Bangor Township School District

PROJECT MANUAL

2023 Bond - Phase 3A
Middle School Addition & Renovations

January 15, 2025

ARCHITECTS/ENGINEERS
Integrated Designs, Inc.
1021 W Baraga Ave
Marquette, MI 49855
Telephone: 906-236-3629
Fax: 906-228-7524

CONSTRUCTION MANAGER
Wolgast Corporation
4835 Towne Centre Road, Suite 203
Saginaw, Michigan 48604
Telephone: (989) 790-9120
Fax: (989) 790-9063

Bidding Requirements, Contract Forms, and Conditions of the Contract

Division 1 – General Requirements

END OF SECTION 00005

Bangor Township Schools will receive sealed bid proposals for construction trade work from qualified contractors for the **Bangor Township School District, 2023 Bond - Phase 3A - Middle School Addition & Renovations.** A pre-bid meeting and project walk-through will be conducted by the Construction Manager, Wolgast Corporation, and the Architect, **Integrated Designs, Inc.**, on **Tuesday, January 21, 2025,** at **3:30 PM** (local time) at **Middle School Main Entrance.**

Proposals may be mailed or delivered in person to **Matt Schmidt, Superintendent**, c/o **Bangor Township Schools, 3359 E Midland Road, Bay City, MI 48706**. Proposals must be received prior to **2:00 PM** (local time) on **Friday, February 7, 2025**, at the **Bangor Township Schools Administration Building** or upload to Building Connected https://app.buildingconnected.com/login?retUrl=%2F Proposals will be publicly opened and read aloud at **2:01 PM** in the **Administration Office.** All bids will be evaluated after the bid opening. All bids received after **2:00 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 **February 24, 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. 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 **Dale Schwerin dschwerin@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: **Bangor Township Schools.**

B. The Architect is: **Integrated Designs, Inc.**

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: **Bangor Township School District, 2023 Bd Ph 3A Middle School Addition & Renovations**

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:

Dale Schwerin, Project Manager, Wolgast Corporation, (989) 790-9120, extension **704** or **dschwerin@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

Middle School Main Entrance
Located at 3281 Kiesel Road
Bay City, MI 48706
Tuesday, January 21, 2025 at 3:30 PM

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.

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:

Bangor Township Schools
Matt Schmidt, Superintendent
3359 E Midland Road
Bay City, MI 48706

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 **2:00 PM** on **Friday, February 7, 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:**

TO: **Bangor Township Schools**
Attn: Matt Schmidt
3359 E Midland Road
Bay City, MI 48706

SEALED BID FOR:

Bangor Township School District
2023 Bond - Phase 3A
Middle School Addition & Renovations

Bid Division No:_____

END OF SECTION 00300

Project: **Bangor Township School District**
2023 Bond - Phase 3A
Middle School Addition & Renovations

Submitted By: _____
(Bidder's Company Name)

Address: _____

City / State / Zip: _____

Phone: _____

Contact Name: _____

Email: _____

Bid Proposal Deadline: **Prior to Friday, February 7, 2025 at 2:00 PM (local time) to:**

Bangor Township Schools
Matt Schmidt, Superintendent,
3359 E Midland Road
Bay City, MI 48706.

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 Bangor Township School District – PH 3a MS (not including Labor Bond, Material Bond, and/or Performance Bond Costs):

_____ Dollars and 00/100ths

$ _____

BOND COST for Bangor Township School District – PH 3a MS (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:
_____	_____
_____	_____
_____	_____
_____	_____

ALTERNATES

Alternate 1 - Connecting Existing Roof Drains to Storm System

1. Base Bid – Storm connections at building addition and West of building addition as depicted on construction drawings.
2. ADD Alternate – Additional roof drain connections and associated work (East of building addition) as depicted on site construction drawings.

Alt 1 ADD _____

Alt 1 BOND _____

Alternate 2 – Sanitary Connection to Main at Keisel Road

1. Base Bid – Refer to Plumbing and Civil drawings. Sanitary Connection to existing underground sanitary line in Room B113 at area of building addition.
2. ADD Alternate – If investigative demolition finds that Sanitary line in room B113 is insufficient of size or depth for connection. Provide Sanitary connection to Main at Keisel Road as depicted on C1.1.

Alt 2 ADD _____

Alt 2 BOND _____

Alternate 3 – Replacement of Existing Domestic Water Pipes

1. Base Bid – No Scope.
2. ADD Alternate – Refer to plumbing plan P2.2, include all trades required for replacement of domestic water piping as shown. Including Acoustical ceiling tile and grid removal and replacement/reinstallation as required to provide access to area of work.

Alt 3 ADD _____

Alt 3 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:

Item(s)	Manufacturer/Subcontractor/Supplier

VOLUNTARY ALTERNATES / VALUE ENGINEERING SUGGESTIONS

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

Summary of Suggestions	Deduct from Base Bid

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 033000 – Cast In Place Concrete
Section 321313 – Concrete Paving
Section 321317 – Concrete Paving Joint Sealants

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

Section 072100 – Thermal Insulation (As it relates to building insulation under slab)
Section 312000 – Earth Moving (As it relates to fine grading & final compaction)
Section 079500 – Interior Expansion Control System

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, 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. 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 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. Contractors shall have a supervisor on site at all times when a crew is present on the job.
18. On Friday, or the 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.

Bid Division: 030100 – Concrete

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. Provide dewatering as needed for work in this Bid Division, if required.
3. 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.
4. Mechanical and electrical housekeeping pads if required.
5. Install all miscellaneous embedded items supplied by others (i.e. anchor bolts, bumper posts, inserts).
6. Coordination with electrician on installation of the under-floor raceway and boxes.
7. Finish grade of all sand or other fill cushion under interior and exterior slabs on grade, walks, pads, or aprons.
8. All exterior concrete. (Including, but not limited to sidewalks, curbs, trash corral pad, footings, chiller pad, etc.)
9. This contractor is responsible for compaction at footing bottoms.
10. Furnish and install foundation and under slab insulation.
11. Provide all thickened slabs.
12. 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.
13. Provide written acceptance of grade elevations to Construction Manager after Site Work contractor has established the building pad.

Project Inclusions:

1. Building coordinates and control points will be provided by the Owner.
2. Any additional layout or surveying to complete your work will be your responsibility.
3. Include a $5,000 allowance for unknow conditions to be used at the direction of the Construction Manager.
4. Provide and install foundations, slab on grade, elevated slabs, walks and curbs. This includes concrete slab infills from plumbing for interior renovations.
5. Provide and install all reinforced for your work.
6. Provide and install all required vapor barriers for your work.
7. Provide and install all rigid insulation noted under slab concrete and against wall foundation.
8. Install metal deck for elevated concrete slab provided by metal contractor.
9. Provide and install all required control joints and control joint material.
10. Provide pricing for Alternate 1 Roof Drain Connections.
11. Provide pricing for Alternate 2 Sanitary Sewer.

Project Exclusions:

1. Concrete Testing
2. Soil Density Testing
3. Supplying metal decking for elevated concrete.

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 DIVISION

Wolgast Corporation

Printed on Thu Jan 16, 2025 at 09:01 am EST

Job #: A23906-5A Bangor Twp - 23 Bond PH 3A - Middle School
3281 Kiesel Road
Bay City, Michigan 48706
9896848121

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 Sealants	321373-2	0	Concrete Paving Joint Sealants - samples	Sample	Draft											
321373 - Concrete Paving Joint Sealants	321373-1	0	Concrete Paving Joint Sealants - product data	Product Information	Draft											
321313 - Concrete Paving	321313-1	0	Concrete Paving - mix design	Product Information	Draft											
079500 - Interior Expansion Control System	079500-2	0	Interior Expansion Joint - samples	Sample	Draft											
079500 - Interior Expansion Control System	079500-1	0	Interior Expansion Joint - product data and install instructions	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 - shop drawings	Shop Drawing	Draft											
#2 03 01 00 Concrete Start Up																
	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																
079500 - Interior Expansion Control System	079500-3	0	Interior Expansion Joint - Warranty	Closeouts	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 042200 – Concrete Unit Masonry
Section 072119 – Foamed-in-place Insulation

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

Section 072100 – Thermal Insulation (As it relates to rigid insulation directly behind masonry)
Section 078413 – Penetration Firestopping (As it relates to this Bid Division)
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. 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 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. Contractors shall have a supervisor on site at all times when a crew is present on the job.
18. On Friday, or the 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.

Bid Division: 040000 – Masonry

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. Installation of miscellaneous steel lintels, bolts, and grouted anchors.
3. Coordinate the location of all masonry openings and penetrations with the trade requiring same.
4. Coordinate masonry opening sizes and locations with all contractors.
5. Layout for opening for other trades to be performed by that trade.
6. Verify correct window rough opening sizes for all new and relocated existing window units prior to building masonry window openings.
7. Provide all required masonry sealants and caulking for wall flashing, weep holes, and rigid insulation.
8. Provide patching of all wall penetrations as required.
9. All toothing and patching as required for all work related to this project. (Coordinate with other Bid Divisions)
10. Grout all jambs and headers of all hollow metal frames, and brass doorjambs per manufacturer's recommendation.
11. The brick is the responsibility of the masonry contractor, to purchase and install.
12. The mason contractor is responsible to remove all excess mortar from salvaged brick prior to installation.
13. Removal of mortar from floors, clean with cleaner and water to remove excess mortar and mortar dust.
14. Cavity wall insulation includes all insulation extending beyond the top of the brick or veneer line but laying against the CMU wall as specified.
15. Provide through wall flashing at building tie-ins, including any demolition required.
16. Temporarily brace masonry as required by industry standards and MIOSHA, to include temporary warning signage and barricades.
17. Samples of brick for exterior walls will be tested for efflorescence per ASTM C67 prior to acceptance of brick.
18. 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.

Project Inclusions:

1. Building coordinates and control points will be provided by the Owner.
2. Any additional layout or surveying to complete your work will be your responsibility.
3. Include a $10,000 allowance for unknow conditions to be used at the direction of the Construction Manager.
4. Provide and install all brick and concrete masonry units.
5. Tooth in masonry openings as noted in the drawings left by mechanical, electrical, and plumbing.
6. Reference interior renovation drawings for new masonry wall infills.
7. Include all required masonry grouting.
8. Provide and install all insulation for masonry walls as noted in the drawings.
9. Include all reinforce, flashing, and control joints to complete your work.
10. Install all the lintels, bearing plates, anchors, etc. in your masonry.
11. Install any steel door frames that are installed into masonry.
12. Provide pricing for Alternate 1 Roof Drain Connections.
13. Provide pricing for Alternate 2 Sanitary Sewer.

Project Excludes:

1. Supplying of lintels, bearing plates, and anchors.
2. Supplying of steel door frames.

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 DIVISION

Wolgast Corporation

Job #: A23906-5A Bangor Twp - 23 Bond PH 3A - Middle School
3281 Kiesel Road
Bay City, Michigan 48706
9896848121

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	079200-2	0	Joint Sealants - color samples	Sample	Draft											
079200 - Joint Sealants	079200-1	0	Joint Sealants - product data	Product Information	Draft											
078413 - Penetration Firestopping	078413-2	0	Penetration Fire Stopping - product data	Product Information	Draft											
072119 - Foamed-in-place Insulation	072119-1	0	Foamed in Place Insulation - product data	Product Information	Draft											
072100 - Thermal Insulation	072100-2	0	Thermal Insulation - Product Data	Product Information	Draft											
042200 - Concrete Unit Masonry	042200-2	0	Concrete Unit Masonry - Samples	Sample	Draft											
042200 - Concrete Unit Masonry	042200-1	0	Concrete Unit Masonry - shop drawings	Shop Drawing	Draft											
#5 04 00 00 Masonry Start Up																
	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	079200-3	0	Joint Sealants - Warranty - see spec	Closeouts	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: 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 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 concete)
Section 042000 – 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. 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 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. Provide all layout and measurements required to perform the work of this Bid Division.
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. Contractors shall have a supervisor on site at all times when a crew is present on the job.
18. On Friday, or the 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.

Bid Division: 050000 – Metals

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

Project Inclusions:

1. Building coordinates and control points will be provided by the Owner.
2. Any additional layout or surveying to complete your work will be your responsibility.
3. Provide and install all structural steel, metal decking, and joists.
4. Turnover all embedded steel such as anchors, lintels, bearing plates to the installing contractor.
5. Provide metal decking for concrete stoop to concrete Contractor.

Excludes:

1. Installation of embedded steel (anchor bolts, lintels, etc.)
2. Testing and inspections of steel.

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 DIVISION

Wolgast Corporation

Job #: A23906-5A Bangor Twp - 23 Bond PH 3A - Middle School
3281 Kiesel Road
Bay City, Michigan 48706
9896848121

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 Fab - shop drawings	Shop Drawing	Draft											
053100 - Steel Decking	053100-1	0	Steel Deck - Shop Drawings	Shop Drawing	Draft											
052100 - Steel Joist Framing	052100-1	0	Joist Framing - shop drawings	Shop Drawing	Draft											
051200 - Structural Steel Framing	051200-2	0	Steel Framing - certs	Other	Draft											
051200 - Structural Steel Framing	051200-1	0	Steel Framing - shop drawings	Shop Drawing	Draft											
#8 05 00 00 Metals Start Up																
	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																
	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 024200 – Selective Demolition
Section 061000 – Rough Carpentry
Section 064116 – Plastic Laminate Clad Architectural Cabinets
Section 081113 – Hollow Metal Doors and Frames
Section 081416 – Flush Wood Doors
Section 092216 – Non-Structural Metal Framing
Section 092900 – Gypsum Board
Section 095100 – Acoustical Ceilings
Section 095154 – Spray-On Acoustical Finish
Section 101419 – Signage and Graphics
Section 102113.19 – Plastic Toilet Compartments
Section 102800 – Toilet Accessories
Section 104413 – Fire Protection Cabinets
Section 104416 – Fire Extinguishers
Section 122413 – Roller Window Shades

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

Section 072100 – Thermal Insulation
Section 079200 – Joint Sealants (As it relates to work in this Bid Division)
Section 079500 – Interior Expansion Control System
Section 087100 – Door Hardware

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. 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 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.

Bid Division: 060000 – General Trades

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 the 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. 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 proper legal off-site disposal off all construction debris generated by the described work.
8. Remove items indicated: clean, service and otherwise prepare them for reuse; store and protect against damage.
9. Remove and legally dispose of items not indicated to be reinstalled, salvaged or to remain the Owner's property.
10. Clean, prep and adjust all equipment immediately prior to Owner occupancy.
11. Provide all temporary enclosures as required, review demo drawings throughout the duration of construction.
12. 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.
13. Provide all wood framing, plywood and nailers as shown and specified.
14. 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.
15. 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. Building coordinates and control points will be provided by the Owner.
2. Any additional layout or surveying to complete your work will be your responsibility.
3. Include a $20,000 allowance for unknow conditions to be used at the direction of the Construction Manager.
4. Include all required saw cutting to remove noted items.
5. Construct a temporary 1-hour fire rated insulated wall to separate the existing building from the new addition at Corridor E100. Include a man door with lock for access.
6. Remove doors, windows, lockers, casework, toilet partitions, toilet accessories, concrete floor for new plumbing, masonry walls, EIFS, flooring with grinding to clean concrete, acoustical ceiling grid and tile, whiteboards, tackboards, and chalk boards noted per the drawings.
7. Review plumbing drawings for required floor slab removal.
8. Salvage items noted per the drawings.
9. Move existing Art Kiln to new addition. Mechanical and Electrical Trades will hookup.
10. Provide and install hollow metal door frames, steel doors or wood doors, and door hardware.
11. Provide and install hollow metal framed window.
12. Turn over any metal frames that's installed into masonry to the masonry contractor.
13. Metal stud framing, bulkhead framing, insulation, acoustical ceilings, and drywall is by this contractor.

Bid Division: 060000 – General Trades

14. Provide and install acoustical (absorptive) finish.
15. New ceiling grid and tile, include modifications to ceiling grid and tile as noted per the drawings.
16. Reference Drawing E1.0, Keynote B for ceiling grid modification.
17. Provide and install all noted toilet partitions.
18. Provide and install all toilet room accessories as noted.
19. Install Owner provided toilet room accessories.
20. Provide and install metal lockers.
21. Provide and install all new whiteboards, bulletin boards, and replace chalk boards with whiteboards per drawing.
22. Provide and install roller shades.
23. Provide and install all noted casework.
24. Provide and install Art Room sink and base.
25. Provide and install all noted restroom accessories and grab bars.
26. Provide and install fire extinguishers, brackets, and cabinets.
27. Provide and install room signage.
28. Provide and install wood nailers, blocking, parapet nailer as noted on the drawings.
29. Provide and install stainless steel cover at removed mechanical unit on but not limited to drawing A8.1, Detail 11 and 9.
30. Provide and install insulation and drywall per draining M3.0, Detail 4.
31. Reference A3.0, Passage A106. This ceiling will need to be removed and replaced with new to allow for M.E.P. installation. You will need to detach and re-install the grid ceiling where Passage A106 meets Corridor 107 to allow for M.E.P. tie-in.
32. Reference E0.1, Keynote 12, Typical. This Contractor required to remove old door hardware and replace it with new. Connection by electrical.
33. Price Alternate 3 replacement of existing domestic water pipes (Include detaching and re-installing of ceiling grid and tile of area of pipe replacement).

Project Exclusions:

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. Removal of asbestos materials.
4. Supply and install of Insulation applied to concrete or masonry.

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 DIVISION

Wolgast Corporation

Job #: A23906-5A Bangor Twp - 23 Bond PH 3A - Middle School
3281 Kiesel Road
Bay City, Michigan 48706
9896848121

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																
122413 - Roller Window Shades	122413-3	0	Roller Window Shades - color samples	Sample	Draft											
122413 - Roller Window Shades	122413-2	0	Roller Window Shades - shop drawings	Shop Drawing	Draft											
122413 - Roller Window Shades	122413-1	0	Roller Window Shades - Product Data	Product Information	Draft											
104416 - Fire Extinguishers	104416-1	0	Fire Extinguishers - product data	Product Information	Draft											
104413 - Fire Protection Cabinets	104413-1	0	Fire Protection Cabinets - product data	Other	Draft											
102800 - Toilet Accessories	102800-2	0	Toilet Accessories - samples	Sample	Draft											
102800 - Toilet Accessories	102800-1	0	Toilet Accessories - product data	Product Information	Draft											
102113 - Toilet Compartments	102113-4	0	Toilet Compartments - product schedule	Other	Draft											
102113 - Toilet Compartments	102113-3	0	Toilet Compartments - samples	Sample	Draft											
102113 - Toilet Compartments	102113-2	0	Toilet Compartments - shop drawings	Shop Drawing	Draft											
102113 - Toilet Compartments	102113-1	0	Toilet Compartments - product data	Product Information	Draft											
101419 - Signage and Graphics	101419-4	0	Signage and Graphics - shop drawings	Shop Drawing	Draft											
101419 - Signage and Graphics	101419-3	0	Signage and Graphics - product data	Product Information	Draft											
101419 - Signage and Graphics	101419-1	0	Signage and Graphics - color samples see spec	Sample	Draft											
095154 - Spray-On Acoustical Finish	095154-1	0	Spray on Acoustical Finish - Samples	Sample	Draft											
095100 - Acoustical Ceilings	095100-3	0	Acoustical Ceilings - Shop Drawings	Shop Drawing	Draft											
095100 - Acoustical Ceilings	095100-2	0	Acoustical Ceilings - Samples	Sample	Draft											
095100 - Acoustical Ceilings	095100-1	0	Acoustical Ceilings - product data	Product Information	Draft											
092900 - Gypsum Board	092900-1	0	Gypsum Board - product data	Product Information	Draft											
092216 - Non-Structural Metal Framing	092216-1	0	Non Structural Metal Framing - product data	Product Information	Draft											
087100 - Door Hardware	087100-3	0	Door Hardware - schedules see spec	Other	Draft											
087100 - Door Hardware	087100-2	0	Door Hardware - samples	Sample	Draft											
087100 - Door Hardware	087100-1	0	Door Hardware - product data	Product Information	Draft											
081416 - Flush Wood Doors	081416-3	0	Flush Wood Doors - finish samples	Sample	Draft											
081416 - Flush Wood Doors	081416-2	0	Flush Wood Doors - shop drawings	Shop Drawing	Draft											
081416 - Flush Wood Doors	081416-1	0	Flush Wood Doors - product data	Product Information	Draft											
081113 - Hollow Metal Doors and Frames	081113-2	0	HM Doors and Frames - shop drawings	Shop Drawing	Draft											
081113 - Hollow Metal Doors and Frames	081113-1	0	HM Doors and Frames - product data	Product Information	Draft											
079500 - Interior Expansion Control System	079500-5	0	Internal Expansion Control System - color samples	Sample	Draft											
079500 - Interior Expansion Control	079500-4	0	Internal Expansion Control System -	Product	Draft											

Wolgast Corporation

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9896848121

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
System			product data	Information												
079200 - Joint Sealants	079200-5	0	Joint Sealant - color samples	Sample	Draft											
079200 - Joint Sealants	079200-4	0	Joint Sealant - product data	Product Information	Draft											
072100 - Thermal Insulation	072100-3	0	Thermal Insulation - Product Data	Product Information	Draft											
064116 - Plastic Laminate Clad Architectural Cabinets	064116-4	0	(No Title)	Sample	Draft											
064116 - Plastic Laminate Clad Architectural Cabinets	064116-3	0	Plastic Lam. Cabinets - color samples	Sample	Draft											
064116 - Plastic Laminate Clad Architectural Cabinets	064116-2	0	Plastic Lam. Cabinets - shop drawings	Shop Drawing	Draft											
064116 - Plastic Laminate Clad Architectural Cabinets	064116-1	0	Plastic Lam. Cabinets - product data	Product Information	Draft											
#11 06 00 00 General Trades Start Up																
	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																
122413 - Roller Window Shades	122413-4	0	Roller Window Shades - manuals	Closeouts	Draft											
104416 - Fire Extinguishers	104416-3	0	Fire Extinguishers - Warranty - see spec	Closeouts	Draft											
104416 - Fire Extinguishers	104416-2	0	Fire Extinguishers - manuals	Closeouts	Draft											
104413 - Fire Protection Cabinets	104413-2	0	Fire Protection Cabinets - maintenance data	Closeouts	Draft											
102800 - Toilet Accessories	102800-3	0	Toilet Accessories - install instructions	Closeouts	Draft											
102113 - Toilet Compartments	102113-6	0	Toilet Compartments - extra materials	Closeouts	Draft											
102113 - Toilet Compartments	102113-5	0	Toilet Compartments - maintenance data	Closeouts	Draft											
101419 - Signage and Graphics	101419-5	0	Signage & Graphics - Warranty see spec	Closeouts	Draft											
101419 - Signage and Graphics	101419-2	0	Signage and Graphics - maintenance data	Closeouts	Draft											
095100 - Acoustical Ceilings	095100-5	0	Acoustical Ceilings - Extra Materials	Closeouts	Draft											
095100 - Acoustical Ceilings	095100-4	0	Acoustical Ceilings - Warranty	Closeouts	Draft											
087100 - Door Hardware	087100-5	0	Door Hardware - Warranty - see spec	Closeouts	Draft											
087100 - Door Hardware	087100-4	0	Door Hardware - manuals	Closeouts	Draft											
081416 - Flush Wood Doors	081416-4	0	Flush Wood Doors - Warranty	Closeouts	Draft											
079500 - Interior Expansion Control System	079500-6	0	Internal Expansion Control System - warranty - see spec	Closeouts	Draft											
079200 - Joint Sealants	079200-6	0	Joint Sealant - Warranty see spec	Closeouts	Draft											
	20	0	Asbestos Materials Affidavits		Draft											

Wolgast Corporation

Job #: A23906-5A Bangor Twp - 23 Bond PH 3A - Middle School
3281 Kiesel Road
Bay City, Michigan 48706
9896848121

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	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 074213.23 – Metal Composite Material Wall Panels
Section 075323 – EPDM Thermoset Single-Ply Roofing
Section 076200 – Sheet Metal Flashing and Trim

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

Section 072100 – Thermal Insulation (Insulation on top of roof deck)
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 & watertight 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. 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 makes 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 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. Contractors shall have a supervisor on site at all times when a crew is present on the job.
18. On Friday, or the 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.

Bid Division: 075000 – Roofing

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. Coordinate all roof penetrations with appropriate contractors, flash and seal. (Please review roof plans, mechanical plans, and electrical plans.)

