate as a bid deduct. Alternate must maintain the same level of quality to meet the design intent. Voluntary alternates must be submitted with the bid for review by the Owner. Failure to comply will be no reason to accept any voluntary alternates after entering into a contract.

1.8 OWNERS ACCEPTANCE OF EQUIPMENT

- A. Refer to Division 1.
- B. Upon the Owner's written acceptance, the Electrical Contractor's guarantee period shall begin and the Owner shall accept the responsibility for operation and maintenance and the Contractor's liability shall be limited to the conditions covered in the guarantee as described in these specifications.

1.9 REFERENCES

- A. Conform to requirements of 2015 Michigan Building Code, 2023 National Electrical Code, 2023 Michigan Electrical Code Rules Part 8, 2017 ICC/ANSI A117.1 and local code requirements.

1.10 SUBMITTALS

- A. Submit electronic shop drawing files.
- B. Proposed Products List: Include Products specified in the following Sections:

1. Section 26 05 36 - Cable Trays for Electrical Systems
 2. Section 26 09 23 - Lighting Control Devices
 3. Section 26 22 13 - Dry Type Transformers
 4. Section 26 24 16 - Panelboards
 5. Section 26 27 26 - Wiring Devices
 6. Section 26 28 16 - Enclosed Switches and Circuit Breakers
 7. Section 26 29 13 - Enclosed Controllers
 8. Section 26 51 00 - Interior Lighting
 9. Section 26 56 00 - Exterior Lighting
 10. Section 27 51 16 - Public Address System
 11. Section 28 46 13 - Fire Alarm System
- C. Submit shop drawings and product data grouped to include complete submittals of related systems, products, and accessories in single submittals.
- D. Mark dimensions and values in units to match those specified.
- E. Shop drawings shall be reviewed and checked by the Electrical Contractor for specification compliance prior to release for the Engineer's review. Failure to comply will be no cause or reason for additional costs to the Owner with project delays.
- F. Electrical distribution submittal shall include cut sheets for each piece of equipment. Written description is not acceptable.
- G. Bill of materials shall be submitted as part of O&M Manual. Bill of Materials is not considered a shop drawing.

1.11 REGULATORY REQUIREMENTS

- A. Conform to applicable Building Code.
- B. Conform to requirements of 2015 Michigan Building Code, 2023 National Electrical Code, 2023 Michigan Electrical Code Rules Part 8, 2017 ICC/ANSI A117.1 and local code requirements.
- C. Equipment: U.L. tested and approved for its purpose.
- D. The Electrical Contractor shall obtain and pay for all permits and inspection fees. Provide the Owner with final inspection documents from authorities having jurisdiction.
- E. State of Michigan, Bureau of Fire Services for Emergency Lighting and Fire Alarm Plan Review.
- B. Equipment: Conform to requirements of 2015 Michigan Building Code, 2023 National Electrical Code, 2023 Michigan Electrical Code Rules Part 8, 2017 ICC/ANSI A117.1 and local code requirements.
- F. Life Safety NFPA 101 – The State of Michigan current adopted edition.

- G. Fire Alarm Code NFPA 72 – The State of Michigan current adopted edition.
- H. 2015 Michigan Energy Code.
- I. ASHRAE 90.1 2013 Edition.
- J. 2019 School Rules.

1.12 PROJECT/SITE CONDITIONS

- A. Install Work in locations shown on drawings, unless prevented by project conditions.
- B. All bidders shall personally inspect the site and acquaint themselves with all existing conditions involved in execution of this contract, and make all necessary measurements. No “extra” will be considered for additional work required because of bidder’s failure to do so.
- C. Arc flash warning labels. Provide arc flash generic warning labels in accordance with 2023 NEC Section 110 requirements.

1.13 TEMPORARY SERVICES

- A. Division 26 Trades shall provide and maintain wiring for all interior construction lighting and power to meet OSHA Standards. Division 26 Trade shall provide and maintain all required lamps and guards. Contractor’s power tools, cords, etc. shall be in strict accordance with National Electrical Code 2023, Article 590.
- B. Electrical Contractor shall pay for all temporary internet and power for their office and or construction trailer.
- C. Electrical Contractor shall be responsible to review Division 1 requirements to provide project temporary lighting and power requirements for the construction and demolition phases.

1.14 RECORD DRAWINGS

- A. The Electrical Contractor shall furnish as-constructed drawings, including all Addendums, Bulletins and associated Field Directed Changes included as part of the record drawings.

1.15 OPERATION AND MAINTENANCE MANUALS

- A. Verbal instruction and written operational instructions are to be given on all equipment and systems under this contract. A time is to be scheduled with the Architect/Engineer and Owner for these instructions and a time submitted in writing for instructions at the facility.
- B. Two (2) bound sets of Operating and Maintenance Manuals are to be submitted to the Architect/Engineer for approval. Manuals are to include complete parts list and

maintenance procedures as well as operating instructions on all equipment supplied under Division 26, 27 & 28.

A. END OF SECTION

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SECTION 26 05 05 - SELECTIVE DEMOLITION FOR ELECTRICAL

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Electrical demolition per plans and specifications.
- B. Conduit supports.

1.2 RELATED SECTIONS

- A. All drawings and specification sections apply to work in this section. Furnish all items, articles, materials, equipment, operations or methods that are mentioned, listed or scheduled on drawings or are in this specification including all labor, equipment, materials and miscellaneous incidentals necessary and/or required for the completion of this project. The work covered under this section of the specifications is in no way complete within itself but is supplementary to the entire specification and drawings.

PART 2 PRODUCTS

2.1 MATERIALS AND EQUIPMENT

- A. Materials and equipment for patching and extending work: As specified in individual Sections.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Electrical Contractor shall examine the project documents and visit the site as they deem necessary prior to submitting a bid. Do not rely solely on the Electrical Plans for all demolition requirements. Review all Project Documents prior to submitting a bid.
- B. The demolition information is provided to assist with labor costs associated with the electrical systems removal. The Electrical Contractor shall be responsible to confirm all quantities and the information provided.
- C. Upon removal of the existing ceiling, the Electrical Trades shall immediately notify the construction manager, Architect and Engineer in writing regarding existing conduits scheduled to remain that are not properly supported. Conduit evaluation shall be conducted with the Owner, Architect and Engineer. Failure for the Electrical Trades to submit a written conduit support condition will obligate the trade to support the conduits to meet current Code methods at no additional cost to the Owner.

3.2 PREPARATION

- A. Confirm with the Architect's Office and/or Construction Manager Project Schedules and review the Architectural, Structural and Mechanical drawings prior to commencing demolition.

3.3 DEMOLITION

- A. As noted or shown on the demolition plans, remove the electrical distribution equipment, lighting, receptacles, switching, associated conduit, surface raceway, interior building cable TV distribution, voice and data from only each station side outlet back to the existing technology distribution frame. Remove the fire alarm system, 120 volt clocks, wiring, PA speakers and the PA front end unit as noted or shown or shown on the drawings. Remove surface mounted conduit, boxes, and non-metallic raceway, from the existing walls in offices, classrooms, etc. Use care during the demolition phase to avoid damage or any glazed block, tile or brick veneered walls. Electrical Contractors are responsible to confirm all quantities and information provided.
- B. Mechanical trades or BAS Contractor shall remove all associated temperature components, and associated conduit and wiring.
- C. As noted or shown on the demolition plans, remove all TV voice and data cables from each station side back to the distribution frames. Remove all cables, patch cords at the distribution frames. Remove all TV cables and outlets from each TV monitor back to the distribution frames.
- D. Electrical Trades shall remove all existing fire alarm devices and associated conduits and surface mounted raceways. Patch to match.
- E. Electrical Trades shall transport all of the electrical salvaged materials to the Owner and include all transportation costs.
- F. Remove all unused conduits and wiring serving lighting and power being removed from the finished ceiling space. Remove all abandoned low voltage cables from accessible portions in accordance with NEC Sections 760.25(A), 640(A), 645.3(A), 725.3(B), 770.3(A), 800.3(C), 820.3(A) and 830.3(A). Include costs in bid to walk the ceiling spaces with the Construction Manager and the Owner for visual assessment of abandoned cables.
- G. The Owner shall be responsible for main incoming internet and voice service to the building.
- H. The Owner shall be responsible for main incoming cable TV service to the building.
- I. The Owner shall be responsible to remove computers, printers, and monitors.
- J. All wall mounted and desk mounted phones shall be removed by the Owner.
- K. As noted or shown on the demolition plans, remove all existing PA speaker and circuits back to the front end. Remove the PA unit front end. Removal shall include all associated conduit as well.
- L. The Owner shall remove the existing TV monitors, the existing ceiling projectors, and all phones. Electrical Trades shall remove the associated raceway, cables and power circuits.

- M. As noted or shown on the demolition drawings, remove the exterior light fixtures. Backbox in-fill shall be completed as part of the masonry upgrade unless noted otherwise. Reuse the existing fixture backbox as noted on the drawings.
- N. As noted or shown on the demolition plans, remove all existing exterior electric bells as noted on the drawings. The existing backbox in-fill shall be completed as part of the masonry upgrade.
- O. Electrical Contractors are responsible to confirm all demolition quantities. Make pre-bid site visit arrangements as deemed necessary.
- P. All security system removal and reinstallation shall be completed by the Owner.

A. END OF SECTION

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SECTION 26 05 19 - LOW VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Building wire and cable.
- B. MC cable
- C. Non-metallic "NM" sheath cable.

1.2 RELATED SECTIONS

- A. All drawings and specification sections apply to work in this section. Furnish all items, articles, materials, equipment, operations or methods that are mentioned, listed or scheduled on drawings or are in this specification including all labor, equipment, materials and miscellaneous incidentals necessary and/or required for the completion of this project. The work covered under this section of the specifications is in no way complete within itself but is supplementary to the entire specification and drawings.

1.3 REFERENCES

- A. Conform to requirements of 2015 Michigan Building Code, 2023 National Electrical Code, 2023 Michigan Electrical Code Rules Part 8, 2017 ICC/ANSI A117.1 and local code requirements.

1.4 PROJECT CONDITIONS

- A. Verify that field measurements are as shown on Drawings.
- B. Conductor sizes are based on copper.
- C. Routing shown on Drawings is approximate unless dimensioned. Field route as required to best suit Project Conditions.
- D. Where wire and cable routing is not shown, and only a load destination is shown, determine exact routing and lengths required.

1.5 COORDINATION

- A. Coordinate Work under provisions of Division 1.
- B. Determine required separation between cable and other work.
- C. Determine cable routing to avoid interference with other work.

1.6 REGULATORY REQUIREMENTS

- A. Conform to requirements of 2015 Michigan Building Code, 2023 National Electrical Code, 2023 Michigan Electrical Code Rules Part 8, 2017 ICC/ANSI A117.1 and local code requirements.
- B. Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for purpose specified and indicated.

PART 2 PRODUCTS

2.1 BUILDING WIRE AND CABLE

- A. Description: Single conductor insulated wire.
- B. Conductor: Copper.
- C. Insulation Voltage Rating: 600 volts.
- D. Insulation: ANSI/NFPA 70, Type THW, THHN/THWN, XHHW-2.

2.2 MC CABLE

- A. Factory assembled multiple insulated conductors enclosed in armor of interlocking metal corrugated sheath.
- B. Provide all clips and supports.

2.3 NON-METALLIC SHEATH CABLE

- A. "NM" "Romex" cable. Not acceptable for this project

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that interior of building has been protected from weather.
- B. Verify that mechanical work likely to damage wire and cable has been completed.

3.2 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Use stranded conductors for control circuits.
- C. Use conductor size not smaller than 12 AWG for power and lighting circuits.
- D. Use 10 AWG conductors for 20 ampere, 120 volt branch circuits longer than 100 feet.
- E. Use 10 AWG conductors for 20 ampere, 277 volt branch circuits longer than 200 feet.

- F. Pull all conductors into raceway at same time.
- G. Protect exposed cable from damage.
- H. Support cables above accessible ceiling, using spring metal clips or plastic cable ties to support cables from structure. Do not rest cable on ceiling panels.
- I. Use suitable cable fittings and connectors.
- J. Neatly train and lace wiring inside boxes, equipment, and panelboards.
- K. Clean conductor surfaces before installing lugs and connectors.
- L. Splices are not permitted.
- M. All power wiring shall be installed in conduit. Low-voltage wiring shall utilize the channel trays-hooks or free-air method, or other cable management methods that meet industry standards as noted on the drawings. Conduit drops for fire alarm devices, card readers, power assisted doors, and voice/data outlets shall be required. Electrical Trades shall be responsible for coordinating with the Owner's low-voltage system and drawings for required raceway. Low voltage cables installed in accessible ceiling space need not to be in conduit. However, the cables must be properly secured to the ceiling structure.
- N. Refer to Section 26 09 23 for Occupancy Sensors wiring.
- O. Refer to Section 27 00 00 for Network/Communication wiring.
- P. Refer to Section 27 51 16 for Public Address System wiring.
- Q. Refer to Section 27 53 13 for GPS Clocks System wiring.
- R. Refer to Section 28 31 00 for Fire Alarm wiring.
- S. If the Electrical Trades Contractor elects, at their option, to combine homerun circuits installed in a single conduit, the derating 2023 NEC 310.15(b) Table must be utilized for allowable conductor ampacity values. If the derating method is utilized, then furnish and install properly derated cables and properly sized conduits to meet Code. Electrical Trades Contractor shall be responsible to obtain inspection from the Electrical Inspector and pay all supplemental inspection and/or requested plan review fees.
- T. Shared neutrals for lighting and power circuits are not permitted.
- U. MC cable shall only be acceptable as the final connection to light fixtures installed in accessible ceilings. Maximum cable shall not exceed 6 feet. MC cable shall not be used for homeruns or feeders.

3.3 INTERFACE WITH OTHER PRODUCTS

- A. Identify wire and cable under provisions of Section 26 05 53.

- B. Identify each conductor with its circuit number or other designation indicated on Drawings.

3.4 FIELD QUALITY CONTROL

- A. Perform field inspection and testing to assure proper operation.
- B. Inspect wire and cable for physical damage and proper connection.
- C. Measure tightness of bolted connections and compare torque measurements with manufacturer's recommended values.
- D. Verify continuity of each branch circuit conductor.

A. END OF SECTION

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SECTION 26 05 26 - GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Grounding electrodes and conductors.
- B. Equipment grounding conductors.
- C. Bonding.
- D. Building foundation grounding.

1.2 RELATED SECTIONS

- A. All drawings and specification sections apply to work in this section. Furnish all items, articles, materials, equipment, operations or methods that are mentioned, listed or scheduled on drawings or are in this specification including all labor, equipment, materials and miscellaneous incidentals necessary and/or required for the completion of this project. The work covered under this section of the specifications is in no way complete within itself but is supplementary to the entire specification and drawings.

1.3 REFERENCES

- A. Conform to requirements of 2015 Michigan Building Code, 2023 National Electrical Code, 2023 Michigan Electrical Code Rules Part 8, 2017 ICC/ANSI A117.1 and local code requirements.

1.4 PERFORMANCE REQUIREMENTS

- A. Resistance: Meet the NEC Code requirements.

1.5 PROJECT RECORD DOCUMENTS

- A. Accurately record actual locations of grounding electrodes.

1.6 REGULATORY REQUIREMENTS

- A. Conform to requirements of 2015 Michigan Building Code, 2023 National Electrical Code, 2023 Michigan Electrical Code Rules Part 8, 2017 ICC/ANSI A117.1 and local code requirements.
- B. Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for purpose specified and indicated.

PART 2 PRODUCTS

2.1 ROD ELECTRODE

- A. Material: Copper-clad steel or copper-weld type.
- B. Diameter: as scheduled on the drawings.
- C. Length: as scheduled on the drawings.

2.2 MECHANICAL CONNECTORS

- A. As scheduled on the drawings.

2.3 EXOTHERMIC CONNECTIONS

- A. As scheduled on the drawings.

2.4 WIRE

- A. Material: As scheduled on the drawings.
- B. Foundation Electrodes: Size to meet NFPA 70 requirements.
- C. Grounding Electrode Conductor: Size to meet NFPA 70 requirements.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify site soil conditions before driving rod electrodes.

3.2 INSTALLATION

- A. Install Products in accordance with manufacturer's instructions.
- B. Install rod electrodes at locations indicated. Install additional rod electrodes as required to achieve specified resistance to ground.
- C. Provide bonding to meet Regulatory Requirements.
- D. Equipment Grounding Conductor: Provide a separate grounding conductor for lighting and power circuits as noted or specified on the drawings.
- E. Complete the grounding conductor to the building foundation rebar in accordance with 2023 NEC 250-52 (3) requirements.
- F. As shown and noted on the drawings, provide ground conductor from the new addition's foundation rebar back to the building's main distribution panel service ground bar. Provide minimum #6 grounding conductor from the main electric distribution equipment to the data racks.
- G. Bond the cable tray or wire mesh tray as noted on the drawings.

3.3 FIELD QUALITY CONTROL

- A. Inspect grounding and bonding system conductors and connections for tightness and proper installation.

A. END OF SECTION

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SECTION 26 05 29 - HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Conduit and equipment supports.
- B. Anchors and fasteners.

1.2 RELATED SECTIONS

- A. All drawings and specification sections apply to work in this section. Furnish all items, articles, materials, equipment, operations or methods that are mentioned, listed or scheduled on drawings or are in this specification including all labor, equipment, materials and miscellaneous incidentals necessary and/or required for the completion of this project. The work covered under this section of the specifications is in no way complete within itself but is supplementary to the entire specification and drawings.

1.3 REFERENCES

- A. Conform to requirements of 2015 Michigan Building Code, 2023 National Electrical Code, 2023 Michigan Electrical Code Rules Part 8, 2017 ICC/ANSI A117.1 and local code requirements.

1.4 REGULATORY REQUIREMENTS

- A. Conform to requirements of 2015 Michigan Building Code, 2023 National Electrical Code, 2023 Michigan Electrical Code Rules Part 8, 2017 ICC/ANSI A117.1 and local code requirements.
- B. Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for purpose specified and indicated.

PART 2 PRODUCTS

2.1 PRODUCT REQUIREMENTS

- A. Materials and Finishes: Provide adequate corrosion resistance.
- B. Provide materials, sizes, and types of anchors, fasteners and supports to carry the loads of equipment and conduit. Consider weight of wire in conduit when selecting products.
- C. Anchors and Fasteners:
 - 1. Concrete Structural Elements: Use expansion anchors.
 - 2. Steel Structural Elements: Use beam clamps.
 - 3. Concrete Surfaces: Use self-drilling anchors and expansion anchors.

4. Hollow Masonry, Plaster, and Gypsum Board Partitions: Use toggle bolts and hollow wall fasteners.
5. Solid Masonry Walls: Use expansion anchors.
6. Sheet Metal: Use sheet metal screws.
7. Wood Elements: Use wood screws.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Attachments of electrical equipment to structural members are the responsibility of the installing trade. Structural members shall not be field cut, welded or otherwise modified without approval of the Architect/Engineer. Attachment to steel joist shall be made at panel points whenever possible. Structural members shall not be overloaded as a result of attachments. Attachment/equipment loading for all trades resulting in total load greater than an equivalent uniform 5 psf for any member shall be submitted to the Architect/Engineer for review. Electrical Trades are still responsible for design, layout, and fabrication and installation of electrical supports and support attachment methods. Electrical Trades shall submit attachment methods to the Structural Engineer for review.
- B. Install products in accordance with manufacturer's instructions.
- C. Do not fasten supports to pipes, ducts, mechanical equipment, and conduit.
- D. Do not use spring steel clips and clamps.
- E. Do not use powder-actuated anchors.
- F. Do not drill or cut structural members without permission from Architect/Engineer.
- G. Fabricate supports from structural steel or steel channel. Rigidly weld members or use hexagon head bolts to present neat appearance with adequate strength and rigidity. Use spring lock washers under all nuts.
- H. Install surface-mounted cabinets and panelboards with minimum of four anchors.
- I. Use sheet metal channel to bridge studs above and below cabinets and panelboards recessed in hollow partitions.

A. END OF SECTION

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SECTION 26 05 33.13 - CONDUIT FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Metal conduit.
- B. Flexible metal conduit.
- C. Liquidtight flexible non-metallic conduit.
- D. Electrical metallic tubing.
- E. Nonmetal conduit.
- F. Electrical nonmetallic tubing.
- G. Flexible nonmetallic conduit.
- H. Fittings and conduit bodies.
- I. Surface raceway assembly.
- J. MC Cable.
- K. Flexible metal conduit.

1.2 REGULATORY REQUIREMENTS

- A. Conform to requirements of 2015 Michigan Building Code, 2023 National Electrical Code, 2023 Michigan Electrical Code Rules Part 8, 2017 ICC/ANSI A117.1 and local code requirements.
- B. Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for purpose specified and indicated.

1.3 RELATED SECTIONS

- A. All drawings and specification sections apply to work in this section. Furnish all items, articles, materials, equipment, operations or methods that are mentioned, listed or scheduled on drawings or are in this specification including all labor, equipment, materials and miscellaneous incidentals necessary and/or required for the completion of this project. The work covered under this section of the specifications is in no way complete within itself but is supplementary to the entire specification and drawings.

1.4 REFERENCES

- A. ANSI C80.1 - Rigid Steel Conduit, Zinc Coated.

- B. ANSI C80.3 - Electrical Metallic Tubing, Zinc Coated.
- C. ANSI C80.3 - Rigid Aluminum Conduit.
- D. ANSI/NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit and Cable Assemblies.
- E. Conform to requirements of 2015 Michigan Building Code, 2023 National Electrical Code, 2023 Michigan Electrical Code Rules Part 8, 2017 ICC/ANSI A117.1 and local code requirements.
- F. NEMA RN 1 - Polyvinyl Chloride (PVC) Externally Coated Galvanized Rigid Steel Conduit and Intermediate Metal Conduit.
- G. NEMA TC 2 - Electrical Plastic Tubing (EPT) and Conduit (EPC-40 and EPC-80).
- H. NEMA TC 3 - PVC Fittings for Use with Rigid PVC Conduit and Tubing.

1.5 DESIGN REQUIREMENTS

- A. Conduit Size: ANSI/NFPA 70.

1.6 PROJECT RECORD DOCUMENTS

- A. Submit under provisions of Division 1.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, protect, and handle Products to site.
- B. Accept conduit on site. Inspect for damage.
- C. Protect conduit from corrosion and entrance of debris by storing above grade. Provide appropriate covering.
- D. Protect PVC conduit from sunlight.

1.8 PROJECT CONDITIONS

- A. Verify routing and termination locations of conduit prior to rough-in.
- B. Conduit routing shown is diagrammatic, field route conduit to avoid interferences.

1.9 REGULATORY REQUIREMENTS

- A. Conform to requirements of 2015 Michigan Building Code, 2023 National Electrical Code, 2023 Michigan Electrical Code Rules Part 8, 2017 ICC/ANSI A117.1 and local code requirements.
- B. Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for purpose specified and indicated.

PART 2 PRODUCTS

2.1 CONDUIT REQUIREMENTS

- A. Minimum Size: $\frac{3}{4}$ inch unless otherwise specified.
- B. Underground Installations:
 - 1. Use Schedule 40 PVC conduit for general underground installation.
 - 2. Use Schedule 80 PVC conduit for heavy traffic areas.
 - 3. Use direct burial seamless HDPE as noted and shown on the drawings for underground installation.
- C. Outdoor Locations, Above Grade: Use rigid steel conduit.
- D. Wet and Damp Locations: Use rigid conduit or liquid-tight non-metallic flexible conduit.
- E. Dry Locations:
 - 1. Concealed: Use electrical metallic tubing.
 - 2. Exposed: Use electrical metallic tubing.
 - 3. Use minimum $\frac{3}{4}$ " conduit for TV outlet and fire alarm drops.
 - 4. Use flexible metal conduit for final wiring connections to motors, VFD units, light fixtures in accessible ceiling and interior transformers.
 - 5. Use minimum 1" conduit for voice/data wiring.
 - 6. Use minimum $1\frac{1}{4}$ " conduit for ceiling projectors.

2.2 METAL CONDUIT

- A. Rigid Steel Conduit: ANSI C80.1.
- B. Fittings and Conduit Bodies: ANSI C80.5.
- C. Intermediate Metal Conduit (IMC): Rigid Steel.
- D. Fittings and Conduit Bodies: ANSI/NEMA FB 1; material to match conduit.

2.3 FLEXIBLE METAL CONDUIT

- A. Description: Interlocked steel construction.
- B. Fittings: ANSI/NEMA FB 1.

2.4 LIQUID-TIGHT NON-METALLIC FLEXIBLE METAL CONDUIT

- A. Description: Type NM. Manufacturer with a spiral of rigid PVC embedded reinforcement with a flexible PVC wall.
- B. Compatible fittings.

- C. Use for wet or exterior location as final wiring connections to motors or electrical equipment, etc.

2.5 ELECTRICAL METALLIC TUBING (EMT)

- A. Description: ANSI C80.3; galvanized tubing.
- B. Fittings and Conduit Bodies: ANSI/NEMA FB 1; set screw type.

2.6 NONMETALLIC CONDUIT

- C. Description: NEMA TC 2; Schedule 40 PVC.
- D. Fittings and Conduit Bodies: NEMA TC 3.

2.7 SURFACE RACEWAY ASSEMBLY

- A. One steel raceway as scheduled or noted on the drawings.
- B. Divided metallic raceway basic components
 - 1. Base cover
 - 2. Flat elbow
 - 3. Divided entrance fitting
 - 4. Blank end fitting
 - 5. Dividers
 - 6. Fill-in covers
 - 7. 2 gang horizontal device bracket

2.8 MC CABLE

- A. Corrugated steel tubing with integral conductors.
- B. Use MC cable as noted on the drawings and specified in Low Voltage Electrical Power Conductors & Cables Specification 26 05 19.
- C. MC cable is not permitted for homeruns or feeders or branch device drops.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install nonmetallic conduit in accordance with manufacturer's instructions.
- B. Arrange supports to prevent misalignment during wiring installation.
- C. Support conduit using coated steel or malleable iron straps, lay-in adjustable hangers, clevis hangers, and split hangers.

- D. Group related conduits; support using conduit rack. Construct rack using steel channel; provide space on each for 25 percent additional conduits.
- E. Fasten conduit supports to building structure and surfaces under provisions of Section 26 05 29.
- F. Do not support conduit with wire or perforated pipe straps. Remove wire used for temporary supports.
- G. Do not attach conduit to ceiling support wires.
- H. Arrange conduit to maintain headroom and present neat appearance.
- I. Route conduit parallel and perpendicular to walls or building centerlines.
- J. Route conduit installed above accessible ceilings parallel and perpendicular to walls. Install metal conduit sleeves or fire rated assembly in all fire rated wall as identified on the electrical or architectural life safety plans.
- K. Route conduit in and under slab from point-to-point.
- L. Do not cross conduits in slab.
- M. Maintain adequate clearance between conduit and piping.
- N. Maintain 12 inch clearance between conduit and surfaces with temperatures exceeding 104 degrees F.
- O. Cut conduit square using saw or pipecutter; de-burr cut ends.
- P. Bring conduit to shoulder of fittings; fasten securely.
- Q. Join nonmetallic conduit using cement as recommended by manufacturer. Wipe nonmetallic conduit dry and clean before joining. Apply full even coat of cement to entire area inserted in fitting. Allow joint to cure for 20 minutes, minimum.
- R. Use conduit hubs or sealing locknuts to fasten conduit to sheet metal boxes in damp and wet locations and to cast boxes.
- S. Install no more than equivalent of three 90-degree bends between boxes. Use conduit bodies to make sharp changes in direction, as around beams.
- T. Provide suitable fittings to accommodate expansion and deflection where conduit crosses, control and expansion joints. Use a UL listed expansion joint. If expansion length exceeds the manufactured expansion fitting, the use of PVC coated metallic flexible conduit is an acceptable method.
- U. Provide suitable pull wire in each empty conduit except sleeves and nipples.
- V. Use suitable caps to protect installed conduit against entrance of dirt and moisture.
- W. Ground and bond conduit under provisions of Section 26 05 26.

- X. Identify conduit under provisions of Section 26 05 53.
- Y. Firestop the conduits passing thru fire rated walls. Electrical Contractor shall be responsible to review the Architectural Life Safety drawings for fire rated wall locations.
- Z. The control system contractor shall be responsible to adhere to the mechanical plans and/or temperature control system drawings to establish conduit routes.
- AA. Electrical Contractor shall be required to install new conduit (concealed) in all finished areas for the following, but not limited to: exit lights, clocks, light fixtures, receptacles, sensors, switching, fire alarm manual pull stations, horn/strobe unit and strobe units, etc. Saw cut, channel and patch the walls. Neatly saw cut all existing brick veneer, glazed block or tiled areas to complete the new work. Firestop all conduits passing through fire rated walls, floors or separation barriers. Take the necessary steps to prevent chipping during the saw cutting and or wall channeling operation in the brick veneer, glazed tile or block areas. It shall be acceptable to install conduit from the opposite wall side to minimize brick veneer, glaze block or tile work. In non-finished spaces such as janitor closets, mechanical rooms, hub rooms, electrical rooms and storage rooms, conduit can be surface mounted. Provide flush mounted device boxes in all new wall construction as shown on the architectural drawings. Conduit drops or MC cable shall be concealed in the new walls and as noted and specified on the drawings.
- BB. All power, voice, clock, public address, data, fire alarm, occupancy sensor lighting wiring installed in exposed spaces shall be installed in conduit.
- CC. Electrical Contractor shall install the metallic divided surface raceway as noted or shown on the drawings. Refer to Electrical plans for a typical raceway detail.
- DD. Low-voltage voice and data device conduit drops shall only be required to be extended into the accessible ceiling space or to a cable tray as noted or specified on the drawings.
- EE. Contractor shall provide separate raceway for the emergency power distribution system.
- FF. Electrical Contractor shall identify emergency power. Identify all of the junction box cover plates with panelboard source ID and circuit number(s). Provide engraved label. Handwritten on the junction box cover plate is not acceptable.
- GG. Provide conduit wall sleeves for low-voltage wiring installation as shown and noted on the drawings. Firestop the conduit openings. Use fire rated wireway as specified or noted on the drawings.
- HH. Provide empty conduit for power assisted doors as noted and shown on the drawings.
- II. Provide empty conduit for security system as noted and shown on the drawings.

3.2 INTERFACE WITH OTHER PRODUCTS

- A. Install conduit to preserve fire resistance rating of partitions and other elements, using materials and methods consistent with facility standards or this project specification. Contractor is responsible to review the Architectural drawings to determine fire rated locations.

- B. Route conduit through roof openings for piping and ductwork or through suitable roof jack with pitch pocket or detail to match roof type specified.

A. END OF SECTION

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SECTION 26 05 33.16 - BOXES FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Wall and ceiling outlet boxes.
- B. Floor boxes.
- C. Pull and junction boxes.
- D. Fire alarm device boxes.
- E. Public address speaker backbox assembly.
- F. Clock boxes.
- G. TV outlet.
- H. Voice/data boxes.
- I. Occupancy sensor boxes.
- J. Power assisted door boxes.
- K. Security system boxes.

1.2 RELATED SECTIONS

- A. All drawings and specification sections apply to work in this section. Furnish all items, articles, materials, equipment, operations or methods that are mentioned, listed or scheduled on drawings or are in this specification including all labor, equipment, materials and miscellaneous incidentals necessary and/or required for the completion of this project. The work covered under this section of the specifications is in no way complete within itself but is supplementary to the entire specification and drawings.

1.3 REFERENCES

- A. NEMA FB 1 - Fittings and Supports for Conduit and Cable Assemblies.
- B. NEMA OS 1 - Sheet-steel Outlet Boxes, Device Boxes, Covers, and Box Supports.
- C. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).
- D. Conform to requirements of 2015 Michigan Building Code, 2023 National Electrical Code, 2023 Michigan Electrical Code Rules Part 8, 2017 ICC/ANSI A117.1 and local code requirements.

1.4 SUBMITTALS FOR REVIEW

- A. Provide submittal as listed in Section 26 01 00.

1.5 REGULATORY REQUIREMENTS

- A. Conform to requirements of 2015 Michigan Building Code, 2023 National Electrical Code, 2023 Michigan Electrical Code Rules Part 8, 2017 ICC/ANSI A117.1 and local code requirements.
- B. Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for purpose specified and indicated.

PART 2 PRODUCTS

2.1 BRANCH DEVICE BOXES

- A. Sheet Metal Outlet Boxes: Use 4" square stamped steel box with single gang device ring as general project requirement.
- B. Nonmetallic Outlet Boxes: NEMA OS 2. (Not permitted unless as noted on the drawing).
- C. Cast Aluminum Boxes: for exterior location use a single gang shallow box with thread hub connection. Provide gasketed cover by box manufacturer.
- D. Use masonry box in masonry walls.
- E. Use 4" octagon box for ceiling smoke detectors.
- F. Use in line non-metallic type box in non-metal surface raceway assembly as scheduled and detailed on the drawings.

2.2 FLOOR BOXES

- A. As scheduled on the drawing.

2.3 PULL AND JUNCTION BOXES

- A. Sheet Metal Boxes
 - 1. NEMA 1 enclosure for interior location.
 - 2. NEMA 3R or 4X for exterior location.
 - 3. Stainless steel for food service area.
 - 4. Non-metallic pull and junction boxes are not permitted for this project unless noted otherwise.

2.4 OCCUPANCY SENSORS

- A. Refer to the manufacturer for box requirements.

2.5 PUBLIC ADDRESS AND TELEVISION DISTRIBUTION SYSTEM

- A. Refer to Sections 26 06 50 and 27 13 33.

2.6 VOICE AND DATA BOXES

- A. Use 4 11/16" square stamped steel box with a single gang device.

2.7 POWER ASSISTED DOOR BOXES

- A. Provide 4" square box for palm button backbox for use by the installing vendor.

2.8 SECURITY BOXES

- A. Provide empty 4" square boxes as noted and shown on the drawings.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install in locations as shown on Drawings, and as required for wire pulling, equipment connections and compliance with regulatory requirements.
- B. Set wall mounted boxes at elevations to accommodate mounting heights indicated.
- C. Electrical boxes are shown on Drawings in approximate locations unless dimensioned.
- D. Orient boxes to accommodate wiring devices oriented as specified in Section 26 27 26.
- E. Maintain headroom and present neat mechanical appearance.
- F. Install pull boxes and junction boxes above accessible ceilings and in unfinished areas only.
- G. Inaccessible Ceiling Areas: Install outlet and junction boxes no more than 6 inches from ceiling access panel or from removable recessed luminaire.
- H. Install boxes to preserve fire resistance rating of partitions and other elements.
- I. Coordinate mounting heights and locations of outlets for counters, backsplashes, benches in casework and workstations.
- J. Locate outlet boxes to allow luminaires positioned as shown.
- K. Align adjacent wall mounted outlet boxes for switches, etc.
- L. Use flush mounting outlet box in finished areas. Surface mounted boxes are acceptable for non-finished spaces.
- M. Locate flush mounting box in masonry wall to require cutting of masonry unit corner only. Coordinate masonry cutting to achieve neat opening.

- N. Do not install flush mounting box back-to-back in walls; provide minimum 6 inches separation. Provide minimum 24 inches separation in acoustic rated walls.
- O. Secure flush mounting box to interior wall and partition studs. Accurately position to allow for surface finish thickness.
- P. Use stamped steel bridges to fasten flush mounting outlet box between studs.
- Q. Install flush mounting box without damaging wall insulation or reducing its effectiveness.
- R. Use adjustable steel channel fasteners for hung ceiling outlet box.
- S. Do not fasten boxes to ceiling support wires.
- T. Support boxes independently of conduit.
- U. Use gang box where more than one device is mounted together. Do not use sectional box.
- V. Use gang box with plaster ring for single device outlets.
- W. Install floor boxes flush with the finished floor.
- X. Use cast floor boxes for installations in slab on grade; formed steel boxes are acceptable for other installations. Set floor boxes level.
- Y. Install in line boxes in the surface mounted raceway system as shown on the drawing.
- Z. Large Pull Boxes: Provide screwed cover or hinged enclosure in interior dry locations as noted or specified on the drawing.
- AA. Junction box cover plates installed above the ceiling shall be facing down.

3.2 INTERFACE WITH OTHER PRODUCTS

- A. Coordinate installation of outlet box for equipment connected under other sections.
- B. Refer to Section 28 31 00 for fire alarm mounting height.
- C. Install public address speaker backbox at locations noted or shown on the drawings. Confirm final ceiling location to avoid the interferences with light fixtures, fire alarm and HVAC diffusers.

3.3 ADJUSTING

- A. Adjust floor box flush with finish flooring material.
- B. Adjust flush-mounting outlets to make front flush with finished wall material.
- C. Install knockout closures in unused box openings.

A. END OF SECTION

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SECTION 26 05 36 - CABLE TRAYS FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Cable trays and accessories.
- B. Wire mesh tray.
- C. Center rail tray.

1.2 RELATED SECTIONS

- A. All drawings and specification sections apply to work in this section. Furnish all items, articles, materials, equipment, operations or methods that are mentioned, listed or scheduled on drawings or are in this specification including all labor, equipment, materials and miscellaneous incidentals necessary and/or required for the completion of this project. The work covered under this section of the specifications is in no way complete within itself but is supplementary to the entire specification and drawings.

1.3 REFERENCES

- A. Conform to requirements of 2015 Michigan Building Code, 2023 National Electrical Code, 2023 Michigan Electrical Code Rules Part 8, 2017 ICC/ANSI A117.1 and local code requirements.
- B. ASTM A 123 - Specification for Zinc (Hot-Galvanized) Coatings on Products Fabricated from Rolled, Pressed, and Forged Steel Shapes, Plates, Bars, and Strip.
- C. ASTM A 525 - General Requirements for Steel Sheet, Zinc-Coated Galvanized by the Hot-Dip Process.
- D. NEMA VE 1 - Metallic Cable Tray Systems.

1.4 SUBMITTALS

- A. Provide submittals as listed in Section 26 01 00.
- B. Shop Drawings: Indicate tray type, dimensions, support points, and finishes.
- C. Product Data: Provide data for fittings and accessories.

1.5 PROJECT RECORD DOCUMENTS

- A. Record actual routing of cable tray and locations of supports.