Project Inclusions:

1. Provide and install single ply EPDM roof system with tapered insulation
2. Install equipment curbs or rails supplied by the Mechanical Contractor.
3. All metal panels as required for a complete, warranted and weather tight system to include field measuring, timely shop drawings, clips, shims, fasteners, final cleaning, and touch-up as required. This includes all required fasteners or additional framing required to install panels not shown on the drawings.

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 DIVISION

Wolgast Corporation

Job #: A23906-5A Bangor Twp - 23 Bond PH 3A - Middle School
3281 Kiesel Road
Bay City, Michigan 48706
9896848121

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																
079200 - Joint Sealants	079200-8	0	Joint Sealant - color samples	Sample	Draft											
079200 - Joint Sealants	079200-7	0	Joint Sealant - product data	Product Information	Draft											
076200 - Sheet Metal Flashing and Trim	076200-3	0	Sheet Metal Flashing and Trim - color 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											
075300 - Elastomeric Membrane Roofing	075300-3	0	EPDM - color samples	Sample	Draft											
075300 - Elastomeric Membrane Roofing	075300-2	0	EPDM - shop drawings	Shop Drawing	Draft											
075300 - Elastomeric Membrane Roofing	075300-1	0	EPDM - product data	Product Information	Draft											
074213 - Metal Wall Panels	074213-3	0	Metal Wall Panels - finish colors	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											
072100 - Thermal Insulation	072100-4	0	Thermal Insulation - Product Data	Product Information	Draft											
#14 07 50 00 Roofing Start Up																
	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	079200-9	0	Joint Sealant - Warranty see spec	Closeouts	Draft											
076200 - Sheet Metal Flashing and Trim	076200-5	0	Sheet Metal Flashing and Trim - Warranty - see spec	Closeouts	Draft											
076200 - Sheet Metal Flashing and Trim	076200-4	0	Sheet Metal Flashing and Trim - maintenance data	Closeouts	Draft											
075300 - Elastomeric Membrane Roofing	075300-4	0	EPDM Warranty - see spec	Closeouts	Draft											
074213 - Metal Wall Panels	074213-5	0	Metal Wall Panels - Warranty - see spec	Closeouts	Draft											
074213 - Metal Wall Panels	074213-4	0	Metal Wall Panels - maintenance data	Closeouts	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											

Job #: A23906-5A Bangor Twp - 23 Bond PH 3A - Middle School
3281 Kiesel Road
Bay City, Michigan 48706
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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: 084000 – Glass & Glazing

Bid to Include:

Total Responsibility for Specification Sections:

Section 081743 – FRP/Aluminum Hybrid Doors and Frames
Section 084113 – Aluminum Framed Storefronts
Section 085113 – Aluminum Windows
Section 088000 – Glazing

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

Section 079200 – Joint Sealants (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. 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 makes 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 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. Contractors shall have a supervisor on site at all times when a crew is present on the job.
18. On Friday, or the 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.

Bid Division: 084000 – Glass & Glazing

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 to all Fire Safety Codes.

Project Inclusions:

1. Provide and install all FRP doors and frames, aluminum storefront, aluminum windows, and glazing for all windows.
2. Provide and install door hardware for your doors.
3. Provide impact resistant security film for windows. See note on finish schedule
4. Field measure existing opening with windows & doors in place immediately after awarded contract so order can be placed. Include any required trim, metal wraps, etc. for a complete window installation. Any new construction window & door opening will be held to dimension noted on the drawings.

Project Exclusions:

1. Hollow metal window frame.

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 DIVISION

Wolgast Corporation

Job #: A23906-5A Bangor Twp - 23 Bond PH 3A - Middle School
3281 Kiesel Road
Bay City, Michigan 48706
9896848121

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	088000-3	0	Glazing - samples	Sample	Draft											
088000 - Glazing	088000-2	0	Glazing - shop drawings	Shop Drawing	Draft											
088000 - Glazing	088000-1	0	Glazing - product data	Product Information	Draft											
087100 - Door Hardware	087100-8	0	Door Hardware - Samples	Sample	Draft											
087100 - Door Hardware	087100-7	0	Door Hardware - shop drawings	Shop Drawing	Draft											
087100 - Door Hardware	087100-6	0	Door Hardware - product data	Product Information	Draft											
085113 - Aluminum Windows	085113-3	0	Alum Windows - Samples - see spec	Sample	Draft											
085113 - Aluminum Windows	085113-2	0	Alum Windows - shop drawings see spec	Shop Drawing	Draft											
085113 - Aluminum Windows	085113-1	0	Alum Windows - product data	Product Information	Draft											
084113 - Aluminum Framed Storefronts	084113-3	0	Alum Storefronts - finish samples	Sample	Draft											
084113 - Aluminum Framed Storefronts	084113-2	0	Alum Storefronts - shop drawings see spec	Shop Drawing	Draft											
084113 - Aluminum Framed Storefronts	084113-1	0	Alum Storefronts - product data	Product Information	Draft											
081743 - FRP/Aluminum Hybrid Doors and Frames	081743-4	0	FRP Alum Doors and Frames - door and finish samples - see spec	Sample	Draft											
081743 - FRP/Aluminum Hybrid Doors and Frames	081743-3	0	FRP Alum Doors and Frames - shop drawings	Shop Drawing	Draft											
081743 - FRP/Aluminum Hybrid Doors and Frames	081743-2	0	FRP Alum Doors and Frames - product data	Product Information	Draft											
079200 - Joint Sealants	079200-11	0	Joint Sealant - color samples	Sample	Draft											
079200 - Joint Sealants	079200-10	0	Joint Sealant - product data	Product Information	Draft											
#17 08 40 00 Glass & Glazing Start Up																
	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	088000-5	0	Glazing - warranty see spec	Closeouts	Draft											
088000 - Glazing	088000-4	0	Glazing - maintenance	Closeouts	Draft											
087100 - Door Hardware	087100-9	0	Door Hardware - Maintenance Data	Closeouts	Draft											
085113 - Aluminum Windows	085113-5	0	Alum Windows - Warranty - see spec	Closeouts	Draft											
085113 - Aluminum Windows	085113-4	0	Alum Windows - install instructions	Closeouts	Draft											

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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
084113 - Aluminum Framed Storefronts	084113-5	0	Alum Storefront - Warranty - see spec	Closeouts	Draft											
084113 - Aluminum Framed Storefronts	084113-4	0	Alum Storefronts - manual	Closeouts	Draft											
081743 - FRP/Aluminum Hybrid Doors and Frames	081743-5	0	FRP Alum Doors and Frames - manuals	Closeouts	Draft											
081743 - FRP/Aluminum Hybrid Doors and Frames	081743-1	0	FRP Alum Doors and Frames - Warranty - see spec	Closeouts	Draft											
079200 - Joint Sealants	079200-12	0	Joint Sealant - Warranty see spec	Closeouts	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 – EIFS

Bid to Include:

Total Responsibility for Specification Sections:

Section 074200 – StoCreativ Brick Finish
Section 095400 – STO Textured Wall Finish for Existing EIFS
Section 095400.1 – STO Cleaning Prep

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

Section 079200 – Joint Sealants (Miscellaneous caulking, control joints, etc.)

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 makes 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 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. Contractors shall have a supervisor on site at all times when a crew is present on the job.
18. On Friday, or the 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.***

Bid Division: 091000 – EIFS

Project Inclusions:

1. Include a $5,000 allowance for unknow conditions to be used at the direction of the Construction Manager.
2. Repair EIFS noted on the drawings.
3. Include all required material to complete EIFS work.
4. Provide and install the StoCreativ Brick Finish.
5. Include all caulking and sealants for your work.

Project Exclusions:

1. Painting of existing EIFS.

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 DIVISION

Wolgast Corporation

Job #: A23906-5A Bangor Twp - 23 Bond PH 3A - Middle School
3281 Kiesel Road
Bay City, Michigan 48706
9896848121

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 EIFS																
079200 - Joint Sealants	079200-14	0	Joint Sealant - color samples	Sample	Draft											
079200 - Joint Sealants	079200-13	0	Joint Sealant - product data	Product Information	Draft											
072400 - Exterior Insulation and Finish Systems	072400-3	0	EIFS - shop drawings	Shop Drawing	Draft											
072400 - Exterior Insulation and Finish Systems	072400-2	0	EIFS - finish samples - see spec	Sample	Draft											
072400 - Exterior Insulation and Finish Systems	072400-1	0	EIFS - product data, install instructions	Product Information	Draft											
#20 09 10 00 EIFS Start Up																
	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 EIFS Close Out																
079200 - Joint Sealants	079200-15	0	Joint Sealant - Warranty see spec	Closeouts	Draft											
072400 - Exterior Insulation and Finish Systems	072400-4	0	EIFS - Warranty	Closeouts	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 and Wall Tile

Bid to Include:

Total Responsibility for Specification Sections:

Section 093013 – Ceramic Tiling
Section 096513 – Resilient Base and Accessories
Section 096519 – Resilient Tile Flooring
Section 096816 - Sheet Carpeting

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 079500 – Interior Expansion Control System

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. 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 makes 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 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. Contractors shall have a supervisor on site at all times when a crew is present on the job.
18. On Friday, or the 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.***

Bid Division: 096500 – Flooring and Wall Tile

Division Inclusions:

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

Project Inclusions:

1. Provide and install all ceramic tiling.
2. Provide and install all resilient flooring, base, and accessories, Include base for concrete floorings.
3. Provide and install all carpet flooring.
4. Provide and install polished concrete floors noted per the drawings.

Project Exclusions:

1. Flooring Demolition
2. Resinous (epoxy) Flooring

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 DIVISION

Wolgast Corporation

Job #: A23906-5A Bangor Twp - 23 Bond PH 3A - Middle School
3281 Kiesel Road
Bay City, Michigan 48706
9896848121

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 65 00 Flooring & Wall Tile																
096816 - Sheet Carpeting	096816-4	0	Sheet Carpeting - Shop Drawings	Shop Drawing	Draft											
096816 - Sheet Carpeting	096816-3	0	Sheet Carpeting - product data	Product Information	Draft											
096816 - Sheet Carpeting	096816-1	0	Sheet Carpeting - samples - see spec	Sample	Draft											
096519 - Resilient Tile Flooring	096519-3	0	Resilient Tile Flooring - color samples - see spec	Sample	Draft											
096519 - Resilient Tile Flooring	096519-2	0	Resilient Tile Flooring - shop drawings	Shop Drawing	Draft											
096519 - Resilient Tile Flooring	096519-1	0	Resilient Tile 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											
093013 - Ceramic Tiling	093013-2	0	Ceramic Tiling - samples	Sample	Draft											
093013 - Ceramic Tiling	093013-1	0	Ceramic Tiling - product data	Product Information	Draft											
079500 - Interior Expansion Control System	079500-8	0	Internal Expansion Control System - color samples	Sample	Draft											
079500 - Interior Expansion Control System	079500-7	0	Internal Expansion Control System - product data	Product Information	Draft											
079200 - Joint Sealants	079200-17	0	Joint Sealant - color samples	Sample	Draft											
079200 - Joint Sealants	079200-16	0	Joint Sealant - product data	Product Information	Draft											
#23 09 65 00 Flooring & Wall Tile Start Up																
	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 65 00 Flooring & Wall Tile Close Out																
096816 - Sheet Carpeting	096816-5	0	Sheet Carpeting - Warranty - see spec	Closeouts	Draft											
096816 - Sheet Carpeting	096816-2	0	Sheet Carpeting - maintenance	Closeouts	Draft											
096519 - Resilient Tile Flooring	096519-5	0	Resilient Tile Flooring - extra materials	Closeouts	Draft											
096519 - Resilient Tile Flooring	096519-4	0	Resilient Tile Flooring - Maintenance data	Closeouts	Draft											
093013 - Ceramic Tiling	093013-3	0	Ceramic Tiling - extra material	Closeouts	Draft											
079500 - Interior Expansion Control System	079500-9	0	Internal Expansion Control System - warranty - see spec	Closeouts	Draft											
079200 - Joint Sealants	079200-18	0	Joint Sealant - Warranty see spec	Closeouts	Draft											
	20	0	Asbestos Materials Affidavits		Draft											

Job #: A23906-5A Bangor Twp - 23 Bond PH 3A - Middle School
3281 Kiesel Road
Bay City, Michigan 48706
9896848121

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
	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 096723 – Resinous Flooring
Section 099100 – Painting

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

Section 079200 – Joint Sealants (Interior Control Joints and all dissimilar products)
Section 079500 – Interior Expansion Control System

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. 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 makes 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 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. Contractors shall have a supervisor on site at all times when a crew is present on the job.
18. On Friday, or the 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.***

Bid Division: 099000 – Painting

Division Inclusions:

1. Follow room finish and door schedules.
2. Painting of all electrical and mechanical lines and equipment (as specified).
3. Paint all bulkheads.
4. Paint exposed structural components as specified.
5. Remove all foreign items and substances on existing surfaces (including, but not limited to, nails, hangers, tape, screws, etc.) and patch prior to painting.
6. 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.
7. The 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.
8. Provide final cleaning of work prior to Owner occupancy.
9. Furnish and install all caulking required for the work of this Bid Division.
10. To repair any adjacent material damaged in the execution of the above-listed work.
11. All caulking of interior control joints
12. All caulking of interior joints between any and all dissimilar surfaces including door and window frames, CMU & Drywall.
13. Clean, dust and dirt off bar joist, deck and ductwork prior to painting.

Project Inclusions:

1. Provide and install resinous (epoxy) flooring.
2. Provide and install all painting per the construction documents.
3. See mechanical drawings for painting mechanical covers.
4. Painting of exposed roof deck assembly and mechanical, electrical, and plumbing in new addition.
5. Paint all exterior exposed new gas lines.
6. Provide pricing for Alternate 1 Roof Drain Connections. (Include painting exposed piping.)

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 DIVISION

Wolgast Corporation

Printed on Thu Jan 16, 2025 at 09:08 am EST

Job #: A23906-5A Bangor Twp - 23 Bond PH 3A - Middle School
3281 Kiesel Road
Bay City, Michigan 48706
9896848121

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 90 00 Painting																
099100 - Painting	099100-2	0	Paint - Samples - see spec	Sample	Draft											
099100 - Painting	099100-1	0	Paint - product data	Product Information	Draft											
096723 - Resinous Flooring	096723-4	0	Resinous Flooring - product schedule	Product Information	Draft											
096723 - Resinous Flooring	096723-3	0	Resinous Flooring - samples	Sample	Draft											
096723 - Resinous Flooring	096723-1	0	Resinous Flooring - product data	Product Information	Draft											
079500 - Interior Expansion Control System	079500-11	0	Internal Expansion Control System - color samples	Sample	Draft											
079500 - Interior Expansion Control System	079500-10	0	Internal Expansion Control System - product data	Product Information	Draft											
079200 - Joint Sealants	079200-20	0	Joint Sealant - color samples	Sample	Draft											
079200 - Joint Sealants	079200-19	0	Joint Sealant - product data	Product Information	Draft											
#26 09 90 00 Painting Start Up																
	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 90 00 Painting Close Out																
099100 - Painting	099100-5	0	Painting - Extra material	Closeouts	Draft											
099100 - Painting	099100-4	0	Painting - Warranty - see spec	Closeouts	Draft											
099100 - Painting	099100-3	0	Paint - maintenance data	Closeouts	Draft											
096723 - Resinous Flooring	096723-2	0	Resinous Flooring - maintenance data	Closeouts	Draft											
079500 - Interior Expansion Control System	079500-12	0	Internal Expansion Control System - warranty - see spec	Closeouts	Draft											
079200 - Joint Sealants	079200-21	0	Joint Sealant - Warranty see spec	Closeouts	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: 222300 – Plumbing & HVAC Systems

Bid to Include:

Total Responsibility for Specification Sections:

Section 220500 – Common Work Results for Plumbing
Section 220553 – Identification for Plumbing Piping and Equipment
Section 220719 – Plumbing Piping Installation
Section 221116 – Domestic Water Piping
Section 221119 – Domestic Water Piping Specialties
Section 221316 – Sanitary Waste and Vent Piping
Section 221319 – Sanitary Waste Piping Specialties
Section 221319.13 – Sanitary Drains
Section 221413 – Facility Storm Drainage Piping
Section 221423 – Storm Drainage Piping Specialties
Section 224213.13 - Commercial Water Closets
Section 224213.16 – Commercial Urinals
Section 224316.13 – Commercial Lavatories
Section 224216.16 – Commercial Sinks
Section 224716 – Pressure Water Coolers
Section 230100 – General Mechanical Requirements
Section 230500 – Common Work Results for HVAC
Section 230553 – Identification for HVAC Piping and Equipment
Section 230593 – Testing, Adjusting and Balancing for HVAC
Section 230713 – Duct Insulation
Section 230923 – Building Automation Systems (BAS) for HVAC
Section 231123 – Facility Natural Gas Piping
Section 232113 – Hydronic Piping
Section 233113 – Metal Ducts
Section 233300 – Air Duct Accessories
Section 233346 – Flexible Ducts
Section 233713.13 – Air Diffusers
Section 233713.23 – Registers and Grilles
Section 233723 – HVAC Gravity Ventilators
Section 237416 – Packaged Rooftop Air-Conditioning Units
Section 238219 – Fan Coil Units
Section 238239.13 – Cabinet Unit Heaters

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

Section 078413 – Penetration Firestopping

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.
5. Provide continuous housekeeping and clean-up, and proper legal off-site disposal of any debris generated by this Bid Division’s work.

Bid Division: 222300 – Plumbing & HVAC Systems

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 makes 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 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. Contractors shall have a supervisor on site at all times when a crew is present on the job.
18. On Friday, or the 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. Perform all connections between site utilities and building, coordinate with site contractor on utilities.
2. Removal of all plumbing and heating fixtures.
3. Each Contractor is responsible for their own floor, wall, or ceiling penetration unless noted on the drawing to be removed.
4. Furnish and install duct detectors, back draft dampers, etc. as shown and specified, and/or required by Code.
5. Perform all demolition necessary for the completion of the work of this Bid Division as shown and specified.
6. Provide all final plumbing hook-ups to all plumbing related fixtures and equipment.
7. Provide coordination with roofing and metal contractors for roof penetrations, equipment rails and pipe boots including layouts.
8. Maintain fire rating in all walls penetrated.
9. Remove spoils from site.
10. Provide all required layouts and verify that no conflict occurs with other trades.
11. Provide all necessary connections between temperature control and instrumentation devices and equipment to be controlled.
12. Provide roof curbs for rooftop equipment.
13. Provide all permits required.
14. 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.
15. Provide temporary water distribution as required.
16. Provide all State Certification for equipment (boilers, etc.).
17. Refer to all equipment schedules for additional equipment to be furnished and installed
18. Furnish test and balance reports.
19. Contractor shall maintain existing HVAC systems in fully functional order in occupied areas of the building throughout the duration of the project.
20. 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.
21. All HVAC equipment is to be completed with all motor starters, disconnects or other items to allow for the proper operation of the system.
22. Provide start-up training with Owner Representative, Architect and Construction Manager for all equipment installed.

Wolgast Corporation – Construction Management

Bid Division: 222300 – Plumbing & HVAC Systems

23. Provide water test approval two weeks prior to Owner Occupancy.

Project Inclusions:

1. Include a $20,000 allowance for unknow conditions to be used at the direction of the Construction Manager.
2. Remove and re-stall of existing equipment noted per the drawings.
3. Each Contractor is responsible for their own floor, wall, or ceiling penetration unless noted on the drawing to be removed.
4. Install new venting for Owner's kiln. Kiln moved in place by General Trades.
5. Provide and install all plumbing and mechanical work per the drawings.
6. Mechanical equipment such as Roof Top Units, Fan Coil Units, Finned Tubed Radiators, and Electric Cabinet Unit Heater.
7. Replace exhaust grilles noted.
8. Include control work.
9. Provide pricing for Alternate 1 Roof Drain Connections. Include plumbing from grade to building.
10. Provide pricing for Alternate 2 Sanitary Sewer.
11. Provide pricing for Alternate 3 Replacement of Existing Domestic Water Pipes.

Project Exclusions:

1. Detaching and re-installing of ceiling grid and electrical fixtures per Alternate 3.

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 DIVISION

Wolgast Corporation

Printed on Thu Jan 16, 2025 at 09:09 am EST

Job #: A23906-5A Bangor Twp - 23 Bond PH 3A - Middle School
3281 Kiesel Road
Bay City, Michigan 48706
9896848121

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 22 23 00 Plumbing & HVAC Systems																
238239 - Unit Heaters	238239-2	0	Unit Heaters - Shop drawings	Shop Drawing	Draft											
238239 - Unit Heaters	238239-1	0	Unit Heaters - product data	Product Information	Draft											
238219 - Fan Coil Units	238219-2	0	Fan Coil Units - shop drawings	Shop Drawing	Draft											
238219 - Fan Coil Units	238219-1	0	Fan Coil Units - product data	Product Information	Draft											
237416 - Packaged Rooftop Air Conditioning Units	237416-2	0	Rooftop Air Cont Units - shop drawings	Shop Drawing	Draft											
237416 - Packaged Rooftop Air Conditioning Units	237416-1	0	Rooftop Air Cond Units - product data	Product Information	Draft											
233723 - HVAC Gravity Ventilators	233723-2	0	HVAC Gravity Ventilator - product data	Product Information	Draft											
233723 - HVAC Gravity Ventilators	233723-1	0	HVAC Gravity Ventilators - shop drawings	Shop Drawing	Draft											
233713.23 - Registers and Grilles	233713.23-1	0	Registers and Grilles - product data and schedule	Product Information	Draft											
233713 - Diffusers, Registers, and Grilles	233713-1	0	Diffusers, Registers and Grilles - product data and schedule	Product Information	Draft											
233346 - Flexible Ducts	233346-1	0	Flexible Ducts - product data	Product Information	Draft											
233300 - Air Duct Accessories	233300-1	0	Air Duct Accessories - Product data	Product Information	Draft											
233113 - Metal Ducts	233113-1	0	Metal Ducts - product data	Product Information	Draft											
232113 - Hydronic Piping	232113-1	0	Hydronic Piping - product data	Product Information	Draft											
231123 - Facility Natural Gas Piping	231123-1	0	Natural Gas Piping - product data	Document	Draft											
230923 - Building Automation Systems (BAS) for HVAC	230923-3	0	Building Automation System - shop drawings see spec	Shop Drawing	Draft											
230923 - Building Automation Systems (BAS) for HVAC	230923-2	0	Building Automation System - software - see spec	Document	Draft											
230923 - Building Automation Systems (BAS) for HVAC	230923-1	0	Building Automation System - product data - see spec	Product Information	Draft											
230713 - Duct Insulation	230713-1	0	Duct Insulation - product data	Product Information	Draft											
230553 - Identification for HVAC Piping and Equipment	230553-1	0	ID for HVAC Piping - product data	Product Information	Draft											
224716 - Pressure Water Coolers	224716-2	0	Pressure Water Coolers - shop drawings	Shop Drawing	Draft											
224716 - Pressure Water Coolers	224716-1	0	Pressure Water Coolers - product data	Product Information	Draft											
224216.16 - Commercial Sinks	224216.16-2	0	Sinks - shop drawings	Shop Drawing	Draft											
224216.16 - Commercial Sinks	224216.16-1	0	Sinks - product data	Product Information	Draft											
224216 - Commercial Lavatories and Sinks	224216-1	0	Lavatories - product data	Product Information	Draft											
224213.16 - Commercial Urinals	224213.16-2	0	Urinals - Shop drawings see spec	Shop Drawing	Draft											

Job #: A23906-5A Bangor Twp - 23 Bond PH 3A - Middle School
3281 Kiesel Road
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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
224213.16 - Commercial Urinals	224213.16-1	0	Urinals - product data	Product Information	Draft											
224213 - Commercial Water Closets, Urinals, and Bidets	224213-2	0	Water Closets - shop drawings - see spec	Shop Drawing	Draft											
224213 - Commercial Water Closets, Urinals, and Bidets	224213-1	0	Water Closets - product data	Product Information	Draft											
221423 - Storm Drainage Piping Specialties	221423-1	0	Storm Drainage Piping Specialties - product data	Product Information	Draft											
221413 - Facility Storm Drainage Piping	221413-1	0	Storm Drainage Piping - product data	Product Information	Draft											
221319.13 - Sanitary Drains	221319.13-1	0	Sanitary Drains - product data	Product Information	Draft											
221319 - Sanitary Waste Piping Specialties	221319-1	0	Sanitary Waste Piping - product data	Product Information	Draft											
221316 - Sanitary Waste and Vent Piping	221316-1	0	Sanitary Waste and Vent Piping - product data	Product Information	Draft											
221119 - Domestic Water Piping Specialties	221119-1	0	Dom Water Piping Specialties - product data	Product Information	Draft											
221116 - Domestic Water Piping	221116-1	0	Dom Water Piping - product data	Product Information	Draft											
220719 - Plumbing Piping Insulation	220719-1	0	Plumbing Pipe Insulation - product data	Product Information	Draft											
220553 - Identification for Plumbing Piping and Equipment	220553-1	0	ID for Plumbing Piping - product data	Product Information	Draft											
220500 - Common Work Results for Plumbing	220500-2	0	Plumbing fixtures product data	Product Information	Draft											
220500 - Common Work Results for Plumbing	220500-1	0	Plumbing - permits and inspections	Document	Draft											
078413 - Penetration Firestopping	078413-1	0	Penetration Firestopping - product data and product schedule	Product Information	Draft											
#29 22 23 00 Plumbing & HVAC Systems Start Up																
	11	0	Copy of 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 22 23 00 Plumbing & HVAC Systems Close Out																
238239 - Unit Heaters	238239-3	0	Unit Heaters - maintenance data	Closeouts	Draft											
238219 - Fan Coil Units	238219-5	0	Fan Coil Units - Warranty	Closeouts	Draft											
238219 - Fan Coil Units	238219-4	0	Fan Coil Units - extra materials	Closeouts	Draft											
238219 - Fan Coil Units	238219-3	0	Fan Coil Units - Maintenance data	Closeouts	Draft											
237416 - Packaged Rooftop Air Conditioning Units	237416-5	0	Rooftop Air Cond Units - Manuals	Closeouts	Draft											
237416 - Packaged Rooftop Air Conditioning Units	237416-4	0	Rooftop Air Conditioning Units - Warranty	Closeouts	Draft											

Wolgast Corporation

Job #: A23906-5A Bangor Twp - 23 Bond PH 3A - Middle School
3281 Kiesel Road
Bay City, Michigan 48706
9896848121

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
237416 - Packaged Rooftop Air Conditioning Units	237416-3	0	Rooftop Air Cond Units - Extra Material	Closeouts	Draft											
233300 - Air Duct Accessories	233300-3	0	Air Duct Accessories - extra materials	Closeouts	Draft											
233300 - Air Duct Accessories	233300-2	0	Air Duct Accessories - manuals	Closeouts	Draft											
230923 - Building Automation Systems (BAS) for HVAC	230923-4	0	Building Automation System - training	Closeouts	Draft											
230593 - Testing, Adjusting, and Balancing for HVAC	230593-1	0	Test and Balance Reports	Closeouts	Draft											
224716 - Pressure Water Coolers	224716-4	0	Pressure Water Coolers - extra materials	Closeouts	Draft											
224716 - Pressure Water Coolers	224716-3	0	Pressure Water Coolers - maintenance	Closeouts	Draft											
224216.16 - Commercial Sinks	224216.16-4	0	Sinks - Extra Materials	Closeouts	Draft											
224216.16 - Commercial Sinks	224216.16-3	0	Sinks - maintenance data	Closeouts	Draft											
224216 - Commercial Lavatories and Sinks	224216-2	0	Lavatories - manuals	Closeouts	Draft											
224213.16 - Commercial Urinals	224213.16-4	0	Urinals - extra materials	Closeouts	Draft											
224213.16 - Commercial Urinals	224213.16-3	0	Urinals - manuals	Closeouts	Draft											
224213 - Commercial Water Closets, Urinals, and Bidets	224213-3	0	Water Closets - manuals	Closeouts	Draft											
221319 - Sanitary Waste Piping Specialties	221319-2	0	Sanitary Waste Piping - manuals	Closeouts	Draft											
221316 - Sanitary Waste and Vent Piping	221316-2	0	Sanitary Waste and Vent Piping - warranty see spec	Closeouts	Draft											
221119 - Domestic Water Piping Specialties	221119-2	0	Dom Water Piping Specialties - manuals	Closeouts	Draft											
	23	0	Final Permit Inspections		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: 260000 – Electrical, Communication, and Fire Alarm

Bid to Include:

Total Responsibility for Specification Sections:

Section 260500 – 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 – Raceway and Boxes for Electrical Systems
Section 260553 – Identification for Electrical Systems
Section 262416 – Panelboards
Section 262702 – Equipment Wiring Devices
Section 262726 – Wiring Devices
Section 262816 – Enclosed Switches and Circuit Breakers
Section 264313 – Surge Protection
Section 265100 – Interior Lighting
Section 265600 – Exterior Lighting
Section 271501 – Basic Cabling Requirements
Section 283100 – Fire Detection and Mass Notification

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

Section 024119 – Selective Demolition (Demolition of electrical components)
Section 078413 – Penetration Firestopping

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 conduit, 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.
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 makes 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 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.

Bid Division: 260000 – Electrical

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 the 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. The contractor shall maintain existing electrical systems in fully functional order in all areas of the building during the duration of the project.
2. The contractor shall coordinate with the utility company for purchase and installation of exterior transformers and associated work, if required.
3. The 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.
4. Provide all permits required.
5. Maintain fire rating at all walls penetrated.
6. All excavation, backfill, compaction, and disposal of spoil for any electrical work placed below finish grade.
7. Coordinate with other trades for rough-in locations.
8. Provide temporary lighting and power distribution. A minimum of 100 watts of temporary lighting per 250 SF of floor area.
9. Provide all plywood or nailers required for mounting of electrical, audio, fire alarm or phone equipment.
10. Furnish any access hatches to mason and drywall contractors for installation required for electrical work.
11. Final hook-up of all equipment for other disciplines of work.
12. Perform all required demolition required for this trade as shown and specified.
13. Supply and install a complete & operational fire protection alarm system.
14. Contractor is responsible for complete code compliance of Fire Alarm System.
15. 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.)

Project Inclusions:

1. Include a $10,000 allowance for unknow conditions to be used at the direction of the Construction Manager.
2. Include removal of noted electrical items.
3. This Contractor is responsible for detaching and reinstallation of life safety devices and speakers.
4. Each Contractor is responsible for their own floor, wall, or ceiling penetration unless noted on the drawing to be removed.
5. Provide and install all electrical, communication, and fire alarm noted per the drawings.
6. Power hook up of Owner provided kiln. Kiln moved and placed by General Trades.
7. Provide installation of Owner supplied Card Readers.
8. Reference E0.1, Keynote 17 and include device in your Proposal.
9. Design, submit for approval, supply and install required fire alarm for new addition.
10. Provide pricing for Alternate 3 Replacement of Existing Domestic Water Pipes (Include detaching and re-installing of lighting, fire alarm, and speakers of area of pipe replacement).

Project Exclusions:

1. Supplying Card Readers.

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 DIVISION

Wolgast Corporation

Job #: A23906-5A Bangor Twp - 23 Bond PH 3A - Middle School
3281 Kiesel Road
Bay City, Michigan 48706
9896848121

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 26 00 00 Electrical																
283100 - Fire Detection and Mass Notification	283100-2	0	Fire Detection/Mass Notification - shop drawings	Shop Drawing	Draft											
283100 - Fire Detection and Mass Notification	283100-1	0	Fire Detection/Mass Notification - product data	Product Information	Draft											
271501 - Basic Cabling Requirements	271501-1	0	Cabling - shop drawings	Shop Drawing	Draft											
265100 - Interior Lighting	265100-1	0	Interior/Exterior - shop drawings	Shop Drawing	Draft											
264313 - Surge Protection	264313-2	0	Surge Protection - testing	Other	Draft											
264313 - Surge Protection	264313-1	0	Surge Protection - shop drawings see spec	Shop Drawing	Draft											
262816 - Enclosed Switches and Circuit Breakers	262816-1	0	Switches and Breakers - shop drawings see spec	Shop Drawing	Draft											
262726 - Wiring Devices	262726-1	0	Wiring Devices - product data	Product Information	Draft											
262416 - Panelboards	262416-1	0	Panelboards - shop drawings see spec	Shop Drawing	Draft											
260526 - Grounding and Bonding for Electrical Systems	260526-1	0	Grounding and Bonding product data	Product Information	Draft											
260500 - Basic Electrical Requirements	260500-2	0	Electrical - product data and shop drawings for product listed	Product Information	Draft											
260500 - Basic Electrical Requirements	260500-1	0	Electrical - permits and inspections	Document	Draft											
078413 - Penetration Firestopping	078413-3	0	Penetration Fire Stopping - product data	Product Information	Draft											
#32 26 00 00 Electrical Start Up																
	11	0	Copy of 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 26 00 00 Electrical Close Out																
283100 - Fire Detection and Mass Notification	283100-6	0	Fire Detection/Mass Notification - Extra Materials	Closeouts	Draft											
283100 - Fire Detection and Mass Notification	283100-5	0	Fire Detection/Mass Notification - Warranty - see spec	Closeouts	Draft											
283100 - Fire Detection and Mass Notification	283100-4	0	Fire Detection/Mass Notification - software see spec	Closeouts	Draft											
283100 - Fire Detection and Mass Notification	283100-3	0	Fire Detection/Mass Notification - manuals	Closeouts	Draft											
262416 - Panelboards	262416-2	0	Panelboards - extra materials	Closeouts	Draft											
	23	0	Final Permit Inspections		Draft											

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3281 Kiesel Road
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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
	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: 310000 – Site Work

Bid to Include:

Total Responsibility for Specification Sections:

Section 311000 – Site Clearing
Section 312000 – Earth Moving
Section 323113 – Chain Link Fences and Gates
Section 329200 – Turf Restoration
Section 334200 – Storm Utility Drainage Piping

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

Section 024119 – Selective Demolition

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. 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 makes 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 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. Contractors shall have a supervisor on site at all times when a crew is present on the job.
18. On Friday, or the 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.

Bid Division: 310000 – Site Work

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. Selective Demolition of site to including but not limited to fencing, asphalt removal, curb, sidewalk, landscaping, concrete stoops, pipe railings, playground equipment, flagpole, etc.
4. Provide de-watering for work in your Bid Division.
5. Furnish and install all gravel base material, finish grading of gravel, compaction and preparation for all placement of asphalt paving.
6. Finish grading 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.
7. 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.
8. 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.
9. All site demolition required for installation of asphalt work and final site work.
10. 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.
11. Responsible for all required permits for erosion and sedimentation control.
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. All seeding is required for all areas affected by construction.
14. Aggregate base course to be finished graded after placement and also immediately prior to lay down of asphaltic concrete paving.
15. All required topsoil. Topsoil to be graded to + .1 feet of designed finish grade after placement and also immediately prior to landscaping activities.
16. All site utilities as it relates to water, storm, sanitary, and gas to within 5 feet of building.
17. 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.
18. Provide temporary fencing around all additions during construction.
19. Provide all required permits.
20. Provide all import fill soils and export of all spoil or unusable soils necessary to complete all work or required by the construction documents.
21. Notify and correspond with Miss Dig before work commences and throughout the project.

Project Inclusions:

1. Building coordinates and control points will be provided by the Owner.
2. Any additional layout or surveying to complete your work will be your responsibility.
3. Include a $20,000 allowance for unknow buried utilities and soil conditions to be used at the direction of the Construction Manager.
4. Provide, maintain, and remove temporary construction fence for new building addition and lay down area. Include two sets of double gates for access. See drawing.
5. Detach and reinstall existing fence as noted in the drawings.
6. Remove noted concrete walks, topsoil, and underlying materials for new work as noted on the drawings.
7. Include saw cutting to complete your work.
8. Site Contractor shall locate all existing utilities before beginning work.
9. Submit for Permit on Soil Erosion Control. Include installation, maintenance, and removal of all soil erosion control measures for the site.
10. Provide and install underground storm sewer and roof drains to just above grade.
11. Include excavation, subbase, and backfill for all new work.
12. Provide and install storm & sanitary sewer as noted in the drawings.
13. Provide and install foundation drain system as noted on the drawings.
14. Include topsoil, grading, and seeding required to complete this work. Include fenced Construction area.
15. Provide pricing for Alternate 1 Roof Drain Connections.
16. Provide pricing for Alternate 2 Sanitary Sewer.

Bid Division: 310000 – Site Work

Project Exclusions:

1. Concrete Testing
2. Soil Density Testing

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 DIVISION

Printed on Thu Jan 16, 2025 at 09:11 am EST

Job #: A23906-5A Bangor Twp - 23 Bond PH 3A - Middle School
3281 Kiesel Road
Bay City, Michigan 48706
9896848121

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 31 00 00 Site Work																
334200 - Storm Utility Drainage Piping	334200-2	0	Storm Utility Drainage Piping - shop drawings see spec	Shop Drawing	Draft											
334200 - Storm Utility Drainage Piping	334200-1	0	Storm Utility Drainage Piping - product data for items listed	Product Information	Draft											
329200 - Turf Restoration	329200-1	0	Turf Restoration - product data for listed items	Product Information	Draft											
323113 - Chain Link Fences and Gates	323113-2	0	Chain Link Fences and Gates - shop drawings	Shop Drawing	Draft											
323113 - Chain Link Fences and Gates	323113-1	0	Chain Link Fences and Gates - product data	Product Information	Draft											
#35 31 00 00 Site Work Start Up																
	11	0	Copy of 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 31 00 00 Site Work Close Out																
	23	0	Final Permit Inspections		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
Dale Schwerin dschwerin@wolgast.com or **Lisa Donahue** 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: **Bangor Township School District**

Site Location: **2023 Bond - Phase 3A - Middle School Addition & Renovations**

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

1.01OWNER/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

AIA® 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)

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.

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.

TABLE OF ARTICLES

ARTICLE 1 THE CONTRACT DOCUMENTS

The Contract Documents consist of this Agreement, Conditions of the Contract (General, Supplementary, and other Conditions), Drawings, Specifications, Addenda issued prior to 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:

[X] The date of this Agreement.

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

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

If a date of commencement of 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
«Alternate_Description»	

§ 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 o 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

§ 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

§ 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
«Addendum 1»	«Adm Date»	

«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

.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	CONTRACTOR
«Owner_Name»	«Contractor»
_____	_____
(Signature)	(Signature)
«Owner_and_Title»	_____
(Printed name and title)	(Printed name and title)
_____	_____
(Date)	(Date)

PART 1 – GENERAL

1.01BID 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 oblige.

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.**

1.02LABOR & 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 MICHGIAN.**

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.

1.03SUPPLY 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.**

1.04BOND 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).

1.05SUBMISSION 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: **Bangor Township Schools**
3359 E Midland Road
Bay City, MI 48706

D. Certificates must show as 'additional insured' the Owner, **Bangor Township Schools,** the Architect, **Integrated Designs, Inc.,** 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:

Bangor Township 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.

ACORD®

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	CONTACT NAME:	
(2)	PHONE (A/C, No, Ext):	FAX (A/C, No):
	E-MAIL ADDRESS:	

INSURED	INSURER(S) AFFORDING COVERAGE	NAIC #
(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 INSD	SUBR WVD	POLICY NUMBER	POLICY EFF (MM/DD/YYYY)	POLICY EXP (MM/DD/YYYY)	LIMITS	
	X COMMERCIAL GENERAL LIABILITY (5A) ☐ CLAIMS-MADE ☐ OCCUR GEN'L AGGREGATE LIMIT APPLIES PER: ☐ POLICY ☐ PRO-JECT ☐ LOC ☐ OTHER:			(5B)	(5C)		EACH OCCURRENCE (5D) DAMAGE TO RENTED PREMISES (Ea occurrence) MED EXP (Any one person) PERSONAL & ADV INJURY GENERAL AGGREGATE PRODUCTS - COMP/OP AGG	$ 1,000,000.00 $ 100,000.00 $ 5,000.00 $ 1,000,000.00 $ 1,000,000.00 $ 1,000,000.00
	AUTOMOBILE LIABILITY (6A) X ANY AUTO ☐ OWNED AUTOS ONLY ☐ SCHEDULED AUTOS X HIRED AUTOS ONLY X NON-OWNED AUTOS ONLY			(6B)	(6C)		COMBINED SINGLE LIMIT (Ea accident) (6D) BODILY INJURY (Per person) BODILY INJURY (Per accident) PROPERTY DAMAGE (Per accident)	$ 1,000,000.00
	X UMBRELLA LIAB ☐ OCCUR (7A) EXCESS LIAB ☐ CLAIMS-MADE DED RETENTION $			(7B)	(7C)		EACH OCCURRENCE (7D) AGGREGATE	$ 2,000,000.00 $ 2,000,000.00
	WORKERS COMPENSATION AND EMPLOYERS' LIABILITY (8A) Y/N ANYPROPRIETOR/PARTNER/EXECUTIVE OFFICER/MEMBEREXCLUDED? ☐ N/A (Mandatory in NH) If yes, describe under DESCRIPTION OF OPERATIONS below			(8B)	(8C)		☐ PER STATUTE ☐ OTH-ER (8D) E.L. EACH ACCIDENT E.L. DISEASE - EA EMPLOYEE E.L. DISEASE - POLICY LIMIT	$ 500,000.00 $ 500,000.00 $ 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	CANCELLATION
(11) INSERT THE OWNER'S NAME HERE NOTE: PLEASE HAVE YOUR INSURANCE COMPANY MAIL THIS DOCUMENT TO THE CONTRUCTION MANAGER	(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)

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.

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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.

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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 employee 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)

Bangor Township School District, 2023 School Bond Construction Program – including erecting, furnishing, and equipping additions to school buildings; remodeling, furnishing and refurnishing, and equipping and re-equipping school buildings; and preparing, developing, and improving sites; all in accordance with the relevant application for preliminary qualification of bonds, the approved project scopes, applicable laws, the applicable plans and specifications, the Owner's fixed budget, and as otherwise approved by the Owner.

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.

THE CONSTRUCTION MANAGER:
(Name, legal status, and address)

Wolgast Corporation
4835 Towne Centre Road, Suite 203
Saginaw, Michigan 48604
Telephone: (989) 790-9120
Facsimile: (989) 790-9063

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

Bangor Township School District
3359 East Midland Road
Bay City, Michigan 48706
Telephone: (989) 684-8121
Facsimile: (989) 684-6000

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

Integrated Designs, Inc.
8571 West Grand River Avenue, Suite 600
Brighton, Michigan 48116
Telephone: (810) 229-2701
Facsimile: (810) 229-6767

TABLE OF ARTICLES

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

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

~~Any use of, or reliance on, all or a portion of a building information model without agreement to protocols governing the use of, and reliance on, the information contained in the model and without having those protocols set forth in AIA~~

~~Document E203™–2013, Building Information Modeling and Digital Data Exhibit, and the requisite AIA Document G202™–2013, Project Building Information Modeling Protocol Form, shall be at the using or relying party's sole risk and without liability to the other party and its contractors or consultants, the authors of, or contributors to, the building information model, and each of their agents and employees.~~

ARTICLE 2 OWNER

§ 2.1 General

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

~~§ 3.5.2 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~~ determine 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.

§ 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 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 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 detailed 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 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~~ may 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.

§ 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 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.

§ 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.

.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 of 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 encumbered (less amounts withheld by Owner) have been paid or otherwise satisfied, (2) a certificate evidencing that insurance required by the Contract Documents to remain in force after final payment is currently in effect, (3) a written statement that the Contractor knows of no reason that the insurance will not be renewable to cover the period required by the Contract Documents, (4) consent of surety, if any, to final ~~payment (5)~~ 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.

§ 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 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 for 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,~~ Owner 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 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.~~Order..

§ 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 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 by 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 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.~~ 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.

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

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

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

§ 12.2.4 The Contractor shall bear the cost of correcting destroyed or damaged construction of the Owner, 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. 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,~~ Documents or applicable law, 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~~ which may include 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.~~in 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.

§ 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.

§ 15.1.2.1 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.

§ 15.2.2 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).

§ 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,~~ 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' RESPONSIBILITES***

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.

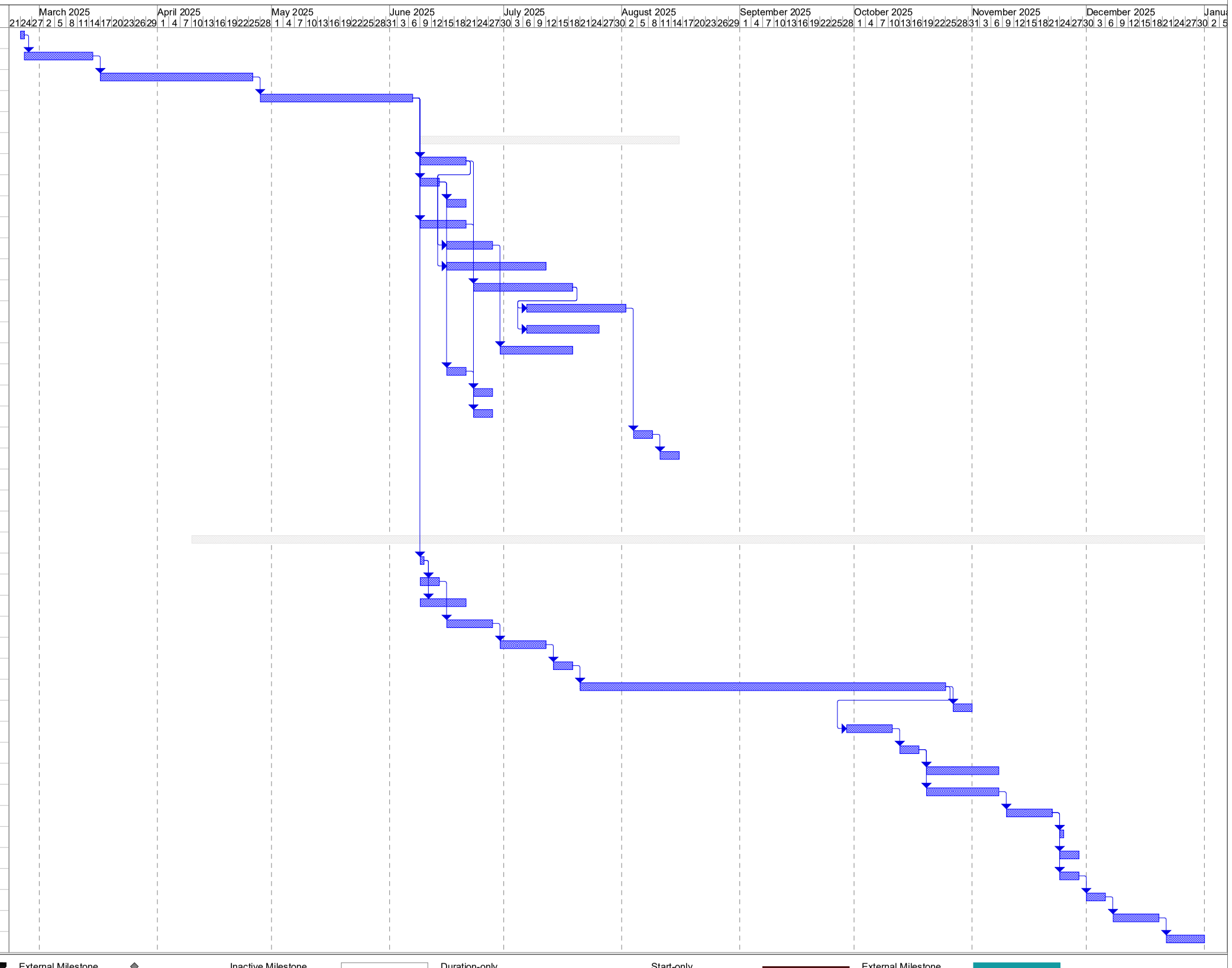
END OF SECTION 00900

MILESTONE SCHEDULE ON FOLLOWING PAGE(S)

END OF SECTION 00999

Bangor Township
Middle School Milestone Schedule

ID	Task Name	Duration	Start	Finish	Predecessors
1	Award Contract	1 day	Mon 2/24/25	Mon 2/24/25	
2	Sign Contract	14 days	Tue 2/25/25	Fri 3/14/25	1
3	Submittals	30 days	Mon 3/17/25	Fri 4/25/25	2
4	Precurement	30 days	Mon 4/28/25	Fri 6/6/25	3
5					
6	**Building Renovation**	50 days	Mon 6/9/25	Fri 8/15/25	
7	Demoliton	10 days	Mon 6/9/25	Fri 6/20/25	4
8	Mechanical, Electrical, and Plumbing Remov	5 days	Mon 6/9/25	Fri 6/13/25	4
9	Ceiling Grid	5 days	Mon 6/16/25	Fri 6/20/25	8
10	Interior Painting	10 days	Mon 6/9/25	Fri 6/20/25	4
11	Interior Masonry	10 days	Mon 6/16/25	Fri 6/27/25	7FS-5 days
12	Rough Mechanical, Electrical, and Plumbing	20 days	Mon 6/16/25	Fri 7/11/25	7FS-5 days
13	Window and Door Replacement	20 days	Mon 6/23/25	Fri 7/18/25	7
14	EFIS Repair & STO Brick	20 days	Mon 7/7/25	Fri 8/1/25	13FS-10 days
15	Painting Exterior	15 days	Mon 7/7/25	Fri 7/25/25	13FS-10 days
16	Tile Work	15 days	Mon 6/30/25	Fri 7/18/25	11
17	Cabinetry	5 days	Mon 6/16/25	Fri 6/20/25	8
18	Flooring	5 days	Mon 6/23/25	Fri 6/27/25	17
19	Display Board	5 days	Mon 6/23/25	Fri 6/27/25	10
20	Inspections Occupancy	5 days	Mon 8/4/25	Fri 8/8/25	14
21	Punchlist	5 days	Mon 8/11/25	Fri 8/15/25	20
22					
23					
24					
25	**Building Addition**	190 days	Thu 4/10/25	Wed 12/31/25	
26	Site Moblization	1 day	Mon 6/9/25	Mon 6/9/25	4
27	Building Excavation	5 days	Mon 6/9/25	Fri 6/13/25	26FS-1 day
28	Sanitary Sewer Investagation / New Install	10 days	Mon 6/9/25	Fri 6/20/25	26FS-1 day
29	Footing & Foundation Walls	10 days	Mon 6/16/25	Fri 6/27/25	27
30	Below Grade Plumbing	10 days	Mon 6/30/25	Fri 7/11/25	29
31	Building Slab	5 days	Mon 7/14/25	Fri 7/18/25	30
32	Masonry Walls	70 days	Mon 7/21/25	Fri 10/24/25	31
33	Windows / Doors	5 days	Mon 10/27/25	Fri 10/31/25	32
34	Structural Steel / Steel Decking	10 days	Mon 9/29/25	Fri 10/10/25	32FS-20 days
35	Roofing	5 days	Mon 10/13/25	Fri 10/17/25	34
36	HVAC Rough	15 days	Mon 10/20/25	Fri 11/7/25	35
37	Electrical Rough	15 days	Mon 10/20/25	Fri 11/7/25	35
38	Painting	10 days	Mon 11/10/25	Fri 11/21/25	37
39	Marker Boards / Blinds	1 day	Mon 11/24/25	Mon 11/24/25	38
40	Hang Light Fixtures	5 days	Mon 11/24/25	Fri 11/28/25	38
41	Finish Plumbing / Mechanical / Millwork	5 days	Mon 11/24/25	Fri 11/28/25	38
42	Polished Floors	5 days	Mon 12/1/25	Fri 12/5/25	41
43	Inspections	10 days	Mon 12/8/25	Fri 12/19/25	42
44	Punchlist / Turn-Over	8 days	Mon 12/22/25	Wed 12/31/25	43



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

PART 1 – GENERAL

1.01 PROJECT DESCRIPTION

A. Bangor Township School District – 2023 Bond - Phase 3A - Middle School Addition & Renovations

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 Complied Laws.