1.6 REGULATORY REQUIREMENTS

- A. Conform to requirements of 2015 Michigan Building Code, 2023 National Electrical Code, 2023 Michigan Electrical Code Rules Part 8, 2017 ICC/ANSI A117.1 and local code requirements.
- B. Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for purpose specified and indicated.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Husky.
- B. B-Line - Flex tray.
- C. Wiremold Fieldmate
- D. Cablofil.

2.2 WIRE MESH CABLE TRAY

- A. Electroplated zinc galvanized steel wire.
- B. Width and side rail height as scheduled on the drawings.
- C. Provide all components, fittings, etc. for a complete installation above those specified.

2.3 CENTER RAIL CABLE TRAY

- A. Width and side rail and rung spacing as scheduled on the drawings.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install metallic cable tray in accordance with NEMA VE 1.
- C. Support trays in accordance with Section 26 05 29. Provide supports at each connection point, at the end of each run, and at other points to maintain spacing between supports of 10 ft maximum.
- D. Use expansion connectors where required.
- E. Ground and bond cable tray under provisions of Section 26 05 26.
 - 1. Provide continuity between tray components.
 - 2. Use anti-oxidant compound to prepare aluminum contact surfaces before assembly.

3. Provide #6 AWG bare copper equipment grounding conductor through entire length of tray; bond to each component.
 4. Connections to tray may be made using mechanical or exothermic connectors.
- F. Install the wire mesh tray above the finished accessible ceiling space and as shown on the drawings. Avoid piping, duct interferences. Set up trade coordination meeting prior to installation to avoid construction conflict.
- G. Cable tray shall only be used for low-voltage cable systems. Divisions 25, 26 and 27 shall use the tray to manage the various low-voltage system wiring called for in the specifications and drawings. The low voltage system vendor, who is in a direct contract with the Owner, shall also use the cable tray as field determined by the installing vendor. Contractors shall install the cables equally on both of the tray's center support for an even weight distribution.
- H. Provide a center support rod for the tray support or a wall bracket mounting, or trapeze hanger. Provide all hardware, mounting brackets. Welding is not permitted to any roof steel beams or joists.
- I. Where cable tray passes thru fire rated walls, the following firestop methods are acceptable.
1. Fire blankets installed in the tray on each side of the wall opening.
 2. Stop the cable tray short of the wall opening and use a fire rated framed cable transit barrier or fire rated wireway to free air the cables from the tray to fire rated assembly. Acceptable cable transit barriers are Rox System or equal Nelson. Acceptable wireway – EZ Path or approved equal.

A. END OF SECTION

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SECTION 26 05 53 - IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Nameplates and labels.
- B. Wire and cable markers.
- C. Conduit markers.
- D. Labeling methods and standards.
- E. Conductor color coding and identification.
- F. Panelboard directory.
- G. Arc flash warning labels.
- H. Voice/data faceplates and data rack patch panel ports.
- I. Electrical distribution equipment.

1.2 RELATED SECTIONS

- A. All drawings and specification sections apply to work in this section. Furnish all items, articles, materials, equipment, operations or methods that are mentioned, listed or scheduled on drawings or are in this specification including all labor, equipment, materials and miscellaneous incidentals necessary and/or required for the completion of this project. The work covered under this section of the specifications is in no way complete within itself but is supplementary to the entire specification and drawings.

1.3 REFERENCES

- A. Conform to requirements of 2015 Michigan Building Code, 2023 National Electrical Code, 2023 Michigan Electrical Code Rules Part 8, 2017 ICC/ANSI A117.1 and local code requirements.

1.4 REGULATORY REQUIREMENTS

- A. Conform to requirements of 2015 Michigan Building Code, 2023 National Electrical Code, 2023 Michigan Electrical Code Rules Part 8, 2017 ICC/ANSI A117.1 and local code requirements.
- B. Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for purpose specified and shown.

PART 2 PRODUCTS

2.1 NAMEPLATES AND LABELS

- A. Nameplates:
 - 1. Engraved three-layer laminated plastic, black letters on white background for normal power.
- B. Locations:
 - 1. Each electrical distribution panelboard, switchboard and power panel.
 - 2. Each starter.
 - 3. Each disconnect.
 - 4. Emergency circuit junction box cover plates.
 - 5. MDF/IDF patch panel ports.
 - 6. Voice/data outlets.
 - 7. Each VFD.
- C. Nameplate size minimum 1"x3" or match existing.

2.2 WIRE MARKERS

- A. Manufacturers:
 - 1. Brady or equal.
- B. Description: Tape type wire markers.
- C. Locations: Each conductor at panelboard gutters, pull boxes, outlet and junction boxes, and each load connection.
- D. Legend:
 - 1. Power and Lighting Circuits: Branch circuit or feeder number indicated on drawings.
 - 2. Control Circuits: Control wire numbers.

2.3 CONDUIT MARKERS

- A. Emergency raceway or specialty systems.
- B. Location: Furnish stencil or painted stripe for each conduit longer than 10 feet. Stencil painted stripe shall not be less than 10" long (i.e. red or black).
- C. Spacing: 20 feet on center.
- D. Color:
 - 1. 120, 208 or 480 Volt Normal Power System: Black.
 - 2. 120, 208 or 480 Volt Emergency Power Supply: Red.
- E. Legend:
 - 1. Normal Power Supply Panel Feeder: Indicate panel being fed and from where. (LPM fed from DP4)

- Emergency Power Supply Panel Feeder: Emergency Power Supply LS, CB, EB respectively. (i.e. LSIA, CBIC, EBDP)

• **LABELING METHODS AND STANDARDS**

A. Engraved Labels

- All electrical panels, starters, disconnect switches, terminal cabinets, fire alarm panel, nurse call system cabinet, personnel patient TV system cabinet or similar central system cabinet shall be permanently identified using engraved labels. These labels shall be secured with double face type or mechanically fastened in applications where the tape may have a tendency to fail.
- Normal power fed systems shall have white labels with black lettering. Emergency power fed systems shall have red labels with white lettering.
- Lettering sizes may vary due to space constraints or to distinguish between main versus branch systems. Sizes should be consistent throughout the project, use the following guidelines:

Switchboard or Panelboard Main Label:	1" high minimum
Switchboard or Panelboard Branches	1/2" high minimum
Starters, Disconnects, VFDs, Boiler e-stop station	1/2" high minimum
Manual Motor Starters	1/4" high minimum

- All labels shall identify where panel or equipment is fed from. Ex (panel A fed from MDP)

B. Adhesive Tape Labels

- Receptacles shall have the circuit number identified on the device cover plate using clear adhesive tape labels with 1/4" high printed block characters in black.
- Provide circuit identification on junction or pull box covers for all circuits within.
- Conductors in branch circuit panelboards shall have phase conductors, neutrals and grounds identified with adhesive labels within the panel at junction or pull boxes and at the device outlet box. Refer also to conductor color coding with respect to operating voltage.

2.4 CONDUCTOR COLOR CODING AND IDENTIFICATION

- A. Feeder phase conductors shall be identified as to phase and operating voltage using colored tape as follows:

	<u>480 Volt</u>	<u>120/208 Volt</u>
Phase A	yellow	black

Phase B	brown	red
Phase C	orange	blue
Neutral	gray	white
Ground	green	green

- B. Conductors from #18 up through #10 shall have colored insulating jackets to match the color code and phasing scheme as described above for feeders. Receptacle and lighting circuit conductors shall be #12 minimum for 15 or 20 amp circuits. Conductors #18 through #14 shall only be used for control circuits with colored jackets and wire numbers correlated to each system accordingly.
- C. Spare conductors shall be clearly identified as such through color, labels, tags, etc.

2.5 PANELBOARD DIRECTORY

- A. Provide typed directory. Handwritten is not acceptable.

PART 3 EXECUTION

3.1 PREPARATION

- A. Degrease and clean surfaces to receive nameplates and labels.

3.2 APPLICATION

- A. Install nameplate and label parallel to equipment lines.
- B. Secure nameplate to inside surface of door on panelboard.
- C. Contractor shall review the drawings to confirm all label schemes or ID requirements listed or noted on the drawings. Review mechanical drawings for equipment ID designation to provide a ID tag that corresponds to the mechanical equipment.
- D. Provide arc flash generic warning label on all electrical distribution equipment in accordance with NEC 2017 requirements. Provide PPE arc flash warning labels as specified with arc flash/short circuit coordination study.
- E. Panelboard, switchboards, transformers, etc. shall include their source of power included in nameplate label. (i.e. LPA feed from PP2)

A. END OF SECTION

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SECTION 26 05 83 - WIRING CONNECTIONS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Mechanical equipment.
- B. GPS clocks.
- C. Occupancy sensor equipment.
- D. Owner furnish equipment.
- E. Electrical water cooler
- F. Blank feed thru GFI

1.2 RELATED SECTIONS

- A. All drawings and specification sections apply to work in this section. Furnish all items, articles, materials, equipment, operations or methods that are mentioned, listed or scheduled on drawings or are in this specification including all labor, equipment, materials and miscellaneous incidentals necessary and/or required for the completion of this project. The work covered under this section of the specifications is in no way complete within itself but is supplementary to the entire specification and drawings.

1.3 REFERENCES

- A. NEMA WD 1 - General Purpose Wiring Devices.
- B. NEMA WD 6 - Wiring Device Configurations.
- C. Conform to requirements of 2015 Michigan Building Code, 2023 National Electrical Code, 2023 Michigan Electrical Code Rules Part 8, 2017 ICC/ANSI A117.1 and local code requirements.

1.4 COORDINATION

- A. Coordinate work under provisions of Division 1.
- B. Obtain and review shop drawings, product data, and manufacturer's instructions for equipment furnished under other sections.
- C. Determine connection locations and requirements.
- D. Sequence rough-in of electrical connections to coordinate with installation schedule for equipment.

- E. Sequence electrical connections to coordinate with start-up schedule for equipment.
- F. Provide a 120 volt power supply in a junction box for use by the sprinkler contractor to connect to main sprinkler riser flow switch.
- G. Mechanical Trades shall be responsible to furnish and install all temperature control components, associated conduit, wiring and 120 volt power supplies. Electrical Trades shall reserve 120 volt circuit breaker as scheduled in the panels for this purpose.
- H. All VFD programming shall be completed as part of the Mechanical Trades work.
- I. Provide a readily accessible GFI outlet for electrical water cooler.
- J. Where equipment will cover a GFI outlet within 6 feet of sink, provide a blank feed thru GFI test station.

1.5 REGULATORY REQUIREMENTS

- A. Conform to requirements of 2015 Michigan Building Code, 2023 National Electrical Code, 2023 Michigan Electrical Code Rules Part 8, 2017 ICC/ANSI A117.1 and local code requirements.
- B. Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for purpose specified and indicated.

PART 2 PRODUCTS

2.1 CORDS AND CAPS

- A. Manufacturers:
 - 1. Hubbell, Pass & Seymour, Leviton or equal.
- B. Attachment Plug Construction: Conform to NEMA WD 1.
- C. Configuration: NEMA WD 6; match receptacle configuration at outlet provided for equipment.
- D. Cord Construction: ANSI/NFPA 70, Type SO multi-conductor flexible cord with identified equipment grounding conductor, suitable for use in damp locations.
- E. Size: Suitable for connected load of equipment, length of cord, and rating of branch circuit over current protection.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify conditions under provisions of Division 1.

- B. Verify that equipment is ready for electrical connection, wiring, and energization.

3.2 ELECTRICAL CONNECTIONS

- A. Make electrical connections in accordance with equipment manufacturer's instructions.
- B. Make conduit connections to equipment using metallic flexible conduit for all dry interior locations. Use liquid tight non-metallic flexible conduit with watertight connectors in damp or wet locations and kitchen areas.
- C. Make wiring connections using wire and cable with insulation suitable for temperatures encountered in heat producing equipment.
- D. Provide the NEMA configuration that matches receptacle.
- E. Provide suitable strain-relief clamps and fittings for cord connections at outlet boxes and equipment connection boxes.
- F. Install disconnect switches, power relays, motor starters and as noted on the drawings.
- G. Provide and install fuses in mechanical trades furnished fused disconnects and combination starters per manufacturer's requirements.
- H. Final power connection to powerized furniture shall be completed by the installing vendor. Where the furniture system utilizes shared neutrals, the Electrical Trades shall furnish and install a circuit breaker tie.
- I. Electrical Contractor shall install mechanical furnished motor speed control and as required to control motor speed.
- J. Complete all lighting controls as scheduled, noted and shown on the drawings.
- K. Electrical Contractor shall complete all main power wiring to the mechanical equipment shown and noted.
- L. VFD control wiring and programming shall be completed as part of the Mechanical Trades bid. VFD shall be factory installed with the equipment unless noted or specified otherwise.

3.3 BLANK FEED THRU GFI

- A. Install a remote blank feed thru GFI where a refrigerator, freezer or other equipment that blocks access to the receptacle located within 6 feet of a sink.

A. END OF SECTION

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SECTION 26 09 23 - LIGHTING CONTROL DEVICES

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Power packs.
- B. Occupancy sensor.
- C. Relay panels.
- D. Low voltage push button stations.
- E. CAT 5E wiring.
- F. Room controllers.
- G. Bridge Connectors.
- H. Low-voltage momentary switching.
- I. Fire alarm interface.

1.2 RELATED SECTIONS

- A. All drawings and specification sections apply to work in this section. Furnish all items, articles, materials, equipment, operations or methods that are mentioned, listed or scheduled on drawings or are in this specification including all labor, equipment, materials and miscellaneous incidentals necessary and/or required for the completion of this project. The work covered under this section of the specifications is in no way complete within itself but is supplementary to the entire specification and drawings.

1.3 REFERENCES

- A. ASHRAE 90.1 2013 Energy Code.
- B. Conform to requirements of 2015 Michigan Building Code, 2017 National Electrical Code, 2017 State of Michigan Code Rules Part 8, 2009 ICC/ANSI 117.1 and local code requirements.
- C. 2015 Michigan Energy Code.

1.4 SUBMITTALS

- A. Provide submittal as listed in Section 26 01 00.
- B. Shop Drawings: Occupancy sensor cut sheets, control panel layouts, wiring connections, diagrams, and dimensions. Cut sheets shall either be marked or

arrowed components with catalog numbers. Failure to comply will be cause to return the submittals for corrections at no delays or extra costs to the Owner.

1.5 REGULATORY REQUIREMENTS

- A. ASHRAE 90.1 2013.
- B. Conform to requirements of 2015 Michigan Building Code, 2017 National Electrical Code, 2017 State of Michigan Code Rules Part 8, 2009 ICC/ANSI 117.1 and local code requirements.
- C. Products: Furnish products listed or labeled to conform to requirements of 2017 National Electric Code, 2017 State of Michigan Electric Code Rules Part 8, and local authority having jurisdiction.
- D. 2015 Michigan Energy Code.
- E. 2015 Life Safety Code. NFPA 101. Chapter 7 – 7.8.1.2.2 Means of Egress Lighting.

PART 2 PRODUCTS

2.1 SYSTEM COMPLIANCE

- A. System components manufactured in accordance with UL 916 and UL 924 standards where applicable.
- B. System components manufactured in accordance with CFR Title 47, Part 15 standards where applicable.
- C. System components manufactured in accordance with ISED Canada RSS-247 standards where applicable.
- D. System components manufactured in accordance with IFT-008-2015 and NOM-208-SCFI-2016 standards where applicable.
- E. System listed as qualified under DesignLights Consortium Networked Lighting Control System Specification v5.0.
- F. Performance Criteria:
 - 1. Regulatory Requirements:
 - a. Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.

2.2 SYSTEM PERFORMANCE REQUIREMENTS

- A. System Architecture:
 - 1. System architecture based upon the following concepts:
 - a. Networkable intelligent lighting control devices.
 - b. Standalone lighting control zones using distributed intelligence.

- c. Optional system backbone for remote, time-based, and global operation.
 2. Intelligent lighting control devices with individually addressable network communication capability and having one or more basic lighting control components including: occupancy sensor, photosensor, relay, dimming output, contact closure input, analog 0-10 V(dc) input, and manual wall station capable of indicating switching, dimming, and/or scene control. Combining one or more of these components into a single device enclosure permissible to minimize overall system device count.
 3. System capable of interfacing directly with networked luminaires such that either low-voltage network cabling or wireless RF communication is used to interconnect networked luminaires with control components such as sensors, switches, and system backbone.
 4. Networked luminaires and intelligent lighting control devices support individual (unique) configuration of device settings and properties, with such configuration residing within the networked luminaires and intelligent control devices.
 5. Lighting control zones consisting of one or more networked luminaires and intelligent lighting control devices capable of providing automatic control from sensors (occupancy and/or photosensor) and manual control from local wall stations without requiring connection to a higher-level system backbone.
 - a. Lighting control zones (wired and wireless) support at least 128 devices per zone.
 - b. Capable of being networked with a higher-level system backbone to provide time-based control, control from inputs or systems external to control zone, and remote configuration and monitoring through a software interface.
 6. Networked luminaires and intelligent lighting control devices with distributed intelligence programming stored in non-volatile memory, such that following any loss of power the lighting control zones operate according to their defined default settings and sequence of operations.
 7. System to include one or more system controllers that provide time-based control.
 8. System controller provides means of connecting the lighting control system to a system software interface and building management systems via BACnet/IP or BACnet MS/TP protocol.
 9. System controller supports both low-voltage wired and wireless RF communication within a single controller device.
 10. System devices support firmware update, either remotely or from within the application space, for purposes of upgrading functionality at a later date.
 11. System capable of reporting lighting system events and performance data to management software for display and analysis.
- B. Wired Networked Control Zone Characteristics:
1. Connections to devices within a wired networked lighting control zone and to backbone components accomplished with a single type of low-voltage network cable, compliant with CAT5e specifications or higher. Use of mixed types of low-voltage network cables is unacceptable.
 2. Devices connected in "daisy-chain" topology. "Hub-and-spoke" topology, requiring all individual networked devices to be connected to a central

- component, is unacceptable, to reduce the total amount of network cable required for each control zone.
4. Pre-terminated, plenum-rated, low-voltage network cabling supplied with hardware. Following proper installation and provision of power, all networked devices connected with low-voltage network cable must automatically form a functional lighting control zone without requiring any type of programming, regardless of the programming mechanism (e.g. software application, handheld remote, pushbutton).
 - a. The "out of box" default sequence of operation is intended to provide typical sequence of operation to minimize the system startup and programming requirements and to also have functional lighting control operation prior to system startup and programming.
 5. System software capable of automatic discovery of all connected devices without requiring any provisioning of system or zone addresses.
 6. Networked devices capable of detecting improper communication wiring and LED notification to alert installation/startup personnel.
 7. Networked control devices suitable for control of egress or emergency light sources without additional, externally mounted UL 924 shunting or 0-10 V(dc) disconnect devices, to provide a compliant sequence of operation while reducing the overall installation and wiring costs of the system. Capable of supporting the following sequence of operation:
 - a. Low-Voltage Power Sensing: Devices automatically provide 100 percent light level upon detection of loss of power sensed via low-voltage network cable connection where applicable.
 - b. Line-Voltage Power Sensing: Devices listed as UL 924 emergency relays which automatically close load-control relay and provide 100 percent light output upon detection of loss of power sensed via line voltage connection to normal power.
 8. Global Control Zones: Networked luminaires and intelligent lighting control devices located in different areas able to transmit and track information within at least 128 system-wide control zones to support required sequences of operation that may span multiple areas. Occupancy, photosensor inhibit, and switch commands available across multiple controllers.
 9. Wired Networked Wall Station Scene-Control Capabilities:
 - a. Preset Scenes that activate a specific combination of light levels across multiple local and global channels.
 - b. Local Profile Support: Profile Scenes that modify the sequence of operation for devices in the area (group) in response to a button press to dynamically optimize occupant experience and lighting energy usage.
 - 1) Wall stations able to manually start and stop local profiles, or local profile capable of ending after a specific duration of time between five minutes and 12 hours.
 - 2) Configurable Parameters:
 - a) Fixture light level.
 - b) Occupancy time delay.
 - c) Response to occupancy sensors (including enabling/disabling response).
 - d) Response to daylight sensors (including enabling/disabling response).

e) Enabling/disabling wall stations.

- c. Three-Way or Multi-Way Control: Multiple wall stations capable of controlling the same local and global control zones, to support "multi-way" preset scene and profile scene control.
- C. System Integration Capabilities:
1. Capable of interface with third-party building management systems (BMS) to support two-way communication using BACnet/IP protocol, BACnet MS/TP protocol, and RESTful API including the following system integration capabilities:
 - a. "Write" messages for control of individual devices, including control of relay and dimming output.
 - b. "Write" messages for control of groups of devices through a single command, including control of relay and dimming output of all devices.
 - c. "Read" messages for individual device status information.
 - 1) Available status will vary based on device type and capabilities, which may include relay state, dimming output, power measurement, occupancy sensor status, and photosensor light measurement.
 - d. "Read" messages for group status information for occupancy, relay state, and dimming output.
 - e. Activation of pre-defined system Global Profiles.
 2. Activation of Global Profiles from third-party systems via dry contact closure output signals or digital commands via RS-232 or RS-485.
 3. Activation of demand response levels from Demand Response Automation Servers (DRAS) via OpenADR 2.0a protocol.
- D. Supported Sequence of Operations:
1. Control Zones:
 - a. Local Control Zones: Networked luminaires and intelligent lighting control devices installed in an area (also referred to as a group of devices) capable of transmitting and tracking occupancy sensor, photosensor, and manual switch information within at least 48 unique control zones to support different and reconfigurable sequences of operation within area. These will also be referred to as local control zones.
 - b. Adjacent Control Zones: Networked luminaires and intelligent lighting control devices capable of tracking occupancy broadcasts from adjacent zones. When this feature is enabled, luminaire output for a vacant zone will reduce to a configurable dimmed state if one or more adjacent zones are occupied. Luminaires will turn off when both primary and adjacent zones are vacant.
 - c. Global Control Zones: Networked luminaires and intelligent lighting control devices located in different areas able to transmit and track information within at least 128 system-wide control zones to support required sequences of operation that may span across multiple areas. Occupancy, photosensor inhibit, and switch commands available across multiple controllers.
 2. Wall Station Capabilities:
 - a. Wall stations support the following capabilities:
 - 1) On/Off of a local or global control zone.
 - 2) Continuous dimming control of light level of a local or global control zone.

- b. Multi-Way Control: Multiple wall stations capable of controlling the same local or global control zones, to support "multi-way" switching and dimming control.
- 3. Occupancy Sensing Capabilities:
 - a. Occupancy sensors configurable to control a local or global zone.
 - b. Multiple occupancy sensors capable of controlling the same local or global zones. This capability combines occupancy sensing coverage from multiple sensors without consuming multiple control zones.
 - c. Occupancy sensing sequence of operation modes:
 - 1) On/Off Occupancy Sensing.
 - 2) Partial-On Occupancy Sensing.
 - 3) Partial-Off Occupancy Sensing.
 - 4) Vacancy Sensing (Manual-On / Automatic-Off).
 - d. On/Off, Partial-On, and Partial-Off Occupancy Sensing Modes Sequence of Operation:
 - 1) Occupancy automatically turn lights on to a designated level when occupancy is detected. Designated occupied light level support at least 100 dimming levels.
 - 2) Occupancy sensors automatically turn lights off or to a dimmed state (Partial-Off) when vacancy occurs or if sufficient daylight is detected. Designated unoccupied dim level support at least 100 dimming levels.
 - 3) System capable of combining Partial-Off and Full-Off operation by dimming lights to a designated level when vacant and turning the lights off completely after an additional time delay.
 - 4) Photosensor readings, if enabled in occupancy sensing control zone, automatically adjust light levels during occupied or unoccupied conditions as necessary.
 - 5) Wall station activation changes the dimming level or turn lights off as selected by the occupant. Lights optionally remain in this manually specified light level until the zone becomes vacant. Upon vacancy, normal sequence of operation resumes.
 - e. Vacancy Sensing or Manual-On/Automatic-Off Mode Sequence of Operation:
 - 1) Activation of a wall station is required turn lights on. System capable of programming the zone to turn on to either a designated light level or previous user-set light level. Initially occupying the space without using a wall station must not result in lights turning on.
 - 2) Occupancy sensors automatically turn lights off or to a dimmed state (Partial-Off) when vacancy occurs or if sufficient daylight is detected. Designated unoccupied dim level support at least 100 dimming levels.
 - 3) System capable of dimming the lights when vacant and then turning the lights off completely after an additional time delay.
 - 4) System capable of an "automatic grace period" immediately following detection of vacancy, during which time any detected occupancy results in the lights reverting to the previous level. After the grace period has expired, the use of a wall station is required to turn lights on.
 - 5) Photosensor readings, if enabled in the Occupancy Sensing control zone, capable of automatically adjusting the light level during occupied or unoccupied conditions as necessary.

- 6) Wall station interaction changes the dimming level or turn lights off as selected by occupant. Lights remain at manually specified light level until zone becomes vacant; normal sequence of operation resumes upon vacancy.
- f. Occupancy time delays before dimming or shutting off lights separately programmable for all control zones from 15 seconds to 2 hours.
4. Photosensor Sensing Capabilities (Automatic Daylight Sensing):
 - a. Photosensor devices configurable to control a local zone.
 - b. Photosensor-Based Control:
 - 1) Continuous Dimming: Control zone automatically adjusts dimming output in response to photosensor readings, to maintain a minimum light level consisting of both electric light and daylight sources. Photosensor response configurable to adjust set point and dimming rates.
5. Schedule Capabilities:
 - a. System capable of time schedules for time-of-day to override devices including offsets from dusk and dawn.
 - b. System capable of providing a visible "blink warning" five minutes prior to the end of the schedule.
 - c. Wall stations may be programmed to provide timed extensions/overrides that turn the lights on for an additional time period.
 - 1) Timed override/extension duration programmable for each individual device, zone of devices, or customized group of devices, from five minutes to 12 hours.
6. Global Profile Capabilities:
 - a. System capable of automatically modifying the sequence of operation for selected devices in response to any of the following:
 - 1) Time-of-day schedule.
 - 2) Contact closure input state.
 - 3) Manually triggered wired wall station input.
 - 4) RS-232/RS-485 command to wired input device.
 - 5) BACnet input command.
 - b. Global Profile Capabilities:
 - 1) Global Profiles stored within and executed from the system controller (via internal timeclock). Dedicated software host or server is not required to be online to support automatic scheduling and/or operation of Global Profiles.
 - 2) Global Profile time-of-day schedules capable of recurrence settings including daily, specific days of week, every "n" number of days, weekly, monthly, and yearly. Lighting control global profile schedules support definition of start date, end date, end after "n" recurrences, or never ending.
 - 3) Daylight savings time adjustments capable of being performed automatically, if desired.
 - 4) Global Profile holiday schedules follow recurrent settings for specific U.S. holiday dates regardless if they always occur on a specific date or are determined by day/week of the month.
 - 5) Global Profiles capable of being scheduled to run according to timed offsets relative to sunrise or sunset. Sunrise/sunset times

- automatically derived from location information using an astronomical clock.
- 6) Software management interface capable of displaying a graphic calendar view of profile schedules for each control zone.
 - 7) Global Profiles capable of manual activation directly from system controller, specially programmed wired input devices, scene-capable wired wall stations, and software management interface.
 - 8) Global Profiles selectable to apply to a single device, zone of devices, or customized group of devices.
 - 9) Global Profile Configurable Parameters:
 - a) Fixture light level.
 - b) Occupancy time delay.
 - c) Response to occupancy sensors (including enabling/disabling response).
 - d) Response to daylight sensors (including enabling/disabling response).
 - e) Enabling/disabling of wall stations.
 - c. Local and Global Profiles backed up and stored on software's host server such that Profile backup can be applied to a replacement system controller or wired wall station.
7. System supports automated demand response capabilities with automatic reduction of light level to at least three levels of demand response, configurable for each output device.

2.3 SYSTEMS SOFTWARE INTERFACES

- A. Management Interface:
1. Web-based management interface for remote system control, live status monitoring, and configuration of lighting control settings and schedules.
 2. Compatible with industry-standard web browser clients.
 3. Minimum of 100 unique password-protected user accounts.
 4. Minimum of three user permission levels: read-only, read and change settings, and full administrative system access.
 5. Capable of restricting access for user accounts to specific devices within the system.
 6. All system devices capable of being given user-defined names.
 7. Device identification information displayed in the Management interface including:
 - a. Model number.
 - b. Model description.
 - c. Serial number or network ID.
 - d. Manufacturing date code.
 - e. Custom label.
 - f. Parent network device.
 8. Management interface capable of displaying live status of a networked luminaire or intelligent control device including:
 - a. Luminaire on/off status.
 - b. Dim level.
 - c. Power consumption.
 - d. Device temperature.

- e. PIR occupancy sensor status.
 - f. Microphonic occupancy sensor status.
 - g. Remaining occupancy time delay.
 - h. Photosensor reading.
 - i. Active Profiles.
9. Management interface capable of displaying and modifying the current active settings of a networked luminaire or intelligent control device including:
 - a. Dimming trim levels.
 - b. Occupancy sensor and photosensor enable/disable.
 - c. Occupancy sensor time delay and light level settings.
 - d. Occupancy sensor response (normal or vacancy).
 - e. Photosensor setpoints and transition time delays.
 10. Management interface capable of applying settings changes for a zone of devices or a group of selected devices using a single action that does not require the user to apply settings changes for each individual device.
 11. Management interface capable of compiling a printable network inventory report.
 12. Management interface capable of compiling a printable report detailing all system profiles.
 13. All sensitive information stored encrypted.
 14. System software updates available for automatic download and installation via the Internet.
- B. System Energy Analysis and Reporting:
1. Intuitive graphical screens to facilitate simple viewing of system energy performance.
 2. Energy Scorecard: Summarized display that indicates calculated energy savings in dollars or KWh.
 3. Software calculates allocation of energy savings by control measures including occupancy sensors, photosensors, and manual switching.
 4. Energy savings data calculated for the system as a whole.
 5. Time-scaled graph showing all relay transitions.
 6. Time-scaled graph showing zone occupancy time delays.
 7. Time-scaled graph showing the total light level.
 8. Software capable of storing information remotely onto an open-source, object-relational database, such as PostgreSQL.
 9. Data stored in the database will be accessed utilizing an open standard, application programming interface, such as Open Database Connectivity (ODBC).
- C. Visualization and Programming Interfaces:
1. System provides an optional web-based visualization interface that displays a graphical floorplan.
 2. Graphical floorplan will offer the following types of system visualization:
 - a. Full Device Option: Master graphic of entire building, by floor, showing each control device installed with zones outlined including:
 - 1) Controls embedded light fixtures.
 - 2) Controls devices not embedded in light fixtures.
 - 3) Daylight sensors.
 - 4) Occupancy sensors.

- 5) Wall switches and dimmers.
- 6) Scene controllers.
- 7) Networked relays.
- 8) Wired bridges.
- 9) System Controllers.
- 10) Wired relay panels.
- 11) Group outlines.
- b. Group-Only Option: Master graphic of the entire building, by floor, showing only control groups outlined.
- c. Pan and zoom commands supported to allow smaller areas to be displayed on a larger scale simply by panning and zooming each floor's master graphic.
- d. Selecting any control device displays the following as applicable:
 - 1) Device catalog number.
 - 2) Device name and custom label.
 - 3) Device diagnostic information.
 - 4) Link to further information on device including status or current configuration.
3. Programming capabilities through the application will include the following:
 - a. Switch, occupancy sensor, and photosensor zone configuration.
 - b. Manual-on or automatic-on modes.
 - c. Turn-on and dim to dimming levels.
 - d. Occupancy sensor time delays and PIR sensitivity.
 - e. Dual technology occupancy sensors sensitivity.
 - f. Photosensor calibration adjustment and auto-setpoint.
 - g. Multiple photosensor zone offset.
 - h. Trim level settings.
 - i. Preset scene creation and copy for scene-capable devices.
 - j. Application of custom device labels to the Bluetooth Low-Energy Programming Devices and individual connected lighting control devices.
 - k. Fade rate settings.
- D. Smartphone Programming Interface for Wired and Wireless Devices:
 1. Interface provided for both Apple iOS and Android operating systems that allows configuration of lighting control settings.
 2. Application supports configuration of wireless networked control devices.
 - a. Application access granted with valid user name and password.
 - b. Access to program information governed by permission system that allows users to share access with other users and restrict access to those who should not be able to reconfigure the equipment.
 - c. Indication of signal strength where multiple Bluetooth Low-Energy Programming Devices are available for configuration.
 3. Application supports configuration of wired networked control devices.
 - a. Connected device access granted through user-defined passcode at initial install.
 - b. Indication of signal strength where multiple Bluetooth Low-Energy Programming Devices are available for configuration.
 4. Programming Capabilities:
 - a. Switch, occupancy sensor, and photosensor group configuration.
 - b. Manual-on or automatic-on modes.

- c. Turn-on and dim to dimming levels.
- d. Occupancy sensor time delays and PIR sensitivity.
- e. Dual technology occupancy sensors sensitivity.
- f. Photosensor calibration adjustment and auto-setpoint.
- g. Multiple photosensor zone offset.
- h. Trim level settings.
- i. Preset scene creation.
- j. Application of custom device labels for individual connected lighting control devices.
- k. Fade rate settings.

2.4 SYSTEM BACKBONE AND SYSTEM INTEGRATION EQUIPMENT

- A. System Controller: Multi-tasking, real-time digital control processor consisting of modular hardware with plug-in enclosed processors, communication controllers, and power supplies.
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide nLight; Acuity Brands Lighting, Inc.; nECY or comparable product by one of the following:
 - a. [Cooper Industries, Inc.](#)
 - b. [Leviton Manufacturing Co., Inc.](#)
 - 2. System Controller Processor: 32-bit microprocessor operating at a minimum of 1 GHz.
 - 3. System Controller Memory: Minimum of 512MB memory, with a minimum of 4GB non-volatile flash, to support operating system and databases.
 - 4. System Controller Functions:
 - a. Time-based control of downstream wired and wireless network devices.
 - b. Linking into an Ethernet network.
 - c. Integration with Building Management Systems (BMS) and Heating, Ventilation and Air Conditioning (HVAC) equipment.
 - d. Connection to various software interfaces, including management interface, historical database and analytics interface, and visualization interface.
 - 5. Integral web server to support system controller configuration and diagnostics **[with control and visualization of connected devices]**.
 - a. Web Server Control Interface:
 - 1) Display associated devices within the context of a graphical floorplan.
 - 2) Provide control of output-capable devices through virtual sliders, toggle buttons, preset level widgets, and transparent layers on floorplan.
 - 3) Control Capabilities:
 - a) Control of individual output devices, including control of relay state and analog dimming level where applicable.
 - b) Control of local lighting control zones, including control of relay state and analog dimming level where applicable.
 - c) Control of global lighting control zones, including control of relay state and analog dimming level where applicable.
 - d) Control of Global Profiles.
 - b. Visualization Interface:

- 1) Customizable display with the ability to superimpose colored, transparent layers representing real-time property values, including occupancy status, dimming level status, light level status, and online or offline status where applicable.
- 2) Ad hoc display of trended information via an intuitive values-over-time graph.
- 3) Report Creation:
 - a) Reports accept and graphically display trended status datasets for creator selected devices or zones of devices.
 - b) Report information displayed over a user-defined interval and date range.
 - c) Reports exportable to a standard CSV format.
6. Graphical touch screen to support configuration and diagnostics.
7. Minimum of three RJ-45 networked lighting control ports for connection to any of the following:
 - a. Graphical touch screen.
 - b. Wired communication bridges.
 - c. Direct connection to networked wired luminaires and intelligent lighting control devices (up to 128 total devices per port).
8. Device will automatically detect all network-connected devices.
9. Capable of managing and operating a minimum of 750 networked devices (wired or wireless) per system controller.
10. Multiple System Controllers capable of connection via LAN for scalability to a minimum of 20,000 networked devices.
11. Supports BACnet/IP and BACnet MS/TP protocols to directly interface with BMS and HVAC equipment without additional protocol translation gateways.
 - a. BACnet MS/TP Connection Speed: 9600 to 115200 baud rate.
 - b. BACnet Testing Laboratory (BTL listed) using Device Profile BACnet Building Controller (B-BC) with outlined enhanced features.
12. Integral FIPS 140-2, Level 1 cryptographic module.
13. Supports RESTful API for control of BACnet objects, user management, date and time, and file management.
14. NEMA 1 enclosure with Class 1 and Class 2 separation.
 - a. Power Supply Voltage: [120 to 277] [347] V(ac).
15. Automatic algorithm to eliminate redundant, wireless networked paths to streamline communication between the system controller and end devices.
16. System Controller Security Provisions:
 - a. Disallow the use of default passwords and require passwords to be updated prior to use.
 - b. Support user role-based access, such as administrator, user, and viewer.
 - c. Signed firmware to ensure that unmodified, authentic software is always installed.
 - d. IP-based communication protected with strong encryption algorithms such as AES or TLS1.2+.
 - e. Prevent rollback of firmware to firmware versions with known, critical vulnerabilities.
 - f. Valid cybersecurity listing through a third party.
17. Cellular Remote Access: Cellular router and modem for remote access.

- a. Router supports remote access to at least five system controllers on its local area network or network subnet.

- b. Remote access capable of device setting updates, schedule updates, system performance optimization, and diagnostics.
- c. Remote access enabled through outbound communication from router to an outside source. Solutions that begin communication via inbound requests for network access are unacceptable.
- d. Router supports outbound communication to manufacturer-hosted portal using TLS1.2 or greater in-transit encryption over a cellular or Ethernet connection.
- e. Router with integral firewall to prevent unauthorized access to devices connected to its local area network port.
- f. Router includes cellular SIM capable of connection to AT&T, T-Mobile, Sprint, US Cellular, Alaska Wireless, Telefonica, Tellus, Bell, or Sasktel networks where carrier service is available.
- g. Outbound communication from the router limited to whitelisted endpoints. Devices that allow unrestricted communication are unacceptable.
- h. Outbound communication from router includes only lighting control system information.