_____
Deponent Signature

_____
Deponent Name – Typewritten

_____County, Michigan
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 Complied 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 **Bangor Township School District – 2023 Bond - Phase 3A - Middle School Addition & Renovations** to provide

_____For the improvement of the property described as **Bangor Township School District,** and hereby waive my/our construction lien to the amount of $_____

_____ for labor/materials provided through _____.

This waiver, together will 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 **Bangor Township School District – 2023 Bond - Phase 3A - Middle School Addition & Renovations** to provide

_____For the improvement of the property described as **Bangor Township School District,** 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, sitpulating 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 ☐ increased / ☐ 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:

1. Method of quotation of the cost of each alternate, and the basis of the Owner's acceptance of alternates: Bidding Documents
2. 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

WOLGAST CORPORATION 4835 TOWNE CENTRE ROAD, SUITE 203, SAGINAW, MI 48604 PH 989-790-9120 FX 989-790-9063

PART 1 – GENERAL

1.01CONSTRUCTION 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 handless 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 comsumption 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 waranty/ 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 Contactor(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 **Bangor Township School District** as they pertain to hazardous materials.

The SDS's are attached for all hazardous materials which will be brought to **Bangor Township School District.**

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.

_____ Date:_____

Signature of Contractor's Representative

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 **Bangor Township School District**.

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: **Bangor Township School District – 2023 Bond - Phase 3A - Middle School Addition & Renovations**
Project #: **A23906-5A**
Owner: **Bangor Township Schools**
Address: **3359 E Midland Road, Bay City, MI 48706**

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: Bangor Township 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 Bangor Township 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

_____
Name

_____
Title

_____
Address

_____
City, State, Zip

State of_____County of _____

Subscribed and sworn to before me this _____

day of _____

Notary Public: _____

My Commission Expires: _____

_____
Seal

END OF SECTION 01805

LEA Name | Bangor Township Schools

SB | Christa McAuliffe Middle School

INSPECTOR AND BUILDING DATA

1. Date of Inspection

September 15, 2023

2. Inspector Name

Armstrong, James D.

3. Inspector Signature | Date

James D. Armstrong | 10-16-23

4. State of Accreditation

Michigan

5. Accreditation Number

A3184

6. Building Name

Christa McAuliffe Middle School

7. Building Address

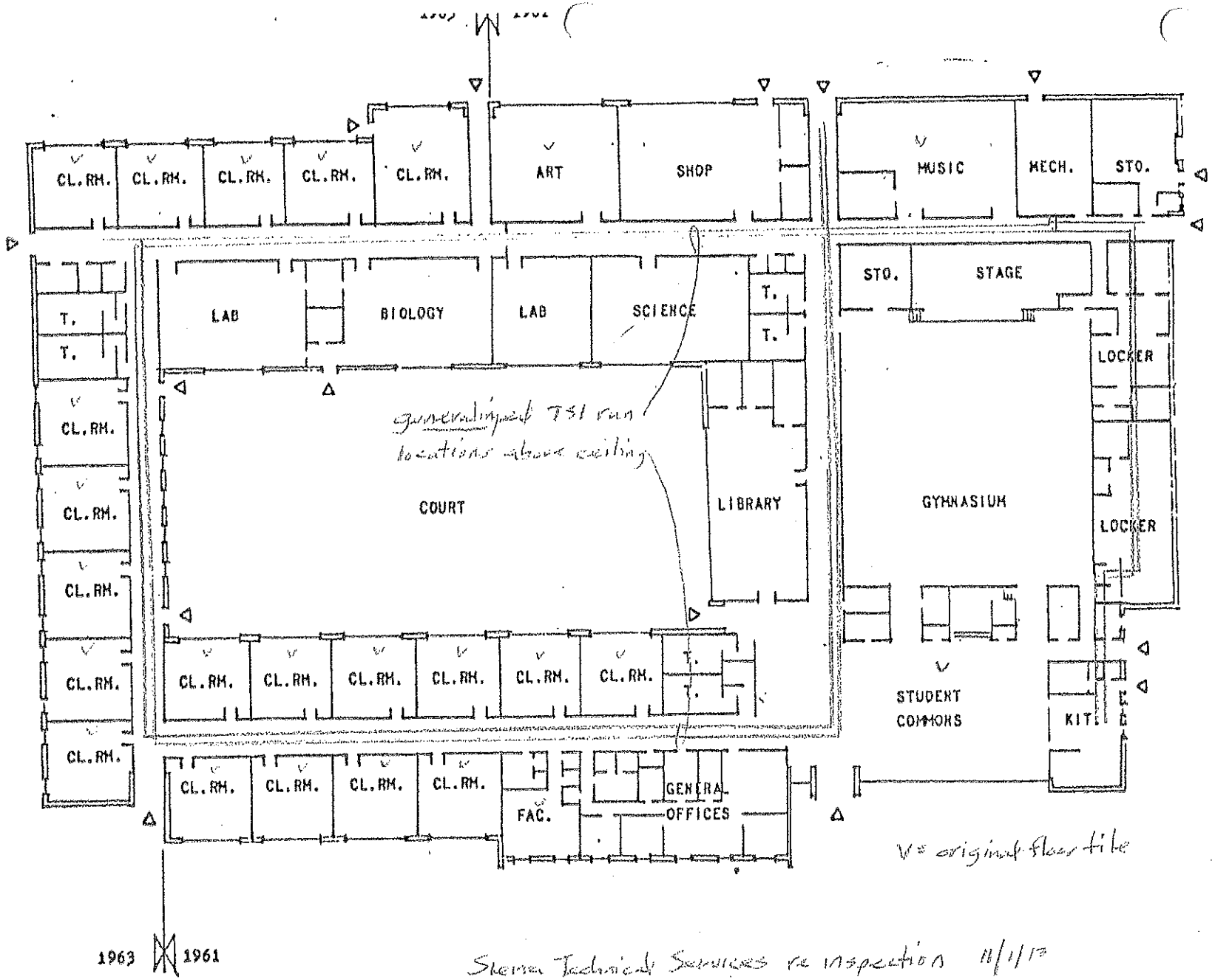
Street	City	Zip
3281 Kiesel	Bay City	48706

8. Local Education Agency (LEA) Name

Bangor Township Schools

9. LEA Address

Street	City	Zip
3359 East Midland Road	Bay City	48706

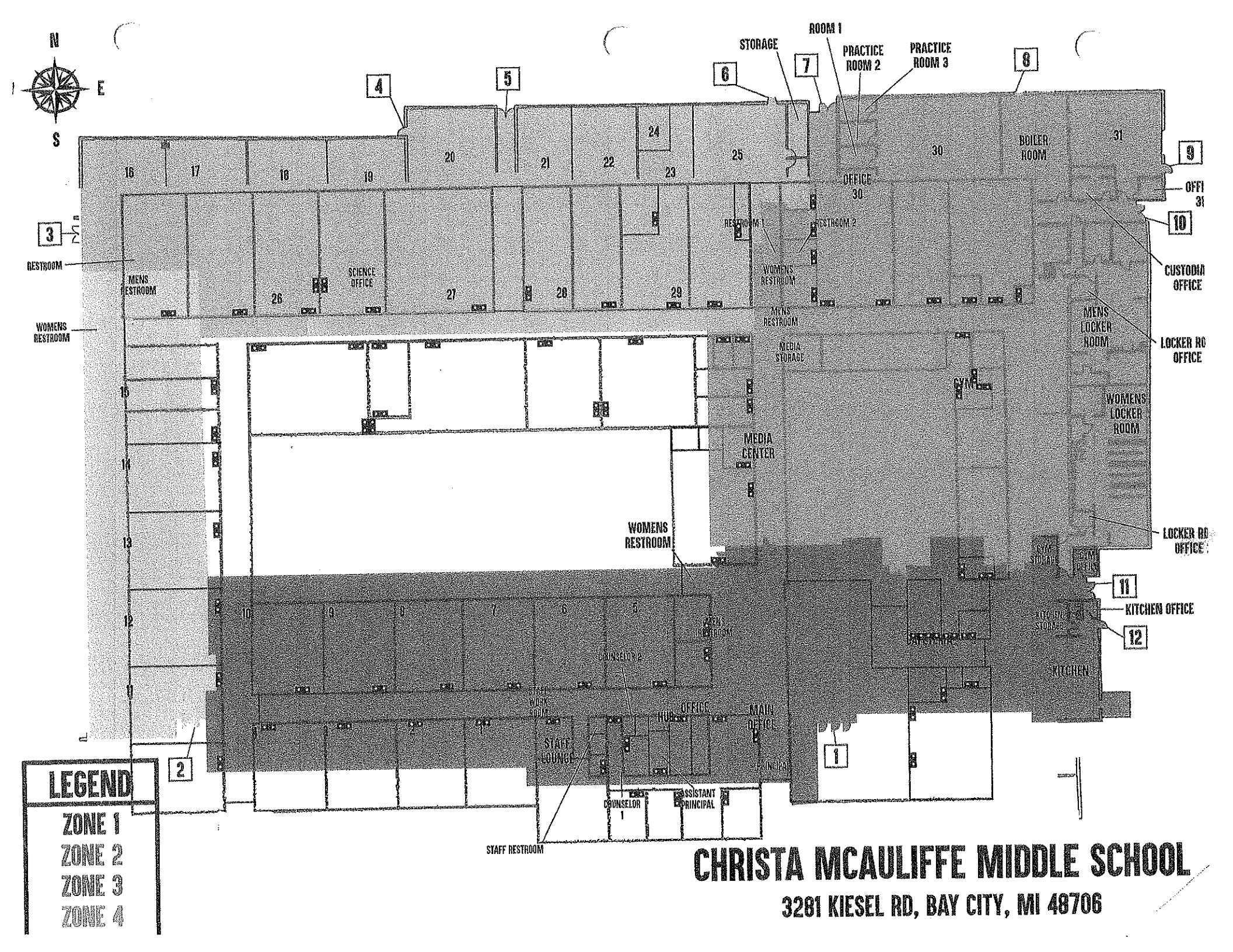


general input TSI room locations above ceiling

V = original floor tile

Sierra Technical Services re inspection 11/1/17

BANGOR INTERMEDIATE SCHOOL



CHRISTA MCAULIFFE MIDDLE SCHOOL

3281 KIESEL RD, BAY CITY, MI 48706

LEA Name: Bangor Township Schools

SB: Christa McAuliffe Middle School

HOMOGENEOUS AREA REPORT

Homogeneous Area (HA) Name	HA#	F/NF	K/A/N	Classification SM/TSI/MM	~ Quantity
HEATING HOT WATER SUPPLY FITTINGS	06	F	K	TSI	245 P.F.
HEATING HOT WATER RETURN FITTINGS	07	F	K	TSI	200 P.F.
COLD WATER	08	F	K	TSI	800 L.F.
COLD WATER FITTINGS	09	F	K	TSI	100 P.F.
DOMESTIC HOT WATER LOOP	10	F	K	TSI	1,350 L.F.
DOMESTIC HOT WATER LOOP FITTINGS	11	F	K	TSI	100 P.F.
FIRE DOORS	12	NF	A	MM	2 DOORS
SPECKLED TROWEL ON CEILING	14	NF	A	SM	3,300 S.F.
WINDOW CAULKING	17	NF	A	MM	1,100 L.F.
VINYL FLOORING	18	NF	A	MM	26,650 S.F.
PLASTERBOARD	20	NF	A	MM	7,700 S.F.

ACM – >1% Asbestos Containing Material

F – Friable
NF– Non friable
HA – Homogeneous Area
SF – Square Foot
<1% – <1% Asbestos

K – Known ACM
N – No Asbestos Detected
A – Assumed ACM
LF – Linear Foot
~ – Approx. Qty.

TSI – Thermal System Insulation
SM – Surfacing Material
MM – Miscellaneous Material
PF – Pipe Fittings

LEA Name | Bangor Township Schools

SB | Christa McAuliffe Middle School

HOMOGENEOUS AREA REPORT

Homogeneous Area (HA) Name	HA#	F/NF	K/A/N	Classification SM/TSI/MM	~ Quantity
BLACK BASEBOARD	31	NF	A	MM	150 L.F.
PHONE & ELECTRICAL WIRES	32	NF	A	MM	UNKNOWN
PIPE FITTINGS	33	F	K	TSI	9 P.F.

ACM – >1% Asbestos Containing Material

F – Friable
NF– Non friable
HA – Homogeneous Area
SF – Square Foot
<1% – <1% Asbestos

K – Known ACM
N – No Asbestos Detected
A – Assumed ACM
LF – Linear Foot
~ – Approx. Qty.

TSI – Thermal System Insulation
SM – Surfacing Material
MM – Miscellaneous Material
PF – Pipe Fittings

LEA Name | Bangor Township Schools

SB | Christa McAuliffe Middle School

HOMOGENEOUS AREA LOCATOR

HA#

06 – Positive

Homogeneous Area Location

Homogeneous Area 06 – HEATING HOT WATER SUPPLY FITTINGS	
1. Above Corridor drop in ceilings, above Classroom drop in ceilings, above Kitchen Bathroom and Locker area plaster ceilings [245 P.F.]*	2. Kitchen Store Room (adjacent to Gym) [9 P.F.]

HA#

07 – Positive

Homogeneous Area Location

Homogeneous Area 07 – HEATING HOT WATER RETURN FITTINGS	
1. Above Corridor drop in ceilings, above Classroom drop in ceilings, above Kitchen Bathroom and Locker area plaster ceilings [200 P.F.]*	2. Kitchen Store Room (adjacent to Gym) [9 P.F.]

HA#

08 – Positive

Homogeneous Area Location

Homogeneous Area 08 – COLD WATER	
1. Above Corridor drop in ceilings, above Classroom drop in ceilings, above Kitchen Bathroom and Locker area plaster ceilings [800 L.F.]*	

* LOCATIONS & QUANTITIES OBTAINED FROM THE 2013 REINSPECTION

LEA Name | Bangor Township Schools |

SB | Christa McAuliffe Middle School |

HOMOGENEOUS AREA LOCATOR

HA#

09 – Positive

Homogeneous Area Location

Homogeneous Area 09 – COLD WATER FITTINGS	
1. Above Corridor drop in ceilings, above Classroom drop in ceilings, above Kitchen Bathroom and Locker area plaster ceilings [100 P.F.]*	

HA#

10 – Positive

Homogeneous Area Location

Homogeneous Area 10 – DOMESTIC HOT WATER LOOP	
1. Above Corridor drop in ceilings, above Classroom drop in ceilings, above Kitchen Bathroom and Locker area plaster ceilings [1,350 L.F.]*	

HA#

11 – Positive

Homogeneous Area Location

Homogeneous Area 11 – DOMESTIC HOT WATER LOOP FITTINGS	
1. Above Corridor drop in ceilings, above Classroom drop in ceilings, above Kitchen Bathroom and Locker area plaster ceilings [100 PF.]*	

* LOCATIONS OBTAINED FROM THE ORIGINAL MANAGEMENT PLAN/1998 REINSPECTION

LEA Name | Bangor Township Schools

SB | Christa McAuliffe Middle School

HOMOGENEOUS AREA LOCATOR

HA#

12 – Assumed

Homogeneous Area Location

Homogeneous Area 12 – FIRE DOORS	
1. Boiler Room [1 Door]*	2. Janitor's Closet [1 Door]*

HA#

14 – Assumed

Homogeneous Area Location

Homogeneous Area 14 – SPECKLED TROWELED ON CEILING	
1. Entryways [3,300 S.F.]*	

HA#

17 – Assumed

Homogeneous Area Location

Homogeneous Area 17 – WINDOW CAULKING	
1. Through Out [1,100 L.F.]*	

HA#

18 – Assumed

Homogeneous Area Location

Homogeneous Area 18 – VINYL FLOORING	
1. Girl's Locker Room & Boy's Locker Room [Unknown]*	2. Through Out Building [Unknown]*

* LOCATIONS & QUANTITIES OBTAINED FROM THE 2013 REINSPECTION

LEA Name | Bangor Township Schools

SB | Christa McAuliffe Middle School

HOMOGENEOUS AREA LOCATOR

HA#

20 – Assumed

Homogeneous Area Location

Homogeneous Area 20 – PLASTERBOARD	
1. Through Out [7,700 S.F.]*	

HA#

31 – Assumed

Homogeneous Area Location

Homogeneous Area 31 – BLACK BASEBOARD	
1. Through Out [150 L.F.]*	

HA#

32 – Assumed

Homogeneous Area Location

Homogeneous Area 32 – ELECTRICAL & PHONE WIRES	
1. Through Out [Unknown]* Mostly vinyl romex	

HA#

33 – Positive

Homogeneous Area Location

Homogeneous Area 33 – PIPE FITTINGS	
1. Kitchen Storeroom (Adj. to Gym) [9 P.F.]	

* LOCATIONS & QUANTITIES OBTAINED FROM THE 2013 REINSPECTION

LEA Name: Bangor Township Schools

SB: Christa McAuliffe Middle School

HAZARD ASSESSMENT

1. Inspector Name

Armstrong, James D.

2. Inspector Signature — Date

James D. Armstrong 10-16-23

3. State of Accreditation

Michigan

4. Accreditation Number

A3184

HA#

06 – Heating Hot Water Supply Fittings

Hazard Assessment Classification

5-ACBM with Potential for Damage.

Reason for Classifications

Heating Hot Water Supply Fittings appears to be in good condition with no apparent signs of damage. Potential causes of damage could be attributed to the following: Deterioration, water damage and physical damage. Students and school personnel rarely enter these areas, thus accessibility may be said to be low.

LEA Name | Bangor Township Schools

SB | Christa McAuliffe Middle School

HAZARD ASSESSMENT
(Continued)

HA#

07 – Heating Hot Water Return Fittings

Hazard Assessment Classification

5-ACBM with Potential for Damage.

Reason for Classifications

Heating Hot Water Return Fittings appears to be in good condition with no apparent signs of damage. Potential causes of damage could be attributed to the following: Deterioration, water damage and physical damage. Students and school personnel rarely enter these areas, thus accessibility may be said to be low.

HA#

08 – Cold Water

Hazard Assessment Classification

5-ACBM with Potential for Damage.

Reason for Classifications

Cold Water appears to be in good condition with no apparent signs of damage. Potential causes of damage could be attributed to the following: Deterioration, water damage and physical damage. Students and school personnel rarely enter these areas, thus accessibility may be said to be low.

HA#

09 – Cold Water Fittings

Hazard Assessment Classification

5-ACBM with Potential for Damage.

Reason for Classifications

Cold Water Fittings appears to be in good condition with no apparent signs of damage. Potential causes of damage could be attributed to the following: Deterioration, water damage and physical damage. Students and school personnel rarely enter these areas, thus accessibility may be said to be low.

LEA Name | Bangor Township Schools

SB | Christa McAuliffe Middle School

HAZARD ASSESSMENT
(Continued)

HA#

10 – Domestic Hot Water Loop

Hazard Assessment Classification

5-ACBM with Potential for Damage.

Reason for Classifications

Domestic Hot Water Loop appears to be in good condition with no apparent signs of damage. Potential causes of damage could be attributed to the following: Deterioration, water damage and physical damage. Students and school personnel rarely enter these areas, thus accessibility may be said to be low.

HA#

11 – Domestic Hot Water Loop Fittings

Hazard Assessment Classification

5-ACBM with Potential for Damage.

Reason for Classifications

Domestic Hot Water Loop Fittings appears to be in good condition with no apparent signs of damage. Potential causes of damage could be attributed to the following: Deterioration, water damage and physical damage. Students and school personnel rarely enter these areas, thus accessibility may be said to be low.

HA#

33 – Pipe Fittings

Hazard Assessment Classification

5-ACBM with Potential for Damage.

Reason for Classifications

Pipe Fittings appear to be in good condition with no apparent signs of damage. Potential causes of damage could be attributed to the following: Deterioration, water damage and physical damage. School personnel regularly enter these areas, thus accessibility may be said to be high.

LEA Name | Bangor Township Schools

SB | Christa McAuliffe Middle School

RECOMMENDATIONS

1. Management Planner Name

Armstrong, James D.

2. Management Planner Signature | Date

James D. Armstrong | 10-16-23

3. State of Accreditation

Michigan

4. Accreditation Number

A3184

5. Recommendations

Homogeneous Area 06 – HEATING HOT WATER SUPPLY FITTINGS

Maintain as is. Repair and or replace as needed with non-asbestos material using trained personnel and PPE. Continue Operations and Maintenance until major renovation or demolition requires removal. Maintain all thermal system insulation ACM and its covering in an intact state and undamaged condition. Preventative Measures: Aluminum or plastic coverings should be installed on all ACM TSI, where contact is most likely.

Homogeneous Area 07 – HEATING HOT WATER RETURN FITTINGS

Maintain as is. Repair and or replace as needed with non-asbestos material using trained personnel and PPE. Continue Operations and Maintenance until major renovation or demolition requires removal. Maintain all thermal system insulation ACM and its covering in an intact state and undamaged condition. Preventative Measures: Aluminum or plastic coverings should be installed on all ACM TSI, where contact is most likely.

Homogeneous Area 08 – COLD WATER

Maintain as is. Repair and or replace as needed with non-asbestos material using trained personnel and PPE. Continue Operations and Maintenance until major renovation or demolition requires removal. Maintain all thermal system insulation ACM and its covering in an intact state and undamaged condition. Preventative Measures: Aluminum or plastic coverings should be installed on all ACM TSI, where contact is most likely.

LEA Name | Bangor Township Schools

SB | Christa McAuliffe Middle School

RECOMMENDATIONS
(continued)

Homogeneous Area 09 – COLD WATER FITTINGS

Maintain as is. Repair and or replace as needed with non-asbestos material using trained personnel and PPE. Continue Operations and Maintenance until major renovation or demolition requires removal. Maintain all thermal system insulation ACM and its covering in an intact state and undamaged condition. Preventative Measures: Aluminum or plastic coverings should be installed on all ACM TSI, where contact is most likely.

Homogeneous Area 10 – DOMESTIC HOT WATER LOOP

Maintain as is. Repair and or replace as needed with non-asbestos material using trained personnel and PPE. Continue Operations and Maintenance until major renovation or demolition requires removal. Maintain all thermal system insulation ACM and its covering in an intact state and undamaged condition. Preventative Measures: Aluminum or plastic coverings should be installed on all ACM TSI, where contact is most likely.

Homogeneous Area 11 – DOMESTIC HOT WATER LOOP FITTINGS

Maintain as is. Repair and or replace as needed with non-asbestos material using trained personnel and PPE. Continue Operations and Maintenance until major renovation or demolition requires removal. Maintain all thermal system insulation ACM and its covering in an intact state and undamaged condition. Preventative Measures: Aluminum or plastic coverings should be installed on all ACM TSI, where contact is most likely.

Homogeneous Area 12 – FIRE DOORS

Maintain as is. Repair and or replace as needed with non-asbestos fire doors using trained personnel and PPE. Continue Operations and Maintenance until major renovation or demolition requires removal.

Homogeneous Area 14 – SPECKLED TROWELED ON CEILING

Maintain as is. Repair and or replace as needed with non-asbestos material using trained personnel and PPE. Continue Operations and Maintenance until major renovation or demolition requires removal.

Homogeneous Area 17 – WINDOW CAULKING

Maintain as is. Repair and or replace as needed with non-asbestos material using trained personnel and PPE. Continue Operations and Maintenance until major renovation or demolition requires removal.

LEA Name | Bangor Township Schools

SB | Christa McAuliffe Middle School

RECOMMENDATIONS
(continued)

Homogeneous Area 18 – VINYL FLOORING

Maintain as is. Repair and or replace as needed with non-asbestos floor tile and mastic using trained personnel and PPE. Continue Operations and Maintenance until major renovation or demolition requires removal.

Homogeneous Area 20 – PLASTERBOARD

Maintain as is. Repair and or replace as needed with non-asbestos materials using trained personnel and PPE. Continue Operations and Maintenance until major renovation or demolition requires removal.

Homogeneous Area 31 – BLACK BASEBOARD

Maintain as is. Repair and or replace as needed with non-asbestos material using trained personnel and PPE. Continue Operations and Maintenance until major renovation or demolition requires removal.

Homogeneous Area 32 – ELECTRICAL & PHONE WIRES

Maintain as is. Repair and or replace as needed with non-asbestos material using trained personnel and PPE. Continue Operations and Maintenance until major renovation or demolition requires removal.

Homogeneous Area 33 – PIPE FITTINGS

Maintain as is. Repair and or replace as needed with non-asbestos material using trained personnel and PPE. Continue Operations and Maintenance until major renovation or demolition requires removal. Maintain all thermal system insulation ACM and its covering in an intact state and undamaged condition. Preventative Measures: Aluminum or plastic coverings should be installed on all ACM TSI, where contact is most likely.

LEA Name | Bangor Township Schools

SB | Christa McAuliffe Middle School

RESPONSE ACTION AND PREVENTIVE MEASURES

1. Location

Homogeneous Area 06 – HEATING HOT WATER SUPPLY FITTINGS

Please refer to the Homogeneous Area Locator Forms (FORM D-3) for the exact locations of this material.

2. Methods

Repair and or replace, as needed using non-ACM materials using trained personnel and PPE. Avoid use of power tools and abrasive maintenance procedures that could cause a fiber release.

PREVENTATIVE MEASURES: Aluminum or plastic pipe coverings should be installed on all ACM TSI, where contact is most likely.

3. Reasons

Material is in good condition, but has a potential for damage.
Improper maintenance procedures and improper removal of asbestos-containing material could result in the release of high levels of asbestos.

4. Schedule

Begin October 16, 2023 and complete as needed.

LEA Name | Bangor Township Schools

SB | Christa McAuliffe Middle School

RESPONSE ACTION AND PREVENTIVE MEASURES

1. Location

Homogeneous Area 07 – HEATING HOT WATER RETURN FITTINGS

Please refer to the Homogeneous Area Locator Forms (FORM D-3) for the exact locations of this material.

2. Methods

Repair and or replace, as needed using non-ACM materials using trained personnel and PPE. Avoid use of power tools and abrasive maintenance procedures that could cause a fiber release.

PREVENTATIVE MEASURES: Aluminum or plastic pipe coverings should be installed on all ACM TSI, where contact is most likely.

3. Reasons

Material is in good condition, but has a potential for damage.
Improper maintenance procedures and improper removal of asbestos-containing material could result in the release of high levels of asbestos.

4. Schedule

Begin October 16, 2023 and complete as needed.

LEA Name | Bangor Township Schools

SB | Christa McAuliffe Middle School

RESPONSE ACTION AND PREVENTIVE MEASURES

1. Location

Homogeneous Area 08 – COLD WATER

Please refer to the Homogeneous Area Locator Forms (FORM D-3) for the exact locations of this material.

2. Methods

Repair and or replace, as needed using non-ACM materials using trained personnel and PPE. Avoid use of power tools and abrasive maintenance procedures that could cause a fiber release.

PREVENTATIVE MEASURES: Aluminum or plastic pipe coverings should be installed on all ACM TSI, where contact is most likely.

3. Reasons

Material is in good condition, but has a potential for damage.
Improper maintenance procedures and improper removal of asbestos-containing material could result in the release of high levels of asbestos.

4. Schedule

Begin October 16, 2023 and complete as needed.

LEA Name | Bangor Township Schools

SB | Christa McAuliffe Middle School

RESPONSE ACTION AND PREVENTIVE MEASURES

1. Location

Homogeneous Area 09 – COLD WATER FITTINGS

Please refer to the Homogeneous Area Locator Forms (FORM D-3) for the exact locations of this material.

2. Methods

Repair and or replace, as needed using non-ACM materials using trained personnel and PPE. Avoid use of power tools and abrasive maintenance procedures that could cause a fiber release.

PREVENTATIVE MEASURES: Aluminum or plastic pipe coverings should be installed on all ACM TSI, where contact is most likely.

3. Reasons

Material is in good condition, but has a potential for damage.
Improper maintenance procedures and improper removal of asbestos-containing material could result in the release of high levels of asbestos.

4. Schedule

Begin October 16, 2023 and complete as needed.

LEA Name | Bangor Township Schools

SB | Christa McAuliffe Middle School

RESPONSE ACTION AND PREVENTIVE MEASURES

1. Location

Homogeneous Area 10 – DOMESTIC HOT WATER LOOP

Please refer to the Homogeneous Area Locator Forms (FORM D-3) for the exact locations of this material.

2. Methods

Repair and or replace, as needed using non-ACM materials using trained personnel and PPE. Avoid use of power tools and abrasive maintenance procedures that could cause a fiber release.

PREVENTATIVE MEASURES: Aluminum or plastic pipe coverings should be installed on all ACM TSI, where contact is most likely.

3. Reasons

Material is in good condition, but has a potential for damage.
Improper maintenance procedures and improper removal of asbestos-containing material could result in the release of high levels of asbestos.

4. Schedule

Begin October 16, 2023 and complete as needed.

LEA Name | Bangor Township Schools

SB | Christa McAuliffe Middle School

RESPONSE ACTION AND PREVENTIVE MEASURES

1. Location

Homogeneous Area 11 – DOMESTIC HOT WATER LOOP FITTINGS

Please refer to the Homogeneous Area Locator Forms (FORM D-3) for the exact locations of this material.

2. Methods

Repair and or replace, as needed using non-ACM materials using trained personnel and PPE. Avoid use of power tools and abrasive maintenance procedures that could cause a fiber release.

PREVENTATIVE MEASURES: Aluminum or plastic pipe coverings should be installed on all ACM TSI, where contact is most likely.

3. Reasons

Material is in good condition, but has a potential for damage.
Improper maintenance procedures and improper removal of asbestos-containing material could result in the release of high levels of asbestos.

4. Schedule

Begin October 16, 2023 and complete as needed.

LEA Name | Bangor Township Schools

SB | Christa McAuliffe Middle School

RESPONSE ACTION AND PREVENTIVE MEASURES

1. Location

Homogeneous Area 12 – FIRE DOORS

Please refer to the homogeneous Area Locator Forms (FORM D-3) for the exact locations of this material.

2. Methods

Repair and or replace, as needed using non-ACM materials using trained personnel and PPE. Avoid use of power tools and abrasive maintenance procedures that could cause a fiber release.

3. Reasons

Material is in good condition, but has a potential for damage.
Improper maintenance procedures and improper removal of asbestos-containing material could result in the release of high levels of asbestos.

4. Schedule

Begin October 16, 2023 and complete as needed.

LEA Name | Bangor Township Schools

SB | Christa McAuliffe Middle School

RESPONSE ACTION AND PREVENTIVE MEASURES

1. Location

Homogeneous Area 14 – SPECKLED TROWEL ON CEILING

Please refer to the homogeneous Area Locator Forms (FORM D-3) for the exact locations of this material.

2. Methods

Repair and or replace, as needed using non-ACM materials using trained personnel and PPE. Avoid use of power tools and abrasive maintenance procedures that could cause a fiber release.

3. Reasons

Material is in good condition, but has a potential for damage.
Improper maintenance procedures and improper removal of asbestos-containing material could result in the release of high levels of asbestos.

4. Schedule

Begin October 16, 2023 and complete as needed.

LEA Name | Bangor Township Schools

SB | Christa McAuliffe Middle School

RESPONSE ACTION AND PREVENTIVE MEASURES

1. Location

Homogeneous Area 17 –WINDOW CAULKING

Please refer to the homogeneous Area Locator Forms (FORM D-3) for the exact locations of this material.

2. Methods

Repair and or replace, as needed using non-ACM materials using trained personnel and PPE. Avoid use of power tools and abrasive maintenance procedures that could cause a fiber release.

3. Reasons

Material is in good condition, but has a potential for damage.
Improper maintenance procedures and improper removal of asbestos-containing material could result in the release of high levels of asbestos.

4. Schedule

Begin October 16, 2023 and complete as needed.

LEA Name | Bangor Township Schools

SB | Christa McAuliffe Middle School

RESPONSE ACTION AND PREVENTIVE MEASURES

1. Location

Homogeneous Area 18 –VINYL FLOORING

Please refer to the homogeneous Area Locator Forms (FORM D-3) for the exact locations of this material.

2. Methods

Repair and or replace, as needed using non-ACM floor tile/covering and mastic using trained personnel and PPE. During any maintenance of asbestos containing floor tile/covering which may involve a buffing or sanding action, the floor should be kept wet, run machines at a slow speed, select the least abrasive pad and do not overstrip the floors. For further information contact the EPA.

3. Reasons

Material is in good condition, but has a potential for damage.
Improper maintenance procedures and improper removal of asbestos containing floor tile/covering could result in the release of high levels of asbestos.

4. Schedule

Begin October 16, 2023 and complete as needed.

LEA Name | Bangor Township Schools

SB | Christa McAuliffe Middle School

RESPONSE ACTION AND PREVENTIVE MEASURES

1. Location

Homogeneous Area 20 –PLASTERBOARD

Please refer to the homogeneous Area Locator Forms (FORM D-3) for the exact locations of this material.

2. Methods

Repair and or replace, as needed using non-ACM materials using trained personnel and PPE. Avoid use of power tools and abrasive maintenance procedures that could cause a fiber release.

3. Reasons

Material is in good condition, but has a potential for damage.
Improper maintenance procedures and improper removal of asbestos-containing material could result in the release of high levels of asbestos.

4. Schedule

Begin October 16, 2023 and complete as needed.

LEA Name | Bangor Township Schools

SB | Christa McAuliffe Middle School

RESPONSE ACTION AND PREVENTIVE MEASURES

1. Location

Homogeneous Area 31 –BLACK BASEBOARD

Please refer to the homogeneous Area Locator Forms (FORM D-3) for the exact locations of this material.

2. Methods

Repair and or replace, as needed using non-ACM materials using trained personnel and PPE. Avoid use of power tools and abrasive maintenance procedures that could cause a fiber release.

3. Reasons

Material is in good condition, but has a potential for damage.
Improper maintenance procedures and improper removal of asbestos-containing material could result in the release of high levels of asbestos.

4. Schedule

Begin October 16, 2023 and complete as needed.

LEA Name | Bangor Township Schools

SB | Christa McAuliffe Middle School

RESPONSE ACTION AND PREVENTIVE MEASURES

1. Location

Homogeneous Area 32 –ELECTRICAL & PHONE WIRES

Please refer to the homogeneous Area Locator Forms (FORM D-3) for the exact locations of this material.

2. Methods

Repair and or replace, as needed using non-ACM materials using trained personnel and PPE. Avoid use of power tools and abrasive maintenance procedures that could cause a fiber release.

3. Reasons

Material is in good condition, but has a potential for damage.
Improper maintenance procedures and improper removal of asbestos-containing material could result in the release of high levels of asbestos.

4. Schedule

Begin October 16, 2023 and complete as needed.

LEA Name | Bangor Township Schools

SB | Christa McAuliffe Middle School

RESPONSE ACTION AND PREVENTIVE MEASURES

1. Location

Homogeneous Area 33–PIPE FITTINGS

Please refer to the homogeneous Area Locator Forms (FORM D-3) for the exact locations of this material.

2. Methods

Repair and or replace, as needed using non-ACM materials using trained personnel and PPE. Avoid use of power tools and abrasive maintenance procedures that could cause a fiber release.

PREVENTATIVE MEASURES: Aluminum or plastic pipe coverings should be installed on all ACM TSI, where contact is most likely.

3. Reasons

Material is in good condition, but has a potential for damage.
Improper maintenance procedures and improper removal of asbestos-containing material could result in the release of high levels of asbestos.

4. Schedule

Begin October 16, 2023 and complete as needed.

LEA Name | Bangor Township Schools

SB | Christa McAuliffe Middle School

REMAINING ASBESTOS

Description

Homogeneous Area 06 – HEATING HOT WATER SUPPLY FITTINGS

Homogeneous Area 07 – HEATING HOT WATER RETURN FITTINGS

Homogeneous Area 08 – COLD WATER

Homogeneous Area 09 – COLD WATER FITTINGS

Homogeneous Area 10 – DOMESTIC HOT WATER LOOP

Homogeneous Area 11 – DOMESTIC HOT WATER LOOP FITTINGS

Homogeneous Area 12 – FIRE DOORS

Homogeneous Area 14 – SPECKLED TROWEL ON CEILING

Homogeneous Area 17 – WINDOW CAULKING

Homogeneous Area 18 – VINYL FLOORING

Homogeneous Area 20 – PLASTERBOARD

Homogeneous Area 31 – BLACK BASEBOARD

Homogeneous Area 32 – ELECTRICAL & PHONE WIRES

Homogeneous Area 33 – PIPE FITTINGS

Please refer to the Homogeneous Area Locator Forms (FORM D-3) for the exact locations of this material.

LEA Name | Bangor Township Schools

SB | Christa McAuliffe Middle School

CONSULTANT ACCREDITATION STATEMENT

1. LEA Designated Person Name

2. LEA designated Person Signature Date

3. Accreditation Statement

ARM Industrial & Environmental Consultants, LLC (ARM) has contributed in the development of the Management Plan.

ARM has utilized personnel in accordance with 40 CFR part 763.93 (e) (12) (I) which have been accredited by EPA approved course developed under section 206 (b) to Title II of the act.

Name(s) of consultant(s) who have contributed in the development of the Management Plan are as follows:

1. Armstrong, James D.

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

Specifications For

Bangor Township School Bond MS Addition & Renovations

Project Location:

Middle School
3281 Kiesel RD, Bay City, MI 48706

Owner

Bangor Township Schools
3359 E. Midland Rd, Bay City, MI 48706

Issued For: Construction
Date: December 20, 2024

IDI integrated designs inc. ARCHITECTURE ENGINEERING CONSULTING

Project Number

22-011

DIVISION 1 - GENERAL REQUIREMENTS

003121	Site Survey Information
003132	Geotechnical Data
	Geotechnical Report
012300	Alternates
014000	Quality Requirements
015813	Temporary Project Signage

DIVISION 2 – EXISTING CONDITIONS

024119	Selective Demolition

DIVISION 3 – CONCRETE

033000	Cast in Place Concrete

DIVISION 4 – MASONRY

042200	Concrete Unit Masonry

DIVISION 5 – METALS

051200	Structural Steel Framing
052100	Steel Joist Framing
053100	Steel Decking
055000	Metal Fabrications

DIVISION 6 – WOOD, PLASTICS AND COMPOSITES

061000	Rough Carpentry
064116	Plastic Laminate Clad Architectural Cabinets

DIVISION 7 – THERMAL AND MOISTURE PROTECTION

072100	Thermal Insulation
072119	Foamed-in-place Insulation
074200	StoCreativ Brick Finish
074213.23	Metal Composite Material Wall Panels
075323	EPDM Thermoset Single-Ply Roofing
076200	Sheet Metal Flashing and Trim
078413	Penetration Firestopping
079200	Joint Sealants
079500	Interior Expansion Control System

DIVISION 8 – OPENINGS

081113	Hollow Metal Doors and Frames
081416	Flush Wood Doors

081743	FRP/Aluminum Hybrid Doors and Frames
084113	Aluminum Framed Storefronts
085113	Aluminum Windows
087100	Door Hardware
088000	Glazing

DIVISION 9 – FINISHES

092216	Non-Structural Metal Framing
092900	Gypsum Board
093013	Ceramic Tiling
095100	Acoustical Ceilings
095154	Spray-On Acoustical Finish
095400	STO Textured Wall Finish for Existing EIFS
095400.1	STO Cleaning Prep
096513	Resilient Base and Accessories
096519	Resilient Tile Flooring
096723	Resinous Flooring
096816	Sheet Carpeting
099100	Painting

DIVISION 10 – SPECIALTIES

101419	Signage and Graphics
102113.19	Plastic Toilet Compartments
102800	Toilet Accessories
104413	Fire Protection Cabinets
104416	Fire Extinguishers

DIVISION 11 – (NOT USED)

DIVISION 12 – FURNISHINGS

122413	Roller Window Shades

DIVISION 13-21 (NOT USED)

DIVISION 22 – PLUMBING

220500	Common Work Results for Plumbing
220553	Identification for Plumbing Piping and Equipment
220719	Plumbing Piping Insulation
221116	Domestic Water Piping
221119	Domestic Water Piping Specialties
221316	Sanitary Waste and Vent Piping
221319	Sanitary Waste Piping Specialties
221319.13	Sanitary Drains
221413	Facility Storm Drainage Piping
221423	Storm Drainage Piping Specialties
224213.13	Commercial Water Closets
224213.16	Commercial Urinals

224216.13 Commercial Lavatories
224216.16 Commercial Sinks
224716 Pressure Water Coolers

DIVISION 23 – HEATING, VENTILATING AND AIR CONDITIONING

230100 General Mechanical Requirements
230500 Common Work Results for HVAC
230553 Identification for HVAC Piping and Equipment
230593 Testing, Adjusting, and Balancing for HVAC
230713 Duct Insulation
230923 Building Automation Systems (BAS) for HVAC
231123 Facility Natural Gas Piping
232113 Hydronic Piping
233113 Metal Ducts
233300 Air Duct Accessories
233346 Flexible Ducts
233713.13 Air Diffusers
233713.23 Registers and Grilles
233723 HVAC Gravity Ventilators
237416 Packaged Rooftop Air-Conditioning Units
238219 Fan Coil Units
238239.13 Cabinet Unit Heaters

DIVISION 26 – ELECTRICAL

260500 Basic Electrical Requirements
260505 Selective Demolition for Electrical
260519 Low-Voltage Electrical Power Conductors and Cables
260526 Grounding and Bonding for Electrical Systems
260529 Hangers and Support for Electrical Systems
260533 Raceway and Boxes for Electrical Systems
260553 Identification for Electrical Systems
262416 Panelboards
262702 Equipment Wiring Systems
262726 Wiring Devices
262816 Enclosed Switches and Circuit Breakers
264313 Surge Protection
265100 Interior Lighting
265600 Exterior Lighting

DIVISION 27 – COMMUNICATIONS

271501 Basic Cabling Requirements

DIVISION 28 – ELECTRONIC SAFETY AND Security

283100 Fire Detection and Mass Notification

DIVISION 31 – EARTHWORK

311000 Site Clearing
312000 Earth Moving

END OF TABLE OF CONTENTS

SECTION 003121
SITE SURVEY INFORMATION

PART 1 - GENERAL

1.1 SURVEY INFORMATION

A. This Document with its referenced attachments is part of the Procurement and Contracting Requirements for Project. They provide Owner's information for Bidders' convenience and are intended to supplement rather than serve in lieu of Bidders' own investigations. They are made available for Bidders' convenience and information. This Document and its attachments are not part of the Contract Documents.

B. The Site Survey, completed by Nederveld dated, August 15, 2023, was used for the bases of design and, is available as upon request.

END OF SECTION 003121

SECTION 003132
GEOTECHNICAL DATA

PART 1 - GENERAL

1.1 GEOTECHNICAL DATA

A. This Document with its referenced attachments is part of the Procurement and Contracting Requirements for Project. They provide Owner's information for Bidders' convenience and are intended to supplement rather than serve in lieu of Bidders' own investigations. They are made available for Bidders' convenience and information. This Document and its attachments are not part of the Contract Documents.

B. Because subsurface conditions indicated by the soil borings are a sampling in relation to the entire construction area, and for other reasons, the Owner, the Engineer, the Engineer's consultants, and the firm reporting the subsurface conditions do not warranty the conditions below the depths of the borings or that the strata logged from the borings are necessarily typical of the entire site. Any party using the information described in the soil borings and geotechnical report shall accept full responsibility for its use.

C. Soil-boring data for Project, obtained by Driesenga & Associates, Inc. and included in the Geotechnical Report dated October 6, 2023, is available as an appendix to this Document

1. The opinions expressed in this report are those of a geotechnical engineer and represent interpretations of subsoil conditions, tests, and results of analyses conducted by a geotechnical engineer. Owner is not responsible for interpretations or conclusions drawn from the data
2. Any party using information described in the geotechnical report shall make additional test borings and conduct other exploratory operations that may be required to determine the character of subsurface materials that may be encountered.

END OF SECTION 003132

SECTION 015813
TEMPORARY PROJECT SIGNAGE

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 SECTION INCLUDES

A. Project identification sign.
B. Project informational signs.

1.3 QUALITY ASSURANCE

A. Design sign and structure to withstand 90 miles/hr wind velocity.
B. Sign Manufacturer to have experience in manufacturing signage with references on similar projects.
C. Finishes, Vinyl: Adequate to withstand weathering, fading, and chipping for duration of construction.

1.4 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.
B. Shop Drawing: Show content, layout, lettering, color, foundation, structure, sizes and grades of members.

PART 2 - PRODUCTS

2.1 SIGN MATERIALS

A. Structure and Framing: New, wood, structurally adequate.
B. Sign Surfaces: Exterior grade plywood with medium density overlay, minimum 3/4 inch thick, standard large sizes to minimize joints.
C. Rough Hardware: Galvanized.
D. Vinyl: Exterior quality; sign background of color as selected.
E. Lettering: Vinyl or digitally printed, colors as selected.

2.2 PROJECT IDENTIFICATION SIGN

A. Two vinyl graphic signs, 64 sq ft area total, bottom 4 feet above ground.
B. Graphic Design, Colors, Style of Lettering: Designated by Architect.

2.3 PROJECT INFORMATIONAL SIGNS

A. Vinyl informational signs of same colors and lettering as Project Identification sign, or standard products; size lettering to provide legibility at 100 foot distance.
B. Provide at field office, and directional signs to direct traffic into and within site. Relocate as Work progress requires.
C. Provide municipal traffic agency directional traffic signs to and within site.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install project identification sign within 14 days after date fixed by Notice to Proceed.
B. Erect at designated location.
C. Erect supports and framing on secure foundation, rigidly braced and framed to resist wind loadings.
D. Install sign surface plumb and level. Anchor securely.
E. Exposed surfaces of sign, supports, and framing to be treated lumber.

3.2 MAINTENANCE

A. Maintain signs and supports clean, repair deterioration and damage.

3.3 REMOVAL

A. Remove signs, framing, supports and foundations at completion of Project and restore the area.

END OF SECTION

SECTION 012300
ALTERNATES

PART 1 - GENERAL

1.1 SUMMARY

1. Section includes administrative and procedural requirements for alternates.

1.2 DEFINITIONS

1. Alternate: An amount proposed by bidders and stated on the Bid Form for certain work defined in the bidding requirements that may be added to or deducted from the base bid amount if the Owner decides to accept a corresponding change either in the amount of construction to be completed or in the products, materials, equipment, systems, or installation methods described in the Contract Documents.