2.5 WIRED NETWORKED DEVICES

- A. Wired Networked Wall Switches, Dimmers, Scene Controllers:
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide nLight; Acuity Brands Lighting, Inc.; [nPODM] [nPODM xS] [nPODM xL] [nPODMA] [nPODMA xS] [nPODMA xL] or comparable product by one of the following:
 - a. [Cooper Industries, Inc.](#)
 - b. [Leviton Manufacturing Co., Inc.](#)
 - 2. Mounting: Suitable for installation in single-gang switch box.
 - 3. Communication and low-voltage power delivered via standard low-voltage network cabling with RJ-45 connectors.
 - 4. All switches detect valid communication and blink a unique LED pattern to visually indicate a potential wiring issue.
 - 5. Devices with mechanical push buttons provide tactile and LED user feedback.
 - 6. Devices with mechanical push buttons manufactured with custom button labeling.
 - 7. Wall switch and dimmer options:
 - a. Number of control zones: [1] [2] [4]. Refer to device schedule on drawings.
 - b. Control Types Supported:
 - 1) On/Off.
 - 2) On/Off/Dimming.
 - 3) On/Off/Dimming/Correlated Color Temperature Control for specific luminaire types.
 - c. Color: [Ivory] [White] [Light Almond] [Gray] [Black] [Red]. To be selected on a room by room basis during the submittal phase.
 - 8. Scene Controller Options:
 - a. Number of Scenes: [1] [2] [4]. Refer to device schedule on drawings.
 - b. Control Types Supported:
 - 1) On/Off.

- 2) On/Off/Dimming.
 - 3) Preset Level Scene Type.
 - 4) On/Off/Dimming/Presets Level for Correlated Color Temperature.
 - 5) Reprogramming of other devices within daisy-chained zone to implement user-selected lighting scene including manual start/stop from the scene controller, or optionally programmed automatic stop after a user-selectable duration between five minutes and 12 hours.
 - 6) Selecting a lighting profile to be run by device's upstream controller to implement a selected lighting profile across multiple zones including manual start/stop from the scene controller, or optionally programmed automatic stop after a user-selectable duration between five minutes and 12 hours.
- c. Color: **[Ivory]** **[White]** **[Light Almond]** **[Gray]** **[Black]** **[Red]**. To be selected on a room by room basis during the submittal phase.
- B. Networked Graphic Wall Stations:
1. Basis-of-Design Product: Subject to compliance with requirements, provide nLight; Acuity Brands Lighting, Inc.; nPOD TOUCH or comparable product by one of the following:
 - a. [Cooper Industries, Inc.](#)
 - b. [Leviton Manufacturing Co., Inc.](#)
 2. Mounting: Suitable for installation in single-gang switch box.
 3. Integral **3.5-inch (88 mm)** capacitive full-color touch screen.
 4. Power via polarity insensitive Class 2 low-voltage 15 to 24V (dc) power supply.
 5. Device enables mobile application control of control zones and scenes through Bluetooth.
 6. Communication over standard low-voltage network cabling with RJ-45 connectors.
 7. User-customizable screen saver utilizing uploaded image file in common file format including jpg, png, gif, bmp, or tif.
 8. Capable of configuration of all switches, dimmers, control zones, and lighting preset scenes via password-protected setup screens.
 9. Graphic Wall Station Options:
 - a. Number of Control Zones: Up to 16.
 - b. Number of Scenes: Up to 16.
 - c. Profile Scene Duration: User configurable from five minutes to 12 hours.
 - d. Color: **[White]** **[Black]**. Color to be selected during the submittal phase.
- C. Digital Time Clock:
1. Basis-of-Design Product: Subject to compliance with requirements, provide nLight; Acuity Brands Lighting, Inc.; nDTC or comparable product by one of the following:
 - a. [Cooper Industries, Inc.](#)
 - b. [Leviton Manufacturing Co., Inc.](#)
 2. Controls a linear bus of lighting devices supplying all time functions without connection to a system controller.
 - a. Programming of the linear bus of lighting devices must not require additional hardware, including computers, specialized dongles, or other connection devices.

- b. Programming of the linear bus exclusively done through the touch-screen interface.
 3. Capable of up to 32 schedules. Each schedule consists of one set of On and Off times per day for each day of the week and for each of two holiday lists. Schedules assignable to any individual relay or group of relays.
 4. Operates from non-volatile memory so that all system programming is retained indefinitely.
 6. Mounted inside a relay panel to eliminate the necessity for additional enclosures for complete installation.
 7. Capacitive **3.5-inch (88 mm)**, full-color touch screen.
- D. Wired Networked Digital Key Switches:
1. Basis-of-Design Product: Subject to compliance with requirements, provide nLight; Acuity Brands Lighting, Inc.; nPODA KEY[**MNTN**] or comparable product by one of the following:
 - a. [Cooper Industries, Inc.](#)
 - b. [Leviton Manufacturing Co., Inc.](#)
 2. Mounting: Suitable for installation in single-gang switch box.
 3. Communication and low-voltage power delivered via standard low-voltage network cabling with RJ-45 connectors.
 4. All switches detect valid communication and blink a unique LED pattern to visually indicate a potential wiring issue.
 5. LED user feedback to provide indication of on/off status of the programmed lights or scene, as well as indication of device power.
 6. Digital Key Switch Options:
 - a. Control Types Supported:
 - 1) On/Off.
 - 2) On/Off/Dimming.
 - 3) Preset Level Scene Type.
 - 4) On/Off/Dimming/Preset Level for Correlated Color Temperature.
 - 5) User-programmed local lighting scene run within a daisy-chained group including manual start/stop from the switch, or optionally programmed automatic-stop after a user-selectable duration between five minutes and 12 hours.
 - 6) User-programmed global lighting profile run by an upstream controller across multiple groups including manual start/stop from the switch, or optionally programmed automatic-stop after a user-selectable duration between five minutes and 12 hours.
 - b. Color: [**Ivory**] [**White**] [**Light Almond**] [**Stainless Steel**]. Color to be selected on a room by room basis during the submittal phase.
- E. Wired Networked Auxiliary Input / Output (I/O) Devices:
1. Basis-of-Design Product: Subject to compliance with requirements, provide nLight; Acuity Brands Lighting, Inc.; nIO series or comparable product by one of the following:
 - a. [Cooper Industries, Inc.](#)
 - b. [Leviton Manufacturing Co., Inc.](#)
 2. Plenum rated.

3. Mounting: [inline wired] [screw mountable] [extended chase nipple for mounting to a 1/2-inch (16 mm) knockout].

4. Communication and low-voltage power delivered to each device via standard low-voltage network cabling with RJ-45 connectors.
 5. Auxiliary Input/Output Devices Options:
 - a. Contact closure or pull-high input.
 - 1) Input programmable to support maintained or momentary inputs that can activate local or global scenes and profiles, activate lights at a preconfigured level, ramp light level up or down, or toggle lights on/off.
 - b. 0-10V analog input.
 - 1) Input supports zero to 10 V dimming output control from a dimmer switch.
 - 2) Input programmable to function as a daylight sensor.
 - c. RS-232/RS-485 digital input.
 - 1) Input supports activation of up to four local or global scenes and profiles, and on/off/dimming control of up to 16 local control zones.
 - 2) Provides relay and dimming level status to external device (e.g. Touchscreen) when polled.
 - d. 0-10V dimming control output, capable of sinking up to 20mA.
 - 1) Output programmable to support all standard sequence of operations supported by system.
 - e. Digital control output via eLoLED LEDcode communication.
 - 1) Output programmable to support light intensity control, as well as optional correlated color temperature (CCT) control, of the connected luminaire.
- G. Wired Networked Occupancy and Photosensors:
1. Basis-of-Design Product: Subject to compliance with requirements, provide nLight; Acuity Brands Lighting, Inc.; [nCM] [nCMB] [nRM] [nWV] [nHW] or comparable product by one of the following:
 - a. [Cooper Industries, Inc.](#)
 - b. [Leviton Manufacturing Co., Inc.](#)
 2. Detect the presence of human activity within space and fully control the on/off function of lights.
 3. Utilize passive infrared (PIR) technology, which detects occupant motion, to initially turn lights on from an off state, thus preventing false on conditions. Ultrasonic and Microwave-based sensing technologies are unacceptable.
 4. Dual technology sensors used in locations where a second method of sensing is necessary to adequately detect maintained occupancy (such as in rooms with obstructions).
 5. Dual technology sensors must have one sensing technology not motion dependent to detect occupancy. Acceptable dual technology includes PIR/Microphonics (also known as Passive Dual Technology or PDT), which detects both occupant motion and sounds indicating occupants. Sensors where both technologies detect motion (PIR/Ultrasonic) are unacceptable.
 6. All sensing technologies are acoustically passive, meaning they do not transmit sound waves of any frequency (for example in the Ultrasonic range), as these technologies have the potential for interference with other electronic devices within the space (such as electronic white board readers and hearing devices). Acceptable detection technologies include Passive

Infrared (PIR), and/or Microphonic technology. Ultrasonic and Microwave-based sensing technologies are unacceptable.

7. Ceiling, fixture, recessed, and corner mounted sensors available, with multiple lens options available customized for specific applications.
8. Communication and low-voltage power delivered to each device via standard low-voltage network cabling with RJ-45 connectors.
9. All sensors detect valid communication and blink a unique LED pattern to visually indicate a potential wiring issue.
10. Sensor programming parameter available and configurable remotely from the software and locally via the device push button.
11. Ceiling mount occupancy sensors include one integrated dry contact switching relay, capable of switching 1 A at 24 V, resistive only.
12. Sensors available with one or two occupancy "poles," each of which provides a programmable time delay.
13. Photosensor/daylight override, automatic dimming control, and low temperature/high humidity operation.
14. Photosensor provide one on/off set-point and include a dead band to prevent the artificial light from cycling. Delay incorporated into the photosensor to prevent rapid response to passing clouds.
15. Photosensor and dimming sensor's set-point and dead band automatically calibrated through the sensor's microprocessor by initiating an "Automatic Set-Point Programming" procedure. Min and max dim settings as well as set-point may be manually entered or modified.
16. Dead band setting verified and modified by the sensor automatically every time the lights cycle to accommodate physical changes in the space (i.e., furniture layouts, lamp depreciation, or lamp outages).
17. Dual zone option available for On/Off Photosensor, Automatic Dimming Control Photosensor, or Combination units. The secondary daylight zone capable of being controlled as an "offset" from the primary zone.

H. Wired Networked Wall Switch Sensors:

1. Basis-of-Design Product: Subject to compliance with requirements, provide nLight; Acuity Brands Lighting, Inc.; **[nWSX LV]** **[nWSXA LV]** or comparable product by one of the following:
 - a. [Cooper Industries, Inc.](#)
 - b. [Leviton Manufacturing Co., Inc.](#)
2. Mounting: Suitable for installation in single-gang switch box.
3. Communication and low-voltage power delivered via standard low-voltage network cabling with RJ-45 connectors.
4. All switches detect valid communication and blink a unique LED pattern to visually indicate a potential wiring issue.
5. Devices with mechanical push buttons provide tactile and LED user feedback.
6. Wall Switch Sensor Options:
 - a. User Input Control Types: **[On/Off]** **[On/Off/Dimming]**.
 - b. Occupancy Sensing Technology: **[PIR only]** **[Dual technology acoustic]**.
 - c. Daylight Sensing Option: Inhibit Photosensor.
 - d. Color: **[Ivory]** **[White]** **[Light Almond]** **[Gray]** **[Black]** **[Red]**. Color to be selected on a room by room basis during the submittal phase.

- I. Wired Networked Embedded Fixture Sensors:
1. Basis-of-Design Product: Subject to compliance with requirements, provide nLight; Acuity Brands Lighting, Inc.; nES or comparable product by one of the following:
 - a. [Cooper Industries, Inc.](#)
 - b. [Leviton Manufacturing Co., Inc.](#)
 2. Network system sensors with occupancy sensors and/or dimming photosensors that can be embedded into luminaire such that only the lens shows on luminaire face.
 3. Occupancy sensor detection pattern suitable for 7.5 to 20-ft. (2.2 to 6-m) mounting heights.
 4. Embedded Sensor Options:
 - a. Occupancy Sensing technology: **[PIR only] [Dual technology acoustic]**.
 - b. Sensing Option: **[Occupancy only] [Daylight only] [Combination Occupancy/ Daylight sensor]**.
- J. Wired Networked Power Packs:
1. Basis-of-Design Product: Subject to compliance with requirements, provide nLight; Acuity Brands Lighting, Inc.; nPP16 series or comparable product by one of the following:
 - a. [Cooper Industries, Inc.](#)
 - b. [Leviton Manufacturing Co., Inc.](#)
 2. Plenum rated.
 3. Communication will be delivered to each device via standard low-voltage network cabling with RJ-45 connectors.
 4. Supply Voltage: **[120 to 277] [347] V(ac)**.
 5. Relay Output: Class 1 relay rated for 16 A at **[277] [347] V(ac)** and 1/2 HP at 120 V(ac).
 6. Dimming Output: 0-10 VDC Dimming output.
 7. Sink Current: 100 mA at 0-10 V(dc).
 8. Mounting: Integral **1/2-inch (16-mm)** chase nipple. Plastic clips into junction box are unacceptable.
- K. Wired Networked Relay and Dimming Panel:
1. Basis-of-Design Product: Subject to compliance with requirements, provide nLight; Acuity Brands Lighting, Inc.; ARP or comparable product by one of the following:
 - a. [Cooper Industries, Inc.](#)
 - b. [Leviton Manufacturing Co., Inc.](#)
 2. Outputs: **[4] [8] [12] [16] [24] [32] [40] [48]** Individual relays per panel, with an equal number of individual 0-10 V(dc) dimming outputs. Relay panel relays per drawings schedules.
 3. Field Configurable Relays (FCR):
 - a. Field configurable to operate in single-, double-, or triple-pole relay groupings.
 - b. Field configurable to operate as normally closed or normally open.
 - c. Provides visual status of current state and manual override control of each relay.
 - d. Minimum Relay Contact Ratings:
 - 1) 40 A at 120-480 V(ac) Ballast.

- 2) 16 A at 120-277 V(ac) Electronic.
 - 3) 20 A at 120-277 V(ac) Tungsten.
 - 4) 20 A at 48V (dc) Resistive.
 - 5) 2 HP at 120 V(ac).
 - 6) 3 HP at 240-277 V(ac).
 - 7) 65kA SCCR at 480 V(ac).
 4. Dimming Output Rating: Minimum of 100 mA sink current per dimming output.
 5. Relay and dimming outputs individually programmable.
 6. Listing: UL 924 for control of emergency lighting circuits.
 7. Power Supply: Integrated [**120-277**] [**347**] V(ac) supply.
 8. Low-Voltage Sensor Input:
 - a. Configurable to support any of the following input types:
 - 1) Indoor Photosensor.
 - 2) Outdoor Photosensor.
 - 3) Occupancy Sensor.
 - 4) Contact Closure.
 - b. Low-voltage sensor input provides 24 V(dc) power for sensor so additional auxiliary power supplies are not required.
 - c. Sensor input supports all standard sequence of operations.
 9. Integrated Digital Time Clock for local schedule control.
 10. Contact Closure Input: One for each group of eight output relays that acts as a panel override to activate the normally configured state of all associated relays (i.e., normally open or normally closed).
 11. Panel supplies current limited low-voltage power to other networked devices connected via low-voltage network cable.
 12. Enclosure:
 - a. Enclosure Rating: NEMA 1.
 - a. Mounting: [**Surface**] [**Flush**] mounted.
 - a. Cover: [**Hinged cover with keyed lock**] [**Screw-fastened and plenum rated**].
- L. Wired Networked Bluetooth Low-Energy Programming Device:
1. Basis-of-Design Product: Subject to compliance with requirements, provide nLight; Acuity Brands Lighting, Inc.; nIO BT or comparable product by one of the following:
 - a. [Cooper Industries, Inc.](#)
 - b. [Leviton Manufacturing Co., Inc.](#)
 2. Plenum rated, inline wired, and screw mountable.
 3. Communication and low-voltage power delivered to device via standard low-voltage network cabling with RJ-45 connectors.
 4. Bluetooth communication allows connection from smartphone application for programming device settings within the local daisy-chain zone.
 5. Device provides visual indication of remote Bluetooth connection via LED integrated into device enclosure such that it is visible from all angles while the zone is being programmed.
- M. Wired Networked Communication Bridge:

1. Basis-of-Design Product: Subject to compliance with requirements, provide nLight; Acuity Brands Lighting, Inc.; nBRG or comparable product by one of the following:
 - a. [Cooper Industries, Inc.](#)
 - b. [Leviton Manufacturing Co., Inc.](#)
2. Suitable for surface mount to a standard 4 by 4-inch (100 by 100 mm) square junction box.
3. Communication Ports: Eight RJ-45 ports for connection to lighting control zones (up to 128 devices per port), additional network bridges, and System Controller.
4. Capable of aggregating communication from multiple lighting control zones for purposes of minimizing backbone wiring requirements back to System Controller.
5. Power Input: Class 2 low-voltage supplied locally via a directly wired power supply.
6. Wired Bridge capable of redistributing power from its local supply and connected lighting control zones with excess power to lighting control zones with insufficient local power. Architecture enables loss of power to a particular area to be less impactful on network lighting control system.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install in accordance with manufacturer's instructions and wiring diagrams.
- B. Contractor shall provide all components, etc. above those specified or shown for a complete installation.

3.2 SYSTEM TRAINING

- A. Include (2) 4 four-hour training sessions. These training sessions shall be on different days, which will require two separate trips by the instructor. The training shall take place at the Owner's facility.

3.3 FUNCTIONAL TESTING

- A. Provide functional testing with 2013 ASHRAE.
- B. Provide certified documents that lighting controls were tested for programming and working conditions.

A. END OF SECTION

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SECTION 26 22 00 - LOW VOLTAGE TRANSFORMERS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Dry type two winding transformers.

1.2 RELATED SECTIONS

- A. All drawings and specification sections apply to work in this section. Furnish all items, articles, materials, equipment, operations or methods that are mentioned, listed or scheduled on drawings or are in this specification including all labor, equipment, materials and miscellaneous incidentals necessary and/or required for the completion of this project. The work covered under this section of the specifications is in no way complete within itself but is supplementary to the entire specification and drawings.

1.3 REFERENCES

- A. NEMA ST 1 - Specialty Transformers
- B. NEMA ST 20 - Dry Type Transformers for General Applications.
- C. Conform to requirements of 2015 Michigan Building Code, 2023 National Electrical Code, 2023 Michigan Electrical Code Rules Part 8, 2017 ICC/ANSI A117.1 and local code requirements.

1.4 SUBMITTALS

- A. Provide submittal as listed in Section 26 01 00.
- B. Product Data: Provide outline and support point dimensions of enclosures and accessories, unit weight, voltage, kVA, and impedance ratings and characteristics, tap configurations, insulation system type, and rated temperature rise.
- C. Test Reports: Indicate loss data, efficiency at 25, 50, 75 and 100 percent rated load, and sound level.
- D. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by Product testing agency specified under Regulatory Requirements. Include instructions for storage, handling, protection, examination, preparation, installation, and starting of Product.
- E. Manufacturer's Certificate: Certify that Products meet or exceed specified requirements.

1.5 REGULATORY REQUIREMENTS

- A. Conform to requirements of 2015 Michigan Building Code, 2023 National Electrical Code, 2023 Michigan Electrical Code Rules Part 8, 2017 ICC/ANSI A117.1 and local code requirements.
- B. Furnish products listed and classified by UL as suitable for purpose specified and shown.
- C. Department of Energy 2016 ruling 10 CFR Part 431 for transformer efficient levels.
- D. Transformer shall be UL listed or labeled to meet the requirements of 2023 National Electric Code, 2023 Michigan Electric Code Rules Part 8, and local authority having jurisdiction

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Store, protect, and handle products to site.
- B. Deliver transformers individually wrapped for protection and mounted on shipping skids.
- C. Accept transformers on site. Inspect for damage.
- D. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.
- E. Handle in accordance with manufacturer's written instructions. Lift only with lugs provided for the purpose. Handle carefully to avoid damage to transformer internal components, enclosure, and finish.

PART 2 PRODUCTS

2.1 TWO-WINDING TRANSFORMERS

- A. Manufacturers:
 - 1. As scheduled on the drawings.
- B. Description: NEMA ST 20, factory-assembled, air cooled dry type transformers, ratings as indicated.
- C. Insulation system and average winding temperature rise for rated kVA as follows:
 - 1. 1-15 kVA: Class 185 with 115 degrees C rise, and aluminum windings, DOE compliant.
 - 2. 16-500 kVA: Class 220 with 115 degrees C rise, and aluminum windings, DOE compliant.
- D. Case temperature: Do not exceed 40 degrees C rise above ambient at warmest point.
- E. Winding Taps:
 - 1. Transformers Less than 15 kVA: Two 5 percent below rated voltage, full capacity taps on primary winding.

2. Transformers 15 kVA and Larger: NEMA ST 20.
- F. Sound Levels: NEMA ST 20. Maximum sound levels are as follows:
 1. 1-5 kVA: 40 dB.
 2. 6-25 kVA: 45 dB.
 3. 26-150 kVA: 50 dB.
 4. 151-225 kVA: 55 dB.
 5. 226-300 kVA: 55 dB.
 6. 301-500 kVA: 60 dB.
 - G. Basic Impulse Level: 10 kV for transformers less than 300 kVA, 30 kV for transformers 300 kVA and larger.
 - H. Ground core and coil assembly to enclosure by means of a visible flexible copper grounding strap.
 - I. Mounting: Suitable for wall, floor, or trapeze mounting.
 - J. Coil Conductors: Continuous windings with terminations brazed or welded.
 - K. Isolate core and coil from enclosure using vibration-absorbing mounts.
 - L. Nameplate: Include transformer connection data and overload capacity based on rated allowable temperature rise.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that surfaces are suitable for installing transformer supports.

3.2 INSTALLATION

- A. Install Products in accordance with manufacturer's instructions.
- B. Set transformer plumb and level.
- C. Use flexible conduit, under the provisions of Section 26 05 33.13, for the final wiring connection to the transformer. Make conduit connections to side panel of enclosure.
- D. Mount transformers on vibration isolating pads suitable for isolating the transformer noise from the building structure as noted or shown.
- E. Provide grounding and bonding in accordance with Section 26 05 26.
- F. Use a trapeze type transformer support or knee brace support unless noted otherwise.

3.3 FIELD QUALITY CONTROL

- A. Field inspection and testing will be performed to assure proper operation.

- B. Check for damage and tight connections prior to energizing transformer.
- C. Measure primary and secondary voltages and make appropriate tap adjustments.

A. END OF SECTION

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SECTION 26 24 16 - PANELBOARDS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Distribution panelboards.
- B. Branch circuit panelboards.

1.2 RELATED SECTIONS

- A. All drawings and specification sections apply to work in this section. Furnish all items, articles, materials, equipment, operations or methods that are mentioned, listed or scheduled on drawings or are in this specification including all labor, equipment, materials and miscellaneous incidentals necessary and/or required for the completion of this project. The work covered under this section of the specifications is in no way complete within itself but is supplementary to the entire specification and drawings.

1.3 REFERENCES

- A. NEMA AB 1 - Molded Case Circuit Breakers.
- B. NEMA ICS 2 - Industrial Control Devices, Controllers, and Assemblies.
- C. NEMA KS 1 - Enclosed Switches.
- D. NEMA PB 1 - Panelboards.
- E. NEMA PB 1.1 - Instructions for Safe Installation, Operation and Maintenance of Panelboards Rated 600 Volts or Less.
- F. Conform to requirements of 2015 Michigan Building Code, 2023 National Electrical Code, 2023 Michigan Electrical Code Rules Part 8, 2017 ICC/ANSI A117.1 and local code requirements.

1.4 SUBMITTALS

- A. Provide submittal as listed in Section 26 01 00.
- B. Shop Drawings: Indicate outline and support point dimensions, voltage, main bus ampacity, integrated short circuit ampere rating, circuit breaker and fusible switch arrangement and sizes.
- C. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by Product testing agency. Include instructions for storage, handling, protection, examination, preparation, installation, and starting of Product.

- D. Panelboard submittal shall match drawing schedule arrangement. Submittal shall custom edit schedules to match design drawings.
- E. Manufacturer and Contractor shall verify the overcurrent protective device to match wire size as shown and noted in the bid documents.

1.5 OPERATION AND MAINTENANCE DATA

- A. Maintenance Data: Include spare parts data listing; source and current prices of replacement parts and supplies; and recommended maintenance procedures and intervals.

1.6 REGULATORY REQUIREMENTS

- A. Conform to requirements of 2015 Michigan Building Code, 2023 National Electrical Code, 2023 Michigan Electrical Code Rules Part 8, 2017 ICC/ANSI A117.1 and local code requirements.
- B. Furnish products listed and classified by UL as suitable for purpose specified and indicated.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. As scheduled on the drawings.

2.2 DISTRIBUTION PANELBOARDS

- A. Panelboards: NEMA PB 1, circuit breaker type or fusible switch type per plan.
- B. Panelboard Bus: Copper, ratings as indicated. Provide copper ground bus in each panelboard.
- C. Fusible Switch Assemblies: NEMA KS 1, quick-make, quick-break, load interrupter enclosed knife switch with externally operable handle. Provide interlock to prevent opening front cover with switch in ON position. Handle lockable in OFF position. Fuse clips: Designed to accommodate Class R fuses.
- D. Molded Case Circuit Breakers: NEMA AB 1. Provide circuit breakers with integral thermal and instantaneous magnetic trip in each pole. Provide circuit breakers UL listed as Type HACR for air conditioning equipment branch circuits.
- E. Molded Case Circuit Breakers with Current Limiters: NEMA AB 1. Provide circuit breakers with replaceable current limiting elements, in addition to integral thermal and instantaneous magnetic trip in each pole.
- F. Current Limiting Molded Case Circuit Breakers: NEMA AB 1. Provide circuit breakers with integral thermal and instantaneous magnetic trip in each pole, coordinated with automatically resetting current limiting elements in each pole.

- G. Provide circuit breaker accessory trip units and auxiliary switches as indicated.
- H. Cabinet Front: Surface type, fastened with concealed trim clamps, hinge and latch. Provide hinged door with flush lock. Finish in manufacturer's standard gray enamel.

2.3 BRANCH CIRCUIT PANELBOARDS

- A. As scheduled on the drawings.

2.4 FUSES

- A. Manufacturers:
 - 1. Bussman, or equal.
- B. Fuses 600 Amperes and Less: Dual element, current limiting, time delay, one-time fuse, 600 volt.
- C. Fuses 601 Amperes and Larger: Current limiting, time delay one time fuse, 600 volt, UL Class L.
- D. Interrupting Rating: 200,000 rms amperes.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install panelboards in accordance with NEMA PB 1.1.
- B. Height: 6 ft to top of panelboard; install panelboards taller than 6 ft with bottom no more than 4 inches above floor.
- C. Provide filler plates for unused spaces in panelboards.
- D. Provide typed circuit directory for each branch circuit panelboard. Revise directory to reflect circuiting changes required to balance phase loads.
- E. Provide engraved plastic nameplates under the provisions of Section 26 05 53.
- F. Provide spare conduits out of each recessed panelboard to an accessible location above ceiling. Minimum spare conduits: 5 empty 1 inch. Identify each as SPARE.

3.2 FIELD QUALITY CONTROL

- A. Field inspection and testing will be performed to assure proper operation.
- B. Measure steady state load currents at each panelboard feeder; rearrange circuits in the panelboard to balance the phase loads to within 20 percent of each other. Maintain proper phasing for multi-wire branch circuits.

- C. Visual and Mechanical Inspection: Inspect for physical damage, proper alignment, anchorage, and grounding. Check proper installation and tightness of connections for circuit breakers, fusible switches, and fuses.

A. END OF SECTION

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SECTION 26 27 16 - ELECTRICAL CABINETS AND ENCLOSURES

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Hinged cover enclosures.
- B. Cabinets.
- C. Terminal blocks.
- D. Accessories.

1.2 RELATED SECTIONS

- A. All drawings and specification sections apply to work in this section. Furnish all items, articles, materials, equipment, operations or methods that are mentioned, listed or scheduled on drawings or are in this specification including all labor, equipment, materials and miscellaneous incidentals necessary and/or required for the completion of this project. The work covered under this section of the specifications is in no way complete within itself but is supplementary to the entire specification and drawings.

1.3 REFERENCES

- A. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).
- B. NEMA ICS 4 - Terminal Blocks for Industrial Control Equipment and Systems.
- C. Conform to requirements of 2015 Michigan Building Code, 2023 National Electrical Code, 2023 Michigan Electrical Code Rules Part 8, 2017 ICC/ANSI A117.1 and local code requirements.

1.4 SUBMITTALS

- A. Provide submittal as listed in 26 01 00.
- B. Product Data: Provide manufacturer's standard data for enclosures and cabinets.
- C. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by Product testing agency specified under Regulatory Requirements. Include instructions for storage, handling, protection, examination, preparation, installation, and starting of Product.

1.5 EXTRA MATERIALS

- A. Provide two (2) of each cabinet key.

1.6 REGULATORY REQUIREMENTS

- A. Conform to requirements of 2015 Michigan Building Code, 2023 National Electrical Code, 2023 Michigan Electrical Code Rules Part 8, 2017 ICC/ANSI A117.1 and local code requirements.
- B. Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for purpose specified and indicated.

PART 2 PRODUCTS

2.1 HINGED COVER ENCLOSURES

- A. As scheduled on the drawing.

2.2 CABINETS

- A. As scheduled on the drawing.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that surfaces are ready to receive Work.

3.2 INSTALLATION

- A. Install Products in accordance with manufacturer's instructions.
- B. Install enclosures and boxes plumb. Anchor securely to wall and structural supports at each corner.
- C. Install cabinet fronts plumb.

A. END OF SECTION

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SECTION 26 27 26 - WIRING DEVICES

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Wall switches.
- B. Receptacles.
- C. Device plates.
- D. Floor box service fittings.
- E. Tamper resistant receptacles.

1.2 RELATED SECTIONS

- A. All drawings and specification sections apply to work in this section. Furnish all items, articles, materials, equipment, operations or methods that are mentioned, listed or scheduled on drawings or are in this specification including all labor, equipment, materials and miscellaneous incidentals necessary and/or required for the completion of this project. The work covered under this section of the specifications is in no way complete within itself but is supplementary to the entire specification and drawings.

1.3 REFERENCES

- A. NEMA WD 1 - General Requirements for Wiring Devices.
- B. NEMA WD 6 - Wiring Device -- Dimensional Requirements.
- C. Conform to requirements of 2015 Michigan Building Code, 2023 National Electrical Code, 2023 Michigan Electrical Code Rules Part 8, 2017 ICC/ANSI A117.1 and local code requirements.
- D. ADA - Americans with Disabilities Act - As amended.

1.4 REGULATORY REQUIREMENTS

- A. Conform to requirements of 2015 Michigan Building Code, 2023 National Electrical Code, 2023 Michigan Electrical Code Rules Part 8, 2017 ICC/ANSI A117.1 and local code requirements.
- B. Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for purpose specified and indicated.

PART 2 PRODUCTS

2.1 WALL SWITCHES

- A. Manufacturers:
 - 1. Pass & Seymour, Hubbell, Leviton or equal.
- B. Description: NEMA WD 1, Heavy-Duty, AC only general-use snap switch.
- C. Body and Handle: Color to be determined from standard colors by the Architect.
- D. Ratings:
 - 1. Voltage: 120/277 volts, AC.
 - 2. Current: 20 amperes.
- E. Boiler Emergency Power Off
 - 1. Provide EPO station as scheduled on the drawings.

2.2 WALL DIMMERS

- A. Manufacturers:
 - 1. As scheduled on the drawings.

2.3 RECEPTACLES

- A. Manufacturers:
 - 1. Hubbell, Pass & Seymour, Leviton, or equal
- B. Description: NEMA WD 1, Heavy-duty specification grade duplex receptacle.
- C. Device Body: Color to be determined from standard colors by the Architect.
- D. Configuration: NEMA WD 6, type as specified and indicated.
- E. Convenience Receptacle: Type 5-20.
- F. GFCI Receptacle: Convenience duplex receptacle with integral ground fault circuit interrupter to meet regulatory requirements.
- G. Damp and wet location receptacles shall be rated "WR".
- H. Tamper Resistant Receptacles
 - 1. All 15 amp and 20 amp receptacles shall be listed tamper resistant as follows:
 - Dwelling units.
 - Guest rooms.
 - Child care facilities.
 - Preschools and elementary education facilities.
 - Business offices, corridors, waiting rooms, and the like in clinics, medical and dental offices, and outpatient facilities.
 - Assembly occupancies, including gyms, skating rinks, and auditoriums.

2.4 WALL PLATES

- A. Cover Plate: stainless steel

- B. Use "in use" weather proof metallic covers at exterior locations as indicated on the drawings to meet 2023 NEC Section 406.
- C. Provide blank metal cover plates on abandoned boxes.
- D. Provide stamped metal cover plate for unfinished spaces.

2.5 FLOOR MOUNTED SERVICE FITTINGS

- A. As scheduled on the drawings.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that outlet boxes are installed at proper height.
- B. Verify that wall openings are neatly cut and will be completely covered by wall plates.
- C. Verify that floor boxes are adjusted properly.
- D. Verify that branch circuit wiring installation is completed, tested, and ready for connection to wiring devices.

3.2 PREPARATION

- A. Provide extension rings to bring outlet boxes flush with finished surface.
- B. Clean debris from outlet boxes.

3.3 INSTALLATION

- A. Install devices plumb and level.
- B. Install switches with OFF position down.
- C. Install receptacles with grounding pole on bottom.
- D. Connect wiring device grounding terminal to outlet box with bonding jumper or branch circuit equipment grounding conductor where specified.
- E. Install plates on switch, receptacle, and blank outlets in finished areas.
- F. Connect wiring devices by wrapping conductor around screw terminal.
- G. Install galvanized steel plates on outlet boxes and junction boxes in unfinished areas, above accessible ceilings, and on surface mounted outlets.
- H. Install protective rings on active flush cover service fittings.

- I. Shared neutral are not permitted for lighting and power circuits.

3.4 INTERFACE WITH OTHER PRODUCTS

- A. Confirm with architectural drawings for counter casework, etc. details for wiring devices mounting heights.
- B. Install wall switch 48 inches to top of box above finished floor.
- C. Install convenience receptacle 16 inches to bottom of box above finished floor.
- D. Install convenience receptacle 6 inches above backsplash of counter.
- E. Install dimmer 48 inches to top of box above finished floor.
- F. 18" mounting height is lieu of the 16" minimum specified is acceptable pending masonry course lines.
- G. Electrical Trades shall review 2017 ICC/ANSI A117.1 for ADA requirements. Obtain a copy as required.
- H. Refer to all other sections of the specification, drawings, and Architectural drawing for specific mounting requirements for clocks, receptacles shown in counters, work stations. Do not rely solely on the electrical drawings for this information. Division 26, 27 & 28 Contractor shall be responsible to review all project documentation and obtain all required information from the district.
- I. Refer to section 28 31 00 and drawing notes for fire alarm device mounting heights.

3.5 FIELD QUALITY CONTROL

- A. Inspect each wiring device for defects.
- B. Operate each wall switch with circuit energized and verify proper operation.
- C. Verify that each receptacle device is energized.
- D. Test each receptacle device for proper polarity.
- E. Test each GFCI receptacle device for proper operation.

3.6 ADJUSTING

- A. Adjust devices and wall plates to be flush and level.

A. END OF SECTION

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SECTION 26 28 13 - FUSES

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Fuses.

1.2 RELATED SECTIONS

- A. All drawings and specification sections apply to work in this section. Furnish all items, articles, materials, equipment, operations or methods that are mentioned, listed or scheduled on drawings or are in this specification including all labor, equipment, materials and miscellaneous incidentals necessary and/or required for the completion of this project. The work covered under this section of the specifications is in no way complete within itself but is supplementary to the entire specification and drawings.

1.3 REFERENCES

- A. Conform to requirements of 2015 Michigan Building Code, 2023 National Electrical Code, 2023 Michigan Electrical Code Rules Part 8, 2017 ICC/ANSI A117.1 and local code requirements.
- B. NEMA FU 1 - Low Voltage Cartridge Fuses.

1.4 PROJECT RECORD DOCUMENTS

- A. Record actual fuse sizes.

1.5 REGULATORY REQUIREMENTS

- A. Conform to requirements of 2015 Michigan Building Code, 2023 National Electrical Code, 2023 Michigan Electrical Code Rules Part 8, 2017 ICC/ANSI A117.1 and local code requirements.
- B. Furnish products listed and classified by UL as suitable for purpose specified and indicated.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Bussman or equal.

2.2 FUSE REQUIREMENTS

- A. Dimensions and Performance: NEMA FU 1, Class as specified or indicated.
- B. Voltage: Provide fuses with voltage rating suitable for circuit phase-to-phase voltage.

C. Main Service Switches Larger than 600 amperes: Class L (time delay).

2.3 CLASS RK1 (TIME DELAY) CURRENT LIMITING FUSES

A. Manufacturers:

1. Bussman or equal.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install fuses in accordance with manufacturer's instructions.

B. Install fuse with label oriented such that manufacturer, type, and size are easily read.

A. END OF SECTION

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SECTION 26 28 16 - ENCLOSED SWITCHES AND CIRCUIT BREAKERS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Fusible switches.
- B. Nonfusible switches.
- C. Fuses.

1.2 REFERENCES

- A. NEMA KS 1 - Enclosed Switches.
- B. Conform to requirements of 2015 Michigan Building Code, 2023 National Electrical Code, 2023 Michigan Electrical Code Rules Part 8, 2017 ICC/ANSI A117.1 and local code requirements.
- C. UL 198C - High-Interrupting Capacity Fuses; Current Limiting Type.
- D. UL 198E - Class R Fuses.

1.3 SUBMITTALS

- A. Provide submittal as listed in Section 26 01 00.
- B. Product Data: Provide switch ratings and enclosure dimensions.
- C. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by Product testing agency specified under Regulatory Requirements. Include instructions for storage, handling, protection, examination, preparation, installation, and starting of Product.

1.4 REGULATORY REQUIREMENTS

- A. Conform to requirements of 2015 Michigan Building Code, 2023 National Electrical Code, 2023 Michigan Electrical Code Rules Part 8, 2017 ICC/ANSI A117.1 and local code requirements.
- B. Furnish products listed and classified by UL as suitable for purpose specified and shown.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. As scheduled on the drawings.