    1. Alternates described in this Section are part of the Work only if enumerated in the Agreement.
    2. The cost or credit for each alternate is the net **addition to or deduction from** the Contract Sum to incorporate alternates into the Work. No other adjustments are made to the Contract Sum.

1.3 PROCEDURES

1. Coordination: Revise or adjust affected adjacent work as necessary to completely integrate work of the alternate into Project.

    1. Include as part of each alternate, miscellaneous devices, accessory objects, and similar items incidental to or required for a complete installation whether or not indicated as part of alternate.

2. Execute accepted alternates under the same conditions as other work of the Contract.

3. Schedule: A schedule of alternates is included at the end of this Section. Specification Sections referenced in schedule contain requirements for materials necessary to achieve the work described under each alternate.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 SCHEDULE OF ALTERNATES

1. Alternate No. 1: Connecting Existing Roof Drains to Storm System

    1. Base Bid: Storm connections at building addition and West of building addition as depicted on construction drawings.
    2. ADD Alternate: Additional roof drain connections and associated work (East of building addition) as depicted on site construction drawings.

2. Alternate No. 2: Sanitary Connection to Main at Keisel Road

    1. Base Bid: Refer to Plumbing and Civil drawings. Sanitary Connection to existing underground sanitary line in Room B113 at area of building addition.
    2. ADD Alternate: If investigative demolition finds that Sanitary line in room B113 is insufficient of size or depth for connection. Provide Sanitary connection to Main at Keisel Road as depicted on C1.1.

3. Alternate No. 3: Replacement of Existing Domestic Water Pipes

    1. Base Bid: No Scope
    2. ADD Alternate: Refer to plumbing plan P2.2, include all trades required for replacement of domestic water piping as shown. Including Acoustical ceiling tile and grid removal and replacement / reinstallation as required to provide access to area of work.

END OF SECTION 012300

SECTION 024119 - SELECTIVE DEMOLITION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Demolition and removal of selected portions of building or structure.
2. Demolition and removal of selected site elements.
3. Salvage of existing items to be reused or recycled.

1.2 MATERIALS OWNERSHIP

A. Unless otherwise indicated, demolition waste becomes property of Contractor.

1.3 FIELD CONDITIONS

A. Owner will occupy portions of building immediately adjacent to selective demolition area. Conduct selective demolition so Owner's operations will not be disrupted.

B. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.

C. Notify Architect of discrepancies between existing conditions and Drawings before proceeding with selective demolition.

D. Storage or sale of removed items or materials on-site is not permitted.

E. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.

1. Maintain fire-protection facilities in service during selective demolition operations.

F. Arrange selective demolition schedule so as not to interfere with Owner's operations.

PART 2 - EXECUTION

2.1 EXAMINATION

A. Verify that utilities have been disconnected and capped before starting selective demolition operations.

B. Inventory and record the condition of items to be removed and salvaged.

2.2 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

A. Existing Services/Systems to Remain: Maintain services/systems indicated to remain and protect them against damage.

B. Existing Services/Systems to Be Removed, Relocated, or Abandoned: Locate, identify, disconnect, and seal or cap off utility services and mechanical/electrical systems serving areas to be selectively demolished.

1. Owner will arrange to shut off indicated services/systems when requested by Contractor.
2. If services/systems are required to be removed, relocated, or abandoned, provide temporary services/systems that bypass area of selective demolition and that maintain continuity of services/systems to other parts of building.
3. Disconnect, demolish, and remove fire-suppression systems, plumbing, and HVAC systems, equipment, and components indicated on Drawings to be removed.
    a. Piping to Be Removed: Remove portion of piping indicated to be removed and cap or plug remaining piping with same or compatible piping material.
    b. Equipment to Be Removed: Disconnect and cap services and remove equipment.
    c. Equipment to Be Removed and Reinstalled: Disconnect and cap services and remove, clean, and store equipment; when appropriate, reinstall, reconnect, and make equipment operational.
    d. Equipment to Be Removed and Salvaged: Disconnect and cap services and remove equipment and deliver to Owner.

2.3 PROTECTION

A. Temporary Protection: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.

B. Temporary Shoring: Design, provide, and maintain shoring, bracing, and structural supports as required to preserve stability and prevent movement, settlement, or collapse of construction and finishes to remain, and to prevent unexpected or uncontrolled movement or collapse of construction being demolished.

C. Remove temporary barricades and protections where hazards no longer exist.

2.4 SELECTIVE DEMOLITION

A. General: Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:

1. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping. Temporarily cover openings to remain.
2. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.

3. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain portable fire-suppression devices during flame-cutting operations.
4. Maintain fire watch during and for at least 1 hours after flame-cutting operations.
5. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
6. Dispose of demolished items and materials promptly. Comply with requirements in Section 017419 "Construction Waste Management and Disposal."

B. Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.

C. Removed and Salvaged Items:

1. Clean salvaged items.
2. Pack or crate items after cleaning. Identify contents of containers.
3. Store items in a secure area until delivery to Owner.
4. Transport items to Owner's storage area designated by Owner .
5. Protect items from damage during transport and storage.

D. Removed and Reinstalled Items:

1. Clean and repair items to functional condition adequate for intended reuse.
2. Pack or crate items after cleaning and repairing. Identify contents of containers.
3. Protect items from damage during transport and storage.
4. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make item functional for use indicated.

E. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by Architect, items may be removed to a suitable, protected storage location during selective demolition and cleaned and reinstalled in their original locations after selective demolition operations are complete.

2.5 CLEANING

A. Remove demolition waste materials from Project site and recycle or dispose of them according to Section 017419 "Construction Waste Management and Disposal."

1. Do not allow demolished materials to accumulate on-site.
2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
3. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.
4. Comply with requirements specified in Section 017419 "Construction Waste Management and Disposal."

B. Burning: Do not burn demolished materials.

C. Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before selective demolition operations began.

END OF SECTION 024119

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.

1.2 REFERENCES

A. ACI 301 Specifications for Structural Concrete for Buildings.
B. ACI 305 Hot Weather Concreting.
C. ACI 306.1 Standard Specification for Cold Weather Concreting.
D. ACI 318 Building Code Requirements for Reinforced Concrete.
E. ANSI/ASTM A185 Welded Wire Fabric for Concrete Reinforcement.
F. ASTM A615 Deformed and Plain Billet Steel for Concrete Reinforcement.
G. ASTM C33 Concrete Aggregates.
H. ASTM C94 Ready Mixed Concrete.
I. ASTM C150 Portland Cement.
J. ASTM C260 Air Entraining Admixtures for Concrete.
K. ASTM C309 Liquid Membrane Forming Compounds for Curing Concrete.
L. ASTM D2103 Polyethylene Film and Sheeting.

1.3 RELATED SECTIONS

A. Section 042200- Masonry: rebar dowels, embedded in foundations, to match masonry wall rebar.
B. Section 051200- Structural Steel: Anchor bolts, embedded in foundations, bearing plates attached to form work.
C. Section 076200- Sheet Metal Flashing and Trim: Flashing reglets attached to formwork.

1.4 ACTION SUBMITTALS

A. Shop Drawings:

1. Construction Joint Layout: Indicate proposed construction joints required to construct the structure and as approved by the Architect.
2. Submit shop drawings of reinforcing steel to Architect for approval prior to fabrication. Submit under provisions established by Construction Manager.
3. Indicate reinforcement sizes, spacings, locations and quantities of reinforcing steel, bending and cutting schedules, and splices.

1.5 INFORMATIONAL SUBMITTALS

A. Material Certificates: For each of the following, signed by manufacturers:

1. Cementitious materials.
2. Admixtures.
3. Vapor retarders.
4. Joint-filler strips.

B. Material Test Reports: For the following, from a qualified testing agency:

1. Portland cement.
2. Fly ash.
3. Aggregates.
4. Admixtures:

C. Field quality-control reports.

1.6 QUALITY ASSURANCE

A. Perform work in accordance with ACI 301, ACI 305, ACI 306.1, and ACI 318.
B. Maintain copies of ACI 301, 305, 306.1, and 318 on site.
C. In the ACI publications, consider advisory provisions mandatory, as though the word “shall” had been substituted for “should” wherever “should” appears.
D. For conflicts in the provisions of the ACI publications, ACI 301 shall govern. For any conflicts between the ACI publications and this specification, this specification shall govern.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Comply with ASTM C94/C94M and ACI 301.

1.8 FIELD CONDITIONS

A. Cold-Weather Placement: Comply with ACI 301 and ACI 306.1.

PART 2 - PRODUCTS

2.1 CONCRETE, GENERAL

A. ACI Publications: Comply with ACI 301 unless modified by requirements in the Contract Documents.

2.2 FORM MATERIALS

A. Conform to ACI 301.
B. Plywood forms: APA B-B Plyform Class I sound undamaged sheets.
C. Lumber: spruce-pine-fir #2 or better; with grade stamp clearly visible.
D. Steel Forms: Minimum thickness to support weight of concrete with minimum deflection.
E. Form Ties: removable or snap-off metal, of fixed or adjustable length.

2.3 REINFORCING STEEL

A. Reinforcing Steel: ASTM A615, 60 ksi yield grade billet steel deformed bars, uncoated finish.
B. Welded Wire Fabric: Plain type, ANSI/ASTM A185; in flat sheets; uncoated finish.

2.4 CONCRETE MATERIALS

A. Cementitious Materials:

1. Portland Cement: ASTM C150/C150M, Type I.
2. Fly Ash: ASTM C618, Class C or F.
3. Slag Cement: ASTM C989/C989M, Grade 100 or 120.

B. Normal-Weight Aggregates: ASTM C33/C33M, Class 3M coarse aggregate or better, graded. Provide aggregates from a single source.
C. Water and Water Used to Make Ice: ASTM C94/C94M, potable

2.5 VAPOR RETARDERS

A. Sheet Vapor Retarder, Class A: ASTM E1745, Class A; thickness as indicated on drawings. Include manufacturer's recommended adhesive or pressure-sensitive tape.

2.6 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. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than portland cement in concrete as follows:

1. Fly Ash or Other Pozzolans: 25 percent by mass.
2. Total of Fly Ash or Other Pozzolans, Slag Cement: 50 percent by mass, with fly ash or pozzolans not exceeding 25 percent by mass.
3. Total of Fly Ash or Other Pozzolans: 35 percent by mass with fly ash or pozzolans not exceeding 25 percent by mass.

C. Admixtures: Use admixtures in accordance with manufacturer's written instructions.

1. Use admixture in concrete, as required, for placement and workability.

D. WVRA: ASTM C 494/C 494M, Type S; complex catalyzed hydrous silicate, water and vapor proofing liquid admixture.
1. Basis-of-Design Product: Subject to compliance with requirements, provide, Specialty Products Group; Vapor Lock 20/20™ or comparable product by one of the following:
   a. Concure.
   b. Moxie International.
2. Properties:
   a. W/C Ratio: Maximum 0.52 without written permission and approval of mix design by WVRA manufacturer.
   b. W/C Ratio: Minimum 0.42 without written permission and approval of mix design by WVRA manufacturer.
   c. Water Seepage or Permeability: Not to exceed 2.0 x 10-9 ft/s (6 x 10-8 cm/s) according to ASTM D 5084.
   d. Internal Wet Curing: Additional curing is unnecessary when using WVRA admixtures, except during hot or cold weather concreting conditions; follow ACI 306.1 and ACI 301
3. Warranty:
   a. Design mixture containing a WVRA must be approved in writing by WVRA manufacturer.
   b. Installer shall be WVRA certified.
   c. Cylinder Testing: Testing agency or WVRA manufacturer to obtain concrete cylinder from mockup and test at testing agency specified by WVRA manufacturer according to ASTM D 5084. Cost of test shall be borne by WVRA manufacturer.
   d. Manufacturer's Warranty: WVRA admixture manufacturer agrees to repair, replace or re-apply damaged floor covering or

adhesive, surface treatment, coating or paint materials that fail within specified warranty period.

(1) Failures include, but are not limited to, proven claims made on any floor covering or adhesive, surface treatment, coating or paint that sustains damage due to moisture vapor migration or alkali efflorescence attack, which had migrated through concrete, and includes blistering, peeling, leakage, seepage, or absorption of moisture, petroleum, sulfides, or acids.

(2) Warranty does not apply to, or cover, the following:

(a) Water vapor migration moving laterally under a floor covering originating from external sources such as drains or broken pipes.

(b) Structural cracks or damage or conditions caused by neglect, abuse, acts of God or nature; other materials and/or conditions resulting from inferior application or workmanship or design, whether intentional or not; or situations beyond its control.

(c) Liquidated, incidental and/or consequential damages or for contribution or indemnity.

(3) Material Warranty Period: 10 years from date of Substantial Completion

(4) Third-Party Labor and Material Insurance:

(5) Liability insurance purchased by WVRA manufacturer (the first party) from a legitimate insurer (the second party) for protection against the claims of end-user and all stakeholders in Project (the third) party.

(a) Coverage Amount: $20 million dollars U.S.

4. Do not apply any Liquid Floor Treatment Applications to concrete that contains WVRA admixture. The addition of the WVRA removes all required Liquid Floor Treatment applications from construction documents.

5. Inspections: For concrete containing WVRA admixture provide the following:

a. Moisture Testing: Conducted by WVRA manufacturer or appointed representative prior to installation of moisture sensitive coatings and adhesives. No other moisture testing by installers is required.

b. Bond Testing: Conducted by WVRA manufacturer or appointed representative on moisture sensitive materials installed by Contractor.

c. Ph Testing: Conducted by WVRA manufacturer or appointed representative.

d. Report test results in writing to Architect and Contractor within 48 hours of testing.

e. Authorization to proceed with installation of moisture sensitive coatings and materials must be obtained in writing from WVRA manufacturer.

E. WVRA Testing: ASTM D 5084; 4- by 8-inch cylinder size obtained by WVRA manufacturer or appointed representative.

2.7 ACCESSORIES

A. Bonding Agent: ASTM C932.

B. Vapor Barrier: ASTM D2103, 6 mil thick clear polyethylene film.

C. Non-Shrink Grout: Premixed compound with non-metallic aggregate, cement, water reducing and plasticizing agents; capable of minimum compressive strength of 4000 psi.

D. Drilled in Concrete Anchors (DCA's). Provide stainless steel or galvanized to F185 coating per ASTM A153 for DCA's in contact with preservative treated wood.

E. Flashing Reglets: Galvanized steel; longest possible lengths; alignment splines for joints; securable to formwork.
F. Construction Joints: 2”x2” key, formed with prefabbed galvanized steel or wood forms.
G. Expansion Joints: ½” wide with bituminous impregnated fiberboard filler conform to ANSI/ASTM D994.
H. Form Release Agent: Colorless material which will not stain concrete, absorb moisture, or impair natural bonding or color characteristics of coating intended for use on concrete.

2.8 CURING MATERIALS

A. Water: Clean and drinkable.
B. Membrane Curing Compound: ASTM C309
C. Polyethelene Film: ASTM D2103, 4 mil thick, clear color.
D. Sealer: BASF Kure and Seal 30, or equal, at exposed concrete floor areas. Coordinate with architectural finish schedule.

2.9 CONCRETE MIXTURES

A. Class A: Normal-weight concrete used for footings, grade beams, and tie beams.

1. Minimum Compressive Strength: 3000 psi at 28 days.
2. Slump Limit: 4 inches, plus or minus 1 inch

B. Class B: Normal-weight concrete used for foundation and retaining walls.

1. Minimum Compressive Strength: 3000 psi at 28 days.
2. Slump Limit: 4 inches, plus or minus 1 inch

C. Class C: Normal-weight concrete used for interior slabs-on-ground.

1. Minimum Compressive Strength: 4000 psi at 28 days.
2. Slump Limit: 4 inches, plus or minus 1 inch

D. Class D: Normal-weight concrete used for interior suspended slabs.

1. Minimum Compressive Strength: 4000 psi at 28 days.
2. Slump Limit: 4 inches, plus or minus 1 inch

E. Class F: Normal-weight concrete used for concrete toppings.

1. Minimum Compressive Strength: 4000 psi at 28 days.
2. Slump Limit: 4 inches, plus or minus 1 inch.

F. Add air entraining agent to mix for all concrete except interior footings, interior walls, interior piers and interior slabs.

PART 3 - EXECUTION

3.1 FORMWORK EXECUTION

A. Verify lines, levels, and measurement before proceeding with formwork.
B. Hand trim sides and bottom of earth forms; remove loose dirt.
C. Align for joints.
D. Do not apply form release agent where concrete surfaces receive special finishes or applied coatings which may be affected by agent.

E. Coordinate work of other Sections in forming and setting openings, slots, recesses, chases, sleeves, bolts, anchors and other inserts.

3.2 REINFORCEMENT

A. Place, supports, and secure reinforcement against displacement.
B. Locate reinforcing splices at points of minimum stress.

3.3 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. Install reglets to receive waterproofing and to receive through-wall flashings in outer face of concrete frame at exterior walls, where flashing is shown at lintels, shelf angles, and other conditions.

3.4 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.

3.5 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.
C. Control Joints in Slabs-on-Ground: Form weakened-plane control joints, sectioning concrete into areas as indicated. Construct control joints for a depth equal to at least one-fourth of concrete thickness as follows:
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.

3.6 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 unless approved by Architect in writing, but not to exceed the amount indicated on the concrete delivery ticket.

1. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.

D. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301, but not to exceed the amount indicated on the concrete delivery ticket.

1. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.

E. 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.

F. 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.

3.7 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 exposed to public view.

2. ACI 301Surface Finish SF-2.0: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams.

    a. Patch voids larger than 3/4 inch wide or 1/2 inch deep.
    b. Remove projections larger than 1/4 inch.
    c. Patch tie holes.
    d. Surface Tolerance: ACI 117 Class B.
    e. Locations: Apply to concrete surfaces exposed to public view, to receive a rubbed finish, or to be covered with a coating or covering material applied directly to concrete.

3.8 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.

C. Flatness and levelness tolerances for floor slabs shall be in accordance with ACI 117, section 4.5.6 and/or 4.5.7.

1. All areas, except as described in b. or c., below, or unless noted otherwise, shall conform to ACI 117 “conventional straightedged “construction, i.e., 5/16” in ten feet or F_F=20 & F_L=15 for the “F” number method.
2. For slabs intended to support a synthetic or hardwood gym floor, use “very flat” construction per ACI 117, i.e., 1/8” in 10 feet or F_F=50 & F_L=30 for the “F” number method.
3. For slabs intended to be finished with cork tile, use “flat” construction per ACI 117, i.e., 3/16” in 10 feet or F_F=30 & F_L=20 for the “F” number method.

D. Pitch to drains at 1/8” per foot nominal. Refer to plumbing plans for drain locations.

3.9 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. Equipment Bases and Foundations:

1. Coordinate sizes and locations of concrete bases with actual equipment provided.
2. Minimum Compressive Strength: 4000 psi at 28 days.

C. Steel Pan Stairs: Provide concrete fill for steel pan stair treads, landings, and associated items.

1. Cast-in inserts and accessories, as shown on Drawings.
2. Screed, tamp, and trowel finish concrete surfaces.

3.10 TOLERANCES

A. Conform to ACI 117.

3.11 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing and inspecting agency to perform tests and inspections and to submit reports.

1. Testing agency shall 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/C31M.
2. Testing agency shall 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 shall include reporting requirements of ASTM C31/C31M, ASTM C39/C39M, 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.

B. 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.

C. 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.
5. Verification of concrete strength before removal of shores and forms from beams and slabs.
6. Batch Plant Inspections: On a random basis, as determined by Architect.

D. Concrete Tests: Testing of composite samples of fresh concrete obtained in accordance with ASTM C 172/C 172M shall be performed in accordance with the following requirements:

1. Testing Frequency: Three concrete test cylinders will be taken for every 150 or less cubic yards of each class of concrete placed each day.

    a. When frequency of testing provides fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.

2. Slump: ASTM C143/C143M:

    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. Slump Flow: ASTM C1611/C1611M:

    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.

4. Air Content: ASTM C231/C231M pressure method, for normal-weight concrete; ASTM C173/C173M volumetric method, for structural lightweight concrete.

    a. One test for each composite sample, but not less than one test for each day's pour of each concrete mixture.

5. Concrete Temperature: ASTM C1064/C1064M:

    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.

6. Unit Weight: ASTM C567/C567M fresh unit weight of structural lightweight concrete.

    a. One test for each composite sample, but not less than one test for each day's pour of each concrete mixture.

7. Compression Test Specimens: ASTM C31/C31M:

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.
b. Cast, initial cure, and field cure two sets of two standard cylinder specimens for each composite sample.

8. Compressive-Strength Tests: ASTM C39/C39M.

a. Test one set of two laboratory-cured specimens at seven days and one set of two specimens at 28 days.
b. Test one set of two field-cured specimens at seven days and one set of two specimens at 28 days.
c. A compressive-strength test shall be the average compressive strength from a set of two specimens obtained from same composite sample and tested at age indicated.

9. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, Contractor shall evaluate operations and provide corrective procedures for protecting and curing in-place concrete.
10. Strength of each concrete mixture will be satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength, and no compressive-strength test value falls below specified compressive strength by more than 500 psi if specified compressive strength is 5000 psi, or no compressive strength test value is less than 10 percent of specified compressive strength if specified compressive strength is greater than 5000 psi.
11. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.
12. Additional Tests:

a. Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect.
b. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C42/C42M or by other methods as directed by Architect.

1) Acceptance criteria for concrete strength shall be in accordance with ACI 301 section 1.6.6.3.

13. Additional testing and inspecting, at Owner's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
14. Correct deficiencies in the Work that test reports and inspections indicate do not comply with the Contract Documents.

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.
8. Protect concrete surfaces scheduled to receive surface hardener or polished concrete finish using Floor Slab Protective Covering.

END OF SECTION

SECTION 042200
CONCRETE UNIT MASONRY

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Concrete masonry units.
2. Clay face brick.
3. Concrete face brick.
4. Steel reinforcing bars.

1.2 RELATED SECTIONS

A. Section 033000- Cast-in-place Concrete: Placement of reinforcing bars.
B. Section 079200- Joint Sealers: rod and sealant at control and expansion joints.

1.3 REFERENCES

A. ACI 530/ASCE 5/TMS 402 Building Code Requirements for Masonry Structures.
B. ACI 530.1/ASCE 6/TMS 602 Specifications for Masonry Structures.
C. ANSI/ASTM A82 Cold Drawn Steel Wire for Concrete Reinforcement.
D. ANSI/ASTM C216 Facing Brick(Solid Masonry Units Made From Clay or Shale).
E. ASTM A307 Carbon Steel Externally Threaded Standard Fasteners.
F. ASTM C67-Standard Test Methods for Sampling and Testing Brick and Structural Clay Tile.
G. ASTM C90 Load Bearing Concrete Masonry Units.
H. ASTM C91 Masonry Cement
I. ASTM C94 Ready Mixed Concrete
J. ASTM C144 Aggregate for Masonry Mortar
K. ASTM C150 Portland Cement
L. ASTM C207 Hydrated Lime for Masonry Purposes
M. ASTM C270 Mortar for Unit Masonry
N. ASTM C387 Packaged, Dry, Combined Materials, for Mortar and Concrete
O. ASTM C404 Aggregates for Masonry Grout
P. ASTM C476 Grout for Masonry IMIAWC International Masonry Industry All Weather Council: Recommended Practices and Guide Specifications for Clod Weather Masonry Construction

1.4 DEFINITIONS

A. CMU(s): Concrete masonry unit(s).
B. Reinforced Masonry: Masonry containing reinforcing steel in grouted cells.

1.5 ACTION SUBMITTALS

A. Shop Drawings: For reinforcing steel. Detail bending, lap lengths, and placement of unit masonry reinforcing bars. Comply with ACI 315.
B. Samples: For each type and color of the following:

1. Face brick
2. Colored-aggregate mortar.

1.6 INFORMATIONAL SUBMITTALS

A. Material Certificates: For each type and size of product. For masonry units, include data on material properties material test reports substantiating compliance with requirements.

1.7 QUALITY ASSURANCE

A. Sample Panels: Build sample panels to verify selections made under Sample submittals and to demonstrate aesthetic effects. Comply with requirements in Section 014000 "Quality Requirements" for mockups.

1. Build sample panels for each type of exposed unit masonry construction, typical exterior wall, typical interior wall, typical exterior and interior walls in sizes approximately 16 inches long by 24 inches high**.**

1.8 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.