2.2 ENCLOSED SWITCHES

- A. Fusible Switch Assemblies: NEMA KS 1, Type Heavy Duty load interrupter enclosed knife switch with externally operable handle interlocked to prevent opening front cover with switch in ON position. Handle lockable in OFF position. Fuse clips: Designed to accommodate Class R fuses.
- B. Nonfusible Switch Assemblies: NEMA KS 1, Type Heavy Duty load interrupter enclosed knife switch with externally operable handle interlocked to prevent opening front cover with switch in ON position. Handle lockable in OFF position.
- C. Enclosures: NEMA KS 1.
 - 1. Interior Dry Locations: Type 1.
 - 2. Exterior Locations: Type 3R.
- D. Disconnect switches serving the elevator main power must be a heavy duty type to meet the State of Michigan Elevator Code. Disconnect switch shall include auxiliary contacts for use by the elevator contractor to send a signal the main power disconnect is open.

2.3 FUSES

- A. Manufacturers:
 - 1. Bussman or equal.
- B. Description: Dual element, current limiting, time delay, one-time fuse, 600 volt.
- C. Interrupting Rating: 200,000 rms amperes.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install disconnect switches where indicated.
- B. Install fuses in fusible disconnect switches.
- C. Provide adhesive label on inside door of each switch indicating UL fuse class and size for replacement.
- D. Contractor shall confirm final elevator main power requirements to properly size the disconnect switch and fusing.
- E. Electrical Contractor shall be responsible to review the mechanical equipment schedules to determine if any factory installed switches are scheduled and noted as part of the equipment to minimize duplication by electrical trades.
- F. Furnish and install a separate lockable fusible disconnect switch for the elevator car fan and light.
- G. Furnish and install a lockable fusible disconnect switch for each boiler main incoming power disconnecting means to meet the State's Boiler Code Division requirements.

A. END OF SECTION

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SECTION 26 29 13 - ENCLOSED CONTROLLERS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Manual motor starters.
- B. Combination magnetic motor starters.

1.2 RELATED SECTIONS

- A. All drawings and specification sections apply to work in this section. Furnish all items, articles, materials, equipment, operations or methods that are mentioned, listed or scheduled on drawings or are in this specification including all labor, equipment, materials and miscellaneous incidentals necessary and/or required for the completion of this project. The work covered under this section of the specifications is in no way complete within itself but is supplementary to the entire specification and drawings.

1.3 REFERENCES

- A. Conform to requirements of 2015 Michigan Building Code, 2023 National Electrical Code, 2023 Michigan Electrical Code Rules Part 8, 2017 ICC/ANSI A117.1 and local code requirements.
- B. UL 198C - High-Interrupting Capacity Fuses; Current Limiting Type.
- C. UL 198E - Class R Fuses.
- D. NEMA AB 1 - Molded Case Circuit Breakers.
- E. NEMA ICS 2 - Industrial Control Devices, Controllers, and Assemblies.
- F. NEMA ICS 6 - Enclosures for Industrial Controls and Systems.
- G. NEMA KS 1 - Enclosed Switches.

1.4 SUBMITTALS

- A. Provide submittal as listed in Section 26 01 00.
- B. Product Data: Provide catalog sheets showing voltage, controller size, ratings and size of switching and overcurrent protective devices, short circuit ratings, dimensions, and enclosure details.
- C. Test Reports: Indicate field test and inspection procedures and test results.
- D. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by Product testing agency specified under Regulatory

Requirements. Include instructions for storage, handling, protection, examination, preparation, installation, and starting of Product.

1.5 REGULATORY REQUIREMENTS

- A. Conform to requirements of 2015 Michigan Building Code, 2023 National Electrical Code, 2023 Michigan Electrical Code Rules Part 8, 2017 ICC/ANSI A117.1 and local code requirements.
- B. Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for purpose specified and indicated.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. As scheduled on the drawings.

2.2 MANUAL CONTROLLERS

- A. As scheduled on the drawings.

2.3 POWER RELAYS

- A. As scheduled on the drawings.
- B. Furnish and install the power relay for the new mechanical equipment as shown on the drawings to allow for interface by the BAS contractor.

2.4 COMBINATION MOTOR STARTERS

- A. As scheduled on the drawings.

2.5 UNIT HEATERS

- A. Provide manual motor starter as noted and shown on the drawing.
- B. Electrical Trades shall install and wire all loose pump starter panels furnished as part of Mechanical Trades. Electrical Trades shall be responsible to determine what mechanical equipment will have loose equipment and include costs as part of the bid submitted. Contact the mechanical bidders to obtain all information. All control wiring shall be completed as part of the temperature control contractor bid.

2.6 BOILER IN-LINE CIRCULATING PUMPS

- A. Provide manual motor starter and power relays as noted and shown on the drawing.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install enclosed controllers where indicated, in accordance with manufacturer's instructions.
- B. Install enclosed controllers plumb. Provide supports in accordance with Section 26 05 29.
- C. Height: 5 ft to operating handle.
- D. Install fuses in fusible switches.
- E. Select and install overload heater elements in motor controllers to match installed motor characteristics.
- F. Provide engraved plastic nameplates under the provisions of Section 26 05 53.
- G. Provide neatly typed label inside each motor controller door identifying motor served, nameplate horsepower, full load amperes, code letter, service factor, and voltage/phase rating.

3.2 FIELD QUALITY CONTROL

- A. Field inspection and testing will be performed for proper operation.
- B. Inspect and test each enclosed controller to NEMA ICS 2.

A. END OF SECTION

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SECTION 26 33 19 - CENTRAL BATTERY EQUIPMENT FOR EMERGENCY LIGHTING

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Emergency Inverter.

1.2 RELATED SECTIONS

- A. All drawings and specification sections apply to work in this section. Furnish all items, articles, materials, equipment, operations or methods that are mentioned, listed or scheduled on drawings or are in this specification including all labor, equipment, materials and miscellaneous incidentals necessary and/or required for the completion of this project. The work covered under this section of the specifications is in no way complete within itself but is supplementary to the entire specification and drawings.

1.3 REFERENCES

- A. Conform to requirements of 2015 Michigan Building Code, 2023 National Electrical Code, 2023 Michigan Electrical Code Rules Part 8, 2017 ICC/ANSI A117.1 and local code requirements.

1.4 SCOPE

- A. Furnish and install emergency inverters to serve emergency lighting in accordance with plans and specifications.

1.5 OPERATION AND MAINTENANCE DATA

- A. Operation Data: Include instructions for operation.
- B. Maintenance Data: Include UPS drawings, interconnecting wiring diagrams, routine maintenance requirement and procedures. Include O & M manuals.

1.6 REGULATORY REQUIREMENTS

- A. Conform to requirements of 2015 Michigan Building Code, 2023 National Electrical Code, 2023 Michigan Electrical Code Rules Part 8, 2017 ICC/ANSI A117.1 and local code requirements.

1.7 DELIVERY, STORAGE AND HANDLING

- A. Contractor shall accept, unload, store, protect, set and install the inverter.

1.8 SUBMITTALS

- A. Provide submittals as listed in Section 26 01 00.

- B. Shop Drawings: Indicate electrical characteristics and connection requirements. Provide dimensions; battery type, size, dimensions, and weight; detailed equipment outlines, weight, and dimensions; location of conduit entry and exit; single-line diagram indicating metering, control, and external wiring requirements.
- C. Product Data: Provide catalog sheets and technical data sheets to indicate physical data and electrical performance, electrical characteristics, and connection requirements.

PART 2 PRODUCTS

2.1 EMERGENCY INVERTER INPUT

- A. Input
 - 1. Input voltage as scheduled on the drawings.
 - 2. Input frequency 60 hz.
 - 3. Input rating as scheduled on the drawings.
 - 4. Harmonic distortion 10% or less for restrictive load.
- B. Output.
 - 1. Output voltage as scheduled on the drawings
 - 2. Static voltage +/- 2%
 - 3. Harmonic distortion 3% THD
 - 4. Output types normally on, normally off or switch.

2.2 TRANSFER TIME

- A. 2-10 milliseconds.

2.3 BATTERY OPERATION

- A. Minimum 90 minutes.

2.4 INVERTER COMPATIBILITY

- A. Compatible to LED lighting.

2.5 UL LISTED

- A. UL 924 listed

2.6 SINE WAVES

- A. Pure sine technology.

2.7 ENCLOSURE

- A. Indicator lights for charge, ready and test switch.

2.8 BATTERY

- A. Lead acid type.

2.9 ACCEPTABLE MANUFACTURER

- A. Iota, Bodine or Myers, Power Sentry

PART 3 EXECUTION

3.1 SOURCE QUALITY CONTROL

- A. Factory tested to ensure proper operation.

3.2 FIELD QUALITY CONTROL

- A. Onsite testing.
- B. Onsite start-up/commissioning.

3.3 WARRANTY

- A. Battery 1 year.
- B. Electronics 3 years.

3.4 SYSTEM TRAINING

- A. Onsite training at the commissioning, at the end of 12 month operation, and the end of warranty period.

A. END OF SECTION

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SECTION 26 51 00 - INTERIOR LIGHTING

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Interior luminaires per schedule.

1.2 RELATED SECTIONS

- A. All drawings and specification sections apply to work in this section. Furnish all items, articles, materials, equipment, operations or methods that are mentioned, listed or scheduled on drawings or are in this specification including all labor, equipment, materials and miscellaneous incidentals necessary and/or required for the completion of this project. The work covered under this section of the specifications is in no way complete within itself but is supplementary to the entire specification and drawings.

1.3 REFERENCES

- A. NEMA WD 6 - Wiring Devices-Dimensional Requirements.
- B. Conform to requirements of 2015 Michigan Building Code, 2023 National Electrical Code, 2023 Michigan Electrical Code Rules Part 8, 2017 ICC/ANSI A117.1 and local code requirements.
- C. NFPA 101 - Life Safety Code, current adopted edition.
- D. 2015 Michigan Energy Code.
- E. ASHRAE 90.1 2013 Edition.
- F. LED Standards LM 79 and LM 80.

1.4 SUBMITTALS FOR REVIEW

- A. Provide submittal as listed in Section 26 01 00.
- B. Shop Drawings: Indicate dimensions and components for each luminaire that is not a standard product of the manufacturer.
- C. Product Data: Provide dimensions, ratings, and performance data.

1.5 REGULATORY REQUIREMENTS

- A. Conform to requirements of 2015 Michigan Building Code, 2023 National Electrical Code, 2023 Michigan Electrical Code Rules Part 8, 2017 ICC/ANSI A117.1 and local code requirements.
- B. Conform to requirements of NFPA 101.

- C. Products: Listed and classified by Underwriters Laboratories, Inc. as suitable for the purpose specified and indicated.
- D. 2015 Michigan Energy Code.

PART 2 PRODUCTS

2.1 LUMINAIRES

- A. Furnish Products as scheduled on the drawings.

2.2 LED DRIVERS

- A. LED drivers shall include a factory disconnecting means in accordance with 2023 NEC 410-130G.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install suspended luminaires using pendants supported from swivel hangers. Provide pendant length required to suspend luminaire at indicated height.
- B. Support luminaires independent of ceiling framing.
- C. Locate recessed ceiling luminaires as indicated on reflected ceiling plan.
- D. Install surface mounted luminaires and exit signs plumb and adjust to align with building lines and with each other. Secure to prevent movement.
- E. Exposed Grid Ceilings: Provide auxiliary members spanning ceiling grid members to support surface mounted luminaires. Fasten surface mounted luminaires to ceiling grid members using bolts, screws, rivets, or suitable clips at a minimum of (4) points of attachment to prevent movement.
- F. Install recessed luminaires to permit removal from below.
- G. Install recessed luminaires using accessories and firestopping materials to meet regulatory requirements for fire rating.
- H. Install clips to secure recessed grid-supported luminaires in place at a minimum of (4) points of attachment to prevent movement.
- I. Install wall mounted luminaires at height as indicated on Drawings and/or architectural drawings.
- J. Install accessories furnished with each luminaire.
- K. Connect emergency luminaires and exit signs to the emergency distribution or inverter as noted and shown on the drawings.

- L. Make wiring connections to branch circuit using building wire with insulation suitable for temperature conditions within luminaire.
- M. Bond products and metal accessories to branch circuit equipment grounding conductor.
- N. Luminaires specified with factory installed battery drivers shall be wired as noted and shown on the drawings.

3.2 FIELD QUALITY CONTROL

- A. Operate each luminaire after installation and connection. Inspect for proper connection and operation.

3.3 ADJUSTING

- A. Contract Closeout: Division 1: Adjusting installed work.
- B. Aim and adjust luminaires as indicated or as directed.
- C. Position exit sign directional arrows as indicated.

3.4 CLEANING

- A. Contract Closeout: Cleaning installed work.
- B. Clean electrical parts to remove conductive and deleterious materials.
- C. Remove dirt and debris from enclosures.
- D. Clean photometric control surfaces as recommended by manufacturer.
- E. Clean finishes and touch up damage.

3.5 DEMONSTRATION AND INSTRUCTIONS

- A. Replace light fixtures with non-working LED's, broken or discolored lens.

3.6 PROTECTION OF FINISHED WORK

- A. Contract Closeout: Protecting installed work.

3.7 SCHEDULES

- A. Refer to Drawings.

END OF SECTION

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SECTION 26 56 00 - EXTERIOR LIGHTING

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Exterior luminaires and accessories.

1.2 RELATED SECTIONS

- A. All drawings and specification sections apply to work in this section. Furnish all items, articles, materials, equipment, operations or methods that are mentioned, listed or scheduled on drawings or are in this specification including all labor, equipment, materials and miscellaneous incidentals necessary and/or required for the completion of this project. The work covered under this section of the specifications is in no way complete within itself but is supplementary to the entire specification and drawings.

1.3 REFERENCES

- A. LED Standards LM 79 and LM 80.
- B. ANSI O5.1 - Specifications and Dimensions for Wood Poles.
- C. IES 10th Edition.
- D. Conform to requirements of 2015 Michigan Building Code, 2023 National Electrical Code, 2023 Michigan Electrical Code Rules Part 8, 2017 ICC/ANSI A117.1 and local code requirements.
- E. 2015 Michigan Energy Code.

1.4 SUBMITTALS FOR REVIEW

- A. Provide submittal as listed in Section 26 01 00.
- B. Shop Drawings: Indicate dimensions and components for each luminaire which is not a standard Product of the manufacturer.
- C. Product Data: Provide dimensions, ratings, and performance data.

1.5 REGULATORY REQUIREMENTS

- A. Conform to requirements of 2015 Michigan Building Code, 2023 National Electrical Code, 2023 Michigan Electrical Code Rules Part 8, 2017 ICC/ANSI A117.1 and local code requirements.
- B. Products: Listed and classified by Underwriters Laboratories, Inc. as suitable for the purpose specified and indicated.
- C. Michigan Uniform Energy Code.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Material and Equipment: Transport, handle, store, and protect products.
- B. Store and handle solid wood poles in accordance with ANSI O5.1.

1.7 COORDINATION

- A. Coordination, refer to Division 1.

PART 2 PRODUCTS

2.1 LUMINAIRES AND ACCESSORIES

- A. Furnish Products as scheduled on the drawings.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Bond luminaires to branch circuit equipment grounding conductor. Provide supplementary grounding electrode at each pole.

3.2 FIELD QUALITY CONTROL

- A. Operate each luminaire after installation and connection. Inspect for improper connections and operation.
- B. Measure illumination levels to verify conformance with performance requirements.
- C. Take measurements during night sky, without moon or with heavy overcast clouds effectively obscuring moon.

3.3 ADJUSTING

- A. Contract Closeout: Adjusting installed work, refer to Division 1.
- B. Aim and adjust luminaires to provide illumination levels and distribution as specified.

3.4 CLEANING

- A. Contract Closeout: Cleaning installed work, refer to Division 1.
- B. Clean electrical parts to remove conductive and deleterious materials.
- C. Remove dirt and debris from enclosure.
- D. Clean photometric control surfaces as recommended by manufacturer.
- E. Clean finishes and touch up damage.

3.5 PROTECTION OF FINISHED WORK

- A. Contract Closeout: Protecting installed work, refer to Division 1.
- B. Relamp luminaires which have failed lamps at Substantial Completion.

3.6 SCHEDULE

- A. Refer to drawings.

A. END OF SECTION

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SECTION 27 05 28 - PATHWAYS FOR COMMUNICATION SYSTEM

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Voice/Data raceway.

1.2 RELATED SECTIONS

- A. All drawings and specification sections apply to work in this section. Furnish all items, articles, materials, equipment, operations or methods that are mentioned, listed or scheduled on drawings or are in this specification including all labor, equipment, materials and miscellaneous incidentals necessary and/or required for the completion of this project. The work covered under this section of the specifications is in no way complete within itself but is supplementary to the entire specification and drawings.

1.3 REFERENCES

- A. EIA/TIA-568 - Commercial Building Wiring Standard.
- B. EIA/TIA-569 - Commercial Building Standard for Telecommunication Pathways and Spaces.
- C. Conform to requirements of 2015 Michigan Building Code, 2023 National Electrical Code, 2023 Michigan Electrical Code Rules Part 8, 2017 ICC/ANSI A117.1 and local code requirements.

1.4 SYSTEM DESCRIPTION

- A. Backbone Pathway: Conform to EIA/TIA 569 using combination of conduit and sleeves as indicated.
- B. Horizontal Pathway: Conform to EIA/TIA 569, using raceway, backboards as indicated.
- C. Voice/Data wiring: By contractor

1.5 PROJECT RECORD DOCUMENTS

- A. Submit under provisions of Division 1.
- B. Record actual locations and sizes of pathways and outlets.

1.6 REGULATORY REQUIREMENTS

- A. Conform to requirements of 2015 Michigan Building Code, 2023 National Electrical Code, 2023 Michigan Electrical Code Rules Part 8, 2017 ICC/ANSI A117.1 and local code requirements.

- B. Furnish Products listed and classified by Underwriters Laboratories, Inc. as suitable for purpose specified and indicated.

PART 2 PRODUCTS

Section Not Used

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install raceways in accordance with EIA/TIA 568.
- B. Support raceways and cabinets under the provisions of Section 26 05 29.
- C. Install recessed cabinets flush with wall finishes, and stub 5 empty 1 inch conduits to accessible location above ceiling at each location.
- D. Install polyethylene pulling string in each empty voice conduit over ten feet in length or containing a bend.
- E. Install a #6 AWG green ground wire from rack to ground bar.
- F. Voice/data outlet minimum mounting heights shall match duplex receptacles. Refer to Section 26 06 24.

A. END OF SECTION

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SECTION 27 15 00 - COMMUNICATIONS HORIZONTAL CABLING

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Data patch panel.
- B. Cable management.
- C. Voice/data/terminations.
- D. Wall station faceplate.
- E. Category 6e cable.
- F. Voice cable.
- G. "Interwrite" boards.

1.2 RELATED SECTIONS

- A. All drawings and specification sections apply to work in this section. Furnish all items, articles, materials, equipment, operations or methods that are mentioned, listed or scheduled on drawings or are in this specification including all labor, equipment, materials and miscellaneous incidentals necessary and/or required for the completion of this project. The work covered under this section of the specifications is in no way complete within itself but is supplementary to the entire specification and drawings.

1.3 REFERENCES

- A. ANSI EIA/TIA-568-B.2, 568-B.2, 568-B.3 - Commercial Building Wiring Standard.
- B. Conform to requirements of 2015 Michigan Building Code, 2023 National Electrical Code, 2023 Michigan Electrical Code Rules Part 8, 2017 ICC/ANSI A117.1 and local code requirements.

1.4 REGULATORY REQUIREMENTS

- A. Conform to requirements of 2015 Michigan Building Code, 2023 National Electrical Code, 2023 Michigan Electrical Code Rules Part 8, 2017 ICC/ANSI A117.1 and local code requirements.

1.5 PROJECT RECORD DOCUMENTS

- A. A record shall be compiled and provided to the owner in compliance with the ANSI EIA/TIA 606-A standard.

- B. Each horizontal cable shall be tested in accordance with ANSI EIA/TIA 568-B.2 to verify C6e compliance. Passable test per cable segment shall be submitted to the Owner.

1.6 SUBMITTALS

- A. Provide submittals as listed in Section 26 01 00. The submittal shall be prepared by manufacturer's representative. Supply house or contractor's prepared submittals will be returned
- B. Submittals shall include the total IDF rack layout include patch panels, power strips, cable management, relay rack and all component cut sheets. Mark or arrow cut sheets with catalog numbers. Failure to comply will be cause to return the submittals for corrections at no delays or extra costs to the District.

1.7 SCOPE OF WORK, BUT NOT LIMITED TO THE FOLLOWING

- A. Furnish and install Contractor furnished system components for a complete operating and tested system.
 - 1. General Requirements:
 - a. Contractor shall install new rack permit additional patch panels, CAT 6e cabling. Include all terminations to serve the new data jacks.
 - 2. Specific Project Requirements:
 - a. Remove all existing voice and data cabling from the station side outlets, to the existing distribution frames. Removal shall include all wiring installed from the ceiling space.
 - b. Furnish and install the fire rated wireway specified for cables passing thru fire rated walls as noted and shown on the drawings.
 - c. Furnish and install multi-port faceplate with modular jacks suitable for in-line device mounting.
 - d. Provide J hooks in addition to the wire mesh cable tray. Nylon ties for supports or bundling of new cables are not permitted. Nylon ties are accepted for existing cables that are feasible to be retrained into the new tray.
 - e. Complete all new voice, data cables that exits from the MDF or IDF frames to serve the station side outlets.

1.8 SCOPE OF WORK

- A. The contractor shall provide, install and test the system components including but not limited to the new IDF data rack, power strip, patch panels, horizontal cat6e cabling, supports, cable tray, jacks, faceplates, labeling and terminations. Owner shall provide the fiber optic cabling, terminations, switches, ups and patch cords.

1.9 PERMITS

- A. Contractor shall obtain and pay all permit costs and inspection fees for voice and data device drops.

1.10 PRE-START CONFERENCE

- A. The Contractor shall be responsible to set up a pre-start meeting with the construction manager or the Owner's technology vendor to determine installation phasing and actual work installation methods prior to starting this phase of the work.

PART 2 PRODUCTS

2.1 PATCH PANEL

- A. Refer to drawings for basis of design.

2.2 WALL STATION FACEPLATE

- A. Flush mounted single gang, minimum 4 port. Include blue, C6e, RJ45, modular jack insert for data. Contractor to review the drawing for each station to determine quantity and type. Faceplate covers shall be stainless steel.

2.3 IDF RACK EQUIPMENT

- A. Contractor shall furnish, install and terminate patch panels, cable management components, labeling, wall station faceplate terminations and certifications to match the district's existing installation. Contractor shall review the district's existing rack installation to gain knowledge and technical information methods for design, layout and installation for this project's requirements. Network/communication shop drawing submittals shall include cut sheets of the rack, patch panel, rack layout, face plates, modular jacks, CAT 6E wiring and patch cords.
- B. Contractor shall be responsible to design, layout, and arrange the rack equipment and associated components for a complete system installation. Contractor shall also be responsible to make all field adjustments as directed by the district as well.
- C. Provide components to meet school standards. Hub switches shall be furnished and installed by the school district.

2.4 CATEGORY 6E CABLE

- A. Refer to drawings for basis of design.
Blue jacket - data

PART 3 EXECUTION

3.1 INSTALLATION

- A. Furnish and install all voice/data components in accordance with plans and specifications.

- B. Contractor shall complete all terminations, testing and certifications in accordance with ANSI EIA/TIA 568-B.2 standard. Testing includes all components: cable, patch cords, equipment cords and connecting hardware for copper cable. Fiber optic cable shall be tested to verify length, continuity, and measure loss and/or attenuation.
- C. Label data rack equipment, closet side, station side cables, faceplates.
- D. Firestop all wall sleeve openings conduits and cables installed through the sleeve.
- E. All terminations and test each cable in accordance with the ANSI EIA/TIA 568-B.2 standard. Passable test results per cable shall be provided to the Owner. Written final documentation shall be furnished at closeout of project and serve as part of the as-built records.
- F. Network/Communication cables shall not exceed bend radius or pulling tension. Obtain manufacturer's data prior to starting this phase of the work.
- G. Review the school's facility wide standards voice/data rack installation to gain a knowledgeable insight and technical installation methods for this project.
- H. Contractor shall install data C6e UTP cables from each work station to patch panel in accordance with plans and specification. Each cable shall be a "home run" back to telecommunications room and/or IDF. Splices are not acceptable.
- I. Provide modular jack RJ45 type or as specified.
- J. Furnish and install cable management devices either D-rings, or J hooks above accessible ceilings. Provide EMT conduit for physical protection of all low voltage system cables in exposed areas. Use the cable tray where ever available as noted or shown on the drawings.
- K. Provide firestop caulk for all conduit sleeves and fire rated wireway as shown on the drawings.
- L. Arrange with the Owner during the bid phase to visit an existing facility to review rack configuration, equipment layouts, labeling, patch cords, faceplate modular jack color and labeling scheme.
- M. Provide cable maintenance loops at the racks for all voice and data cables.
- N. Install voice C6E UTP cables from each work station to 110 wiring blocks in accordance with plans and specifications. Each cable shall be a "home run" back to the telecommunications room and/or IDF. Splices are not acceptable.
- O. Minimally compliant cable and connectivity is not acceptable.
- P. Project will require a certified installer and as such, will provide the Owner with a manufacturer's warranty.

A. END OF SECTION

MAI: 2024-9506

SECTION 27 41 25 – Public Address Intercom Communication System

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. The drawings and general provisions of the Contract Documents apply to this Section.

1.2 SUMMARY

- A. This section includes a fully operational IP platform for a district-wide internal and school Critical Communications Solution, incorporating school safety notifications and general communications including but not limited to the following:
 - 1. The platform shall provide complete internal communications and employ state of the art IP Technology including the minimum functions listed.
 - a. Two-way internal intercommunications between staff locations and classrooms.
 - b. Scheduled bell events.
 - c. Emergency announcements that will override any pre-programmed audio, assuring that all Emergency/Lockdown etc., are heard at each speaker location.
 - d. Capability of prerecording emergency announcements that can be activated by a Soft Key on an administrative console, panic button, dial string, mobile app, or web browser.
 - e. Atomic Time Synchronization with Class Change Tones utilizing multiple, programmable schedules for each zone.
 - f. District-wide, Emergency, Group, All School and Zone live voice paging.
 - g. District-wide, Emergency, group, All School and Zone visual messaging.
 - h. District-wide, Emergency, Group, All School and Zone paging for pre-recorded audio – tones, music, and voice.
 - i. Single sign on web-based user interface for multi-school functionality.
 - 2. The system shall support a minimum of 1000 level priorities which shall be user-definable, allowing each end point to place a minimum of 5 different priority calls at the same time.
 - 3. Any authorized administrator shall be able to call from outside the school into any classroom, zone, or entire school directly via the School District supplied SIP enabled Telephone Network. This shall allow remote monitoring, call-in annunciation, and two-way conversation from outside the facility as well as paging into the system. (Compliance with NEMA Standard SB-40 for emergency communications in K-12 Schools).
 - 4. Authorized system users shall be able to create a minimum of 100 automated sequences with voice instructions, tones, emails, program distribution, and relay activations and replay them.
 - 5. Automated message strings shall be manually initiated from a single-button access on the console, on a SIP connected telephone, panic button, mobile app, from the web-based user interface or via interface with third party systems.

6. Paging and two-way intercom features shall be accessible from any system console or SIP connected telephone for each campus.
7. The platform shall synchronize its system time to the network timeserver or a web-based time server.
8. Each single campus installation shall be locally survivable for intercom, paging, bells, and emergencies such as lockdown, even when the district connection is unavailable.
9. The system shall support a REST API for interface to third party systems.
10. Each school shall support an interactive floor plan that displays system activity including call-in and lockdown initiation location and device status.
11. The system shall support displaying all schools' locations on a single map, showing school status including active emergencies.
12. Included in the emergency procedures is the ability to send specific messages and or instructions. These features can be added to the emergency sequences.
13. The ability to require an access code to initiate or clear an emergency from the administrative console.
14. An app that can run on either Android or Apple phones. This app will give the user the ability to initiate one of 18 emergency procedures programmed into the app. This app will also allow you to view all classrooms check in status. This process will update during the emergency to make sure all information is current.
15. The ability to allow the fire alarm system to signal an active fire alarm to TCU. This will allow supplemental visual and audio messaging from Telecenter U. Telecenter U can be programmed to change system state, dependent on the active emergency. Both fire and emergency will be displayed on the administrative console and mobile application.
16. Any system that requires more than one Cat drop to a classroom to control an IP speaker, up to 5 call-in switches, status lights (up to 2) and message board/digital clock will not be considered equal to the specified system.
17. A map that shows a layout of school and the system of activity of each classroom, hallway, and device status.
18. This specification establishes a minimum level of quality, features, and performance for individual components as well as the integrated system.
19. Systems that do not comply with the feature-sets highlighted in this Specification will not be considered.

1.3 DEFINITION OF TERMS

- A. Installer(s): Shall refer to the person, persons, or company who or which contracts to perform the work specified herein.

1.4 SUBMITTALS

- A. Product data for each component.
- B. Shop Drawings: Prior to proceeding with the work: Provide detailed equipment assemblies and indicate dimensions, weights, required clearances, method of field assembly, components, location of each field connection, and a complete schedule of all

equipment and materials with associated manufacturer's cuts sheets which are to be used.

- a. Wiring Diagrams: Detail wiring for power, signal, and control systems and differentiate between manufacturer-installed and field-installed wiring. Identify terminals to facilitate installation, operation, and maintenance. Include a single-line diagram showing cabling interconnection of components and levels throughout system and impedances.
 - b. Artwork drawings and lists indicating proposed nameplate nomenclature and arrangements for control panels and plug panels prior to fabrication reflecting equipment used.
 - c. Each drawing shall have a descriptive title and all sub-parts of each drawing shall be labeled. All drawings shall have the name and locations of the project, Systems Contractor's name in the title block.
 - d. Details and descriptions of any other aspect of the system, which must differ from the contract documents due to field conditions or equipment, furnished.
- C. Field Test Reports: Indicate and interpret test results for compliance with performance requirements. Include record of final matching transformer-tap settings, and signal ground-resistance measurement certified by Installer.
- D. Maintenance Data: For equipment to be included in maintenance manuals specified in Division 1.
- a. Record of Owners equipment-programming option decisions.
 - b. All instructions necessary for proper operation and manufacturer's instructions.
 - c. "Proof of Performance" information.
 - d. Manufacturer's maintenance information.
 - e. Copies of non-proprietary computer programs and system set up disks documenting all programmable features of the installed system.
- E. Record Drawings: Prior to final acceptance, provide three (3) complete sets of drawings indicating all cable numbers and construction details in accordance with the actual system installation. Revise all shop drawings to represent actual installation conditions. These Record Drawings will be used during "Final Acceptance Testing".
- F. System Training: Submit the following information describing the training programs and system trainers as outlined in paragraph 1.6 of this specification and in accordance with Division 1 specifications.
- a. Include with the submittal a preliminary staff development training program in outline form for review and approval by the owner's representative.
 - b. Include with the submittal a current copy of the trainer's certification from the manufacturer that certifies and identifies the trainer(s) who are eligible to provide training and support for the project.
 - c. Include with the submittal a current copy of trainer's needs assessment form which will be reviewed with the owner's designated representative for the system's preliminary system programming and configuration.
 - d. Include with the submittal copies of all documentation used to identify for the owner those participants attending and completing the training programs.
- G. A copy of the manufacturer's standard statement of warranty proving all equipment provided for the school communications network is covered with the required **five-year**

warranty shall be included with the project submittal. This statement of warranty shall be provided on the manufacturer's stationary.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced Installer who is an authorized representative of equipment manufacturer for both installation and maintenance of equipment required for this Section. Provide the following within thirty (30) days after notification to proceed:
1. Provide a list of installations that the Installer has specifically installed for verification by the Owner. Random installations from other vendors and/or Installers shall not be accepted. The Installer, not its employees, must meet these qualifications.
 2. The Installer shall be bondable.
 3. The Installer shall demonstrate to the satisfaction of the Owner or his representative that he has:
 - a. Adequate plant and equipment to pursue the work properly and expeditiously.
 - b. Adequate staff and technical experience to implement the work.
 - c. Suitable financial status to meet the obligations of the work.
 - d. Technically capable and factory trained service personnel at a local service facility to provide routine and emergency service for all products used in this project.
- B. Any Contractor, who intends to bid on this work and does not meet the requirements of the "Quality Assurance" paragraph(s), shall employ the services of an "Installer" who does meet the requirements and who shall provide the equipment, make all connections and continuously supervise the installation. A subcontractor so employed as the "Installer" must be acceptable to the Architect/Engineer. The "Installer" shall be identified within thirty (30) days of notification to proceed for acceptance by the Architect/Engineer.
- C. Because the life expectancy of this type of communications structure normally exceeds 10 years, the owner expects continuity from the service provider. If the installation/servicing company has not been an authorized provider of the manufacturer's product for at least (10) years, the following is required:
1. A list of (2) systems manufacturers of which they currently are authorized service providers where the relationship exceeds (10) years.
 2. A letter from the manufacturer outlining the details of changes in service providers over the last (10) years and what actions they will take to ensure the continuity of service to the customer.
- D. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction.
- E. Comply with NFPA 70
- F. Comply with NEMA Standard SB-40 for Emergency Communications in K-12 schools.
- G. Comply with UL 60950.
- H. Comply with FCC Part 15.

1.6 IN-SERVICE TRAINING

- A. The contractor shall provide and implement a complete and comprehensive staff training program for all administrators, facility staff members, and teachers. This mandatory training program will provide school staff a complete understanding of how to utilize and properly operate all functions.
- B. The training program shall be implemented by a staff member/trainer employed by the contractor. The trainer must be factory certified to provide training on their product.
- C. All staff development training is to be coordinated through the owner's designated representative. As training sessions are completed, the trainer will provide the school's administrative staff and school district's staff a document listing all the staff and faculty members who attended, received, and completed the training program.

1.7 WARRANTY

- A. Provide a **manufacturer's five-year warranty** of the school communications network equipment against defects in material and workmanship. This warranty will cover all electronic system components. Additional warranties cover clocks, speakers, and call in switches. If any defects are found within the warranty period, the defective equipment shall be replaced at no cost (equipment only); a one-year warranty shall be provided for labor.
- B. A copy of the manufacturer's standard statement of warranty proving all equipment provided for the school communications network is covered with the required five-year warranty shall be included with the project submittal. This statement of warranty shall be provided on the manufacturer's stationary. The standard five-year warranty is an important element in establishing a standard in quality. Manufacturers who circumvent the five-year warranty by offering special "extended warranties" that are not part of their normal published warranty will not be accepted.
- C. Contractor shall respond, excluding weekends and holidays, within 24 hours to any warranty service calls. If equipment cannot be repaired within 24 hours of service visit, the contractor shall provide "loaner" equipment to the facility at no charge.
- D. Make available a service contract offering continuing factory authorized service of the system after the initial warranty period.

1.8 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide the following system:
 - 1. Telecenter manufactured by Rauland
 - a. Authorized Rauland Distributor contact:

Rauland SoundCom Systems
24600 North Industrial Drive
Farmington Hills, MI 48335
Attn: Joe Samborski (248) 787-2317

Email: Joe.Samborski@Ametek.com

PART 2 - PRODUCTS

2.1 SYSTEM REQUIREMENTS

- A. The platform shall utilize state of the art IP Technology for Emergency automation, Call-in Notification, School Safety Paging and Evacuation tones, Class Change Tones utilizing multiple, programmable schedules for each zone, two-way hands-free everyday internal communications and paging, visual messaging, and program distribution. The system shall be easy to learn and operate. All standard programming shall be web-based, district-wide and user friendly to allow the system administrator the ability to easily program system features.
- B. Provide complete and satisfactorily operating district/school communications and district/school safety as described herein, using materials and equipment of types, sizes, ratings, and performances as indicated. Use materials and equipment that comply with referenced standards and manufacturers' standard design and construction, in accordance with published product information. Coordinate the features of all materials and equipment so they form an integrated system, with components and interconnections matched for optimum performance of specified functions.
- C. The platform shall be a single electronic system consisting of a minimum of 10 audio channels for each campus, (classroom) IP Speaker Modules, Status Lights, Message Boards and call switches, IP Zone Modules connecting corridor speakers, inside and outside horns, IP Administrative Consoles, SIP enabled PBX integration and district-wide integration for paging, emergency notifications, calendar scheduling and configuration.
- D. Each Classroom shall be provided with a Speaker Module interface, a status light, and a minimum of 5 different call switches, each with their own annunciation path and priority.
- E. Call-ins may automatically annunciate (display of priority and location) to administrative consoles, TCU Map, SIP enabled phones, and outside phones. Text to Speech capabilities should provide the ability to annunciate call-in priority and location automatically using overhead speakers.
- F. Call-ins shall be programmed to automatically change priority and annunciation route based on age of call-in and original priority.
- G. Call-ins may have priority (and annunciation route) changed by user action from a console or SIP enabled phone.
- H. Call-in annunciation route shall include playing pre-recorded audio over speakers, sending a pre-configured email, and activating relays.
- I. The platform shall lend itself to expansion by simple addition of hardware modules.
- J. The platform shall connect directly to an existing, standard protocol WAN/LAN network, without the need for a separate server at each school location. Configuration, including

bell schedules, calendars, and emergency sequences can be remotely created, changed, stored, and downloaded to the system by an authorized user from a web-based user interface.

- K. The platform shall provide the ability to initiate school safety paging announcements, evacuation tones and take cover tones from any telephone or connected web browser within the facility or outside the facility to any other location within the facility or district.
- L. The platform shall provide the ability to selectively communicate or monitor individual classrooms in emergency situations from any telephone within the facility or outside the facility to any other location within the facility; all communication within the classroom shall be hands-free and will not require any interaction by the classroom user.
- M. The platform shall provide classroom users the ability to confirm that they have safely secured their classrooms during an emergency with a single button press. The front office administrator will receive confirmation that the classroom is safely secured via an administrative console, mobile app, and web-based user interface. The front office administrator can view classrooms that are not safely secured via the administrative console. The front office administrator can view classrooms that are not safely secured via the web-based user interface which includes an interactive floor plan of the school. The front office administrator shall be able to initiate two-way communication, without a pre-announcement tone, to the classroom during an emergency via the administrative console or any connected phone. Web-based user interface will still identify that a school is in an emergency, even if all classrooms are safely secured. Individual classroom check-in and school emergency status shall be viewed from the web-based user interface, both on-site and remotely via list and interactive floor plan.
- N. IP Addressable and POE powered Speaker Modules for individual rooms shall be system programmable and may be assigned any two, three, four, five- or six-digit number as well as name and description. Any extension may be reassigned at any time.
- O. IP-enabled two-way voice communication shall be available from any provided telephone or administrative console through any speaker in a campus. This shall allow hands-free communication to any classroom or any individual loudspeaker unit. A programmable pre-announce tone shall sound immediately before the intercom path is opened and a supervisory tone shall continue to sound at regular intervals when speaker monitoring is active, complying fully with all privacy legislation. Preannounce tone and supervisory tones shall be disabled during designated emergencies automatically.
- P. The platform shall allow users to configure multiple schedules per school, with a minimum of 500 unique events per schedule, and automatic Daylight Savings time correction. Schedules can be programmed to occur once, daily, weekly, monthly, or in any combination of the preceding recurrences. Each school may have a minimum of 20 unique bell schedules, with a minimum of 5 active schedules on any given day for each campus. User shall be able to select from 25 standard included tones as well additional user created and uploaded audio files for class change signaling and messaging. In addition, scheduled events shall include relay actions, email notifications, visual messaging, status lights and paging exclusions as system configuration changes. The platform shall allow control of the bell schedules via the district WAN/LAN without the need for a separate server at each school location. Bell schedules can be remotely created, changed, stored,

and assigned to calendar days for the local school by an authorized user from a single web-based user interface, without logging into multiple systems.

- Q. The platform shall be able to integrate with an existing PA system or operate as a fully independent IP solution. The platform shall be able to function in combination of said configurations and allow for seamless communication within a school or district-wide, regardless of the type of configuration used. The platform shall be scalable, with the ability to easily add, install, and configure additional equipment to a system.
- R. The platform allows for customization of preprogrammed sequences, used for emergencies, events, and everyday communications. Preprogrammed sequences can be activated from the push of a relay button, soft key of an administrative console, a dial string of a SIP phone, or a web browser configured to the district network. Sequences can be initiated automatically as part of a schedule or on the fly. Preprogrammed sequences can be customized to utilize any combination of audio tones, emails, relays, tone exclusions, swings, delays, duples, SIP phone notifications, and program distribution. Audio tones can include customized audio files and voice messages, recorded in any language. Uploaded audio tones and messages can be preprogrammed to announce repeatedly or individually, as part of a scheduled sequence or on the fly. Each school in a district can have its own customized sequences, and can be activated individually, in groups, or district-wide.
- S. The platform allows for emergencies to be initiated in a drill environment, separate from real emergencies. Drill emergencies can be initiated from panic buttons, consoles, SIP phones, or a web browser.
- T. The platform shall provide status lights that will display the status of individual classrooms and school-wide status, including for emergencies, at the same time. Status lights will be customizable in color and flash rate based on event type and priority.
- U. Visual message boards are available in 2 sizes. Small message boards have 8 by 40 LED display with 3 color LED's. the large message board will have 2 lines with 16 by 80 LED display with 3 color LED's. During idle time, the message boards can display date and time. They can also display countdowns for class change or status of an emergency. You will have the ability to change the messages on the fly to display instructions or directions. Status lights can be tied to message boards to give more information as to status of classrooms that checked in or groups of rooms that checked in.
- V. POE zone page amplifier module. This component will give the schools the ability to play audio to drive groups of speakers from a single device. Depending upon configuration you can have 14 or 35 watts of output. The module can be either wall or rack mounted.
- W. Telecenter U Emergency Initiation Mobile App. This app can be installed on either Android or Apple devices. The app can process up to 18 different emergencies. The mobile app will update in real time rooms that have checked in OK. It can also display a Fire emergency is in effect during an emergency.
- X. First Responders Notification. This feature can be initiated so the status lights do not display the rooms that checked in until the first responders are on site. This will not influence any of the other check-in notifications. The App, console and computers can still display the rooms that checked in.

- Y. Telecenter U Mapping. This map is accessed from the web-based user interface. It provides a visual floorplan of the school and informs the user of system activity occurring on the Telecenter system. Call-ins, active audio, active emergencies, and device status can be observed from the Mapping screen.
- Z. Telecenter U Stream to SIP. This feature allows for audio to be stream to over SIP trunks as part of an emergency, schedule, or live page.
- AA. Telecenter U Applications Programming Interface. The system provides the ability to connect to third party systems (Crisis Go) via a REST API to communication emergency status, call-in information and to initiate events on the Telecenter U system.

2.2 EQUIPMENT AND MATERIAL

A. Server Software

1. Provides district-wide paging, bell event scheduling, emergency notification and configuration for entire district.
2. Ability to configure system and initiate system features, per school and district-wide via web-based user interface.
3. The software can sync system time to the Atomic Clock Signal or to the school's or district's network time server.
4. The software will provide a web browser to deliver district-wide emergency paging, pre-recorded messages, and tones from any authorized computer in the facility or the district. The software must be capable of automatically notifying district personnel via the WAN/LAN of an alarm condition.
5. The software can automatically broadcast emergency instructions via associated system hardware throughout an entire district when an alarm (e.g. lockdown, lockout, security, fire) is initiated via the web-based user interface. The emergency instructions are preprogrammed and require no user intervention. Bell tones can be halted during an emergency. The system provides redundant alarm annunciation over intercom/paging speakers and is not meant to replace primary fire alarm or security systems.
6. The software allows for user-uploaded pre-recorded messages and tones. Software supports the upload of MP3 and WAV file types. User-uploaded pre-recorded messages and tones can be part of emergencies, sequences, and bell schedules.
7. The software can be installed in cloud, virtual or physical server environments.
8. The web-based user interface supports secure HTTP browsing.
9. The software supports encryption to ensure secure access.
10. The system shall monitor itself if devices go offline and system actions are not received. Specified users shall receive email notifications when devices go offline. The software shall be able to keep a log and report on system activity within a school or all schools district-wide for a minimum of one year. These reports can be exported to excel spreadsheets.
11. The system shall allow administrators to run reports on all system activities including emergencies, drills, paging, call-ins, check-ins, and system trouble on a per school, multi-school and district-wide basis.
12. The software will support a minimum of 20 bell schedules per school, with 5 schedules assignable to a specific school day. Bell schedules can be

- programmed to annunciate tones, activate relays, send emails, activate program distribution, and notify SIP phones.
13. The system allows programmable end points to be automatically included or excluded for live paging, bell tones, or prerecorded audio, depending on the time or day or day of the week. These inclusions/exclusions can be applied manually or automatically depending on their schedule.
 14. The software can automatically send an email, as part of a programmed sequence of events, to district administrators alerting them of an emergency within the district.
 15. The software provides the ability to view schools that are in an emergency status, using any web browser on the district's network. The software shall identify the name of the school in an emergency as well the type of emergency that school is in.
 16. The web-based user interface offers the ability to display real-time status information on a building floor plan for each campus as well as a map of all buildings from a single log-in. Real time status includes emergencies, call-ins, audio, and network information.
 17. The software provides the ability to view individual classrooms that are not checked-in during an emergency, using any web browser on the district's network. The software shall identify the name, extension, and description of the classroom that is not checked-in during the emergency.
 18. The system has a minimum of 20 customizable emergencies, one of them being an All-Clear – with the ability to return the system from an emergency to normal status. Each emergency shall have a minimum of 500 unique events.
 19. As a district-wide communications solution, the system shall be able to provide simultaneous communications to all schools or groups of schools within a district. The system shall allow a user to initiate district-wide communications to individual schools, all schools, or groups of schools, from a web-based user interface. The system shall allow a user to initiate prerecorded audio, live paging, or programmed sequences to individual schools, all schools, or groups of schools, from the web-based user interface. Programmed sequences shall be customizable per school, and the system shall be able to activate them simultaneously to individual schools, all schools, or groups of schools, from the web-based user interface.
 20. The communications software must allow upgrade from an individual school system to multiple schools, or an entire school district, using the same web-based user interface. The communications software from an individual school system must be identical in typical user operation to the multiple schools or entire school district communications system software.
 21. The system allows for emergencies to be initiated as drills for practice. Drills may include all or some of the associated steps as its corresponding emergency sequence. Drills are recorded in the event history report.
 22. The system provides the ability to export lists of bell schedule steps, emergency sequences, staff directory, users, peripherals, and zone targets.

B. Campus Controller

1. Provides call routing for paging and intercom for a single facility.
2. System shall connect to the district provided Telephone Network via a SIP connection.

3. Support a flexible numbering plan allowing two, three, four, five, or six-digit extensions.
4. SIP interface to a district provided Telephone Network shall be capable of allowing connected phones to display classroom call-ins, answer internal intercom call-ins, make pages, and change priorities of call-ins in progress.
5. Direct dialing, two-way amplified voice intercom between any provided telephone or admin console and speaker without the use of a press-to-talk or talk-listen switch.
6. Ability to upgrade priority level from individual call switch.
7. The ability to answer intercom call-ins registered at administrative consoles and pre-selected telephones.
8. The ability to automatically escalate incoming call-ins to an alternate telephone or group of telephones if they remain unanswered for a predetermined amount of time.
9. The ability to manually upgrade an intercom call-in to an alternate telephone or group of telephones.
10. The ability for classrooms to “check-in” via push button when they have successfully secured their location during emergency.
11. Administrative console shall display locations that have not checked in to confirm their secured location and provide hands-free audio monitoring and communication to unsecured locations.
12. The controller shall not need direct connection to any classroom via home run or distributed wiring. It shall communicate solely through the IP network.
13. Single button access from any console on the system to distribute emergency announcements within the facility to all or select locations equipped with speakers. Emergency announcements originating from any assigned administrative console shall have priority over all regular system functions.
14. Ability for administrative consoles and connected phones to selectively monitor audio at any two-way speaker during an emergency.
15. Stores a minimum of 48 hours’ worth of Bell Event Schedules, all emergency notification sequences as well as facility wide configuration.
16. System can sync system time to the Atomic Clock Signal or to the school’s or districts network time server.
17. System’s SIP Interface shall provide:
 - a. Audio paging access from any telephone to any single intercom speaker, zone (group) of intercom/paging speakers, or all speakers/paging horns throughout the entire facility.
 - b. Ability to answer a call-in directed to that SIP extension.
 - c. Ability to upgrade a call-in directed to that SIP extension.
 - d. Single button access from any telephone on the system to initiate alarm signals within the facility to all or select locations equipped with speakers. A minimum of 25 separate distinct alarm signals shall be provided. Alarm signals originating from any assigned administrative telephone shall have priority over all regular system functions.
 - e. Ability to initiate a school-wide emergency including lockdown and evacuate sequences.
 - f. SIP device shall display call-in information from call in switch. Information will include a minimum of Classroom Name, Number, and Priority Level.
18. The system will have the ability to utilize a web browser to initiate an emergency, pre-recorded messages, and tones from any authorized

- computer in the facility or the district. The system must be capable of automatically notifying district personnel via the WAN of an alarm condition.
19. The system will have the ability to utilize a console.
 20. The system will have the ability to utilize a desktop microphone to deliver school-wide live emergency paging and zone paging throughout the facility.
 21. The system can automatically broadcast emergency instructions throughout an entire campus or district when an alarm (e.g., lockdown, lockout, security, fire) is tripped or manually activated. The emergency instructions are preprogrammed and require no user intervention. Bell tones can be halted during an emergency. The system provides redundant alarm annunciation over intercom/paging speakers and is not meant to replace primary fire alarm or security systems.
 22. The system can integrate with emergency weather radios to generate live emergency broadcasts notification throughout a facility.

C. IP Addressable Modules:

1. System shall provide multiple IP Addressable Modules for intercom, paging and relay activation.
 - a. All Modules are POE 802.3af compliant
 - b. All Modules support DHCP.
 - c. All Modules connect to network with a single RJ45 connector
2. IP Addressable Speaker Module
 - a. Shall interface to school's data network, a classroom speaker, and multiple call switches.
 - b. A minimum of 5 levels of call-in can be placed from an IP Speaker Module. The call-ins are routed to administrative consoles and select SIP connected telephones and can only be cleared from the system once answered. If a call-in is not answered within a preprogrammed time the call-in may reroute to other telephones, consoles, and speakers.
 - c. An option for Privacy call in switches is supported. When the Privacy switch is activated it prevents administrative or classroom telephones from monitoring the specific classroom/location intercom speaker.
 - d. The ability to belong to one or more of a minimum of 100 independent zones for zone paging, program/music distribution zones and class change tone zones; this assignment is a programmable function, changeable by time of day. Each IP Speaker Module's location shall be programmed in software to belong to any combination of software zones. IP Speaker Modules shall be designed to mount near ceiling and wall speakers and in the plenum space.
 - e. Intercom and paging volume adjustable from Software interface.
 - f. Module will support and power a status light that displays individual classroom information including call-ins placed, testing status and emergency check-in status.
3. IP Addressable Zone Paging Module
 - a. Zone Paging Module shall connect multiple speakers for district all page, all page, zone paging, bells, audio events and, emergency notification.
 - b. Zone Paging Modules shall be rack and wall mountable.
 - c. Zone Paging Modules shall be able to belong to one or more of 100 independent zones for live paging, bells, pre-recorded audio, and emergency notification.
4. IP Addressable Aux I/O Module

- a. Aux I/O Module shall have two input contacts and two output contacts.
 - b. Input and output contacts are individually addressable.
 - c. Aux I/O Module shall be wall and rack mountable.
 - d. User can program relays to be activated manually, through an event/bell schedule, or during emergency notification.
 - e. Aux I/O Module can perform school lockdown from a single press of a panic button.
5. IP Addressable Program Line Input Module
- a. Program Line Input Module shall provide line level audio program distribution into system.
 - b. Program Line Input Module shall have a 3.5mm cable jack.
 - c. Program Line Input Module shall be configured via web-based user interface.
 - d. User can configure program distribution to be activated manually or automatically through an event/bell schedule.
 - e. Program Line Input Module will have a system priority level such that emergency communications override program distribution.
6. IP Addressable Microphone Input Module
- a. The system shall support a minimum of five (5) Microphone Input Modules per school.
 - b. Microphone Input Module shall support dynamic and condenser style microphones.
 - c. Microphone Input Module shall support microphones with or without Push-To-Talk functionality.
 - d. Microphone Input Module shall support configurable paging priorities.
 - e. Microphone Input Module shall provide user feedback for paging activity.
 - f. Microphone Input Module shall have adjustable microphone gain levels.
 - g. Microphone Input Module shall be configurable from the web-based user interface.
 - h. Live pages from the Microphone Input Module can automatically increase audio priority during an emergency.
 - i. Initiate a live page or pre-recorded message from a 2-way radio handset.
- D. IP Addressable Analog Gateway
1. IP Addressable Gateway provides integration with existing analog wiring infrastructure – consisting of shielded two-pair classroom field wiring. The Gateway provides the ability to reuse speaker wiring, speakers, and punch blocks to integrate analog infrastructure with IP platform.
 2. Each Gateway will have 5 watts of power per port and 25 watts total per device.
 3. Supports 24 classrooms that utilize 25 Volt speakers and all current Telecenter call switches for front office notification.
 4. Supports minimum of 5 call switch priorities per classroom, capable of lockdown check-in functionality, while reusing existing shielded two-pair classroom field wiring.
 5. Classroom intercom volume adjustable from Software interface.
 6. Classroom paging volume adjustable from Software interface.
 7. Configured to the school network and can be used in conjunction with IP Addressable Modules.
- E. IP Addressable Administrative Console

1. A full color screen with 64 soft keys, 3 line select, volume control, push to talk, speakerphone mode and left/right and up/down scrolling.
2. Audio paging access from any Console to any single intercom speaker, zone (group) of intercom/paging speakers, or all speakers/paging horns throughout the entire school.
3. Programmable soft key access from any console on the system to initiate alarm signals within the school to all or select locations equipped with speakers. A minimum of 25 separate distinct alarm signals shall be provided. Alarm signals originating from any assigned administrative console shall have priority over all regular system functions.
4. Programmable soft key access from any console to automatically broadcast page emergency instructions throughout an entire school when an alarm (e.g. lockdown, lockout, security, fire) is tripped or manually activated. The emergency instructions are preprogrammed and require no user intervention. The system provides redundant alarm annunciation over intercom/paging speakers and is not meant to replace primary fire alarm or security systems.
5. Ability to perform intercom to any single IP Addressable Speaker Module.
6. Ability to display 3 call-ins at a time on the screen while other call-ins are annunciating and the ability to scroll to view all call-ins.
7. Ability to upgrade a call-in via soft key.
8. Programmable soft key access from any console for activating relays, campus wide.
9. Ability to maintain, along with controller and other IP Modules system functions, including intercom, bells and paging for the local campus in the event of district-wide connection loss.
10. Classrooms that have not 'checked-in' during an emergency are listed on the Administrative Console's screen.
11. The time duration of an emergency is shown on the screen of the administrative console. The check-in timer is shown on the screen of the administrative console.

F. Audio Paging/Program Amplifiers

1. Power amplifier(s) shall be provided to provide a minimum of 2 watts of power to all paging speakers, and 15 watts of power to all paging horns.
2. The maximum load on the paging/program amplifiers shall be 80% of the rated maximum output of the amplifiers.

G. Normal/Emergency Call Switch – Rauland Dual Level Call In Switch

1. Normal/Emergency Call Switches indicated on the drawings shall provide the following functions and features:
 - a. One (1) "Normal" call switch that shall activate a distinctive "NORMAL" level call from single button activation. The button shall be clearly marked "NORMAL" and will route the call-in to any one or more Administrative Consoles and/or Marquee Displays for quick and easy response from an Administrative Console.
 - b. One (1) "Emergency" call switch that shall activate a distinctive "EMERGENCY" level call from single button activation. The button shall be red in color and shall be clearly marked "EMERGENCY" and will route the call-in to any one or more Administrative Consoles and/or Displays for quick and easy response from an Administrative Consoles.

- H. Emergency/Check-In Call Switch – Rauland Check-In Call In Switch
1. Emergency/Check-In Call Switches indicated on the drawings shall provide the following functions and features:
 - a. One (1) “Emergency” call switch that shall activate a distinctive “EMERGENCY” level call from single button activation. The button shall be red in color and shall be clearly marked “EMERGENCY” and will route the call-in to any one or more Administrative Consoles and/or Displays for quick and easy response from an Administrative Consoles.
 - b. One (1) “CHECK-IN” call switch that shall activate a distinctive “CHECK-IN” level call from single button activation. The button shall be blue in color and shall be clearly marked “CHECK-IN” and will route the call-in to any one or more Administrative Consoles. This button will be used for emergency check-ins during school emergencies, notifying the front office of the classroom occupants’ safety during an emergency.
- I. Lockdown/Check-In Call Switch – Rauland 4-Button Call In Switch
1. Lockdown/Check-In Call Switches indicated on the drawing shall provide the following functions and features:
 - a. One (1) “Lockdown” call switch that shall activate a configured emergency sequence from single button activation.
 - b. One (1) “Emergency” call switch that shall activate a distinctive “EMERGENCY” level call from single button activation. The button will route the call-in to any one or more Administrative Consoles and/or Displays for quick and easy response from an Administrative Consoles.
 - c. One (1) “Check-In” call switch that shall activate a distinctive “CHECK-IN” level call from single button activation. The button will route the call-in to any one or more Administrative Consoles. This button will be used for emergency check-ins during school emergencies, notifying the front office of the classroom occupants’ safety during an emergency.
 - d. One (1) “Normal” call switch that shall activate a distinctive “NORMAL” level call from single button activation. The button will route the call-in to any one or more Administrative Consoles and/or Marquee Displays for quick and easy response from an Administrative Console.
 - e. Each button can be customizable in color and text.
- J. Status Light
1. Status Light will be powered and controlled by an IP Classroom Module.
 2. Status lights will 2 light segments, one for classroom status and one for school status.
 3. Each segment will display specific colors and blink patterns based on status priorities.
 4. If you add a visual message board an additional status light can be added and driven on the 1 cat wire delivered to the classroom. Both lights can be used for different notifications inside and outside the room.
- K. Zone Page Amplifier Module
1. Depending on configuration the amp output is either 14- or 35-watts output.
 2. Can be wall or rack mounted.
 3. Powered with either a wall wort or POE+
- L. Visual message boards.

1. Can be powered by either POE or POE+ depending on size and features.
2. Comes in 2 sizes
3. Large 2 lines 16 by 80 LED display
4. Small 1 line 8 by 40 LED
5. 3 color LEDs: Red, Amber and Green

M. Equipment Racks

1. All equipment racks shall provide 44 spaces (77") minimum for mounted system equipment.
2. All equipment racks shall be multi-rack format ("gangable") style, bolted together, and open cavity.
3. All equipment racks will be provided with lockable rear doors.
4. Equipment rack(s) shall be in climate-controlled areas/rooms as shown on drawings.
5. All head-end, distribution, and source equipment, including data and power, shall be in racks configured as approved by the Engineer.
6. Rack mounted equipment shall be accessible from front and rear.
7. All unused rack spaces will be covered with appropriate blank/vent panels.

N. Interior Ceiling Speakers

1. Provide Ceiling Speaker Assembly consisting of 8 Ohm, 8" speaker mounted in a 2 foot by 2 foot, or 2 foot by 1 foot, lay-in baffle, with an integrated back box that covers the full area of the baffle.
2. The speaker shall be connected by inserting an 8-pin RJ45 terminated CAT 5e or Cat 6 cable.
3. The speaker shall include provisions to allow attachment of a safety cable if required.

O. Classroom Wall Mounted Speakers & Message Board Assembly

1. Wall mount enclosure for a small message board & 8" full-range speaker in a single baffle.
2. Includes a high efficiency, full-range 8" speaker for audio.
3. Heavy duty, 20-gauge, cold-rolled steel protects electronic devices.

P. Wall Mounted Horns

1. Provide double re-entrant type horn loudspeakers with integral driver. The horn loudspeaker shall be impervious to weather and vandalism. Horn shall be constructed of heavy-duty ABS plastic. Horn loudspeaker drivers shall be rated at 15 watts with a frequency response of 480 Hz to 14 KHz. Sensitivity shall be 106 dB 1 watt, 1 meter. Transformer assembly shall be dual voltage multi-tap type suitable for 25 or 70-volt installations. Dispersion pattern shall be 180 degrees conical. The horn loudspeaker shall be constructed of treated heavy gauge aluminum, with all exposed parts potted and a sealed driver. Wiring terminal shall be fully enclosed. The speaker flange and mounting surface shall have a cork-rubber gasket. The horn loudspeakers finish shall be gray baked on enamel.
2. The recessed back box shall be of heavy gauge cold-rolled steel, spot welded for stability with a rust-retardant gray primer finish. Acoustically treat the interior to eliminate mechanical resonance. The back box shall be 10-3/4"x10-3/4"x6" deep.

3. The baffle shall be vandal proof, the faceplate constructed of 14-gauge carbon steel with a minimum tensile strength of 55,000 PSI. A lattice grid sub-plate shall deny access to the horn but be acoustically transparent for sound projection. Provide tamper proof, stainless steel mounting hardware. The baffle shall a mar/scratch baked epoxy rust inhibitive finish.
- Q. Uninterruptible Power Supplies (UPS)
1. UPS equipment provided for this system will include Power Conditioning to smooth current and voltage fluctuations.
 2. UPS equipment will be sized in accordance with the system manufacturer's recommendations.
 3. Provide an individual UPS for EACH SYSTEM CONTROLLER (Gateway) furnished with the system.
 4. Provide additional UPS(s) for protection of all other equipment furnished with the system and housed in the equipment racks.
 5. All UPS equipment shall be rack mounted.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine conditions, with the Installer present, for compliance with requirements and other conditions affecting the performance of the School Communications and School Safety Network.
- B. Do not proceed until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General: Install system in accordance with NFPA 70 and other applicable codes. Install equipment in accordance with manufacturer's written instructions.
- B. Furnish and install all material, devices, components, and equipment for a complete operational system.
- C. Impedance and Level Matching: Carefully match input and output impedance's and signal levels at signal interfaces. Provide matching networks where required.
- D. Control Circuit Wiring: Install control circuits in accordance with NFPA 70 and as indicated. Provide number of conductors as recommended by system manufacturer to provide control functions indicated or specified.
- E. All housings are to be located as indicated.
- F. The contractor shall provide necessary transient protection on the AC power feed, all copper station lines leaving or entering the building, and all central office trunks. All

protection shall be as recommended by the equipment supplier and referenced to earth ground.

- G. Wiring within Enclosures: Provide adequate length of conductors. Bundle, lace, and train the conductors to terminal points with no excess. Provide and use lacing bars.
- H. Provide physical isolation from speaker-microphone, telephone, line-level wiring, and power wiring. Run in separate raceways, or where exposed or in same enclosure, provide 12-inch minimum separation between conductors to speaker-microphones, telephone wiring and adjacent parallel power. Provide physical separation as recommended by equipment manufacturer for other system conductors.
- I. Identification of Conductors and Cables: Use color coding of conductors and apply wire and cable marking tape to designate wires and cables so all media are identified in coordination with system wiring diagrams.
- J. Weatherproofing: Provide weatherproof enclosures for items to be mounted outdoors or exposed to weather.

3.3 GROUNDING

- A. Provide equipment grounding connections for Integrated Electronic Communications Network systems as indicated. Tighten connections to comply with tightening torques specified in UL Standard 486A to assure permanent and effective grounds.
- B. Ground equipment, conductor, and cable shields to eliminate shock hazard and to minimize to the greatest extent possible, ground loops, common mode returns, noise pickup, cross talk, and other impairments. Provide 5-ohm ground at main equipment location. Measure, record, and report ground resistance.
- C. Provide all necessary transient protection on the AC power feed and on all copper station lines leaving or entering the building. Note in system drawings, the type and location of these protection devices as well as all wiring information.

3.4 FIELD QUALITY CONTROL

- A. Manufacturer's Field Services: Provide services of a duly factory authorized service representative for this project location to supervise the field assembly and connection of components and the pre-testing, testing, and adjustment of the system.
- B. Inspection: Make observations to verify that units and controls are properly labeled, and interconnecting wires and terminals are identified. Provide a list of final tap settings of paging speaker line matching transformers.
- C. Testing: Rectify deficiencies indicated by tests and completely re-test work affected by such deficiencies at Contractor's expense. Verify by the system test that the total system meets the Specifications and complies with applicable standards.

3.5 FINAL ACCEPTANCE TESTING

- A. The Final Acceptance Testing shall be provided to the Owner or the Owners designated representative only. Final acceptance testing to any other trade or service provider for the project will not comply with the requirements of this section.
- B. The contractor will provide a Final Acceptance Test record document signed by both the contractor and the Owner or designated Owner's Representative establishing the "In Warranty" date. The warranty period will not commence until the Final Acceptance Test is completed.
- C. Be prepared to verify the performance of any portion of the installation by demonstration, listening and viewing test, and instrumented measurements. Make additional adjustments within the scope of work and which are deemed necessary by the Owner because of the acceptance test.

3.6 COMMISSIONING

- A. The contractor shall train the Owner's maintenance personnel in the procedures and schedules involved in operating, troubleshooting, servicing, and preventative maintenance of the system. This training will be in accordance with the training as outlined in Section 1.6 of these specifications. In addition to the Training Materials provided, the contractor will also furnish Operators Manuals and Users Guides at the time of this training.
- B. Schedule training with Owner through the owner's representative, with at least seven days advance notice.

3.7 OCCUPANCY ADJUSTMENTS

- A. The contractor shall provide Occupancy Adjustments in accordance with Section 1.6 of these specifications. A response scenario amenable to both the owner and the contractor will be established and followed for the first year of service.

3.8 CLEANING AND PROTECTION

- A. Prior to final acceptance, the contractor shall vacuum and clean all system components and protect them from damage and deterioration. All blank spaces in equipment cabinets will be covered with blank panels. Top and side panels, and all cabinet doors will be installed. All general areas within and around all equipment rack/cabinets in the facility will be swept, vacuumed, and cleaned up. No cabinets will be left unlocked and all cabinet keys will be turned over to the owner or designated owner's representative.

END OF SECTION

MAI: 2024-9506

SECTION 281500 - INTEGRATED ACCESS CONTROL HARDWARE DEVICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes access control door hardware for the following:
 - 1. Swinging doors.
 - 2. Other doors to the extent indicated.
- B. Section includes, but is not necessarily limited to, the following for the integrated access control security and site management system:
 - 1. Electrified and Integrated Access Control Card Key Door Hardware
- C. Related Sections include the following:
 - 1. Division 08 Section 080671 "Door Hardware Schedule".
 - 2. Division 08 Section 081113 "Hollow Metal Doors and Frames."
 - 3. Division 08 Section 081700 "Integrated Door Opening Assemblies".
 - 4. Division 08 Section 084113 "Aluminum-Framed Entrances and Storefronts".
 - 5. Division 08 Section 087100 "Door Hardware".
 - 6. Division 14 Section "Elevators" for security access to elevator floor selection controls.
 - 7. Division 26 Section "Electrical" for connections to electrical power system and for low-voltage wiring work.
 - 8. Division 27 Section "Communications" for connections to the LAN.
 - 9. Division 28 Section "Access Control" for access control devices and equipment installed at door openings and provided as part of a security and site management system.
 - 10. Division 28 Section "Intrusion Detection" for detection devices installed at door openings and provided as part of an intrusion detection system.
 - 11. Division 28 Section "Video Surveillance" for motion detection and video camera devices and equipment installed at door openings and provided as part of a security and site management system.
 - 12. Division 28 Section "Fire Detection and Alarm" for connections to building fire alarm system.
- D. References:
 - 1. ANSI A117.1 (1998) - Accessible and Usable Buildings and Facilities.
 - 2. IBC - International Building Code
 - 3. NFPA 70 (2002) - National Electrical Code.
 - 4. NFPA 80 (1999) - Fire Doors and Windows.

5. NFPA 101 (2006) - Life Safety Code.
 6. UL 294 - Access Control Systems.
 7. UL 1076 - Proprietary Burglar Alarm Units and Systems.
- E. Products installed, but not provided under this Section include the following. Coordination to remain a requirement of this Section.
1. Security or High Security keyed cylinders, including provisions for temporary construction keying, for mechanical override at access control locking hardware to be furnished under Division 8 Section "Door Hardware".

1.3 SUBMITTALS

- A. Product Data: Manufacturer's product data sheets including installation details, material descriptions, dimensions of individual components and profiles, operational descriptions and finishes.
- B. System Operational Descriptions: Complete system operational narratives for the integrated access controlled openings defining the owner's prescribed requirements for the opening functionality. Narratives include, but are not limited to, the following situations: normal secured/unsecured state of door; authorized access; authorized egress; unauthorized access; unauthorized egress; fire alarm and loss of power conditions, and interfaces with other building control systems.
- C. Shop Drawings: Details of electrified integrated locking hardware and access control firmware, indicating the following:
1. Wiring Diagrams: Upon receipt of approved schedules, submit detailed system wiring diagrams for power, signaling, monitoring, communication and control of the access control system electrified hardware and firmware. Differentiate between manufacturer-installed and field-installed wiring. Include the following:
 - a. Elevation diagram of each unique access controlled opening showing location and interconnection of major system components with respect to their placement in the respective door openings.
 - b. Complete (risers, point-to-point) access control system block wiring diagrams.
 2. Electrical Coordination: Coordinate with related Electrical Sections the voltages and wiring details required at electrically controlled and operated hardware openings.
- D. Proof of Certification: Upon request provide a copy of manufacturer(s) official certification or accreditation document indicating proof of status as a qualified and authorized provider of the primary access control components.
- E. Operating and Maintenance Manuals: Provide manufacturers operating and maintenance manuals for each item comprising the complete access control and site management installation in quantity as required in Division 01, Closeout Submittals. The manual to include the name, address, and telephone number of the supplier/integrator providing the installation and the nearest service representatives for each item of equipment included in the system. The final

copies delivered after completion of the installation test to include "as built" modifications made during installation, checkout, and acceptance.

1. As-Built Drawings: During system installation, the Contractor to maintain a separate hard copy set of drawings, elevation diagrams, and wiring diagrams of the access control system to be used for record drawings. This set to be kept up to date by the Contractor with all changes and additions to the access control system accurately recorded.

F. Warranties and Maintenance: Special warranties and maintenance agreements specified in this Section.

1.4 QUALITY ASSURANCE

A. Manufacturers Qualifications: Engage qualified manufacturers with a minimum of five (5) years of documented experience in providing access control and security systems equipment and software similar to that indicated for this Project and that have a proven record of successful in-service performance.

1. Software and access control systems components to have been previously and thoroughly tested together with proven installations similar in size and functionality to the design requirements indicated for this Project.

B. Supplier Qualifications: Supplier/Dealers, verifiably authorized and in good standing with the primary product manufacturers, with a minimum of three (3) years of experience supplying integrated access control systems similar in material, design, and scope to that indicated for this Project and whose work has resulted in construction with a proven record of successful in-service performance.

1. ASSA ABLOY access control products are required to be supplied only through designated "Authorized Channel Partners."

a. List Qualified ACP Companies

C. System Integrator Qualifications: Systems Integrators, verifiably factory trained and certified by the primary product manufacturers, with a minimum of three (3) years documented experience installing complete integrated access control systems similar in material, design, and scope to that indicated for this Project and whose work has resulted in construction with a proven record of successful in-service performance. Qualifications include, but are not necessarily limited, to the following:

1. References: Provide a list of references for similar projects including contact name, phone number, name and type of project.

2. Professional Staffing: Firms to have a dedicated access control systems integration department with full time, experienced professionals on staff experienced in providing on site consulting services for both electrified door hardware and integrated access control systems installations.

3. Factory Training: Installation and service technicians are to be competent factory trained and certified personnel capable of maintaining the system.

4. Service Center: Firms to have a service center capable of providing training, in-stock parts, and emergency maintenance and repairs at the Project site with 24-hour/7-days a week maximum response time.
- D. Installer Qualifications: Certified technicians, verifiably authorized with the primary product manufacturers for installation of IP-Enabled, Wireless, and Power-over-Ethernet Access Control products in accordance with documented instructions and NFPA 80.
1. ASSA ABLOY access control products are required to be installed only through designated "Preferred Installers."
- E. Source Limitations: Obtain the access control door hardware, system firmware and application software specified in this Section from a single source, qualified supplier/integrator unless otherwise indicated.
1. Electrified modifications or enhancements made to a source manufacturer's product line by a secondary or third party source will not be accepted.
 2. Provide integrated access control door hardware from the same manufacturer as mechanical door hardware, unless otherwise indicated.
- F. Regulatory Requirements: Comply with NFPA 70, NFPA 80, NFPA 101 and ANSI A117.1 requirements and guidelines as directed in the model building code including, but not limited to, the following:
1. Comply with NFPA 70 "National Electrical Code", including electrical components, devices, and accessories listed and labeled as defined in Article 100 by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
 2. Where indicated to comply with accessibility requirements, comply with Americans with Disabilities Act (ADA), "Accessibility Guidelines for Buildings and Facilities (ADAAG)," ANSI A117.1.
 3. Comply with NFPA 101 "Life Safety Code" for doors in a means of egress.
 4. Comply with NFPA 80 "Fire Doors and Windows" for fire labeled opening assemblies.
 5. The installed access control system shall conform to all local jurisdiction requirements.
- G. Keying Conference: Reference Division 8 Section "Door Hardware".
- H. Pre-Submittal Conference: Conduct conference in compliance with requirements in Division 01 Section "Project Meetings" with attendance by representatives of Supplier/Dealer, Systems Integrator, and Contractor to review proper methods and procedures for receiving, handling, and installing the access control system hardware. At completion of installation, provide written documentation that components were applied to manufacturer's instructions and recommendations and according to approved schedules.
1. Inspect and discuss Division 26 electrical roughing-in and similar preparatory work performed by other trades.
 2. Review and verify sequence of operation descriptions for each unique access controlled opening.
 3. Review and finalize construction schedule and verify availability of materials.
 4. Review the required inspecting, testing, commissioning, and demonstration procedures.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Do not store electronic access control hardware, software or related accessories at Project site without prior authorization.
 - 1. Access control firmware and software: Where approved and directed, inventory upon receipt and store electronic access control equipment in a secure, temperature and humidity controlled environment in original manufacturer's sealed containers.
- B. Tag each item or package separately with identification related to the final Access Control Door Schedule, and include basic installation instructions with each item or package.
- C. Deliver permanent keys, cores, access control credentials, software and related accessories directly to Owner via registered mail or overnight package service. Instructions for delivery to the Owner established at the "Pre-Submittal Conference".

1.6 COORDINATION

- A. Coordinate quantity and arrangement of assemblies with ceiling space configuration and with components occupying ceiling space, including structural members, pipes, air-distribution components, raceways, cable trays, recessed lighting fixtures, and other items.
- B. Access Control System Electrical Coordination: Coordinate the layout and installation of scheduled electrified door hardware, and related access control equipment, with required connections to source power junction boxes, power supplies, detection and monitoring hardware and fire alarm system.
 - 1. Door Hardware Interface: The card key access control system to interface and be connected to electronic door control hardware (electromechanical locks, electric strikes, magnetic locks, door position switches, other monitoring contacts, and related auxiliary control devices) as described under Division 8 "Door Hardware". Coordinate the installation and configuration of specified door hardware being monitored or controlled with the controls, software and access control hardware specified in this Section.
- C. Templates: Obtain and distribute to the parties involved templates for doors, frames, and other work specified to be factory prepared for installing electrified door hardware and access control system components. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing access control system hardware to comply with indicated requirements.
- D. Door and Frame Preparation: Related Division 08 Sections (Steel, Aluminum and Wood) doors and corresponding frames are to be prepared, reinforced and pre-wired (if applicable) to receive the installation of the specified electrified, monitoring, signaling and access control system hardware without additional in-field modifications.