1.9 EFFLORESCENCE

A. Samples of veneer for exterior walls will be tested for effloresence per ASTM C67 prior to acceptance of veneer. The samples shall be taken directly from the pallets delivered to the site, at the rate of one sample per 5000 units.
B. In the event that efflorescence appears after walls are in place, the Architect shall select samples of veneer and mortar taken directly from the wall to be tested for chemical content. If efflorescence producing materials are found in the veneer or mortar in amounts exceeding the limits called for by this specification and the referenced ASTM standards, the contractor shall bear the cost of the testing and remedial work on the masonry. If efflorescence producing materials in both the veneer and the mortar do not exceed the limits as stated above, the cost of the testing and patching the areas where samples were removed shall be by Owner.

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.
C. Fire-Resistance Ratings: Comply with requirements for fire-resistance-rated assembly designs indicated.

1. Where fire-resistance-rated construction is indicated, units shall be listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction.

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 for exposed units and where indicated.

C. CMUs: ASTM C90.

1. Masonry for the load-bearing wythe of all load-bearing walls and all exterior walls shall have a masonry compressive strength, f'm, of 2500 psi
2. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 3750 psi for load-bearing walls, and 1900 psi for all other walls.
3. Density Classification: Normal weight.

2.3 FACE BRICK

A. Face Brick: ANSI/ASTM C216, Type FBS, Grade SW; color as follows:
   a. Bowerston #1425 Blush Buff Flash Bark, Modular

2. The saturation coefficient requirement of ANSI/ASTM C216 shall not be waived.
3. Maximum water absorption shall not exceed 5% by weight of unit.
4. The initial rate of absorption shall not be less than 6 grams per minute nor more than 20 grams per minute.
5. The maximum permissible extent of chippage 0"-1/4" in from the edge and 0"-3/8" in from the corner shall not exceed 40%.
6. If cored units are supplied, three cores of 1-1/2"maximum diameter shall be the pattern provided.

B. Brick Masonry Units: Nominal modular size of 2-2/3" high x 8" long x 4" wide and nominal utility size 4" high x 12" long x 4" wide, or as indicated in specific brick selection. Provide special units for bull nosed corners.

2.4 CONCRETE LINTELS

A. Concrete Lintels: ASTM C1623, matching CMUs in color, texture, and density classification; and with reinforcing bars indicated. Provide lintels with net-area compressive strength not less than that of CMUs.

2.5 MORTAR AND GROUT MATERIALS

A. Portland Cement: ASTM C150/C150M, Type I, gray color.
B. Hydrated Lime: ASTM C207, Type S.
C. Portland Cement-Lime Mix: Packaged blend of portland cement and hydrated lime containing no other ingredients.
D. Masonry Cement: ASTM C91/C91M, Type S.
E. Aggregate for Mortar: ASTM C144, Standard masonry type.

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.

F. Aggregate for Grout: ASTM C404.

G. Cold-Weather Admixture: Non-chloride, non-corrosive, accelerating admixture complying with ASTM C494/C494M, Type C, and recommended by manufacturer for use in masonry mortar of composition indicated.
H. Water-Repellent Admixture: Liquid water-repellent mortar admixture intended for use with CMUs containing integral water repellent from same manufacturer.
I. Water: Clean and Potable.

2.6 REINFORCEMENT AND ANCHORAGE

A. Uncoated-Steel Reinforcing Bars: ASTM A615/A615M or ASTM A996/A996M, Grade 60.
B. Masonry-Joint Reinforcement, General: ASTM A951/A951M.

1. Interior Walls: Mill- galvanized, carbon steel.
2. Exterior Walls: Hot-dip galvanized carbon steel.
3. Wire Size for Side Rods: 9 gauge (0.148-inch) diameter.
4. Wire Size for Cross Rods: 9 gauge (0.148-inch) diameter.
5. Spacing of Cross Rods: Not more than 16 inches o.c.
6. Provide in lengths of not less than 10 feet, with prefabricated corner and tee units.
7. Cavity Walls: Standard hook and eye adjustable anchors.
8. Strap Anchors: Bent steel shape, one inch wide x 3/16" thick.
9. Dovetail Anchors: Bent steel strap, galvanized finish, 24 gauge with 12 gauge wire triangles.
10. Built-in Anchors: ASTM A307.
11. Reinforcing Steel: Deformed type, specified in Section 03001; uncoated finish.

C. 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/A82M, with ASTM A153/A153M, Class B-2 coating.
2. Steel Sheet, Galvanized after Fabrication: ASTM A1008/A1008M, Commercial Steel, with ASTM A153/A153M, Class B coating.
3. Steel Plates, Shapes, and Bars: ASTM A36/A36M.

D. Partition Top Anchors: 0.105-inch- thick metal plate with a 3/8-inch- diameter metal rod 6 inches long welded to plate and with closed-end plastic tube fitted over rod that allows rod to move in and out of tube. Fabricate from steel, hot-dip galvanized after fabrication.
E. Rigid Anchors: Fabricate from steel bars 1-1/2 inches wide by 1/4 inch thick by 24 inches long, with ends turned up 2 inches or with cross pins unless otherwise indicated.

1. Corrosion Protection: Unless otherwise required, protect joint reinforcement, ties and anchors from corrosion by galvanizing in conformance with Sections 1.13.4.3 of ACI 530/ASCE 5/TMS 402 and Section 2.4 F of ACI 530.1/ASCE 6/TMS 602.

F. All intersecting masonry walls (load and nonloadbearing) shall be anchored or bonded together by one of the methods described in the 2015 Michigan Building Code, unless noted otherwise. Masonry walls intersecting a perpendicular wall of a different material shall be anchored to that wall by means of steel connectors per 2015 Michigan Building Code, unless noted otherwise.
G. Interior nonloadbearing masonry walls, with an unsupported length between intersecting perpendicular walls greater than 36 times the wall thickness, shall be braced to the floor or roof structure above at intervals not exceeding 36 times the wall thickness, unless noted otherwise.

2.7 FLASHING

A. Flexible Flashing: Use one of the following unless otherwise indicated:

1. Copper-Laminated Flashing: 5-oz./sq. ft. copper sheet bonded between two layers of glass-fiber cloth. Use only where flashing is fully concealed in masonry.
2. Rubberized-Asphalt Flashing: Composite flashing product consisting of a pliable, adhesive rubberized-asphalt compound, bonded to a high-density, cross-laminated polyethylene film to produce an overall thickness of not less than 0.030 inch.

2.8 MISCELLANEOUS MASONRY ACCESSORIES

A. Bond-Breaker Strips: Asphalt-saturated felt complying with ASTM D226/D226M, Type I (No. 15 asphalt felt).
B. Drilled in Concrete Anchors (DCA's) for grouted masonry. Provide stainless steel or galvanized to G185 coating per ASTM A153 for DCA's in contact with preservative treated wood.
C. Drilled in Concrete Anchors (DCA's) for hollow masonry. Provide stainless steel or galvanized to G185 coating per ASTM A153 for DCA's in contact with preservative treated wood.
D. Cavity Wall Drainage: Mortar Net, or equal with head joint cell vent as indicated on architectural drawings.
E. Control Joints: Form with preformed rubber or PVC joint devices.

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 portland cement-lime or masonry cement mortar unless otherwise indicated.
3. For exterior masonry, use portland cement-lime or masonry cement mortar.
4. For reinforced masonry, use portland cement-lime or masonry cement mortar.
5. 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, Proportion Specification. 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.
2. For reinforced masonry, use Type S.
3. For exterior, above-grade, load-bearing and nonload-bearing walls and parapet walls; for interior load-bearing walls; for interior nonload-bearing partitions; and for other applications where another type is not indicated, use Type N.
4. For interior nonload-bearing partitions, Type O may be used instead of Type N.

D. Colored-Aggregate Mortar: Produce required mortar color by using colored aggregates and natural color or white cement as necessary to produce required mortar color.

1. Application: Use colored-aggregate mortar for exposed mortar joints with the following units:

a. Face Brick

E. 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, Table 1 or 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 10 inches as measured according to ASTM C143/C143M.

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. Where built-in items are to be embedded in cores of hollow masonry units, place a layer of metal lath, wire mesh, or plastic mesh in the joint below, and rod mortar or grout into core.

F. 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.

1. Space reinforcement not more than 16 inches o.c.
2. Space reinforcement not more than 8 inches o.c. in foundation walls and parapet walls.
3. Provide reinforcement not more than 8 inches above and below wall openings and extending 12 inches beyond openings in addition to continuous reinforcement.

B. Interrupt joint reinforcement at control and expansion joints unless otherwise indicated.

C. Provide continuity at wall intersections by using prefabricated T-shaped units.

D. Provide continuity at corners by using prefabricated L-shaped units.

3.6 FLASHING

A. General: Install embedded flashing at ledges and other obstructions to downward flow of water in wall where indicated.
B. Install flashing as follows unless otherwise indicated:

1. Prepare masonry surfaces so they are smooth and free from projections that could puncture flashing. Where flashing is within mortar joint, place through-wall flashing on sloping bed of mortar and cover with mortar. Before covering with mortar, seal penetrations in flashing with adhesive, sealant, or tape as recommended by flashing manufacturer.
2. At lintels, extend flashing a minimum of 8 inches into masonry at each end. At heads and sills, extend flashing 8 inches at ends and turn up not less than 2 inches to form end dams.
3. Install metal drip edges beneath flexible flashing at exterior face of wall. Stop flexible flashing 1/2 inch back from outside face of wall, and adhere flexible flashing to top of metal drip edge.
4. Install metal flashing termination beneath flexible flashing at exterior face of wall. Stop flexible flashing 1/2 inch back from outside face of wall, and adhere flexible flashing to top of metal flashing termination.

C. Install single-wythe CMU flashing system in bed joints of CMU walls where indicated to comply with manufacturer's written instructions. Install CMU cell pans with upturned edges located below face shells and webs of CMUs above and with weep spouts aligned with face of wall. Install CMU web covers so that they cover upturned edges of CMU cell pans at CMU webs and extend from face shell to face shell.

3.7 WEEPS

A. Provide weep holes at 24” on center horizontally above through-wall flashing and at bottom of walls.
B. Weep holes and cavity vents shall consist of un-mortared, open head joints with honeycomb type inserts.
C. The weep hole shall extend through the lowest bed joint to the top side of the through-wall flashing.
D. Provide cavity vents at the top of each cavity space at 48” on center horizontally.

3.8 REINFORCED UNIT MASONRY

A. Temporary Formwork and Shores: Construct formwork and shores as needed to support reinforced masonry elements during construction.

1. Construct formwork to provide shape, line, and dimensions of completed masonry as indicated. Make forms sufficiently tight to prevent leakage of mortar and grout. Brace, tie, and support forms to maintain position and shape during construction and curing of reinforced masonry.
2. Do not remove forms and shores until reinforced masonry members have hardened sufficiently to carry their own weight and that of other loads that may be placed on them during construction.

B. Placing Reinforcement: Comply with requirements in TMS 602/ACI 530.1/ASCE 6.
C. Grouting: Do not place grout until entire height of masonry to be grouted has attained enough strength to resist grout pressure.

1. Comply with requirements in TMS 602/ACI 530.1/ASCE 6 for cleanouts and for grout placement, including minimum grout space and maximum pour height.

2. Limit height of vertical grout pours to not more than 60 inches.

3.9 FIELD QUALITY CONTROL

A. Reference structural drawings for additional Special Inspection requirements as designated per Chapter 17 of the Michigan Building Code.
B. 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 shall be done at Owners expense.
C. Inspections: Special inspections according to Level C 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.

D. Testing Prior to Construction: One set of tests.
E. Testing Frequency: One set of tests for each 5000 sq. ft. of wall area or portion thereof.
F. Concrete Masonry Unit Test: For each type of unit provided, according to ASTM C140 for compressive strength.
G. Mortar Aggregate Ratio Test (Proportion Specification): For each mix provided, according to ASTM C780.
H. Mortar Test (Property Specification): For each mix provided, according to ASTM C780. Test mortar for compressive strength.
I. Grout Test (Compressive Strength): For each mix provided, according to ASTM C1019.
J. Prism Test: For each type of construction provided, according to ASTM C1314 at 28 days.

3.10 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.

END OF SECTION

SECTION 051200
STRUCTURAL STEEL FRAMING

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes structural steel framing members, base and bearing plates; anchor bolts for structural steel; beams, girders, columns, posts; connecting materials for framing structural steel; fasteners for connecting structural steel items; lintels; and grouting under base plates.
B. Related Sections:

1. Section 052100 – Steel Joist Framing
2. Section 053100 – Steel Decking

1.2 DEFINITIONS

A. Structural Steel: Elements of the structural frame indicated on Drawings and as described in ANSI/AISC 303.

1.3 REFERENCES

A. AISC (American Institute of Steel Construction) - Specification for Structural Steel Buildings, Allowable Stress Design (ASD).
B. AISC (American Institute of Steel Construction) - Code of Standard Practice for Structural Steel Buildings and Bridges.
C. ASTM A36/A36M - Carbon Structural Steel.
D. ASTM A53 Hot Dipped, Zinc coated Welded and Seamless Steel Pipe.
E. ASTM A325 - Structural Bolts, Steel, Heat-Treated, 120/105 ksi Minimum Tensile Strength.
F. ASTM A490 - Heat-Treated Steel Structural Bolts, 150 ksi Minimum Tensile Strength.
G. ASTM A500 - Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
H. ASTM A992 – Standard Specification for Structural Steel Shapes.
I. ASTM F1554-Standard Specification for Anchor Bolts, Steel, 36, 55, and 105 ksi Yield Strength
J. AWS A2.4 (American Welding Society) - Standard Symbols for Welding, Brazing, and Nondestructive Examination.
K. AWS D1.1 (American Welding Society) - Structural Welding Code - Steel.
L. RCSC (Research Council on Structural Connections) - Specification for Structural Joints Using ASTM A325 or A490 Bolts, LRFD or ASD.
M. SSPC (Steel Structures Painting Council) - Steel Structures Painting Manual, Volumes 1 and 2.
N. UL (Underwriters Laboratory, Inc.) - Fire Resistance Directory.

1.4 SUBMITTALS

A. Division 1 – Submittals procedures: Submittal requirements.
B. Shop Drawings:

1. Indicate profiles, sizes, spacing, locations of structural members, openings, attachments, and fasteners.
2. Connections.
3. Cambers. And shear connectors.

4. Indicate welded connections with AWS A2.4 welding symbols. Indicate weld lengths.

C. Welders Certificates: Certify welders employed on the Work, verifying AWS qualification within previous 12 months.

1.5 QUALITY ASSURANCE

A. Fabricate structural steel members in accordance with AISC Code of Standard Practice.
B. Perform Work in accordance with AISC Code of Standard Practice, Section 10.
C. Maintain one copy of each document on site.

PART 2 - PRODUCTS

2.1 STRUCTURAL-STEEL MATERIALS

A. W-Shapes: ASTM A992/A992M.
B. Channels, Angles-Shapes: ASTM A36/A36M.
C. Plate and Bar: ASTM A36/A36M.
D. Cold-Formed Hollow Structural Sections:

1. All square, rectangular and round sections with a wall thickness of 5/8” or less: ASTM A500/A500M, Grade B structural tubing.

E. Steel Pipe: Wall thickness greater than 5/8”: ASTM A53/A53M, Type E or Type S, Grade B.
F. Welding Electrodes: Comply with AWS requirements.

2.2 BOLTS AND CONNECTORS

A. High-Strength A325 Bolts, Nuts, and Washers: ASTM F3125/F3125M, Grade A325, Type 1, heavy-hex steel structural bolts.
B. High-Strength A490 Bolts, Nuts, and Washers: ASTM F3125/F3125M, Grade A490, Type 1, heavy-hex steel structural bolts.
C. Shear Stud Connectors: ASTM A108, AISI C-1015 through C-1020, headed-stud type, cold-finished carbon steel; AWS D1.1/D1.1M, Type B.

2.3 RODS

A. Unheaded Anchor Rods: ASTM F1554, Grade 36.
B. Headed Anchor Rods: ASTM F1554, Grade 36, straight.
C. Threaded Rods: ASTM A36/A36M.

2.4 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.

2.5 SHRINKAGE-RESISTANT GROUT

A. Nonmetallic, Shrinkage-Resistant Grout: ASTM C1107/C1107M, factory-packaged, nonmetallic aggregate grout, noncorrosive and non-staining, mixed with water to consistency suitable for application and a 30-minute working time. Capable of developing minimum compressive strength of 4000 psi at 28 days.

2.6 FABRICATION

A. Structural Steel: Fabricate and assemble in shop to greatest extent possible. Fabricate in accordance with ANSI/AISC 303 and to ANSI/AISC 360.
B. Shear Stud Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Weld using automatic end welding of headed-stud shear connectors in accordance with AWS D1.1/D1.1M and manufacturer's written instructions.

2.7 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/D1.1M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.

2.8 SOURCE QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform shop tests and inspections.

1. Allow testing agency access to places where structural-steel work is being fabricated or produced to perform tests and inspections.
2. Bolted Connections: Inspect and test shop-bolted connections in accordance with RCSC's "Specification for Structural Joints Using High-Strength Bolts."
3. Welded Connections: Visually inspect shop-welded connections in accordance with AWS D1.1/D1.1M and the following inspection procedures, at testing agency's option:

a. Liquid Penetrant Inspection: ASTM E165/E165M.
b. Magnetic Particle Inspection: ASTM E709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration are not accepted.
c. Ultrasonic Inspection: ASTM E164.
d. Radiographic Inspection: ASTM E94/E94M.

4. In addition to visual inspection, test and inspect shop-welded shear stud connectors in accordance with requirements in AWS D1.1/D1.1M.
5. Prepare test and inspection reports.

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 ANSI/AISC 303 and ANSI/AISC 360.
B. Baseplates Bearing Plates: Clean concrete- and masonry-bearing surfaces of bond-reducing materials, and roughen surfaces prior to setting plates. Clean bottom surface of plates.

1. Set plates for structural members on wedges, shims, or setting nuts as required.
2. 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 ANSI/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/D1.1M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.

1. Comply with ANSI/AISC 303 and ANSI/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. Reference structural drawings for additional Special Inspection requirements as designated per Chapter 17 of the Michigan Building Code.
B. 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.

C. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

1. Bolted Connections: Inspect and test 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/D1.1M.

a. In addition to visual inspection, test and inspect field welds in accordance with AWS D1.1/D1.1M and the following inspection procedures, at testing agency's option:

1) Liquid Penetrant Inspection: ASTM E165/E165M.

2) Magnetic Particle Inspection: ASTM E709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration are not accepted.
3) Ultrasonic Inspection: ASTM E164.
4) Radiographic Inspection: ASTM E94/E94M.

END OF SECTION

SECTION 052100
STEEL JOIST FRAMING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Open web steel joists and joist girders with bridging, attached seats and anchors.
2. Framed Floor and roof openings greater than 18”.
3. Joist accessories.

1.2 RELATED SECTIONS

A. Section 033000 – Cast-in-place Concrete: Grouting bearing plates.
B. Section 051200 – Structural Steel Framing.
C. Section 053100 – Steel Decking: Support framing for small openings in floor and roof deck.
D. Section 055000 – Metal Fabrications: Non-framing steel fabrications.

1.3 REFERENCES

A. ASTM A325-High Strength Bolts for Structural Steel Joints.
B. AWS D1.1 – Structural Welding Code.
C. SJI – Standard Specifications for Open Web Steel Joists K Series.
D. SJI – Standard Specifications for Longspan Steel Joists LH Series and Deep Longspan Steel Joists DLH series.
E. SJI – Standard Specifications for Joist Girders.
F. SJI – Recommended Code of Standard Practice for Steel Joists and Joist Girders.
G. SSPC – Steel Structures Painting Council.

1.4 ACTION SUBMITTALS

A. 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.
3. Submit shop drawings to architect for approval prior to fabrication.

1.5 INFORMATIONAL SUBMITTALS

A. Welding certificates.
B. Field quality-control reports.

1.6 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 according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

PART 2 - PRODUCTS

2.1 K-SERIES STEEL JOISTS

A. Manufacture steel joists of type indicated according to "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.
B. Steel Joist Substitutes: Manufacture according to "Standard Specifications for Open Web Steel Joists, K-Series" in SJI's "Specifications," with steel-angle or -channel members.
C. Do not camber joists.

2.2 LONG-SPAN STEEL JOISTS

A. Manufacture steel joists according to "Standard Specification for Longspan Steel Joists, LH-Series and Deep Longspan Steel Joists, DLH-Series" in SJI's "Specifications," with steel-angle top- and bottom-chord members; of joist type and end and top-chord arrangements as indicated.
B. Joist type: LH-series long-span steel joists.
C. Camber: As required to offset deflection due to the joist’s own weight.

2.3 STEEL JOIST GIRDERS

A. Manufactured joist girders according to “Standard Specification for Joist Girders” n SJI’s “Specifications”, with steel angle top and bottom-chord members; with end and top-chord arrangements as follows:

1. End arrangement: Underslung with bottom-chord extension.
2. Top-Chord Arrangement: Parallel.
3. Camber: According to SJI’s “Specifications”.

2.4 PRIMERS

A. Primer: SSPC-Paint 15, or manufacturer's standard shop primer complying with performance requirements in SSPC-Paint 15.

2.5 JOIST ACCESSORIES

A. Bridging: 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. Bridging: Schematically indicated. Detail and fabricate according to SJI's "Specifications." Furnish additional erection bridging if required for stability.
C. Bridging: Fabricate as indicated and according to SJI's "Specifications" and "Standard Specification for Composite Steel Joists, CJ-Series" in "Standard Specifications for Composite Steel Joists, Weight Tables and Bridging Tables, Code of Standard Practice." Furnish additional erection bridging if required for stability.
D. Furnish miscellaneous accessories including splice plates and bolts required by joist manufacturer to complete joist assembly.
E. Bolts, Nuts, and Washers: ASTM A325.
F. Welding Materials: AWS D1.1; type required for materials being welded.

2.6 CLEANING AND SHOP PAINTING

A. Clean and remove loose scale, heavy rust, and other foreign materials from fabricated joists and 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 according to 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 bearing plates and 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.
E. Bolt joists to supporting steel framework using high-strength structural bolts. Comply with RCSC's "Specification for Structural Joints Using ASTM A 325 or ASTM A 490 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. Reference structural drawings for additional Special Inspection requirements as designated per Chapter 17 of the Michigan Building Code.
A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
B. Visually inspect field welds according to AWS D1.1/D1.1M.
C. Visually inspect bolted connections.
D. Prepare test and inspection reports.

END OF SECTION

SECTION 053100
STEEL DECKING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Roof deck.
2. Composite floor deck.

1.2 ACTION SUBMITTALS

A. 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. Welding certificates.
B. Evaluation reports.
C. Field quality-control reports.

1.4 QUALITY ASSURANCE

A. Testing Agency Qualifications: Qualified according to ASTM E 329 for testing indicated.
B. Welding Qualifications: Qualify procedures and personnel according to AWS D1.3/D1.3M, "Structural Welding Code - Sheet Steel."

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. AISI Specifications: Comply with calculated structural characteristics of steel deck according to AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members."

2.2 ROOF DECK

A. Roof Deck: Fabricate panels, without top-flange stiffening grooves, to comply with "SDI Specifications and Commentary for Steel Roof Deck," in SDI Publication No. 31, and with the following:

1. Prime-Painted Steel Sheet: ASTM A1008/A1008M, Structural Steel (SS), Grade 33 minimum, shop primed with manufacturer's standard baked-on, rust-inhibitive primer.
2. Deck Profile: As indicated.
3. Profile Depth: 1-1/2 inches.
4. Design Uncoated-Steel Thickness: 22 gauge, or as indicated on drawings.
5. Acoustical Deck: Inert, non-organic glass fiber sound absorbing batts placed in rib openings where acoustical deck is specified.

2.3 COMPOSITE FLOOR DECK

A. Composite Floor Deck: Fabricate panels, with integrally embossed or raised pattern ribs and interlocking side laps, to comply with "SDI Specifications and Commentary for Composite Steel Floor Deck," in SDI Publication No. 31, with the minimum section properties indicated, and with the following:

1. Galvanized-Steel Sheet: ASTM A 653/A 653M, Structural Steel (SS), Grade 33, G60 zinc coating.
2. Profile Depth: 1-1/2 inches.
3. Design Uncoated-Steel Thickness: 22 gauge, or as indicated on drawings.