1.7 WARRANTY

- A. General Warranty: Reference Division 01, General Requirements. Special warranties specified in this Article will not deprive Owner of other rights Owner may have under other provisions of

the Contract Documents and are in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

- B. Warranty Period: Written warranty, executed by manufacturer(s), agreeing to repair or replace components of the installed access control system hardware and software that fails in materials or workmanship, including all related parts and labor, within specified warranty period after final testing and acceptance by the Owner. Failures include, but are not limited to, the following:
1. Structural failures including excessive deflection, cracking, or breakage.
 2. Faulty operation of the hardware.
 3. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
 4. Electrical component defects and failures within the systems operation.
- C. Standard Warranty Period: One year from date of Substantial Completion, unless otherwise indicated.
- D. Special Warranty Periods (Electrified Access Control Door Hardware):
1. Two years for Electrified, Wiegand Output, and IP-Enabled Access Control Door Hardware.
- E. Maintenance Support and Extended Service Agreement: Submit for Owner's consideration an optional extended Service Agreement for the installed access control system, including support for software related issues. The extended Service Agreement is considered elective and is without manufacturer's requirement stipulating mandatory coverage for owner and/or vendor system support.
1. A published copy of this agreement to be included with the submittal package
 2. Support for the installed access control system components is provided through the vendor under a 24 hour technical assistance program.
 3. Access control and management system components are to be available on a one-day turn around time frame from the manufacturer.
 4. Primary systems manufacturer to offer and provide remote modem or internet access for direct factory support to the vendor. The factory level support to include diagnostics and troubleshooting support on systems related issues at no additional cost to the owner.
- F. Access Control Software Upgrades: Version upgrades and "fix" releases to the access control system software are available at no extra charge as long as the version of software provided under this specification remains the current manufacturer's version or for up to (2) years after a new version release.
1. Major access control software revisions that provide new functionality to the product provided free of charge for up to one (1) year from the date of substantial completion.
 2. Access control system software is to be upgradable as may be required or as necessary, to expand and manage the owner's site or sites. Upgrades are to be offered at a published flat fee for the primary system software, with single license modules included in the primary fee structure. System upgrades offered at a costing structure based upon the original number of licensed modules issued, or on those to be purchased at a future date, are not allowed.

3. As part of the submittal package, provide a list of available software upgrades and/or expansions modules. List to identify related costs for upgrades, or expansions to the original system, up to the next qualifying operational level.

1.8 MAINTENANCE SERVICE

- A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of the installed access control system hardware and components.
- B. Maintenance Service: Beginning at Substantial Completion, and running concurrent with the specified warranty period, provide continuous (6) months full maintenance by skilled employees of the Systems Integrator. Include repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper door opening operation. Provide parts and supplies as used in the manufacture and installation of original products.

1.9 SCOPE OF WORK

- A. On-Line Electronic Access Control System: Furnish and install at the indicated locations the specified electrified and integrated door hardware and access control firmware and software for a completely operational access control and security site management system. System includes, but is not necessarily limited, to the following:
 1. Electrified integrated card reader locks and exit hardware, permanent and temporary override cylinders, network control processors, reader controller panels, I/O monitor/control interfaces, door position switches, remote card readers, keypads, and display terminals, access cards and credentials, system application software, special tools, operating manuals, and required cabling and accessories as detailed below and listed in the Access Control Hardware Sets at the end of Part 3.
 - a. Provide the appropriate number of reader controller panels and I/O monitoring/control expansion interfaces as needed to handle the number of card readers, locking devices, door status devices, and identified alarm inputs specified in this section, and as shown on the security drawings.
 - b. Provide manufacturer approved integrated card reader locks, exit hardware, and remote mounted card readers, keypads, and display terminals that are functionally compatible with the specified access control equipment interfaces.
 2. Access control system equipment to be installed in an enclosure box compatible with the specified components. This enclosure to include, but is not necessarily limited to, the network control processor, I/O monitor/control interface panels, power supplies, terminal strips, wire ducts, keyed lock cylinder, integrated outlet for A/C power, and standoffs.
 - a. Enclosure box to be located in the designated IT/Telecom room(s) with connection to local area network for communication back to the central server host.
 3. Owner to provide the following:

- a. Central server host computer, client workstations, and hardware peripherals to be from an approved, major line computer manufacturer. Specific information detailing compliance with system requirements to be included in the project submittal package as specified.
 - b. Owner will be responsible for ensuring that each computer hardware component includes the required interfaces, expansion boards, and peripherals that will be necessary to allow the system to operate as described within this specification and as indicated on the drawings.
 - c. Power Sourcing and Network Switches: Quantity as required to accommodate installed access control (and video surveillance) devices.
 - d. Network Control Processor Connections:
 - 1) LAN/Ethernet communication ports (jacks) and network interface cards as needed, CAT5e cabling from network router/switch to network control processor, outlet and cover plates and/or patch cables required for network connection within each designated IT/Telecom room.
 - 2) Required static IP addresses.
4. Power Supplies, including battery back up and separately fused surge protection, required for the electrified door hardware and access control equipment.
 5. Installation, final configuration and commissioning of electrified door and access control system hardware, communication firmware, power supplies and related accessories.
 6. System application software including installation, programming, and end user training of the access control system demonstrating operating, repair, and maintenance procedures. Include no fewer than 8 hours of on-site central server training for designated personnel (facilities maintenance, security, IT, administration) by a factory certified representative.
 7. Provide manufacturer required power controllers, interface boards, and programming that may be required for approved electric latch retraction exit devices supplied under Division 08 Section "Door Hardware."
 8. Electrical contractor, Division 26, to provide the following:
 - a. Source power wiring (120VAC) as required for the electrified locking and access control hardware, equipment, accessories and power supplies. This includes quad outlets as required on a dedicated circuit in the designated IT/Telecom room(s) and the related conduit, stub-in, junction boxes and connectors required for the source power delivery and connections.
 - b. Provide required conduit, stub-in, junction and back boxes for both the electrified locking hardware and access control equipment at each of the access controlled or monitored openings per plan drawings and specs. Supply and install conduit between each of the aforementioned devices and between the electrical junction boxes, power supplies and access control equipment located on or above the door opening.
 - 1) At wall mounted remote readers, provide conduit on the secured side of the door, 36" from the finish floor and 6" from the edge of the frame, to the related power supplies and access control equipment.
 - 2) At electrical hardware power transfers provide conduit on the secured side of the opening from the power transfer, thru-wire hinge, or serviceable panel location on the frame jamb to the related power supplies and access control equipment.

- c. Electrical Contractor to provide all 120VAC cabling connections and terminations from the electrical junction boxes to these electrical devices.
9. Access Control System Integrator to provide the following:
 - a. Low voltage wiring (12/24VDC) and communication cabling (RS-232/RS-485) from network control processors to reader controllers, I/O monitor/control interface panels, electrified and integrated locking hardware, remote card readers, keypads, or display terminals, monitoring and signaling switches, and power supplies. Work includes related connectors, final terminations, and hook-ups required for a complete and functional access controlled opening in accordance with applicable codes and specified system operational narratives.
10. Elevator Contractor to provide the following:
 - a. Interface or landing of interface cable onto the elevator call button will be performed by a certified elevator contractor.
 - b. Coordinate with access control systems integrator provisions for a card reader with output allowing the elevator call button to be activated. A validated card read will be required for activation.
11. Full and seamless integration of the site intrusion alarm service if applicable, with the installed site access control system software.
12. Final connections to fire alarm system, if required, by electrical and fire alarm system contractors.
13. Provide permits, submittals and approvals required by the authority having jurisdiction, prior to commencing with work.
14. Provide manufacturer required power controllers, interface boards, and programming that may be required for approved electric latch retraction exit devices supplied under Division 08 Section "Door Hardware."
15. Electrical contractor (Division 26) to provide the following:
 - a. Provide required conduit, stub-in, junction and back boxes for both the electrified locking hardware and access control equipment at each of the access controlled or monitored openings per plan drawings and specs. Supply and install conduit between each of the aforementioned devices and between the electrical junction boxes, power supplies and access control equipment located on or above the door opening.
 - 1) At off-line remote readers, provide conduit on the secured side of the door, 36" from the finish floor and 6" from the edge of the frame, to the related power supplies and access control equipment.
 - 2) At electrified hardware power transfers provide conduit on the secured side of the opening from the power transfer, thru-wire hinge, or serviceable panel location on the frame jamb to the related power supplies and access control equipment.
 - b. Electrical Contractor to provide all 120VAC cabling connections and terminations from the electrical junction boxes to these electrical devices.
16. Access Control System Supplier to provide the following:

- a. Low voltage wiring (12/24VDC) for the electrified locking hardware, remote card readers, monitoring and signaling switches, and power supplies. Work includes related connectors, final terminations and hook-ups required for a complete and functional access-controlled opening in accordance with applicable codes and specified system operational narratives.
17. Typical System Requirements (Owner Provided): Central server host computer, client workstations, and hardware peripherals to be from an approved, major line computer manufacturer. Specific information detailing compliance with system requirements to be included in the project submittal package as specified.

PART 2 - PRODUCTS

2.1 POWER OVER ETHERNET ACCESS CONTROL

- A. IP Enabled Power-over-Ethernet (PoE) Integrated Card Reader Mortise Lock: IP enabled ANSI/BHMA A156.13 Grade 1 mortise lockset with integrated credential reader, request-to-exit, and door position signaling in one complete unit. Motor driven locking/unlocking control of the lever handle trim, 3/4" projection latchbolt, and optional 1" steel deadbolt. Lock is U.L listed and labeled for use on up to 3 hour fire rated openings. Available with or without keyed high security cylinder override.
1. Completely intelligent and integrated locking unit with Ethernet power and communication connection capability directly from the locking unit back to the central system host server without additional access control interfaces or components (excluding PoE Endspan and Midspan devices) via an existing or newly installed IEEE 802.3af PoE enabled network.
 2. Open architecture design supports wired integration with third party access control systems applications via software development kit (SDK). Real-time software accessible alarms for forced door, unknown card and door held open, with inside lever handle (request-to-exit), battery status, tampering, and door position (open/closed status) monitoring.
 3. 2,400 users and 10,000 event transaction history (audit trail). Distributed intelligence allows stand alone operation in absence of network communication allowing for system operational redundancy.
 4. Provide a network and lock configuration CD tool kit for initial lock setup and programming via a USB connection.
 5. Energy Efficient Design: Provide lock bodies which have a holding current draw of 15mA maximum, and can operate on either 12 or 24 volts. Locks are to be field configurable for fail safe or fail secure operation.
 6. Integrated reader supports the following credentials:
 - a. 125kHz proximity credentials: HID, AWID, Indala, and EM4102.
 - b. 13.56 MHz contactless credentials: HID iClass, HID iClass SE, HID iClass Seos, SIO on MIFARE Classic, SIO on MIFARE DESFire EV1, MIFARE Classic, DESfire EV1, NFC-enabled mobile phones, Bluetooth Smart-enabled mobile phones.
 7. Optional push-button keypad for PIN only usage or dual authentication requirements.

8. Communication between access control system and device is protected by AES 128 bit encryption via the SDK. Programmable for time zones, holidays, and automatic unlocking.
9. Power and communication from one Ethernet (CAT5e or higher) cable. Compliant with 802.3af Class 1 device specifications requiring 3.84 watts for Power over Ethernet.
10. Supports real-time system lockdown capabilities. Inside lever retracts latch bolt and deadbolt simultaneously.
11. High security mechanical key provides emergency override retraction of latchbolt without need for electronic activation.
12. Ethernet system framework, network cabling, mounting boxes, PoE end-span/mid-span, electrical hard wiring, grounding, and connections are required for complete system functionality. All system components are by others and are specified elsewhere.
 - a. Power Requirement: PoE Class 2, maximum 7 watts.
 - b. Network Cabling Requirements: Cat5e or higher meeting or exceeding ANSI/TIA/EIA-568-C. 24 AWG Plenum rated.
 - c. Bonding and Grounding: Meet or exceed TIA-607-B requirements. Connect device ground cable to building electrical earth ground.
 - d. Network Surface Mount Box: Meet or exceed ANSI/TIA/EIA-568-C requirements. Cat5e or higher (RJ45).
13. Manufacturers:
 - a. Corbin Russwin Hardware (RU) - IN220 Series.
 - b. Sargent Manufacturing (SA) - IN220 Series.

2.2 CABLES AND WIRING

- A. Comply with Division 27 Section "Conductors and Cables for Electronic Safety and Security."
- B. Data Line Supervision: System to include alarm initiation capability in response to opening, closing, shorting, or grounding of data transmission lines.
- C. Install appropriate number of conductor pairs, in the wire gage (AWG) recommended by manufacturer, corresponding to the electronic locking functions specified, amperage drawn and distances covered between the power supplies, power transfer devices, electrified hardware and access control equipment.

2.3 ACCESS CONTROL HARDWARE FINISHES

- A. Standard: Comply with BHMA A156.18.
- B. Protect mechanical finishes on exposed surfaces from damage by applying temporary protective coverings before shipping.
- C. Where specified, finishes on integrated card key locksets or exit hardware to incorporate an FDA recognized antimicrobial coating (i.e., MicroShield™) listed for use on equipment as a suppressant to the growth and spread of a broad range of bacteria, algae, fungus, mold and mildew.

- D. BHMA Designations: Comply with base material and finish as specified.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine scheduled openings, with Installer present, for compliance with requirements for installation tolerances, labeled fire door assembly construction, wall and floor construction, and other conditions affecting performance of the installed access control system.
- B. Examine roughing-in for electrical source power to verify actual locations of wiring connections before electrified and integrated access control door hardware installation.
- C. Examine roughing-in for LAN and control cable conduit systems to PCs, controllers, card readers, and other cable-connected devices to verify actual locations of conduit and back boxes before device installation.
- D. Notify architect of any discrepancies or conflicts between the specifications, drawings and scheduled access controlled hardware. Proceed only after such discrepancies or conflicts have been resolved in writing.

3.2 PREPARATION

- A. Doors and frames at scheduled access controlled openings to be properly prepared to receive specified electrified and access control hardware and connections without additional in-field modifications.

3.3 INSTALLATION

- A. Install each item of electronic integrated door hardware and access control equipment to comply with manufacturer's written instructions and according to specifications.
- B. Mounting Heights: Mount electronic integrated door hardware units at heights indicated in following applicable publications, unless specifically indicated or required to comply with governing regulations:
 - 1. Standard Steel Doors and Frames: DHI's "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames."
 - 2. Wood Doors: DHI WDHS.3, "Recommended Locations for Architectural Hardware for Wood Flush Doors."
 - 3. Where indicated to comply with accessibility requirements, comply with ANSI A117.1 "Accessibility Guidelines for Buildings and Facilities."
- C. Boxed Power Supplies: Verify locations.
 - 1. Configuration: Provide the least number of power supplies required to adequately serve doors with access control hardware and equipment.

- D. Final connect the system control switches (integrated card key locking hardware, remote readers, keypads, display terminals, biometrics), and monitoring, and signaling equipment to the related Controller devices at each opening to properly operate the electrified door and access control hardware according to system operational narratives.
- E. Retrofitting: Install each door hardware and access control item to comply with manufacturer's published templates and written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing work specified in Division 9 Sections. Do not install surface-mounted items until finishes have been completed on substrates involved.
- F. System Application Software: Install, and test application(s) software and databases for the complete and proper operation of systems involved. Assign software license(s) to Owner.

3.4 FIELD QUALITY CONTROL

- A. Field Inspection (Punch Report): Reference Division 01 Sections "Closeout Procedures". Produce project punch report for each installed door opening indicating compliance with approved submittals and verification hardware is properly installed, operating and adjusted. Include list of items to be completed and corrected, indicating the reasons or deficiencies causing the Work to be incomplete or rejected.
 - 1. Organization of List: Include separate Door Opening and Deficiencies and Corrective Action Lists organized by Mark, Opening Remarks and Comments, and related Opening Images and Video Recordings.
- B. Commissioning and Testing Schedule: Prior to final acceptance of the access control system installation, the following testing and documentation to be performed and provided to the Owner.
 - 1. Inspection: Verify that units and controls are properly installed, connected, and labeled and that interconnecting wires and terminals are identified.
 - 2. Pre-testing: Program and adjust the system and pretest all components, wiring, and functions to verify they conform to specified requirements. Provide testing reports indicating devices tested, pass/fail status, and actions taken to resolve problem(s) on failed tests.
 - 3. Acceptance Test Schedule: Correct deficiencies identified by tests and observations and retest until specified requirements are met.
 - 4. Provide "as designed" drawings showing each device and wiring connection and electronic enclosure legends indicating cabling in and out.
 - 5. Provide a complete set of operating instructions for access control hardware devices and a complete software user manual. The documentation includes module reference guides for each electronic enclosure.

3.5 ADJUSTING

- A. Adjust and check each operating item of integrated access control door hardware, and each door opening to ensure proper secured operation and function of every unit. Replace units that cannot be adjusted to operate as intended.

3.6 CLEANING AND PROTECTION

- A. Clean adjacent surfaces soiled by access control system installation.
- B. Clean operating items as necessary to restore proper finish and provide final protection and maintain conditions that ensure access control door hardware is without damage or deterioration at time of owner occupancy.

3.7 DEMONSTRATION

- A. Engage an authorized systems manufacturer representative to train Owner's maintenance personnel to adjust, operate, and maintain electronic integrated door hardware and the access control system.

3.8 ACCESS CONTROL HARDWARE SETS

- A. The access control system hardware sets listed below represent the design intent and direction of the owner, architect, and security consultant (as applicable). They are intended as a guideline only and should not be considered a detailed opening schedule. Discrepancies, conflicting, and missing items should be brought to the attention of the architect with corrections made prior to the bidding process. Omitted items not included in a hardware set should be scheduled with the appropriate additional hardware required for proper application and functionality.
- B. The supplier is responsible for handing and sizing all products and providing the correct option for the appropriate door type and material where more than one is presented in the hardware sets. Quantities listed are for each pair of doors, or for each single door.
- C. Refer to Section 080671, Door Hardware Sets, for hardware sets.

END OF SECTION 281500

SECTION 281523 - INTERCOM ENTRY SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes multi-tenant video intercom entry systems and related products.
- B. Related Sections:
 - 1. Division 01 Section "Closeout Procedures".
 - 2. Division 28 Section "Security Access Detection Equipment".
 - 3. Division 28 Section "Security Video Intercom System".
- C. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- D. Codes, References and Standards:
 - 1. American National Standards Institute (ANSI/TIA/EIA) 568 - Commercial Building Telecommunications Cabling Standard.
 - 2. International Organization for Standards (ISO) 9001:2000 - Quality Management Systems - Requirements.

1.3 SUBMITTALS

- A. Product Data: Manufacturer's data sheets on each product to be used, including Preparation instructions and recommendations, storage and handling requirements and recommendations and installation methods.
- B. Shop Drawings: Submittals to include wiring diagrams indicating wiring for each item of equipment and interconnections between items of equipment. Include manufacturer's names, model numbers, ratings, power requirements, equipment layout, device arrangement, complete wiring point-to-point diagrams, and conduit layouts.
- C. Installation and Operation Manuals: Submit manufacturer's installation and operation manual, including operation instructions and component wiring diagrams. Provide detailed information required for Owner to properly operate equipment.
- D. Warranty: Submit manufacturer's standard warranty.

1.4 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Engage a qualified manufacturer that is an ISO 9001 (2008) certified company.
- B. Installer Qualifications: Factory trained and experienced with system installations of scope and size required for the Project.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly identifying product name and manufacturer.
- B. Store materials in clean, dry area indoors in accordance with manufacturer's instructions.
- C. Protect materials during handling and installation to prevent damage.

1.6 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 absolute limits.

PART 2 - PRODUCTS

2.1 INTERCOM ENTRY STATIONS

- A. Door Stations (Multi-Tenant, Small Occupancy): Modern, rectangular surface or flush mounted IP video door stations for multi-tenant businesses and buildings with 2 units.
 - 1. Provide door stations with the following functions and features:
 - a. Open API local interface for integration with third-party systems.
 - b. Illuminated call buttons with backlit nameplate.
 - c. Video and audio call on smartphones, tablets, IP, and landline phones; real-time communication with one-way video at 720p with two-way audio.
 - d. Two relays for door release.
 - e. Motion sensor with a 3.3-to-32.9-foot range.
 - f. Built-in RFID reader, 125 KHz; 0 - 3cm range.
 - g. Built-in keypad with 500 entry codes.
 - 2. Manufacturers:
 - a. DoorBird (DR) - D2100 Series.
- B. Indoor Stations: Single-family or multi-tenant door communication IP video stations.
 - 1. Provide door stations with the following functions and features:

- a. Scratch-resistant tempered Gorilla glass 4” true color touch display.
 - b. Visitor history with cloud recording.
 - c. Three relays for door release.
 - d. Two-way HD audio up to 102 dB.
 - e. Room-to-room communication with multiple indoor stations.
 - f. Home and building automation control.
2. Manufacturers:
- a. DoorBird (DR) - A1100 Series.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas to receive integrated security and communication system and notify architect of conditions that would adversely affect installation or subsequent use. Do not begin installation until unacceptable conditions are corrected.

3.2 PREPARATION

- A. Verify the following compliance before starting installation.
 1. All units, except for the entrance station and tenant station, are designed for indoor use only.
 2. The unit turns inoperative during power failure.
 3. In areas where broadcasting station antennas are close by, intercom system may be affected by radio frequency interference.
 4. Keep the intercom wires at least 1 foot away from strong electrical wiring including wiring for inverter electrical appliances; noise and malfunction could result.
 5. Keep the unit more than 3.3 feet away from radio or TV set.
 6. If a strong light shines on the main unit screen, the picture will turn white or only silhouettes will be visible.
 7. Other manufacturer's devices (such as sensor, detectors, door releases) used with this system, comply with the manufacturer's installation requirements.

3.3 INSTALLATION

- A. Install integrated security and communication system in accordance with manufacturer's instructions at locations indicated on the Drawings.
- B. Mount equipment plumb, level, square, and secure. For video entrance stations and video door stations, comply with manufacturer's design requirements to provide optimum picture quality of station monitoring.

3.4 SETUP AND ADJUSTING

- A. Adjust integrated security and communication system for proper operation in accordance with manufacturer's instructions.

3.5 DEMONSTRATION AND TRAINING

- A. Demonstrate that integrated security and communication systems function properly.
 - 1. Perform demonstration at final system inspection by qualified representative of manufacturer.
- B. Provide instruction and training of Owner's personnel as required for operation of integrated security and communication system.
- C. Provide hands-on demonstration of operation of system components and complete system, including user-level program changes and functions.
- D. Provide instruction and training by qualified representative of manufacturer.

3.6 PROTECTION

- A. Protect installed integrated security and communication system from damage during construction.

END OF SECTION 281523

SECTION 28 46 13 - FIRE ALARM SYSTEM

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. New voice evacuation point addressable main fire alarm panel, devices, and new NAC panels.
 - 1. Fire alarm system performance specification.
 - a. Contractor shall be responsible to obtain engineering and AutoCAD from the fire alarm manufacturer to design a new system. Devise an existing system and install a complete fire alarm system.
 - b. Contractor shall submit and pay all fees for plan review, 50% inspection, final inspection and complete and submit all associated documents.
 - c. Contractor shall be responsible for system check-out, start-up and on-site Owner training.
- B. Fire alarm system shall not be limited to: Manual pull stations, magnetic door holders, duct smoke detectors, ceiling smoke detectors, audio/visual devices and visual devices. Include all associated code mandated components, wiring for a complete operating system.
- C. Fire alarm ADA signaling devices.
- D. Fire alarm wiring.
- E. Unit Prices: Provide a unit price for complete device installation as listed: Manual pull stations, audio/visual devices, smoke detectors, duct smoke detectors, conduit, backboxes and wiring. Refer to the Bid Proposal Form for associated requirements.
- F. Combination smoke/fire dampers shall be furnished and installed as part of Mechanical Trades bid. It shall be the responsibility of the Electrical Trades to review the mechanical drawings for damper locations. Do not rely solely on the electrical drawings.
- G. Fire protection system. Electrical Trades shall complete all flow and tamper switch wiring to the fire alarm system. The flow and tamper switches shall be furnished and installed as part of the fire protection contractor's bid. Electrical Trades shall furnish and install a flush mounted backbox, an exterior horn/strobe and wiring to the fire alarm system. Electrical Trades shall be responsible to contact the fire protection contractor to confirm flow and tamper switch quantities and locations, and include all costs.
- H. The fire alarm vendor shall be responsible to review the Architectural door schedules and hardware specification section to include all magnetic door holder devices. Include all fire alarm panel points.

- I. Complete fire alarm wiring to the fire pump controller, flow and tamper switches. Fire pump controller minimum monitoring points shall include phase loss, phase reversal, power loss and frequency sensitivity.
- J. The Fire Alarm vendor shall include in their bid any cost for requesting AutoCAD backgrounds for their use from the Architect or Engineer. The cost will be \$150.00 for the first plan, and \$50.00 for each additional plan that may be requested for AutoCAD use. A waiver of responsibility for the Architect and Engineer related to Contractor use of the CAD files shall be signed by the Fire Alarm vendor.
- K. Fire alarm system interface to egress lighting to meet Chapter 7 Life Safety Code Article 7.8 requirements.

1.2 RELATED SECTIONS

- A. All drawings and specification sections apply to work in this section. Furnish all items, articles, materials, equipment, operations or methods that are mentioned, listed or scheduled on drawings or are in this specification including all labor, equipment, materials and miscellaneous incidentals necessary and/or required for the completion of this project. The work covered under this section of the specifications is in no way complete within itself but is supplementary to the entire specification and drawings.

1.3 REFERENCES

- A. Conform to requirements of 2015 Michigan Building Code, 2017 National Electrical Code, 2017 State of Michigan Code Rules Part 8, 2009 ICC/ANSI 117.1 and local code requirements.
- B. NFPA 72 - Current adopted code.
- C. State of Michigan – Bureau of Fire Services for Fire Alarm Plan Review and Inspections.
- D. Local authorities having jurisdiction.
- E. State of Michigan, 2019 School Rules.
- F. Underwriters Laboratories Inc.
- G. National Fire Protection Association Standards
 - 1. NFPA 13 – Installation of Sprinkler Systems.
 - 2. NFPA 15 – Water Spray Fixed Systems.
 - 3. NFPA 16 – Deluge Foam Water Systems.
 - 4. NFPA 72 – National Fire Alarm Code.
 - 5. NFPA 101 – Life Safety Code.
 - 6. NFPA 720 – Standard for Installation of CO Detection.
- H. All equipment shall be approved by Underwriters Laboratories Inc. (UL) for its intended purpose for the following standards as applicable.

1. UL864 UOJZ - Control units for fire protective signaling systems local signaling unit.
 - a. Central station signaling protected premises unit.
 - b. Remote signaling protected premises unit.
2. UL2075 - CO detectors connected to face.
3. UL864 SYZV - Releasing device control unit (water release only).
4. UL268 - Smoke detectors for fire protective signaling systems.
5. UL268A - Smoke detectors for duct application.
6. UL217 - Smoke detectors for single stations.
7. UL521 - Heat detectors for fire protective signaling systems.
8. UL228 - Door holders for fire protective signaling systems.
9. UL464 - Audible signaling appliances.
10. UL1638 - Visual signaling appliances.
11. UL38 - Manually activated signaling boxes.
12. UL346 - Waterflow indicators for fire protective signaling systems.
13. UL1481 - Power supplies for fire protective signaling systems.

1.4 AMERICANS WITH DISABILITIES ACT (ADA)

- A. All visual notification appliances and manual pull stations shall comply with the requirements with ADA.

1.5 SUBMITTALS

- A. Provide submittal as listed in Section 26 01 00. Submittal cut sheets shall be arrowed or marked with catalog numbers. Failure to comply will be cause for returning submittal for corrections at no delays or extra cost to the Owner.
 1. Plan drawings showing the locations (with room names and numbers) of the system components, including any adjustments in the quantities and locations of initiating devices and notification appliances to meet code requirements.
 2. Riser diagram showing system components, interconnecting wiring and connections to other building systems and equipment.
 3. Wiring diagrams showing manufacturer and field connections at component terminals, complete with conductor color codes and wire numbers.
 4. System configuration list showing inputs, outputs, device addresses and custom location labels, device configurations and program logic.
 5. Submit bill of materials, and not part of the submittal, with O&M Manuals.
 6. Catalog pages showing system components.
 7. System battery sizing calculations.
 8. Power supply, amplifier and circuit sizing calculations.
 9. Door hold-open power supply sizing calculations.
- B. Shop Drawings: Provide control panel layout and system wiring diagram showing each device and wiring connection required.

1.6 PROJECT RECORD DOCUMENTS

- A. Record actual locations for complete fire alarm system.

1.7 OPERATION AND MAINTENANCE DATA

- A. Submit as specified.
- B. Operation Data: Operating instructions.
- C. Maintenance Data: Maintenance and repair procedures.

1.8 REGULATORY REQUIREMENTS

- A. Conform to requirements of 2015 Michigan Building Code, 2017 National Electrical Code, 2017 State of Michigan Code Rules Part 8, 2009 ICC/ANSI 117.1 and local code requirements.
- B. NFPA 72 - Current adopted edition.
- C. NFPA 101 - Life Safety Code, current adopted edition.
- D. State of Michigan, Bureau of Fire Services for Plan Review and Inspections.
- E. Local authorities having jurisdiction.
- F. State of Michigan, 2016 School Rules.
- G. NFPA 90A Current Adopted Edition.
- H. NFPA 92A Current Adopted Edition.
- I. NFPA 92B Current Adopted Edition.
- J. All equipment shall be approved by Underwriters Laboratories Inc. (UL) for its intended purpose for the following standards as applicable.
 - 1. UL864 UOJZ - Control units for fire protective signaling systems local signaling unit.
 - a. Central station signaling protected premises unit.
 - b. Remote signaling protected premises unit.
 - 2. UL2075 - CO detectors connected to face.
 - 3. UL864 SYZV - Releasing device control unit (water release only).
 - 4. UL268 - Smoke detectors for fire protective signaling systems.
 - 5. UL268A - Smoke detectors for duct application.
 - 6. UL217 - Smoke detectors for single stations.
 - 7. UL521 - Heat detectors for fire protective signaling systems.
 - 8. UL228 - Door holders for fire protective signaling systems.
 - 9. UL464 - Audible signaling appliances.
 - 10. UL1638 - Visual signaling appliances.
 - 11. UL38 - Manually activates signaling boxes.
 - 12. UL346 - Waterflow indicators for fire protective signaling systems.
 - 13. UL1481 - Power supplies for fire protective signaling systems.

1.9 SCOPE OF WORK

- A. The design intent is to replace the existing Simplex 4010 Fire Alarm Control Panel and service the entire existing High School and Middle School one for one with new. Existing devices shall be connected to the new panel. The new panel shall be utilized to feed the new fire alarm system in the addition.
- B. This bid package shall include fire alarm panel, all devices and associated NAC panel, wiring and system certification ready for interconnection to one main fire alarm control panel, and a remote annunciator panel as specified.
- C. Provide fire alarm wiring and a 120 volt circuit to any combination smoke/fire dampers as shown on the Mechanical drawings. Electrical Trades shall be responsible to review the Mechanical drawings in addition to the Electrical plans. Mechanical plans shall govern damper location. Interwire to the associated duct smoke detector in accordance with the manufacturer's wiring instructions. Duct smoke detector shall be provided and wired by Electrical Trades, unless specifically listed on the damper schedules.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. JCI/Simplex

2.2 OPERATION

- A. The operation of any manual pull station, flow switch, tamper switch, smoke detector, duct smoke detector, shall cause the sounding of all alarm horns on a temporal pattern basis, sequential flashing of system strobes, activate common alarm relay contacts on the control panel and indicate on the control panel's LCD display the zone and type of device sounding the alarm.
- B. In addition, the operation of any duct smoke detector shall shut down its associated fan or damper motor. Complete interwiring between detector and mechanical equipment control panel.
- C. Refer to the current adopted NFPA 72 Fire Alarm Code for the allowable detector distance and location from the pair of doors.
- D. The operation of the panel mounted alarm silencing switch will turn off all horns but the strobes will continue to flash until the device actuating the alarm is reset to its normal position and the panel mounted system reset button is operated, at which time the system will return to its normal stand by (supervisory) mode.
- E. Any system trouble condition such as an open circuit or ground condition will activate a common trouble LED and indicate on the control panel LCD display the exact zone, circuit or internal panel condition causing the trouble condition. Correction of the trouble source will return the panel to its normal standby mode.
- F. Initiating device circuits shall be two-wire style B, and horn or strobe circuits shall be two-wire style Y utilizing end of line resistors for circuit supervision. All wiring to

initiating and signaling devices shall be looped and continuous to the end of line resistor on its respective circuit. T-tapping is not permissible.

- G. The fire alarm control panel shall communicate with each addressable initiating and control device individually via shielded twisted pair signaling line circuits.
- H. Each signaling line circuit shall be capable of accessing up to 127/250 addressable devices.
- I. Each signaling line circuit shall allow up to 10,000 feet of wire length to the furthest addressable device.
- J. Communications shall be completely digital and shall include parity data bit error checking routines for address codes and check sum routines for the data transmission protocol.
- K. Each device shall be uniquely identified by the device address.
- L. There shall be no limit to the number of initiating devices which may be activated simultaneously.
- M. Each device shall be individually annunciated at the panel. Annunciation shall include the following conditions for each device.
 - 1. Alarm, supervisory or trouble condition.
 - 2. Open, short or ground.
 - 3. Device failure or incorrect device installed.

2.3 FIRE ALARM CONTROL PANEL

- A. New point addressable suitable for voice evacuation sized properly with a minimum of 30% spare capacity.
- B. Provide a fire alarm control panel with the following:
 - 1. Digital display.
 - 2. Multiple pushbutton keypad.
 - 3. LED status indicating lights.
 - 4. Audible status signals.
 - 5. Output relays.
 - 6. Battery charger and batteries.
 - 7. RS-232 communications card.
- C. Evaluate and document the appropriate notification appliance circuit class designation.
 - 1. In general, provide Class B notification appliance circuits.
 - 2. Size the control panel power supplies, amplifiers, and batteries for 25 percent spare capacity calculated with, 1 watt speaker loads, and 150 ma strobe light loads.
 - 3. Provide sufficient spare capacity on each notification appliance circuit for an additional 25 percent of notification appliances.

- D. The system shall supervise the following circuits and components:
 - 1. Initiating device circuits.
 - 2. Signaling line circuits.
 - 3. Notification appliance circuits.
 - 4. Addressable initiating and control devices.
 - 5. Control output wiring.
 - 6. Auxiliary control switches.
 - 7. System, NAC panels, remote annunciator, and remote microphone.
 - 8. Primary power supply.
 - 9. Secondary power supply.
- E. The system shall be capable of being programmed by the Owner on site to accommodate expansion or sequence of operation changes.
- F. Provide 120 volts AC primary power to the system.
- G. Provide a control panel battery charger capable of fully charging a 200 amp-hour battery within 24 hours.
- H. Provide sufficient secondary power battery capacity to operate the entire system (except the door hold-open devices) upon the loss of primary power for a period of 24 hours in a normal supervisory mode followed by 5 minutes of evacuation alarm operation.
 - 1. When emergency voice/alarm communications is provided, provide sufficient battery capacity for 24 hours of operation in a normal supervisory mode followed by 15 minutes of voice/alarm operation.
 - 2. The system shall automatically transfer to and from the secondary power batteries upon an interruption of primary power without initiating a nuisance alarm.
 - 3. The system shall delay initiating a trouble condition for two seconds upon a transfer to or from primary power to avoid nuisance trouble conditions during emergency generator testing.
- I. Provide smoke and heat detectors as required by code and as shown, including the following.
 - 1. Provide a smoke detector in each mechanical, electrical, telecommunications, daycare rooms, and associated egress corridors.
 - 2. Provide duct smoke detectors where required by code. When not in plain view or when more than 10 feet above the floor, provide duct detector remote alarm indicators and test switches mounted in plain view at 48 inches above the floor.
- J. Provide sufficient audible notification appliances to achieve a sound level of 15 dBA above ambient sound level, but not less than 60 dBA nor more than 110 dBA in all occupiable spaces. The sound level in mechanical rooms shall be not less than 90 dBA. The sound shall be a three-pulse temporal pattern evacuation tone.
- K. Provide visual notification appliances in accordance with the intensity and spacing requirements of NFPA 72.
 - 1. Provide speaker/strobes in accordance with plans and specifications.

2. Synchronize strobes.
- L. Provide individually addressable monitor modules to monitor non-addressable initiating devices and status contacts of other systems.
 1. Monitor modules shall use Class B initiating device circuits to monitor the initiating devices and status contacts.
- M. Provide panel auxiliary relay contacts and individually addressable control module contacts, including the required panel control logic programming, to interface with control circuits of other systems and equipment.
 1. Provide normally closed duct smoke detector contacts to shut down ventilation systems.
- N. Assign each initiating device and control module a unique device address. Label each device with its unique address using a clear adhesive backed nylon or Mylar tape with black text. Install the label on the base of any device with a removable or replaceable head.
- O. Label each initiating device and control module that describes the type, room number/name and exact location of the device.
- P. Provide transient voltage surge suppression for the system.

2.4 DEVICES (all point addressable type that is compatible to the main panel)

- A. **Manual Pull Stations:** Individually addressable, suitable for two wire operation, with a high impact red Lexan body and raised white lettering. Stations shall include an ADA compliant single action operating mechanism with a mechanical latch to hold an operated station open until reset.
 1. Reset shall be accomplished through use of a key common to the panel or a small flat-blade screwdriver. Stations which use allen wrenches or special tools to reset are not acceptable. The point of reset shall be front accessible so stations with tamper-resistant covers can be reset easily.
- B. **Smoke Detectors:** Provide photoelectric type with two wire base for mounting to a 4" octagon box. Furnish smoke detectors for control of the magnetic door holder as shown and noted on the plans. Refer to the current adopted NFPA 72 Fire Alarm Code for the allowable detector for locations.
- C. **Duct Smoke Detectors:** Individually addressable and consist of a housing, sampling tubes, a baffle and a detachable detector head. Duct detectors shall include an alarm LED, a local test switch, and an auxiliary SPDT relay for ventilation system control. Duct detectors shall be resettable by actuating the panel reset pushbutton. The sampling tubes shall be capable of being cleaned through the housing cover.
 1. The detector heads shall be photoelectric as specified above, but shall be capable of accepting ionization detector heads.

2. Duct detectors shall include remote alarm indicators and test switches shall be installed in readily accessible locations.
- D. **Audio/Visual Units:** Provide horn and strobe units with 24VDC horn and ADA approved strobe for mounting to a 4" square box.
- E. **Strobes:** As shown for proper illuminance, clear Lexan lens with red "FIRE" or international fire symbol lettering, capable of being synchronized, and capable of wall or ceiling mounting.
- F. **Magnetic Door Holder:** Flush wall unit. Minimum 25 pound holding force, 120 volt operation. Furnish addressable relay for each pair of doors, also include the door plate with holder assembly. Refer to door hardware schedule for additional project requirements, and for holder type. The schedule shall govern and the holders shall be provided, installed and wired to the fire alarm panel.
- G. **Audio/Visual and Visual Units:** For ceiling installation shall include vertical lettering. Horizontal lettering is not acceptable.
- H. Fire alarm panel contact for egress lighting interface to meet Chapter 7 Life Safety Code Article 7.8 requirements.
- I. **Speakers:** Rated 125 to 12,000 Hertz, include four taps rated at from 1/4 to 2 watts, produce a sound level of 82 dBA at 10 feet when set at the 1/2 watt tap, and with a semi-flush body capable of wall or ceiling mounting.
1. Speakers for locations with high ambient noise may be high efficiency horns rated 500 to 6,000 Hertz minimum, 10 watts minimum, include four or more taps, produce a sound level of 106 dBA minimum at 1 meter when set at the 1 watt tap, and be capable of wall or ceiling mounting.
 2. Combination speaker/strobes shall consist of the speakers and strobes as specified in this section, but combined on a single mounting plate. Combination units used outdoors and in wet areas shall be waterproof and mounted to waterproof back boxes.
- J. Emergency voice/alarm communications shall include audio control modules for evacuation tone and voice message generation, controls to choose total building or selected areas communications, audio amplifiers, a local microphone, and a remote microphone at each remote annunciator. All of the components except for the remote microphones shall be located in or adjacent to the fire alarm control panel.
- K. The audio control module default mode shall provide for automatic total building fire alarm evacuation. The evacuation tone shall consist of a three-pulse temporal pattern followed by a pre-recorded fire alarm voice message. At the end of each voice message, the evacuation tone shall resume. The evacuation tone and voice message shall sound alternately until the alarm silence pushbutton at the fire alarm control panel or remote annunciator has been pressed. Audio tones and voice messages shall be digitally transmitted between nodes.

- L. The audio control modules shall provide for manual total building or selected area live voice communications. Upon keying of the local or a remote microphone, a three second continuous alert tone shall sound over the speakers indicating a live voice message will occur.
- M. The evacuation and alert tones shall be digitally generated by programmable software so that changes can be made without component rewiring. The pre-recorded voice messages shall be stored digitally in non-volatile memory.
- N. Audio amplifiers shall have a frequency response of 125 Hz to 12,000 Hz minimum.
- O. **Microphones:** Hand-held, push-to-talk, noise-canceling type with a frequency range of 200 Hz to 4000 Hz and a self-winding five foot coiled cable. An LED shall indicate the microphone push-to-talk pushbutton has been pressed and the speaker circuits are ready for transmission.
- P. **Remote Microphones:** Enclosed in remote annunciator cabinets with lockable doors. Remote microphones shall duplicate the manual voice transmission capability of the local microphone at the fire alarm control panel. The fire alarm control panel microphone shall have priority over any remote microphones.

2.5 FIRE ALARM WIRING

- A. Use (1) pair #18/2 twisted shielded for initiating devices unless directed otherwise by the manufacturer.
- B. Use (1) pair #14 for power duct smoke detectors as directed by the manufacturer.
- C. Use (1) pair #14 for horn/strobe circuits as directed by the manufacturer.
- D. Use (2) pair #18 for control to remote alarm and test station with duct smoke detector.
- E. All fire alarm wiring shall be in compliance with NEC Article 760.
- F. Magnetic door holder wiring. Furnish addressable relay for each pair of doors. Interwire the door holder to the main fire alarm panel. Complete the associated ceiling smoke detectors wiring to the holders and to the main fire alarm system.
- G. Fire alarm supplier to provide circuiting to comply with voltage drop and load calculations per Code requirements.
- H. All wire sizes indicated are minimum.

2.6 NAC PANEL

- A. Node and NAC panels shall be modular with solid state, microprocessor based electronics, operator interfaces, power supplies, audio generators, amplifiers, battery chargers and batteries as required. All components shall be supervised.
- B. Fire alarm vendor/manufacturer shall be responsible for determining the required quantity and location.

2.7 POWER SUPPLIES

- A. Fire alarm vendor shall furnish and install power supplies as required for a complete operating system. Electrical Trades shall field select the location as advised by the fire alarm vendor.

2.8 REMOTE ANNUNCIATOR

- A. The remote annunciator shall duplicate the backlit LCD display; the alarm acknowledge, supervisory acknowledge, trouble acknowledge, alarm silence, and system reset pushbuttons; the alarm, supervisory, and trouble audible signals; the alarm, supervisory, trouble, and power "on" LED's; and the programmable function keys of the fire alarm control panel. A key "enable" switch or door lock, keyed to match the fire alarm control panel door lock, shall permit activating or deactivating the controls.
- B. A remote microphone shall be included with the fire alarm system with emergency voice/alarm communications, along with the same pushbuttons as the fire alarm control panel for selecting pre-recorded voice messages, and the same controls to choose total building or selected areas communications.

2.9 BATTERIES

- A. Batteries shall be lead calcium and supervised so that a failure produces a "TROUBLE" signal.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install fire alarm wiring in conduit for device shown storage room, mechanical rooms and similar space. Use 5'-0" minimum conduit drop in for physical protection.
- B. All junction boxes for fire alarm raceway system shall be painted red labeled "FIRE ALARM". Junction boxes installed in theatrical space where the project requires a black room finish scheme, label the junction box "fire alarm".
- C. Provide and install the fire alarm system in strict accordance with the plans and specifications, codes and manufacturer's instructions.
- D. Fully test the fire alarm system in accordance with NFPA 72, Chapter 7.

- E. Fire alarm vendor shall be responsible to certify the sound coverage for the entire facility.
- F. Audio/visual and visual units shall be installed in accordance with Michigan Building Code under the fire protection system section or NFPA 72 Fire Alarm Code wall mounted appliance shall be mounted such that the entire lens is not less than 80 inches, and not greater than 96 inches above the finished floor. Ceiling mounted device is an acceptable method. Ceiling mounting devices are designated with a C subscript letter.
- G. Manual pull stations shall be mounted a maximum of 48" from the floor level to the activating handle or to the lever. The current adopted Michigan Building Code edition fire protection system Section 907 shall govern over NFPA 72 Fire Alarm Code for mounting heights.
- H. Electrical Trades shall complete the entire fire alarm system in accordance with plans and specifications.
- I. Electrical Trades to install the door plate as part of the door holder installation. Mount the plate to hollow metal door. Do not use thru-bolts. The door hardware schedule and the specified architectural installation methods for use by the hardware installer shall govern over the door plate described method.
- J. All fire alarm wiring installation that may be required to be installed through non-accessible ceiling spaces, and cannot be installed in conduit or cable tray, free air method will be acceptable for those spaces. Open wiring is acceptable method. Properly secure to ceiling structure, use J hooks or D-rings. The cable shall be plenum rated for this application.
- K. Ceiling mounted fire alarm device locations are shown diagrammatic. The design requirement shall be to install the device centered in the classrooms, corridor, offices, etc. Confirm the location with lighting, speaker, HVAC diffusers, to avoid interferences.
- L. NAC panel(s) require a dedicated 120 volt power source. The Contractor shall be responsible for coordinating NAC panel quantities and locations with their fire alarm vendor and include all power circuit costs in the bid.
- M. Electrical Trades and their respective fire alarm vendor shall field determine the remote duct detector test station location to maintain easy access for the Owner usage. The test station locations are not shown on the drawings.
- N. Contractor shall be responsible to wire fire pump controller monitoring points defined as phase loss, phase reversal, power loss and frequency sensitivity. Include fire alarm panel points as part of overall fire alarm panel points.
- O. Contractor shall be responsible to wire tamper switch to the fire alarm panel. Include fire alarm panel points as part of the overall fire alarm panel points.
- P. Electrical Trades shall complete all fire alarm interface wiring to coiling shutter doors, food service fire suppression system connections, at all sprinkler riser

locations. Exterior horn/strobe associated with exterior fire protection fire department hose connections/flow and tamper switches.

- Q. Fire alarm vendor shall wire elevator smoke detectors to elevator controller.
- R. Electrical Trades shall furnish and install a circuit breaker lock for the 120 volt circuit serving the fire alarm panel. Label the panelboard directory branch circuit text in red.
- S. Complete interface wiring from fire alarm panel to egress lighting.

3.2 MANUFACTURER/DISTRIBUTOR SERVICES

- A. The following supervision shall be provided by a factory trained service technician from the distributor of the fire alarm equipment.
- B. A pre-installation visit to the job site to review equipment submittals and to verify the method by which the system is to be wired.
- C. Upon completion of wiring, final checkout and certification of the system shall be made under supervision of this technician.
- D. At that time of the formal checkout, technician shall give operational instructions to the Owner.

3.3 WARRANTY

- A. Provide a one-year guarantee from date of system acceptance by the Owner.

3.4 CLOSE-OUT

- A. Provide O&M manuals, warranty letter, as-built drawings and inspection sign-off.

A. END OF SECTION

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SECTION 311000 - SITE CLEARING

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Clearing and protection of vegetation.
- B. Removal of existing debris.

1.2 RELATED REQUIREMENTS

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

PART 2 PRODUCTS -- NOT USED

PART 3 EXECUTION

3.1 SITE CLEARING

- A. Comply with other requirements specified in Section 017000.
- B. Minimize production of dust due to clearing operations; do not use water if that will result in ice, flooding, sedimentation of public waterways or storm sewers, or other pollution.

3.2 EXISTING UTILITIES AND BUILT ELEMENTS

- A. Coordinate work with utility companies; notify before starting work and comply with their requirements; obtain required permits.
- B. Protect existing utilities to remain from damage.
- C. Do not disrupt public utilities without permit from authority having jurisdiction.
- D. Protect existing structures and other elements that are not to be removed.

3.3 VEGETATION

- A. Scope: Remove trees, shrubs, brush, and stumps in areas to be covered by building structure, paving, playing fields, lawns, and planting beds.
- B. Do not begin clearing until vegetation to be relocated has been removed.
- C. Do not remove or damage vegetation beyond the limits indicated on drawings.
- D. Install substantial, highly visible fences at least 5 feet high to prevent inadvertent damage to vegetation to remain:
 - 1. At vegetation removal limits.
 - 2. Around trees to remain within vegetation removal limits; locate no closer to tree than at the drip line.
 - 3. Around other vegetation to remain within vegetation removal limits.
- E. In areas where vegetation must be removed but no construction will occur other than pervious paving, remove vegetation with minimum disturbance of the subsoil.
- F. Vegetation Removed: Do not burn, bury, landfill, or leave on site, except as indicated.
 - 1. Chip, grind, crush, or shred vegetation for mulching, composting, or other purposes; preference should be given to on-site uses.
 - 2. Trees: Sell if marketable; if not, treat as specified for other vegetation removed; remove stumps and roots to depth of 18 inches.
 - 3. Existing Stumps: Treat as specified for other vegetation removed; remove stumps and roots to depth of 24 inches.
 - 4. Sod: Re-use on site if possible; otherwise sell if marketable, and if not, treat as specified for other vegetation removed.
 - 5. Fill holes left by removal of stumps and roots, using suitable fill material, with top surface neat in appearance and smooth enough not to constitute a hazard to pedestrians.
- G. Restoration: If vegetation outside removal limits or within specified protective fences is damaged or destroyed due to subsequent construction operations, replace at no cost to Owner.

3.4 DEBRIS

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

END OF SECTION

SECTION 312200 - GRADING

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Removal of topsoil.
- B. Rough grading the site.
- C. Finish grading.

1.2 RELATED REQUIREMENTS

- A. Section 312323 - Fill: Filling and compaction.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Topsoil: See Section 312323.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that survey bench mark and intended elevations for the Work are as indicated.
- B. Verify the absence of standing or ponding water.

3.2 PREPARATION

- A. Identify required lines, levels, contours, and datum.
- B. Stake and flag locations of known utilities.
- C. Locate, identify, and protect from damage above- and below-grade utilities to remain.
- D. Notify utility company to remove and relocate utilities as required.
- E. Provide temporary means and methods to remove all standing or ponding water from areas prior to grading.

- F. Protect site features to remain, including but not limited to bench marks, survey control points, existing structures, fences, sidewalks, paving, and curbs, from damage by grading equipment and vehicular traffic.
- G. Protect trees to remain by providing substantial fencing around entire tree at the outer tips of its branches; no grading is to be performed inside this line.
- H. Protect plants, lawns, rock outcroppings, and other features to remain as a portion of final landscaping.

3.3 ROUGH GRADING

- A. Remove topsoil from areas to be further excavated, re-landscaped, or re-graded, without mixing with foreign materials.
- B. Do not remove topsoil when wet.
- C. Remove subsoil from areas to be further excavated, re-landscaped, or re-graded.
- D. Do not remove wet subsoil , unless it is subsequently processed to obtain optimum moisture content.
- E. When excavating through roots, perform work by hand and cut roots with sharp axe.
- F. Stability: Replace damaged or displaced subsoil to same requirements as for specified fill.
- G. Remove and replace soils deemed unsuitable by classification and which are excessively moist due to lack surface water control.

3.4 SOIL REMOVAL

- A. Stockpile excavated topsoil on site.
- B. Stockpiles: Use areas designated on site; pile depth not to exceed 8 feet; protect from erosion.

3.5 FINISH GRADING

- A. Before Finish Grading:
 - 1. Verify building and trench backfilling have been inspected.
 - 2. Verify subgrade has been contoured and compacted.
- B. Remove debris, roots, branches, stones, in excess of 1/2 inch in size. Remove soil contaminated with petroleum products.
- C. Where topsoil is to be placed, scarify surface to depth of 6 inches.

- D. In areas where vehicles or equipment have compacted soil, scarify surface to depth of 6 inches.
- E. Place topsoil in areas where seeding are indicated.
- F. Place topsoil where required to level finish grade.
- G. Place topsoil to the following compacted thicknesses:
 - 1. Areas to be Seeded with Grass: 6 inches.
 - 2. Areas to be Sodded: 4 inches.
 - 3. Shrub Beds: 18 inches.
 - 4. Flower Beds: 12 inches.
 - 5. Planter Boxes: To within 3 inches of box rim.
- H. Place topsoil during dry weather.
- I. Remove roots, weeds, rocks, and foreign material while spreading.
- J. Near plants spread topsoil manually to prevent damage.
- K. Fine grade topsoil to eliminate uneven areas and low spots. Maintain profiles and contour of subgrade.
- L. Lightly compact placed topsoil.
- M. Maintain stability of topsoil during inclement weather. Replace topsoil in areas where surface water has eroded thickness below specifications.

3.6 TOLERANCES

- A. Top Surface of Subgrade: Plus or minus 0.10 foot (1-3/16 inches) from required elevation.
- B. Top Surface of Finish Grade: Plus or minus 0.04 foot (1/2 inch).

3.7 REPAIR AND RESTORATION

- A. Existing Facilities, Utilities, and Site Features to Remain: If damaged due to this work, repair or replace to original condition.
- B. Trees to Remain: If damaged due to this work, trim broken branches and repair bark wounds; if root damage has occurred, obtain instructions from Architect as to remedy.
- C. Other Existing Vegetation to Remain: If damaged due to this work, replace with vegetation of equivalent species and size.

3.8 FIELD QUALITY CONTROL

- A. See Section 312323 for compaction density testing.

3.9 CLEANING

- A. Remove unused stockpiled topsoil. Grade stockpile area to prevent standing water.
- B. Leave site clean and raked, ready to receive landscaping.

END OF SECTION

SECTION 312316 - EXCAVATION

PART 2 PRODUCTS

PART 3 EXECUTION

2.1 EXCAVATING

- A. Excavate to accommodate new structures and construction operations.
- B. Notify Architect of unexpected subsurface conditions and discontinue affected Work in area until notified to resume work.
- C. Do not interfere with 45 degree bearing splay of foundations.
- D. Provide temporary means and methods, as required, to remove all water from excavations until directed by Architect. Remove and replace soils deemed suitable by classification and which are excessively moist due to lack of dewatering or surface water control.

END OF SECTION

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SECTION 312323 - FILL

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Filling, backfilling, and compacting for building volume below grade, footings, slabs-on-grade, paving, and site structures.
- B. Backfilling and compacting for utilities outside the building to utility main connections.
- C. Filling holes, pits, and excavations generated as a result of removal (demolition) operations.

1.2 RELATED REQUIREMENTS

- A. Section 312200 - Grading: Site grading.

1.3 DEFINITIONS

- A. Finish Grade Elevations: Indicated on drawings.

1.4 REFERENCE STANDARDS

- A. ASTM D2487 - Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System) 2017, with Editorial Revision (2020).

1.5 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data for Manufactured Fill.
- C. Soil Samples: 10 pounds sample of each type of fill; submit in air-tight containers to testing laboratory.
- D. Materials Sources: Submit name of imported materials source.
- E. Fill Composition Test Reports: Results of laboratory tests on proposed and actual materials used, including manufactured fill.
- F. Manufacturer's Instructions.
- G. Specimen Warranty.

1.6 QUALITY ASSURANCE

- A. Designer Qualifications: Perform design of structural fill under direct supervision of a Professional Engineer experienced in design of this type of work and licensed in Michigan.
- B. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than ten years of documented experience.
- C. Testing Agency Qualifications: Independent firm specializing in performing testing and inspections of the type specified in this section.
- D. Copies of Documents at Project Site: Maintain at the project site a copy of each referenced document that prescribes execution requirements.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. When necessary, store materials on site in advance of need.
- B. When fill materials need to be stored on site, locate stockpiles where indicated.
 - 1. Separate differing materials with dividers or stockpile separately to prevent intermixing.
 - 2. Prevent contamination.
 - 3. Protect stockpiles from erosion and deterioration of materials.

PART 2 PRODUCTS

2.1 FILL MATERIALS

- A. General Fill - Fill Type [____]: Subsoil excavated on-site.
 - 1. Graded.
 - 2. Free of lumps larger than 3 inches, rocks larger than 2 inches, and debris.
 - 3. Conforming to ASTM D2487 Group Symbol CL.
- B. Topsoil: Topsoil excavated on-site.
 - 1. Free of roots, rocks larger than 1/2 inch, subsoil, debris, large weeds and foreign matter.
 - 2. Containing a minimum of 4 percent and a maximum of 25 percent inorganic matter.

2.2 SOURCE QUALITY CONTROL

- A. See Section 014000 - Quality Requirements, for general requirements for testing and analysis of soil material.
- B. Where fill materials are specified by reference to a specific standard, test and analyze samples for compliance.

- C. If tests indicate materials do not meet specified requirements, change material and retest.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that survey bench marks and intended elevations for the Work are as indicated.
- B. Identify required lines, levels, contours, and datum locations.
- C. Verify areas to be filled are not compromised with surface or ground water.

3.2 PREPARATION

- A. Scarify and proof roll subgrade surface to a depth of 6 inches to identify soft spots.
- B. Cut out soft areas of subgrade not capable of compaction in place. Backfill with general fill.
- C. Compact subgrade to density equal to or greater than requirements for subsequent fill material.
- D. Until ready to fill, maintain excavations and prevent loose soil from falling into excavation.

3.3 FILLING

- A. Fill to contours and elevations indicated using unfrozen materials.
- B. Employ a placement method that does not disturb or damage other work.
- C. Systematically fill to allow maximum time for natural settlement. Do not fill over porous, wet, frozen or spongy subgrade surfaces.
- D. Maintain optimum moisture content of fill materials to attain required compaction density.
- E. Slope grade away from building minimum 2 inches in 10 feet, unless noted otherwise. Make gradual grade changes. Blend slope into level areas.
- F. Correct areas that are over-excavated.
 - 1. Other areas: Use general fill, flush to required elevation, compacted to minimum 97 percent of maximum dry density.
- G. Compaction Density Unless Otherwise Specified or Indicated:
- H. Reshape and re-compact fills subjected to vehicular traffic.

- I. Maintain temporary means and methods, as required, to remove all water while fill is being placed as required, or until directed by the Architect. Remove and replace soils deemed unsuitable by classification and which are excessively moist due to lack of dewatering or surface water control.

3.4 FILL AT SPECIFIC LOCATIONS

- A. Use general fill unless otherwise specified or indicated.
- B. At Lawn Areas:
 1. Use general fill.
 2. Compact to 95 percent of maximum dry density.
 3. See Section 312200 for topsoil placement.
- C. At Planting Areas Other Than Lawns :
 1. Use general fill.
 2. Compact to 85 percent of maximum dry density.
 3. See Section 312200 for topsoil placement.

3.5 CLEANING

- A. See Section 017419 - Construction Waste Management and Disposal, for additional requirements.
- B. Leave borrow areas in a clean and neat condition. Grade to prevent standing surface water.

END OF SECTION

SECTION 321313 - CONCRETE PAVING

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Concrete paving.

1.2 RELATED REQUIREMENTS

- A. Section 033000 - Cast-in-Place Concrete.
- B. Section 079200 - Joint Sealants: Sealing joints.
- C. Section 321726 - Tactile Warning Surfacing: Tactile and detectable warning tiles for pedestrian walking surfaces.

1.3 REFERENCE STANDARDS

- A. ACI 211.1 - Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete 1991 (Reapproved 2009).
- B. ACI 301 - Specifications for Concrete Construction 2020.
- C. ACI 304R - Guide for Measuring, Mixing, Transporting, and Placing Concrete 2000 (Reapproved 2009).
- D. ACI 305R - Guide to Hot Weather Concreting 2020.
- E. ACI 306R - Guide to Cold Weather Concreting 2016.
- F. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement 2022.
- G. ASTM A1064/A1064M - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete 2018a.
- H. ASTM C33/C33M - Standard Specification for Concrete Aggregates 2018.
- I. ASTM C39/C39M - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens 2021.
- J. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete 2022a.
- K. ASTM C150/C150M - Standard Specification for Portland Cement 2022.

- L. ASTM C173/C173M - Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method 2016.
- M. ASTM C260/C260M - Standard Specification for Air-Entraining Admixtures for Concrete 2010a (Reapproved 2016).
- N. ASTM C494/C494M - Standard Specification for Chemical Admixtures for Concrete 2019, with Editorial Revision (2022).
- O. ASTM C618 - Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete 2022.
- P. ASTM C685/C685M - Standard Specification for Concrete Made by Volumetric Batching and Continuous Mixing 2017.
- Q. ASTM D1751 - Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types) 2018.
- R. ASTM D1752 - Standard Specification for Preformed Sponge Rubber, Cork and Recycled PVC Expansion Joint Fillers for Concrete Paving and Structural Construction 2018.

1.4 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on joint filler, admixtures, and curing compound.
- C. Design Data: Indicate pavement thickness, designed concrete strength, reinforcement, and typical details.
- D. Material Certificates: For components of concrete mix, including but not limited to cementitious materials, reinforcement, admixtures, and curing compounds.

PART 2 PRODUCTS

2.1 PAVING ASSEMBLIES

- A. Comply with applicable requirements of ACI 301.

2.2 FORM MATERIALS

- A. Wood form material, profiled to suit conditions.
- B. Joint Filler: Preformed; non-extruding bituminous type (ASTM D1751) or sponge rubber or cork (ASTM D1752).
 - 1. Thickness: 1/2 inch.

2.3 REINFORCEMENT

- A. Reinforcing Steel: ASTM A615/A615M, Grade 80 (80,000 psi) yield strength; deformed billet steel bars; unfinished.
- B. Steel Welded Wire Reinforcement: Plain type, ASTM A1064/A1064M; in either flat sheets or coiled rolls; unfinished.
- C. Dowels: ASTM A615/A615M, Grade 60 - 60,000 psi yield strength; deformed billet steel bars; unfinished finish.

2.4 CONCRETE MATERIALS

- A. Obtain cementitious materials from same source throughout.
- B. Cement: ASTM C150/C150M, Normal - Type I Portland cement, gray color, in accordance with State of Ohio Highways standards..
- C. Fine and Coarse Mix Aggregates: ASTM C33/C33M, Class 4S, uniformly graded
 - 1. Fine aggregate: free of materials with deleterious reactivity to alkali in cement.
- D. Fly Ash: ASTM C618, Class C or F.
- E. Slag Cement: ASTM C989/C989M, Grade 100 or 120.
- F. Water: Clean, and not detrimental to concrete.
- G. Fiber Reinforcement: Synthetic fibers shown to have long-term resistance to deterioration when in contact with alkalis and moisture; 1/2 inch length.
- H. Air-Entraining Admixtures: ASTM C260/C260M.
- I. Chemical Admixtures: ASTM C494/C494M, Type A - Water Reducing, Type C - Accelerating, and Type G - Water Reducing, High Range and Retarding.
 - 1. Do not use chemicals that will result in soluble chloride ions in excess of 0.1 percent by weight of cement.

2.5 ACCESSORIES

- A. Absorptive Cover: AASHTO M 182, Class 3, burlap cloth made from jute or kenaf, approximately 9 ounces per square yard, dry.
- B. Bonding Agent: ASTM C1059/C1059M, Type II, non-redispersible, acrylic emulsion or styrene butadiene.
- C. Curing Compound: ASTM C309, Type 1, Class B, non-staining type.
- D. Evaporation Retarder: Waterborne, monomolecular, film-forming, manufactured for application to fresh concrete.

- E. Moisture Retaining Cover: ASTM C171, polyethylene film or white burlap-polyethylene sheet.
- F. Slab Isolation Joint Filler: 1/2 inch thick, height equal to slab thickness, with removable top section that will form 1/2 inch deep sealant pocket after removal.
 - 1. Material: ASTM D1751, cellulose fiber.

2.6 CONCRETE MIX DESIGN

- A. Proportioning Normal Weight Concrete: Comply with ACI 211.1 recommendations.
- B. Concrete Strength: Establish required average strength for each type of concrete on the basis of field experience or trial mixtures, as specified in ACI 301.
 - 1. For trial mixtures method, employ independent testing agency acceptable to Architect for preparing and reporting proposed mix designs.
- C. Admixtures: Add acceptable admixtures as recommended in ACI 211.1 and at rates recommended by manufacturer.
- D. Fiber Reinforcement: Add to mix at rate of 1.5 pounds per cubic yard, or as recommended by manufacturer for specific project conditions.
- E. Concrete Properties:
 - 1. Compressive strength, when tested in accordance with ASTM C39/C39M at 28 days; 5000 psi.
 - 2. Total Air Content: 4 to 8 percent, determined in accordance with ASTM C173/C173M.
 - 3. Chemical Admixtures: Plasticizing and retarding admixtures, applied per manufacturer's written instructions, as required for placement and workability.
 - 4. Synthetic Fiber: Uniformly dispersed per manufacturer's recommendations, but not less than 1.0 lb per cubic yard.
 - 5. Maximum Aggregate Size: 1 inch.

2.7 MIXING

- A. On Project Site: Mix in drum type batch mixer, complying with ASTM C685/C685M. Mix each batch not less than 1-1/2 minutes and not more than 5 minutes.
- B. Transit Mixers: Comply with ASTM C94/C94M.
 - 1. When air temperature is between 85 and 90 degrees F, reduce mixing and delivery time to 75 minutes.
 - 2. When air temperature is above 90 degrees F, reduce mixing and delivery time to 60 minutes.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify compacted subgrade is acceptable and ready to support paving and imposed loads.
 - 1. Proof-roll with a pneumatic-tired and loaded, 10-wheel, tandem-axle dump truck weighing not less than 15 tons.
 - 2. Completely proof-roll subbase in one direction and repeat in perpendicular direction. Limit vehicle speed to 3 mph.
 - 3. Correct subbase with soft spots and areas of pumping or rutting according to requirements in 312200.
- B. Verify gradients and elevations of base are correct.
- C. Verify manholes, catch basins, and other structures are at correct finish elevations and alignment.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 SUBBASE

- A. Prepare subbase in accordance with State of Ohio Highways standards.

3.3 PREPARATION

- A. Moisten base to minimize absorption of water from fresh concrete.
- B. Remove loose material from compacted subbase surface immediately before placing concrete.
- C. Coat surfaces of manhole and catch basin frames with oil to prevent bond with concrete pavement.

3.4 FORMING

- A. Place and secure forms to correct location, dimension, profile, and gradient.
- B. Assemble formwork to permit easy stripping and dismantling without damaging concrete.
- C. Place joint filler vertical in position, in straight lines. Secure to formwork during concrete placement.

3.5 REINFORCEMENT

- A. Place reinforcement as indicated.

- B. Continue steel reinforcement across construction joints unless otherwise indicated.
- C. Do not continue reinforcement through sides of paving strips unless otherwise indicated.
- D. Provide tie bars at sides of paving strips where indicated.
- E. Place dowels to achieve pavement and curb alignment as detailed.

3.6 COLD AND HOT WEATHER CONCRETING

- A. Follow recommendations of ACI 305R when concreting during hot weather.
- B. Follow recommendations of ACI 306R when concreting during cold weather.
- C. Do not place concrete when base surface temperature is less than 40 degrees F, or surface is wet or frozen.

3.7 PLACING CONCRETE

- A. Place concrete in accordance with ACI 304R.
- B. Consolidate concrete according to ACI 301 by mechanical vibrating equipment supplemented by hand spading, rodding, or tamping. Do not use vibrating equipment near joint assemblies, reinforcement, or side forms. Use only square-faced shovels for hand spreading and consolidation.
- C. Ensure reinforcement, inserts, embedded parts, formed joints and joint devices are not disturbed during concrete placement.
- D. Place concrete continuously over the full width of the panel and between predetermined construction joints. Do not break or interrupt successive pours such that cold joints occur.
- E. Screed paving surfaces with a straightedge and strike off.
- F. Begin initial floating to create a uniform surface plane before excess moisture or bleed-water appears on the surface. Do not further disturb concrete surfaces before beginning finishing operations or applying surface treatments.
- G. Slip-Form Paving: Use design mixture for automatic machine placement. Compact subbase and prepare subgrade to prevent displacement of paving machine during operation.

3.8 JOINTS

- A. Align curb, gutter, and sidewalk joints.

- B. Place 3/8 inch wide expansion joints at 50 foot intervals and to separate paving from vertical surfaces and other components and in pattern indicated
 - 1. Form joints with joint filler extending from bottom of pavement to within 1/2 inch of finished surface where sealant is indicated. Where sealant is not indicated, place top of joint filler flush with pavement surface.
 - 2. Place joint fillers in one-piece lengths. Where more than one length is required, lace or clip filler sections together.
 - 3. Protect top edge of joint filler with removable protective cap during concrete placement.
 - 4. Secure to resist movement by wet concrete.
- C. Grooved Contraction Joints: Form joints with a grooving tool 3/16 inch wide with a 1/4 inch radius after initial floating. Repeat grooving of contraction joints after applying surface finishes. Cut groove 1/5 to 1/4 into depth of slab. Space joints as indicated on drawings with a maximum spacing of 40 times the concrete thickness. Joints shall be the full width of walk or drive.
- D. Doweled Contraction Joints: Install dowel bars and support assemblies where indicated. Lubricate one-half of dowel length to prevent concrete bonding to one side of joint.

3.9 FINISHING

- A. Do not add water to concrete surfaces during finishing operations.
- B. Float surface with power-driven floats or by hand-floating if area is small or inaccessible to power-driven units. Finish surfaces to true planes, cutting down high spots and filling low spots with a uniform, granular texture.
- C. Area Paving: Light broom, texture perpendicular to pavement direction with troweled and radiused edge with a 1/4 inch radius.
- D. Sidewalk Paving: Light broom, texture perpendicular to direction of travel with troweled and radiused edge with a 1/4 inch radius.
- E. Curbs and Gutters: Light broom, texture parallel to pavement direction with troweled and radiused edges with a 1/4 inch radius.
- F. Place curing compound or moisture retaining absorptive cover on exposed concrete surfaces immediately after finishing. Apply in accordance with manufacturer's instructions.
- G. Eliminate all edging tool marks on concrete surfaces.

3.10 TOLERANCES

- A. Maximum Variation of Surface Flatness: 1/4 inch in 10 ft.
- B. Maximum Variation From True Position: 1/4 inch.

- C. Thickness: 1/4 inch.
- D. Alignment of Tie Bar End Relative to Line Perpendicular to Paving Edge: 1/4 inch per foot of tie bar length.
- E. Lateral Alignment and Spacing of Dowels: 1 inch.
- F. Vertical Alignment of Dowels: 1/4 inch.
- G. Alignment of Dowel Bar End Relative to Line Perpendicular to Paving Edge: 1/4 inch per foot of dowel length.
- H. Joint Spacing: 3 inches.
- I. Contraction Joint Depth: Plus 1/4 inch, no minus.
- J. Joint Width: Plus 1/8 inch, no minus.

3.11 FIELD QUALITY CONTROL

- A. An independent testing agency will perform field quality control tests, as specified in Section 014000 - Quality Requirements.
 - 1. Provide free access to concrete operations at project site and cooperate with appointed firm.
 - 2. Submit proposed mix design of each class of concrete to inspection and testing firm for review prior to commencement of concrete operations.
 - 3. Tests of concrete and concrete materials may be performed at any time to ensure conformance with specified requirements.
- B. Compressive Strength Tests: ASTM C39/C39M; for each test, mold and cure three concrete test cylinders. Obtain test samples for every 100 cu yd or less of each class of concrete placed.
 - 1. Take one additional test cylinder during cold weather concreting, cured on job site under same conditions as concrete it represents.
 - 2. Perform one slump test for each set of test cylinders taken.
- C. Maintain records of placed concrete items. Record date, location of pour, quantity, air temperature, and test samples taken.
- D. Paving will be considered defective if it does not pass tests and inspections.
- E. Additional testing and inspection, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.12 PROTECTION AND REPAIR

- A. Immediately after placement, protect pavement from premature drying, excessive hot or cold temperatures, and mechanical injury.

- B. Do not permit pedestrian traffic over pavement for 7 days minimum after finishing.
- C. Do not permit vehicular traffic over pavement for 14 days minimum after finishing.
- D. Remove and replace any concrete paving that is broken, damaged or otherwise defective, or does not comply with requirements of this section. Remove work in complete sections from joint-to-joint unless otherwise approved by Architect.
- E. Sweep paving broom-clean not more than 2 days prior to Substantial Completion inspections.

END OF SECTION

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SECTION 321373 - CONCRETE PAVING JOINT SEALANTS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Self-leveling pourable joint sealants.
- B. Joint backings and accessories.

1.2 REFERENCE STANDARDS

- A. ASTM C920 - Standard Specification for Elastomeric Joint Sealants 2018.
- B. ASTM C1193 - Standard Guide for Use of Joint Sealants 2016.
- C. ASTM C1330 - Standard Specification for Cylindrical Sealant Backing for Use with Cold Liquid-Applied Sealants 2018.
- D. ASTM D1751 – Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types); 2018.

1.3 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data for Sealants: Submit manufacturer's technical data sheets for each product to be used, that includes the following.
 - 1. Physical characteristics, including movement capability, VOC content, hardness, cure time, and color availability.
 - 2. List of backing materials approved for use with the specific product.
 - 3. Substrates that product is known to satisfactorily adhere to and with which it is compatible.
 - 4. Substrates the product should not be used on.
 - 5. Substrates for which use of primer is required.
 - 6. Substrates for which laboratory adhesion and/or compatibility testing is required.
- C. Color Cards for Selection: Where sealant color is not specified, submit manufacturer's color cards showing standard colors available for selection.

1.4 WARRANTY

- A. See Section 017800 - Closeout Submittals, for additional warranty requirements.
- B. Correct defective work within a two-year period after Date of Substantial Completion.

- C. Warranty: Include coverage for installed sealants and accessories that fail to achieve watertight seal, exhibit loss of adhesion or cohesion, or do not cure.

PART 2 - PRODUCTS

2.1 JOINT SEALANT APPLICATIONS

- A. Scope:
 - 1. Exterior Joints: Seal open joints, whether or not the joint is indicated on drawings, unless specifically indicated not to be sealed. Exterior joints to be sealed include, but are not limited to, the following items.
 - a. Joints between different exposed materials.
 - b. Expansion joints in concrete paving.
 - c. Other joints indicated on the drawings.
 - 2. Do not seal the following types of joints.
 - a. Joints indicated to be treated with manufactured expansion joint cover or some other type of sealing device.
- B. Type SL - Control and Expansion Joints in Concrete Paving: Self-leveling polyurethane "traffic-grade" sealant.

2.2 SELF-LEVELING SEALANTS

- A. Type SL - Self-Leveling Polyurethane Sealant: ASTM C920, Grade P, Uses M and A; single or multi-component; explicitly approved by manufacturer for traffic exposure; not expected to withstand continuous water immersion.
 - 1. Movement Capability: Plus and minus 25 percent, minimum.
 - 2. Color: To be selected by Architect from manufacturer's standard range.
 - 3. Service Temperature Range: Minus 40 to 180 degrees F.
 - 4. Manufacturers:
 - a. BASF Corporation; MasterSeal SL2: www.master-builders-solutions.basf.us/en-us/products/sealants-caulks.
 - b. Pecora Corporation; Dynatrol II SG: www.pecora.com/#sle.
 - c. Sika Corporation; Sikaflex-2c SL: www.usa-sika.com/#sle.
 - d. Tremco Commercial Sealants & Waterproofing; THC-900/901: www.tremcosealants.com/#sle.

2.3 ACCESSORIES

- A. Backer Rod: Cylindrical cellular foam rod with surface that sealant will not adhere to, compatible with specific sealant used, and recommended by backing and sealant manufacturers for specific application.
 - 1. Type for Joints Subject to Pedestrian or Vehicular Traffic: ASTM C1330; Type B - Bi-Cellular Polyethylene.
 - 2. Closed Cell and Bi-Cellular: 25 to 33 percent larger in diameter than joint width.

- B. Masking Tape: Self-adhesive, nonabsorbent, non-staining, removable without adhesive residue, and compatible with surfaces adjacent to joints and sealants.
- C. Joint Cleaner: Non-corrosive and non-staining type, type recommended by sealant manufacturer; compatible with joint forming materials.
- D. Primers: Type recommended by sealant manufacturer to suit application; non-staining.
- E. Slab Isolation Joint Filler: 1/2 inch thick, height equal to slab thickness, with removable top section that will form 1/2 inch deep sealant pocket after removal.
 - 1. Material: ASTM D1751, cellulose fiber.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that joints are ready to receive work.
- B. Verify that backing materials are compatible with sealants.
- C. Verify that backer rods are of the correct size.

3.2 PREPARATION

- A. Remove loose materials and foreign matter that could impair adhesion of sealant.
- B. Clean joints, and prime as necessary, in accordance with manufacturer's instructions.
- C. Perform preparation in accordance with manufacturer's instructions and ASTM C1193.
- D. Mask elements and surfaces adjacent to joints from damage and disfigurement due to sealant work; be aware that sealant drips and smears may not be completely removable.
- E. Concrete Floor Joints That Will Be Exposed in Completed Work: Test joint filler in inconspicuous area to verify that it does not stain or discolor slab.

3.3 INSTALLATION

- A. Perform work in accordance with sealant manufacturer's requirements for preparation of surfaces and material installation instructions.
- B. Perform installation in accordance with ASTM C1193.
- C. Measure joint dimensions and size joint backers to achieve width-to-depth ratio, neck dimension, and surface bond area as recommended by manufacturer, except where specific dimensions are indicated.

- D. Install sealant free of air pockets, foreign embedded matter, ridges, and sags, and without getting sealant on adjacent surfaces.
- E. Do not install sealant when ambient temperature is outside manufacturer's recommended temperature range, or will be outside that range during the entire curing period, unless manufacturer's approval is obtained and instructions are followed.

END OF SECTION

SECTION 329115 - SOIL PREPARATION (PERFORMANCE SPECIFICATION)

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Planting soils specified according to performance requirements of the mixes.
 - 1. Existing topsoil will be stripped and stockpiled on site for modification and use. If additional soil is required to complete the project, it must also meet the requirements of this section.

1.2 RELATED REQUIREMENTS:

- A. Drawings and General Provisions of the Contract, including general and supplementary conditions, and Division 01 Specification Sections.
- B. Section 311000 "Site Clearing" for topsoil stripping and stockpiling.
- C. Section 329219 "Seeding" for placing planting soil for turf grass and other seeded areas.
- D. Section 329300 "Plants" for placing planting soil for plantings.

1.3 DEFINITIONS

- A. AAPFCO: Association of American Plant Food Control Officials.
- B. ASTM: American Society of Testing Materials.
- C. Backfill: The earth used to replace or the act of replacing earth in an excavation. This can be amended or unamended soil as indicated.
- D. CEC: Cation exchange capacity.
- E. Compost: The product resulting from the controlled biological decomposition of organic material that has been sanitized through the generation of heat and stabilized to the point that it is beneficial to plant growth.
- F. Duff Layer: A surface layer of soil, typical of forested areas, that is composed of mostly decayed leaves, twigs, and detritus.
- G. Imported Soil: Soil that is transported to Project site for use.
- H. Manufactured Soil: Soil produced by blending soils, sand, stabilized organic soil amendments, and other materials to produce planting soil.

- I. NAPT: North American Proficiency Testing Program. An SSSA program to assist soil-, plant-, and water-testing laboratories through interlaboratory sample exchanges and statistical evaluation of analytical data.
- J. Organic Matter: The total of organic materials in soil exclusive of undecayed plant and animal tissues, their partial decomposition products, and the soil biomass; also called "humus" or "soil organic matter."
- K. Planting Soil: Existing, on-site soil; imported soil; or manufactured soil that has been modified as specified with soil amendments and perhaps fertilizers to produce a soil mixture best for plant growth.
- L. RCRA Metals: Hazardous metals identified by the EPA under the Resource Conservation and Recovery Act.
- M. SSSA: Soil Science Society of America.
- N. Subgrade: Surface or elevation of subsoil remaining after excavation is complete, or the top surface of a fill or backfill before planting soil is placed.
- O. Subsoil: Soil beneath the level of subgrade; soil beneath the topsoil layers of a naturally occurring soil profile, typified by less than 1 percent organic matter and few soil organisms.
- P. Surface Soil: Soil that is present at the top layer of the existing soil profile. In undisturbed areas, surface soil is typically called "topsoil"; but in disturbed areas such as urban environments, the surface soil can be subsoil.
- Q. USCC: U.S. Composting Council.

1.4 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.5 ACTION SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data: For each type of product.
 - 1. Include recommendations for application and use.
 - 2. Include test data substantiating that products comply with requirements.
 - 3. Include sieve analyses for aggregate materials.
 - 4. Material Certificates: For each type of imported soil and soil amendment and fertilizer before delivery to the site, according to the following:
 - a. Manufacturer's qualified testing agency's certified analysis of standard products.
 - b. Analysis of fertilizers, by a qualified testing agency, made according to AAPFCO methods for testing and labeling and according to AAPFCO's SUIP #25.

- c. Analysis of nonstandard materials, by a qualified testing agency, made according to SSSA methods, where applicable.
- C. Samples: For each bulk-supplied material.
 - 1. 1-gal. (4-L) volume of each, in sealed containers labeled with content, source, and date obtained.
 - a. Each sample shall be typical of the lot of material to be furnished, providing an accurate representation of composition, color, and texture.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For each testing agency.
- B. Preconstruction Test Reports: For preconstruction soil analyses specified in "Preconstruction Testing" Article.
- C. Field quality-control reports.

1.7 QUALITY ASSURANCE

- A. Testing Agency Qualifications: An independent, state-operated, or university-operated laboratory; experienced in soil science, soil testing, and plant nutrition; with the experience and capability to conduct the testing indicated; and that specializes in types of tests to be performed.

1.8 PRECONSTRUCTION TESTING

- A. Preconstruction Testing Service: Engage a qualified testing agency that specializes in USDA agricultural soil testing, planting soil mixes, and the types of tests specified below to perform preconstruction soil analyses on existing, on-site soil and/or imported soil. Geotechnical engineering testing labs shall not be used.
- B. Preconstruction Soil Analyses: For each unamended soil type, perform testing on soil samples and furnish soil analysis and a written report containing soil-amendment and fertilizer recommendations by a qualified testing agency performing the testing according to "Soil-Sampling Requirements" and "Testing Requirements" articles.
 - 1. Have testing agency identify and label samples and test reports according to sample collection and labeling requirements.

1.9 SOIL-SAMPLING REQUIREMENTS

- A. General: Extract soil samples according to requirements in this article. Soil testing shall be performed for existing soil to be modified as planting soil and imported topsoil.
 - 1. If tests show soil fails to meet specifications, obtain other sources of material, retest, and resubmit until acceptance by Architect.

- B. Sample Collection and Labeling: Have samples taken and labeled by Contractor under the direction of the testing agency.
 - 1. Number and Location of Samples: Minimum of three representative soil samples from varied locations for each soil to be used or amended for landscaping purposes.
 - 2. Procedures and Depth of Samples: According to USDA-NRCS's "Field Book for Describing and Sampling Soils."
 - 3. Division of Samples: Split each sample into two equal parts. Send half to testing agency and half to the Owner for records.
 - 4. Labeling: Label each sample with the date, location keyed to a site plan or other location system, visible soil condition, and sampling depth.

1.10 TESTING REQUIREMENTS

- A. General: Perform tests on soil samples according to requirements in this article.
- B. Physical Testing:
 - 1. Soil Texture: Soil-particle, size-distribution analysis by one of the following methods according to SSSA's "Methods of Soil Analysis - Part 1-Physical and Mineralogical Methods", as well as USDA gradation (percentage) of gravel, coarse sand, medium sand, and fine sand, in addition to silt and clay:
 - a. Sieving Method: Report sand-gradation percentages for very coarse, coarse, medium, fine, and very fine sand; and fragment-gradation (gravel) percentages for fine, medium, and coarse fragments; according to USDA sand and fragment sizes.
 - b. Hydrometer Method: Report percentages of sand, silt, and clay.
 - 2. Bulk Density: Analysis according to core method and clod method of SSSA's "Methods of Soil Analysis - Part 1-Physical and Mineralogical Methods."
 - 3. Total Porosity: Calculate using particle density and bulk density according to SSSA's "Methods of Soil Analysis - Part 1-Physical and Mineralogical Methods."
 - 4. Water Retention: According to SSSA's "Methods of Soil Analysis - Part 1-Physical and Mineralogical Methods."
 - 5. Saturated Hydraulic Conductivity: According to SSSA's "Methods of Soil Analysis - Part 1-Physical and Mineralogical Methods"; at 85% compaction according to ASTM D 698 (Standard Proctor).
- C. Chemical Testing:
 - 1. CEC: Analysis by sodium saturation at pH 7 according to SSSA's "Methods of Soil Analysis - Part 3- Chemical Methods."
 - 2. Clay Mineralogy: Analysis and estimated percentage of expandable clay minerals using CEC by ammonium saturation at pH 7 according to SSSA's "Methods of Soil Analysis - Part 1-Physical and Mineralogical Methods."
 - 3. Metals Hazardous to Human Health: Test for presence and quantities of RCRA metals including aluminum, arsenic, barium, copper, cadmium, chromium, cobalt, lead, lithium, and vanadium. If RCRA metals are present, include recommendations for corrective action.
 - 4. Phytotoxicity: Test for plant-available concentrations of phytotoxic minerals including aluminum, arsenic, barium, cadmium, chlorides, chromium, cobalt,

copper, lead, lithium, mercury, nickel, selenium, silver, sodium, strontium, tin, titanium, vanadium, and zinc.

- D. Fertility Testing: Soil fertility analysis according to standard laboratory protocol of SSSA NAPT NCR-13, including the following:
1. Percentage of organic matter.
 2. CEC, calcium percent of CEC, and magnesium percent of CEC.
 3. Soil reaction (acidity/alkalinity pH value).
 4. Buffered acidity or alkalinity.
 5. Nitrogen ppm.
 6. Phosphorous ppm.
 7. Potassium ppm.
 8. Magnesium ppm.
 9. Manganese ppm.
 10. Manganese-availability ppm.
 11. Iron ppm.
 12. Calcium ppm.
 13. Zinc ppm.
 14. Zinc availability ppm.
 15. Copper ppm.
 16. Sodium ppm and sodium absorption ratio.
 17. Soluble-salts ppm.
 18. Presence and quantities of problem materials including salts and metals cited in the Standard protocol. If such problem materials are present, provide additional recommendations for corrective action.
 19. Other deleterious materials, including their characteristics and content of each.
- E. Organic-Matter Content: Analysis using loss-by-ignition method according to SSSA's "Methods of Soil Analysis - Part 3-Chemical Methods."
- F. Recommendations: Based on the test results, state recommendations for soil treatments and soil amendments to be incorporated to produce satisfactory planting soil suitable for healthy, viable plants or lawns indicated. Include, at a minimum, recommendations for nitrogen, phosphorous, and potassium fertilization, and for micronutrients.
1. Fertilizers and Soil Amendment Rates: State recommendations in weight per 1000 sq. ft. (100 sq. m) for 6-inch (150-mm) depth of soil.

1.11 DELIVERY, STORAGE, AND HANDLING

- A. Packaged Materials: Deliver packaged materials in original, unopened containers showing weight, certified analysis, name and address of manufacturer, and compliance with state and Federal laws if applicable.
- B. Bulk Materials:
1. Do not dump or store bulk materials near structures, utilities, walkways and pavements, or on existing turf areas or plants.
 2. Provide erosion-control measures to prevent erosion or displacement of bulk materials, discharge of soil-bearing water runoff, and airborne dust reaching adjacent properties, water conveyance systems, or walkways.

3. Do not move or handle materials when they are wet or frozen.
4. Accompany each delivery of bulk fertilizers and soil amendments with appropriate certificates.

PART 2 PRODUCTS

2.1 MATERIALS

2.2 PLANTING SOILS SPECIFIED ACCORDING TO PERFORMANCE REQUIREMENTS

- A. Planting-Soil Type: Existing, on-site surface soil, with the duff layer (if present) retained, stockpiled on-site and modified to produce viable planting soil. Using preconstruction soil analyses and materials specified in other articles of this Section, amend existing, on-site surface soil to become planting soil complying with the following requirements:
1. Particle Size Distribution by USDA Textures: Classified as sandy loam, loam, silt loam, loamy sand, or sand soil according to USDA textures.
 2. Unsuitable Materials: Stones, gravel, roots, plants, sod, clay lumps, pockets of coarse sand that exceed a combined maximum of 2 percent by dry weight of the soil.
 3. Percentage of Organic Matter: Minimum 3 percent, maximum 8 percent by volume.
 4. Soil Reaction: pH of 6 to 8. (Base this on the soil lab report. It's unrealistic to modify it much beyond the existing pH).
 5. CEC of Total Soil: Minimum 15 meq/100 mL at pH of 7.0.
 6. Soluble-Salt Content: Maximum 500 parts per million.
 7. Bulk Density: 1.2 g/cu. cm to 1.4 g/cu. cm at 85 percent compaction.
 8. Total Porosity: Minimum 50 percent at 85 percent compaction.
 9. RCRA Metals: Below maximum limits established by the EPA.
 10. Phytotoxicity: Below phytotoxicity limits established by SSSA.

2.3 ORGANIC SOIL AMENDMENTS

- A. Compost: Blended and ground leaf, wood, and other plant-based material; sourced from yard waste trimmings blended with other plant- or manure- based material designed to produce compost high in fungal material; and complying with the following requirements:
1. Commercially prepared and meeting the USCC's "Seal of Testing Assurance".
 2. Composted for a minimum of nine (9) months at temperatures sufficient to break down all woody fibers, seeds, and leaf structures.
 3. Reaction: pH of 5.5 to 8.0.
 4. Soluble-Salt Concentration: Less than 5 dS/m.
 5. Moisture Content: 30 to 60 percent by weight.
 6. Organic-Matter Content: 30 to 60 percent of dry weight.
 7. Particle Size: Minimum of 98 percent passing through a 3/4-inch (20-mm) sieve.
 8. Chemical Contaminants, mg/kg (ppm): Meet or exceed USEPA Class A standard, 40 CFR ss. 503.13, Tables 1 and 3 levels.

9. Biological Contaminants (select pathogens, fecal coliform bacteria, or salmonella): Meeting or exceeding USEPA Class A standard, 40 CFR ss. 503.32(a) level requirements.
 10. Other Toxic Materials: Below levels harmful to plants or humans.
- B. Provide manufacturer's literature and material certification that the product meets the requirements.

PART 3 EXECUTION

3.1 GENERAL

- A. Inspect all subgrade prior to soil placement. Maintain all required angles of repose of the adjacent materials as shown on the Drawings. Do not over-excavate compacted subgrades of adjacent pavement or structures.
- B. Remove all construction debris and material including any construction materials from the subgrade.
- C. Confirm that the subgrade is at the proper elevations and compacted as required. Subgrade elevations shall slope approximately parallel to the finished grade and/or toward any subsurface drain lines.
- D. Protect adjacent walks, walls, and utilities from damage or staining by the soil. Use ½ inch plywood or plastic sheeting to protect adjacent work.
- E. Place planting soil and fertilizers according to requirements in other Specification Sections.
- F. Verify that no foreign or deleterious material or liquid such as paint, paint washout, concrete slurry, concrete layers or chunks, cement, plaster, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, or acid has been deposited in planting soil.
- G. Proceed with placement only after unsatisfactory conditions have been corrected.

3.2 PREPARATION OF UNAMENDED, ON-SITE SOIL BEFORE AMENDING

- A. Excavation: Excavate existing topsoil from designated area(s) to a depth and in a manner to prevent intermingling with underlying subsoil or other waste materials and stockpile until amended.
- B. Unacceptable Materials: Clean soil of concrete slurry, concrete layers or chunks, cement, plaster, building debris, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, acid, and other extraneous materials that are harmful to plant growth.

- C. Unsuitable Materials: Clean soil to contain a maximum of 2% percent by dry weight of stones, roots, plants, sod, clay lumps, and pockets of coarse sand.
- D. Screening: Pass unamended soil through a 1-inch sieve to remove large materials.

3.3 PLACING AND MIXING PLANTING SOIL OVER EXPOSED SUBGRADE

- A. General: Apply and mix unamended soil with amendments on-site to produce required planting soil. Do not apply materials or till if existing soil or subgrade is frozen, muddy, or excessively wet.
- B. Subgrade Preparation: Till subgrade to a minimum depth of 6 inches (150 mm). Remove stones larger than 1/2 inch (13 mm) in any dimension and sticks, roots, rubbish, and other extraneous matter and legally dispose of them off Owner's property.
 - 1. If area has been compacted during construction, rototill to 6 inches (150mm) to break up the hardpan. Grade to level before topsoil application.
 - 2. Grade to 1inch (25mm) to 1-1/2 inch (38mm) above grade of existing lawn (if applicable). Blend edges to existing turf and sidewalks.
 - 3. Grade all seeded and planted areas to a minimum slope of 1 percent.
- C. Mixing: Spread unamended soil to total depth of 6 inches (150 mm) for seeded areas and 12 inches (300mm) for planting beds, but not less than required to meet finish grades after mixing with amendments and natural settlement. Do not spread if soil or subgrade is frozen, muddy, or excessively wet.
 - 1. Amendments: Apply soil amendments (including fertilizer, if required) evenly on surface, and thoroughly blend them with unamended soil to produce planting soil.
 - 2. Lifts: Apply and mix unamended soil and amendments in lifts not exceeding 8 inches (200 mm) in loose depth for material compacted by compaction equipment, and not more than 4 inches (100 mm) in loose depth for material compacted by hand-operated tampers.
- D. Phase the application of the planting soil such that equipment to deliver or grade soil does not have to operate over previously installed planting soil. Work in rows or lifts the width of the equipment. Work out from the furthest part of each bed from the soil delivery point.
- E. Where possible, place large trees prior to spreading planting soil in the area.
- F. Compaction: Compact the upper 12 inches (300mm) below finished grade to between 75 and 82 percent of maximum Standard Proctor density according to ASTM D 698. Compact each upper lift of planting soil to 85 percent.
- G. Finish Grading: Grade planting soil to a smooth, uniform surface plane with loose, uniformly fine texture. Roll and rake, remove ridges, and fill depressions to meet finish grades. Contractor shall bear in mind any reduction in planting soil volume after settling when installing and fine grading. Provide smooth, rounded transitions between slopes of different gradients and direction. Fill all dips and remove any bumps in the overall plane of the slopes.

3.4 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- B. Perform the following tests:
 - 1. Compaction: Test planting-soil compaction after placing each lift and at completion using a densitometer or soil-compaction meter calibrated to a reference test value based on laboratory testing according to ASTM D 698. Space tests at no less than one for each 2000 sq. ft. (200 sq. m) of in-place soil or part thereof.
 - 2. Performance Testing: For each amended planting-soil type, demonstrating compliance with specified performance requirements. Perform testing according to "Soil-Sampling Requirements" and "Testing Requirements" articles.
- C. Soil will be considered defective if it does not pass tests.
- D. Prepare test reports.
- E. Label each sample and test report with the date, location keyed to a site plan or other location system, visible conditions when and where sample was taken, and sampling depth.

3.5 PROTECTION

- A. Protect areas of in-place soil from additional compaction, disturbance, and contamination. Prohibit the following practices within these areas except as required to perform planting operations:
 - 1. Storage of construction materials, debris, or excavated material.
 - 2. Parking vehicles or equipment.
 - 3. Vehicle traffic.
 - 4. Foot traffic.
 - 5. Erection of sheds or structures.
 - 6. Impoundment of water.
 - 7. Excavation or other digging unless otherwise indicated.
- B. If planting soil or subgrade is overcompacted, disturbed, or contaminated by foreign or deleterious materials or liquids, remove the planting soil and contamination; restore the subgrade as directed by Architect and replace contaminated planting soil with new planting soil.

3.6 CLEANING

- A. Protect areas adjacent to planting-soil preparation and placement areas from contamination. Keep adjacent paving and construction clean and work area in an orderly condition.
- B. Remove surplus soil and waste material including excess subsoil, unsuitable materials, trash, and debris and legally dispose of them off Owner's property unless otherwise indicated.

1. Dispose of excess subsoil and unsuitable materials on-site where directed by Owner.

END OF SECTION

SECTION 329219 - SEEDING

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Preparation of topsoil.
- B. Placing topsoil.
- C. Seeding
- D. Hydroseeding, mulching and fertilizer.
- E. Erosion-Control Materials.
- F. Turf Renovation.
- G. Maintenance.

1.2 RELATED REQUIREMENTS

- A. Section 312200 - Grading
- B. Section 312323 - Fill
- C. Section 329115 - Soil Preparation (Performance Specification)

1.3 DEFINITIONS

- A. Finish Grade: Elevation of finished surface of planting soil.
- B. Pesticide: A substance or mixture intended for preventing, destroying, repelling, or mitigating a pest. Pesticides include insecticides, miticides, herbicides, fungicides, rodenticides, and molluscicides. They also includes substances or mixtures intended for use as a plant regulator, defoliant, or desiccant.
- C. Pests: Living organisms that occur where they are not desired or that cause damage to plants, animals, or people. Pests include insects, mites, grubs, mollusks (snails and slugs), rodents (gophers, moles, and mice), unwanted plants (weeds), fungi, bacteria, and viruses.
- D. Planting Soil: Existing, on-site soil; imported soil; or manufactured soil that has been modified with soil amendments and perhaps fertilizers to produce a soil mixture best for plant growth. See Section 329115 "Soil Preparation (Performance Specification)" and drawing designations for planting soils.

- E. Subgrade: The surface or elevation of subsoil remaining after excavation is complete, or the top surface of a fill or backfill before planting soil is placed.
- F. Weeds: Include Dandelion, Jimsonweed, Quackgrass, Horsetail, Morning Glory, Rush Grass, Mustard, Lambsquarter, Chickweed, Cress, Crabgrass, Canadian Thistle, Nutgrass, Poison Oak, Blackberry, Tansy Ragwort, Bermuda Grass, Johnson Grass, Poison Ivy, Nut Sedge, Nimble Will, Bindweed, Bent Grass, Wild Garlic, Perennial Sorrel, and Brome Grass.

1.4 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Qualification Data: For landscape installer.
- C. Product Certificates: For fertilizers, from manufacturer.
- D. Pesticides and Herbicides: Product label and manufacturer's application instructions specific to Project.
- E. Product Data: For seeding mix, imported soil, and soil amendments.
- F. Certificate: From seed vendor for each seed monostand or mixture, stating the botanical and common name, percentage by weight of each species and variety, and percentage of purity, germination, and weed seed.
 - 1. Include the year of production and date of packaging.
 - 2. Include identification of source and name and telephone number of supplier.
- G. Maintenance Data: Recommended procedures to be established by Owner for maintenance of turf, prairies, and other naturalized seeded areas during a calendar year. Include maintenance instructions, cutting method and maximum grass height; types, application frequency, and recommended coverage of fertilizer . Submit before expiration of required maintenance periods.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver grass seed mixture in sealed containers. Seed in damaged packaging is not acceptable. Deliver seed mixture in containers showing percentage of seed mix, year of production, net weight, date of packaging, and location of packaging.
- B. Deliver fertilizer in waterproof bags showing weight, chemical analysis, and name of manufacturer.

1.6 QUALITY CONTROL

- A. Installer Qualifications: A qualified landscape installer whose work has resulted in successful turf and prairie/field/meadow establishment.

1. Experience: Five years' experience in turf and prairie/field/meadow installation in addition to requirements in Section 014000 "Quality Requirements."
2. Installer's Field Supervision: Require Installer to maintain an experienced full-time supervisor on Project site when work is in progress.
3. Additional Prairie/Field/Meadow Installation Experience: It is required that Installer must have successfully established over 200 acres of such landscape within the same ecoregion as the project site.
4. Maintenance Proximity: Installer's place of business to be located not more than two hours' normal travel time from Project Site.
5. Pesticide Applicator: State licensed, commercial.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Seed and Other Packaged Materials: Deliver packaged materials in original, unopened containers showing weight, certified analysis, name and address of manufacturer, and indication of compliance with state and Federal laws, as applicable.
- B. Bulk Materials:
 1. Do not dump or store bulk materials near structures, utilities, walkways and pavements, or on existing turf areas or plants.
 2. Provide erosion-control measures to prevent erosion or displacement of bulk materials; discharge of soil-bearing water runoff; and airborne dust reaching adjacent properties, water conveyance systems, or walkways.
 3. Accompany each delivery of bulk materials with appropriate certificates.

1.8 FIELD CONDITIONS

- A. Planting Restrictions: Plant during one of the following periods. Coordinate planting periods with initial maintenance periods to provide required maintenance from date of planting completion.
 1. Spring Planting of Turf: Prior to June 15.
 2. Fall Planting of Turf: After August 15.
 3. Fall Planting of Prairie/Field/Meadow: Month of October. (Preferred. Period may be extended to October 1 to June 15 with prior approval by Architect).
- B. Weather Limitations: Proceed with planting only when existing and forecasted weather conditions permit planting to be performed when beneficial and optimum results may be obtained. Apply products during favorable weather conditions according to manufacturer's written instructions.

PART 2 PRODUCTS

2.1 REGULATORY REQUIREMENTS

- A. Comply with regulatory agencies for fertilizer and herbicide composition.

2.2 SEED MIXTURE

- A. General: Fresh, clean, dry, new-crop seed complying with AOSA's "Rules for Testing Seeds" for purity and germination tolerances.
- B. Quality: With not less than 85 percent germination, not less than 95 percent pure seed, and not more than 0.5 percent weed seed.
- C. Turf Grass Seed Mixture: Proportioned by weight as follows:
 - 1. Kentucky Blue Grass: 10 percent.
 - a. Provide at least 2 improved varieties.
 - 2. Turf-Type Tall Fescue Grass: 80 percent.
 - a. Provide blend of 3 improved varieties.
 - 3. Perennial Rye: 10 percent.
 - a. Provide at least 2 improved varieties.
- D. [Specialty] Seed Mixture:
 - 1. Manufacturer: []
 - 2. Seed shall be from sources appropriate for USEPA Ecoregion containing the project site.
 - 3. Seed Carrier: Inert material, sharp clean sand or perlite, mixed with seed at a ratio of not less than two parts seed carrier to one part seed.

2.3 SOIL MATERIALS

- A. Topsoil: As specified in Section 329115 - Soil Preparation (Performance Specification).
- B. Compost: As specified in Section 329115 - Soil Preparation (Performance Specification).

2.4 ACCESSORIES

- A. Mulching Material: At contractor's option, one of the following:
 - 1. Straw Mulch: Threshed straw of oat, wheat, rye, or barley; free of mildew, seeds, weeds, and other foreign matter detrimental to plant life. Hay or chopped cornstalks are not acceptable.
 - 2. Fiber Mulch: Hemlock species wood cellulose fiber; dust form; free of growth or germination inhibiting ingredients; with a maximum moisture content of 15 percent and pH range of 4.5 to 6.5.
 - a. Nonasphaltic tackifier: Colloidal Tackifier recommended by fiber-mulch manufacturer for slurry application, non-toxic and free of plant growth and germination inhibitors.
- B. Fertilizer: Commercial-grade complete fertilizer of neutral character, consisting of fast- and slow-release nitrogen, with fifty percent of the elements derived from natural organic sources of urea formaldehyde, phosphorous, and potassium.

1. Composition: Nitrogen, phosphorus, and potassium in proportion necessary to eliminate any deficiencies of topsoil, as recommended in soil reports from a qualified testing agency.
 2. Phosphorus content: 4 percent maximum, provide at the minimum loading rate necessary for lawn establishment per the soil laboratory analysis.
 3. Apply lawn "starter" fertilizer monthly while grass is actively growing. Do not apply fertilizer to prairie/field/meadow areas.
- C. Water: Clean, fresh and free of substances or matter that could inhibit vigorous growth of grass.
- D. Erosion-Control Materials
1. Fabric / Blankets: Biodegradable wood excelsior, straw, or coconut-fiber mat enclosed in a photodegradable plastic mesh. Include manufacturer's recommended steel wire staples, 6 inches (150 mm) long.
 2. Fiber Mesh: Biodegradable burlap or spun-coir mesh, a minimum of 0.92 lb/sq. yd. (0.5 kg/sq. m), with 50 to 65 percent open area. Include manufacturer's recommended steel wire staples, 6 inches (150 mm) long.
 3. Mats: Cellular, nonbiodegradable slope- stabilization mats designed to isolate and contain small areas of soil over steeply sloped surface; of 3-inch nominal mat thickness. Include manufacturer's recommended anchorage system for slope conditions.
- E. Herbicide: Registered and approved by the EPA, acceptable to authorities having jurisdiction, and of type recommended by manufacturer for each specific problem and as required for Project conditions and application.
1. Pre-Emergent Herbicide (Selective and Non-Selective): Effective for controlling the germination or growth of weeds within planted areas at the soil level directly below the mulch layer.
 2. Post-Emergent Herbicide (Selective and Non-Selective): Effective for controlling weed growth that has already germinated.
- F. Stakes: Softwood lumber, chisel pointed.
- G. String: Inorganic fiber.

2.5 TESTS

- A. Provide analysis of topsoil fill under provisions of Section 014000.
- B. Analyze for compliance with values listed in this section.
- C. Submit minimum 10 oz sample of topsoil proposed. Forward sample to approved testing laboratory in sealed containers to prevent contamination.
- D. Testing is not required if recent tests are available for imported topsoil. Submit these test results to the testing laboratory for approval. Indicate, by test results, information necessary to determine suitability.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that prepared soil base is ready to receive the work of this Section.
 - 1. Verify that no foreign or deleterious material or liquid such as paint, paint washout, concrete slurry, concrete layers or chunks, cement, plaster, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, or acid has been deposited in soil within a planting area.
 - 2. Suspend planting operations during periods of excessive soil moisture until the moisture content reaches acceptable levels to attain the required results.
 - 3. Uniformly moisten excessively dry soil that is not workable or which is dusty.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.
- C. If contamination by foreign or deleterious material or liquid is present in soil within a planting area, remove the soil and contamination as directed by Architect and replace with new planting soil.

3.2 PREPARATION

- A. Install erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.
- B. Protect adjacent structures, utilities, pavements; other facilities; and plants from damage caused by planting operations.
 - 1. Protect adjacent and adjoining areas from hydroseeding and hydromulching overspray.
 - 2. Protect grade stakes set by others until directed to remove them.
- C. Prepare subgrade in accordance with Section 320115 - Soil Preparation (Performance Specification).
- D. Apply and mix unamended soil with amendments on-site to produce required planting soil. Place and mix planting soil in place over exposed subgrade. Provide a minimum depth of 6 inches. Do not apply if soil or subgrade is frozen, muddy, or excessively wet.
- E. Moisten prepared area before planting if soil is dry. Water thoroughly and allow surface to dry before planting. Do not create muddy soil.
- F. Before planting, obtain Architect's acceptance of finish grading; restore planting areas if eroded or otherwise disturbed after finish grading.

3.3 FERTILIZING

- A. Apply fertilizer in accordance with manufacturer's instructions.
 - 1. Apply lawn starter fertilizer monthly while grass is actively growing.

- B. Apply starter fertilizer after smooth raking of topsoil and prior to roller compaction and seeding.
- C. Do not apply fertilizer at same time or with same machine as will be used to apply seed.
- D. Mix thoroughly into upper 4 inches of topsoil.
- E. Lightly water to aid the dissipation of fertilizer.

3.4 SEEDING

- A. Apply seed at a rate of 10-12 lbs per 1000 sq ft evenly in two intersecting directions using a spreader or seeding machine. Rake seed lightly into top 1/8 inch (3 mm) of soil, and roll lightly.
- B. Do not use wet seed or seed that is moldy or otherwise damaged.
- C. Do not seed against existing trees. Limit extent of seed to outside edge of planting saucer.
- D. Do not seed areas in excess of that which can be mulched on same day.
- E. Do not sow immediately following rain, when ground is too dry, or during periods when wind velocity exceeds 5 mph (8 km/h).
- F. Immediately following seeding and compacting, apply mulch to a thickness of 1/8 inches. Maintain clear of shrubs and trees.
- G. Apply water with a fine spray immediately after each area has been mulched. Saturate to 4 inches of soil.
- H. Following germination, immediately re-seed areas without germinated seeds that are larger than 4 by 4 inches.

3.5 EROSION-CONTROL MATERIALS

- A. Prepare area as specified for seeding. Moisten prepared area before planting if surface is dry. Water thoroughly and allow surface to dry before planting. Do not create muddy soil.
- B. Erosion-Control Mesh:
 - 1. Install on slopes exceeding 1:6 and less than 1:4.
 - 2. Install from top of slope, working downward, and as recommended by material manufacturer for site conditions. Fasten as recommended by material manufacturer.
- C. Erosion-Control Blanket:
 - 1. Install on slopes exceeding 1:4 and less than 1:2.

2. Install from top of slope, working downward, and as recommended by material manufacturer for site conditions. Fasten as recommended by material manufacturer.
- D. Erosion–Control Mats:
1. Install on slopes 1:2 or steeper.
 2. Install planting soil in two lifts, with second lift equal to thickness of erosion-control mats. Install erosion-control mat and fasten as recommended by material manufacturer. Fill cells of erosion-control mat with planting soil and compact before planting.

3.6 PROTECTION

- A. Identify seeded areas with stakes and string around area periphery. Set string height to 18 inches. Space stakes at 60 inches.
- B. Cover seeded slopes where grade is 4 inches per foot or greater with erosion fabric. Roll fabric onto slopes without stretching or pulling.
- C. Lay fabric smoothly on surface, bury top end of each section in 6 inch deep excavated topsoil trench. Provide 12 inch overlap of adjacent rolls. Backfill trench and rake smooth, level with adjacent soil.
- D. Secure outside edges and overlaps at 36 inch intervals with stakes.
- E. Lightly dress slopes with topsoil to ensure close contact between fabric and soil.
- F. At sides of ditches, lay fabric laps in direction of water flow. Lap ends and edges minimum 6 inches.

3.7 TURF RENOVATION

- A. Renovate existing turf where indicated. Over seed undamaged areas at seed rate indicated, using same seed mix as new lawn areas.
- B. Renovate turf damaged by Contractor's operations, such as storage of materials or equipment and movement of vehicles, including compaction repair.
 1. Reestablish turf where settlement or washouts occur or where minor regrading is required.
 2. Install new planting soil as required.
- C. Remove sod and vegetation from diseased or unsatisfactory turf areas; do not bury in soil.
- D. Remove topsoil containing foreign materials, such as oil drippings, fuel spills, stones, gravel, and other construction materials resulting from Contractor's operations, and replace with new planting soil.
- E. Mow, dethatch, core aerate at a rate of 9 holes per square foot, and rake existing turf.

- F. Remove weeds before seeding. Where weeds are extensive, apply selective herbicides as required. Do not use pre-emergence herbicides.
- G. Remove waste and foreign materials, including weeds, soil cores, grass, vegetation, and turf, and legally dispose of them off Owner's property.
- H. Till stripped, bare, and compacted areas thoroughly to a soil depth of 6 inches (150 mm).
- I. Apply soil amendments and starter fertilizers required for establishing new turf and mix thoroughly into top 4 inches (100 mm) of existing soil. Install new planting soil to fill low spots and meet finish grades.
 - 1. Soil Amendment(s): Apply according to requirements of Section 329115 "Soil Preparation (Performance Specification)."
 - 2. Initial Fertilizer: Starter fertilizer as defined above.
- J. Apply seed and protect with straw mulch as required for new turf.
- K. Water newly planted areas and keep moist until new turf is established.

3.8 MAINTENANCE

- A. Provide maintenance at no extra cost to Owner; Owner will pay for water.
- B. See Section 017000 - Execution Requirements, for additional requirements relating to maintenance service.
- C. Maintain seeded areas immediately after placement until grass is well established and exhibits a vigorous growing condition, but not less than three months from date of planting or until final acceptance. Contractor is responsible for all maintenance until acceptance by Owner.
 - 1. When the full maintenance period has not elapsed before the end of the planting season, or if turf is not fully established, continue maintenance during the next planting season.
- D. Roll, regrade, and replant bare or eroded areas and remulch to produce a uniformly smooth turf. Provide materials and installation the same as those used in the original installation.
- E. Fill in as necessary soil subsidence that may occur because of settling or other processes. Replace materials and turf damaged or lost in areas of subsidence.
- F. In areas where mulch has been disturbed by wind or maintenance operations, add new mulch and anchor as required to prevent displacement.
- G. Mow grass at regular intervals to maintain at a maximum height of 2 1/2 to 3 inches. Do not cut more than 1/3 of grass blade at any one mowing. Do not delay mowing until grass blades bend over and become matted. Do not mow when grass is wet.
- H. Neatly trim edges and hand clip where necessary.

- I. Immediately remove clippings after mowing and trimming.
- J. Water to prevent grass and soil from drying out.
 - 1. Install and maintain temporary piping, hoses, and turf-watering equipment to convey water from sources and to keep turf uniformly moist to a depth of 4 inches (100 mm).
 - 2. Schedule watering to prevent wilting, puddling, erosion, and displacement of seed or mulch. Lay out temporary watering system to avoid walking over muddy or newly planted areas.
 - 3. Water turf with fine spray daily for the first two weeks, then at a minimum rate of 1 inch (25 mm) per week unless rainfall precipitation is adequate.
- K. Roll or regrade surface to remove minor depressions or irregularities.
- L. Replant bare or eroded areas and remulch to produce a uniformly smooth turf. Provide materials and installation the same as those used in the original installation.
- M. Control growth of weeds. Use integrated pest management practices whenever possible to minimize the use of pesticides and reduce hazards. When used, apply herbicides in accordance with manufacturer's instructions. Remedy damage resulting from improper use of herbicides.
- N. Immediately reseed areas that show bare spots.
- O. Protect seeded areas with fencing and/or warning signs during maintenance period.

3.9 QUALITY ASSURANCE

- A. Turf installations shall meet the following criteria as determined by Architect:
 - 1. Satisfactory Seeded Turf: At end of maintenance period, a healthy, uniform, close stand of grass has been established, free of weeds and surface irregularities, with coverage exceeding 90 percent over any 10 square feet and bare spots not exceeding 5 by 5 inches.
- B. Use specified materials to reestablish turf that does not comply with requirements, and continue maintenance until turf is satisfactory.
- C. Remediate all turf installations not meeting the above requirements as directed by Architect.

END OF SECTION