2.4 ACCESSORIES

A. General: 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, No. 10 minimum diameter.
D. Miscellaneous Sheet Metal Deck Accessories: Steel sheet, minimum yield strength of 33,000 psi, not less than 0.0359-inch design uncoated thickness, of same material and finish as deck; of profile indicated or required for application.
E. 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 according to applicable specifications and commentary in SDI Publication No. 31, manufacturer's written instructions, and requirements in this Section.
B. Place deck panels flat and square and fasten to supporting frame without warp or deflection.
C. Cut and neatly fit deck panels and accessories around openings and other work projecting through or adjacent to deck.
D. Provide additional reinforcement and closure pieces at openings as required for strength, continuity of deck, and support of other work.
E. Fasten deck to steel support members at ends and intermediate supports with #12 TEK screws at 18" o.c. maximum.
F. Fasten male/female side laps with #10 TEK screws. Provide two screws evenly spaced between support members.
G. Reinforce steel deck openings from 6" to 18” in size with 2 x 2 x 3/16 steel angles. Place angles perpendicular to flutes; extend minimum two flutes beyond each side of opening and fasten to deck at each flute.
H. Install 12" (minimum) wide 12 gauge sheet steel cover plates where deck changes direction. Fasten with #10 TEK screws at 12" o.c. maximum.
I. Immediately after fastening deck and other metal components in position, coat damaged surface coating with touch-up prime paint.
J. Pour Stops and Girder Fillers: Weld steel sheet pour stops and girder fillers to supporting structure according to SDI recommendations unless otherwise indicated.
K. Floor-Deck Closures: Weld steel sheet column closures, cell closures, and Z-closures to deck, according to SDI recommendations, to provide tight-fitting closures at open ends of ribs and sides of deck.

3.2 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
B. Field welds will be subject to inspection.
C. Prepare test and inspection reports.

3.3 PROTECTION

A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on both surfaces of deck with galvanized repair paint according to ASTM A 780/A 780M and manufacturer's written instructions.
B. Repair Painting: Wire brush and clean rust spots, welds, and abraded areas on both surfaces of prime-painted deck immediately after installation, and apply repair paint.

END OF SECTION

SECTION 055000
METAL FABRICATIONS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Miscellaneous steel framing and supports.

B. Products furnished, but not installed, under this Section include the following:

1. Section 033000-Cast-in-Place Concrete: Placement of metal fabrications in concrete.
2. Section 042200-Concrete Unit Masonry: Placement of metal fabrications in masonry.
3. Loose steel lintels.
4. Anchor bolts, steel pipe sleeves, slotted-channel inserts, and wedge-type inserts indicated to be cast into concrete or built into unit masonry.

1.2 REFERENCES

A. ASTM A36-Structural Steel.
B. ASTM A53-Hot-Dipped, Zinc-Coated Welded and Seamless Steel Pipe.
C. ASTM 123-Zinc (Hot-Galvanized) Coatings on Products Fabricated from Rolled, Pressed and Forged Steel Shapes, Plates, Bars, and Strip.
D. ASTM A153-Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
E. ASTM 307-Carbon Steel Externally Threaded Standard Fasteners.
F. ASTM 325-High Strength Bolts for Structural Steel Joints.
G. ASTM A386-Zinc Coating (Hot-Dip) on Assembled Steel Products.
H. ASTM A500-Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Round and Shapes.
I. ASTM A992-Standard Specification for Structural Steel Shapes.
J. AWS A2.0-Standard Welding Code.
K. AWS D1.1-Structural Welding Code.
L. SSPC-Steel Structures Painting Council.

1.3 ACTION SUBMITTALS

A. Submit under provisions of Division 1.
B. Shop Drawings: Show fabrication and installation details. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items.
C. Indicate Welded connections using standard AWS A2.0 welding symbols. Indicate weld lengths.
D. Delegated-Design Submittal: For ladders, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.4 QUALIFICATIONS

A. Welder’s Certificates: Submit under provisions of Division 1, certifying welders employed on the Work, verifying AWS qualification within the previous 12 months.

1.5 FIELD MEASUREMENTS

A. Verify that field measurements are as indicated on the Drawings.

PART 2 - PRODUCTS

2.1 METALS

A. Metal Surfaces, General: Provide materials with smooth, flat surfaces unless otherwise indicated. For metal fabrications exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.
B. Structural Steel Wide Flange (“W”) Shapes: ASTM A992
C. Steel Plates, Shapes, and Bars: ASTM A36/A36M.
D. Stainless Steel Bars and Shapes: ASTM A276/A276M.
E. Hollow Structural Sections (“HSS”):

1. All square and rectangular sections, and round sections with a wall thickness of 5/8” or less: ASMT A500, Grade B.
2. Round Sections with wall thickness greater than 5/8”: ASTM A53, Grade B.

F. Rolled-Steel Floor Plate: ASTM A786/A786M, rolled from plate complying with ASTM A36/A36M or ASTM A283/A283M, Grade C or D.
G. Rolled-Stainless Steel Floor Plate: ASTM A793.
H. Steel Tubing: ASTM A500/A500M, cold-formed steel tubing Grade B.
I. Steel Pipe: ASTM A53/A53M, Standard Weight (Grade B, Schedule 40) unless otherwise indicated.
J. All other structural steel shapes, plates, and rods: ASTM A36.
K. Welding Materials: AWS D1.1; type required for materials being welded.
L. Bolts, Nuts, and Washers: ASTM A325 or A307 galvanized to ASTM 153 for galvanized components.

2.2 MISCELLANEOUS MATERIALS

A. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79 and compatible with topcoat.

1. Use primer containing pigments that make it easily distinguishable from zinc-rich primer.

B. Water-Based Primer: Emulsion type, anticorrosive primer for mildly corrosive environments that is resistant to flash rusting when applied to cleaned steel, complying with MPI#107 and compatible with topcoat.
C. Epoxy Zinc-Rich Primer: Complying with MPI#20 and compatible with topcoat.
D. Shop Primer for Galvanized Steel: Primer formulated for exterior use over zinc-coated metal and compatible with finish paint systems indicated.
E. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.
F. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D1187/D1187M.

2.3 FABRICATION, GENERAL

A. Shop Assembly: Preassemble items in the shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.

B. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a small uniform radius unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.
C. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.
D. Form exposed work with accurate angles and surfaces and straight edges.
E. Weld corners and seams continuously to comply with the following:

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.

F. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners or welds where possible. Flush countersunk screws or bolts; unobtrusively located; consistent with design of component, except where specifically noted otherwise.
G. Fabricate seams and other connections that are exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.

2.4 GENERAL FINISH REQUIREMENTS

A. Finish metal fabrications after assembly.
B. Clean surfaces of rust, scale, grease, and foreign matter prior to finishing.
C. Prime paint items with one coat.

2.5 STEEL AND IRON FINISHES

A. Galvanizing: Hot-dip galvanize items as indicated to comply with ASTM A153/A153M for steel and iron hardware and with ASTM A123/A123M for other steel and iron products.

1. Do not quench or apply post galvanizing treatments that might interfere with paint adhesion.
2. Galvanize in accordance with ASTM 123, structural steel members. Provide minmum 1.25 oz/sq. foot galvanized coating.

B. Shop prime iron and steel items unless they are to be embedded in concrete, sprayed-on fireproofing, or masonry, or unless otherwise indicated.
C. Preparation for Shop Priming: Prepare surfaces to comply with SSPC 15, Type 1.
D. 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.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that field conditions are acceptable and are ready to receive work.
B. Beginning of installation means erector accepts existing conditions.

3.2 INSTALLATION, GENERAL

A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation;

with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.

B. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.

C. Field Welding: Comply with the following requirements:

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.

D. Fastening to In-Place Construction: Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction. Provide threaded fasteners for use with concrete and masonry inserts, toggle bolts, through bolts, lag screws, wood screws, and other connectors.

E. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.

3.3 ERECTION TOLERANCES

A. Maximum variation from Plumb: 1/4” per story, non-cumulative.

B. Maximum Offset from true Alignment 1/4”.

3.4 REPAIRS

A. Touchup Painting:

1. Immediately after erection, clean field welds, bolted connections, and abraded areas. Paint uncoated and abraded areas with same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.

B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A780/A780M.

3.5 SCHEDULE

A. The Schedule is a list of principal items only. Refer to Drawing details for items not specifically scheduled.

B. Lintels: As detailed, prime paint finish.

C. Channel: MC8x20 channel at main building entry with ¼” web stiffeners at 16” on center and four ¼”x6”x8” shear tabs for connection of prefabricated canopy, coordinate with canopy supplier, galvanize finish.

END OF SECTION

SECTION 061000
ROUGH CARPENTRY

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Rooftop equipment bases and support curbs.
2. Wood blocking and nailers.
3. Wood furring.
4. Wood sleepers.
5. Plywood backing panels.

B. Related Requirements:

1. Section 061600 "Sheathing" for sheathing, subflooring, and underlayment.

1.2 DEFINITIONS

A. Boards or Strips: Lumber of less than 2 inches nominal size in least dimension.

B. Dimension Lumber: Lumber of 2 inches nominal size or greater but less than 5 inches nominal size in least dimension.

C. OSB: Oriented strand board.

D. Timber: Lumber of 5 inches nominal size or greater in least dimension.

E. Lumber grading agencies, and abbreviations used to reference them, include the following:

1. NeLMA: Northeastern Lumber Manufacturers' Association.
2. NLGA: National Lumber Grades Authority.
3. SPIB: The Southern Pine Inspection Bureau.
4. WCLIB: West Coast Lumber Inspection Bureau.
5. WWPA: Western Wood Products Association.

1.3 DELIVERY, STORAGE, AND HANDLING

A. Stack wood products flat with spacers beneath and between each bundle to provide air circulation. Protect wood products from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.1 WOOD PRODUCTS, GENERAL

A. Lumber: Comply with DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, comply with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Grade lumber by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.

1. Factory mark each piece of lumber with grade stamp of grading agency.
2. Where nominal sizes are indicated, provide actual sizes required by DOC PS 20 for moisture content specified. Where actual sizes are indicated, they are minimum dressed sizes for dry wood products.

B. Maximum Moisture Content of Lumber:

1. Boards: 15 percent.
2. Dimension Lumber: 15 percent for 2-inch nominal thickness or less; 19 percent for more than 2-inch nominal thickness unless otherwise indicated.

C. Engineered Wood Products: Acceptable to authorities having jurisdiction and for which current model code research or evaluation reports exist that show compliance with building code in effect for Project.

1. Allowable design stresses, as published by manufacturer, shall meet or exceed those indicated. Manufacturer's published values shall be determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency.

2.2 PRESERVATIVE TREATMENT

A. Preservative Treatment by Pressure Process: AWPA U1; Use Category UC2 for interior construction not in contact with ground, Use Category UC3b for exterior construction not in contact with ground, and Use Category UC4a for items in contact with ground.

1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium. Do not use inorganic boron (SBX) for sill plates.

B. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Do not use material that is warped or that does not comply with requirements for untreated material.

C. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review.

D. Application: Treat items indicated on Drawings, and the following:

1. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.

2. Wood sills, sleepers, blocking, and similar concealed members in contact with masonry or concrete.
3. Wood floor plates that are installed over concrete slabs-on-grade.

2.3 MISCELLANEOUS LUMBER

A. Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:

1. Blocking.
2. Nailers.
3. Rooftop equipment bases and support curbs.
4. Furring.

B. Dimension Lumber Items: Construction or No. 2 grade lumber of any of the following species: the following species:

1. Spruce-pine-fir (south); NeLMA, WCLIB, or WWPA.
2. Western woods; WCLIB or WWPA.
3. Northern species; NLGA.
4. Eastern softwoods; NeLMA.

C. Concealed Boards: 15 percent maximum moisture content and the following species and grades:

1. Spruce-pine-fir (south) or spruce-pine-fir; Construction or No. 2 Common grade; NeLMA, NLGA, WCLIB, or WWPA.

D. For blocking not used for attachment of other construction, Utility, Stud, or No. 3 grade lumber of any species may be used provided that it is cut and selected to eliminate defects that will interfere with its attachment and purpose.

E. For blocking and nailers used for attachment of other construction, select and cut lumber to eliminate knots and other defects that will interfere with attachment of other work.

F. For furring strips for installing plywood or hardboard paneling, select boards with no knots capable of producing bent-over nails and damage to paneling.

2.4 PLYWOOD BACKING PANELS

A. Equipment Backing Panels: Plywood, DOC PS 1, fire-retardant treated, in thickness indicated or, if not indicated, not less than 1/2-inch 3/4-inch nominal thickness.

2.5 FASTENERS

A. General: Fasteners shall be of size and type indicated and shall comply with requirements specified in this article for material and manufacture. Provide nails or screws, in sufficient length, to penetrate not less than 1-1/2 inches into wood substrate.

1. Where rough carpentry is exposed to weather, in ground contact, pressure-preservative treated, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A153/A153M or ASTM F2329 .
2. For pressure-preservative-treated wood, use stainless steel fasteners.
3. For redwood, use stainless steel or hot-dip galvanized-steel fasteners.

B. Nails, Brads, and Staples: ASTM F1667.

C. Power-Driven Fasteners: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.

D. Post-Installed Anchors: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC01,ICC-ES AC58,ICC-ES AC193 or ICC-ES AC308 as appropriate for the substrate.

2.6 METAL FRAMING ANCHORS

A. Allowable design loads, as published by manufacturer, shall meet or exceed those indicated . Manufacturer's published values shall be determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency. Framing anchors shall be punched for fasteners adequate to withstand same loads as framing anchors.

B. Galvanized-Steel Sheet: Hot-dip, zinc-coated steel sheet complying with ASTM A653/A653M, G60 coating designation.

1. Use for interior locations unless otherwise indicated.

2.7 MISCELLANEOUS MATERIALS

A. Sill-Sealer Gaskets:

1. Glass-fiber-resilient insulation, fabricated in strip form, for use as a sill sealer; 1-inch nominal thickness, compressible to 1/32 inch; selected from manufacturer's standard widths to suit width of sill members indicated.

B. Flexible Flashing: Composite, self-adhesive, flashing product consisting of a pliable, butyl rubber or rubberized-asphalt compound, bonded to a high-density polyethylene film, aluminum foil, or spunbonded polyolefin to produce an overall thickness of not less than 0.025 inch.

C. Adhesives for Gluing Furring and Sleepers to Concrete or Masonry: Formulation complying with ASTM D3498 that is approved for use indicated by adhesive manufacturer.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Framing Standard: Comply with AF&PA's WCD 1, "Details for Conventional Wood Frame Construction," unless otherwise indicated.

B. Framing with Engineered Wood Products: Install engineered wood products to comply with manufacturer's written instructions.

C. Set work to required levels and lines, with members plumb, true to line, cut, and fitted. Fit rough carpentry accurately to other construction. Locate furring, nailers, blocking, and similar supports to comply with requirements for attaching other construction.

D. Install plywood backing panels by fastening to studs; coordinate locations with utilities requiring backing panels. Install fire-retardant-treated plywood backing panels with classification marking of testing agency exposed to view.

E. Install metal framing anchors to comply with manufacturer's written instructions. Install fasteners through each fastener hole.

F. Install sill sealer gasket to form continuous seal between sill plates and foundation walls.

G. Do not splice structural members between supports unless otherwise indicated.

H. Provide blocking and framing as indicated and as required to support facing materials, fixtures, specialty items, and trim.

1. Provide metal clips for fastening gypsum board or lath at corners and intersections where framing or blocking does not provide a surface for fastening edges of panels. Space clips not more than 16 inches o.c.

I. Provide fire blocking in furred spaces, stud spaces, and other concealed cavities as indicated and as follows:

1. Fire block furred spaces of walls, at each floor level, at ceiling, and at not more than 96 inches o.c. with solid wood blocking or noncombustible materials accurately fitted to close furred spaces.
2. Fire block concealed spaces of wood-framed walls and partitions at each floor level, at ceiling line of top story, and at not more than 96 inches o.c. Where fire blocking is not inherent in framing system used, provide closely fitted solid wood blocks of same width as framing members and 2-inch nominal thickness.
3. Fire block concealed spaces between floor sleepers with same material as sleepers to limit concealed spaces to not more than 100 sq. ft. and to solidly fill space below partitions.
4. Fire block concealed spaces behind combustible cornices and exterior trim at not more than 20 feet o.c.

J. Sort and select lumber so that natural characteristics do not interfere with installation or with fastening other materials to lumber. Do not use materials with defects that interfere with

function of member or pieces that are too small to use with minimum number of joints or optimum joint arrangement.

K. Comply with AWPA M4 for applying field treatment to cut surfaces of preservative-treated lumber.

1. Use inorganic boron for items that are continuously protected from liquid water.
2. Use copper naphthenate for items not continuously protected from liquid water.

L. Where wood-preservative-treated lumber is installed adjacent to metal decking, install continuous flexible flashing separator between wood and metal decking.

M. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:

1. Table 2304.9.1, "Fastening Schedule," in ICC's International Building Code (IBC).
2. ICC-ES evaluation report for fastener.

N. Use steel common nails unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting wood. Drive nails snug but do not countersink nail heads unless otherwise indicated.

3.2 INSTALLATION OF WOOD BLOCKING AND NAILERS

A. Install where indicated and where required for attaching other work. Form to shapes indicated and cut as required for true line and level of attached work. Coordinate locations with other work involved.

B. Attach items to substrates to support applied loading. Recess bolts and nuts flush with surfaces unless otherwise indicated.

C. Provide permanent grounds of dressed, pressure-preservative-treated, key-beveled lumber not less than 1-1/2 inches wide and of thickness required to bring face of ground to exact thickness of finish material. Remove temporary grounds when no longer required.

3.3 INSTALLATION OF WOOD FURRING

A. Install level and plumb with closure strips at edges and openings. Shim with wood as required for tolerance of finish work.

B. Furring to Receive Plywood or Hardboard Paneling: Install 1-by-3-inch nominal- size furring horizontally and vertically at 24 inches 600 mm o.c.

3.4 PROTECTION

A. Protect rough carpentry from weather. If, despite protection, rough carpentry becomes wet enough that moisture content exceeds that specified, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

END OF SECTION 061000

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SECTION 064116
PLASTIC-LAMINATE-CLAD ARCHITECTURAL CABINETS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Plastic-laminate-clad architectural cabinets.
2. Cabinet hardware and accessories.
3. Wood furring, blocking, shims, and hanging strips for installing plastic-laminate-clad architectural cabinets that are not concealed within other construction.

B. Related Requirements:

1. Section 061000 "Rough Carpentry" for wood furring, blocking, shims, and hanging strips required for installing cabinets that are concealed within other construction before cabinet installation.
2. Section 123661.16 "Solid Surfacing Countertops"

1.2 COORDINATION

A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to support loads imposed by installed and fully loaded cabinets.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings:

1. Include plans, elevations, sections, and attachment details.
2. Show large-scale details.
3. Show locations and sizes of furring, blocking, and hanging strips, including concealed blocking and reinforcement specified in other Sections.
4. Show locations and sizes of cutouts and holes for items installed in plastic-laminate architectural cabinets.
5. Apply AWI Quality Certification Program label to Shop Drawings.

C. Samples: For each exposed product and for each color and texture specified, in manufacturer's or manufacturer's standard size.

D. Samples for Verification: For the following:

1. Plastic Laminates: 12 by 12 inches, for each type, color, pattern, and surface finish required.
   a. Provide one sample applied to core material with specified edge material applied to one edge.
2. Exposed Cabinet Hardware and Accessories: One full-size unit for each type and finish.

1.4 QUALITY ASSURANCE

A. Manufacturer's Qualifications: Employs skilled workers who custom fabricate products similar to those required for this Project and whose products have a record of successful in-service performance.

1. Manufacturer's Certification: Licensed participant in AWI's Quality Certification Program .

1.5 DELIVERY, STORAGE, AND HANDLING

A. Do not deliver cabinets until painting and similar finish operations that might damage architectural cabinets have been completed in installation areas. Store cabinets in installation areas or in areas where environmental conditions comply with requirements specified in "Field Conditions" Article.

1.6 FIELD CONDITIONS

A. Environmental Limitations without Humidity Control: Do not deliver or install cabinets until building is enclosed, wet-work is complete, and HVAC system is operating and maintaining temperature and relative humidity at levels planned for building occupants during the remainder of the construction period.

B. Field Measurements: Where cabinets are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication, and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1. Locate concealed framing, blocking, and reinforcements that support cabinets by field measurements before being enclosed/concealed by construction, and indicate measurements on Shop Drawings.

PART 2 - PRODUCTS

2.1 ARCHITECTURAL CABINET MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. See AWI member list for local woodworking firms.

2.2 PLASTIC-LAMINATE-CLAD ARCHITECTURAL CABINETS

A. Quality Standard: Unless otherwise indicated, comply with the Architectural Woodwork Standards for grades of cabinets indicated for construction, finishes, installation, and other requirements.

1. Provide labels and certificates from AWI certification program indicating that woodwork and installation complies with requirements of grades specified.
2. The Contract Documents contain requirements that are more stringent than the referenced quality standard. Comply with requirements of Contract Documents in addition to those of the referenced quality standard.

B. Architectural Woodwork Standards Grade: Premium.

C. Type of Construction: Frameless.

D. Door and Drawer-Front Style: Flush overlay.

E. High-Pressure Decorative Laminate: NEMA LD 3, grades as indicated or if not indicated, as required by quality standard.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Formica Corporation.
   b. Pionite; a Panolam Industries International, Inc. brand.
   c. Wilsonart LLC – **basis of design.**

F. Laminate Cladding for Exposed Surfaces:

1. Horizontal Surfaces: Grade HGS .
2. Vertical Surfaces: Grade HGS .
3. Edges: PVC T-mold matching laminate in color, pattern, and finish .
4. Pattern Direction: As indicated.

G. Materials for Semiexposed Surfaces:

1. Surfaces Other Than Drawer Bodies: High-pressure decorative laminate, NEMA LD 3, Grade VGS .

a. Edges of Plastic-Laminate Shelves: PVC T-mold matching laminate in color, pattern, and finish .
b. Edges of Thermally Fused Laminate Panel Shelves: PVC T-mold matching laminate in color.
c. For semiexposed backs of panels with exposed plastic-laminate surfaces, provide surface of high-pressure decorative laminate, NEMA LD 3, Grade VGS .

2. Drawer Sides and Backs: Thermally fused laminate panels with PVC or polyester edge banding.
3. Drawer Bottoms: Hardwood plywood.

H. Dust Panels: 1/4-inch plywood or tempered hardboard above compartments and drawers unless located directly under tops.

I. Concealed Backs of Panels with Exposed Plastic-Laminate Surfaces: High-pressure decorative laminate, NEMA LD 3, Grade BKL.

J. Drawer Construction: Fabricate with exposed fronts fastened to subfront with mounting screws from interior of body.

1. Join subfronts, backs, and sides with glued rabbeted joints supplemented by mechanical fasteners or glued dovetail joints.

K. Colors, Patterns, and Finishes: Provide materials and products that result in colors and textures of exposed laminate surfaces complying with the following requirements:

1. As selected by Architect from laminate manufacturer's full range (refer to drawings).

2.3 WOOD MATERIALS

A. Wood Products: Provide materials that comply with requirements of referenced quality standard for each type of architectural cabinet and quality grade specified unless otherwise indicated.

1. Wood Moisture Content: 5 to 10 percent.

B. Composite Wood Products: Provide materials that comply with requirements of referenced quality standard for each type of architectural cabinet and quality grade specified unless otherwise indicated.

1. Medium-Density Fiberboard (MDF): ANSI A208.2, Grade 130.

2.4 CABINET HARDWARE AND ACCESSORIES

A. General: Provide cabinet hardware and accessory materials associated with architectural cabinets.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Accuride International.
b. Blum, Julius & Co., Inc.
c. Hardware Resources.
d. Knape & Vogt Manufacturing Company.

B. Frameless Concealed Hinges (European Type): ANSI/BHMA A156.9, B01602, 135 degrees of opening.

C. Wire Pulls: Back mounted, solid metal , 4 inches long, 5/16 inch in diameter .

D. Shelf Rests: ANSI/BHMA A156.9, B04013; metal .

E. Drawer Slides: ANSI/BHMA A156.9.

1. Heavy-Duty (Grade 1HD-100 and Grade 1HD-200): Side mount .
   a. Type: Full extension.
   b. Material: Epoxy-coated polymer slides.
   c. Motion Feature: Soft close dampener .
2. Pencil drawers not more than 3 inches high and not more than 24 inches wide, provide 50 lb load capacity.
3. General-purpose drawers more than 3 inches high, but not more than 6 inches high and not more than 24 inches wide, provide 75 lb load capacity.
4. File drawers more than 6 inches high or more than 24 inches wide, provide 100 lb load capacity.
5. Lateral file drawers more than 6 inches high and more than 24 inches but not more than 30 inches wide, provide 150 lb load capacity.
6. Lateral file drawers more than 6 inches high and more than 30 inches wide, provide 200 lb load capacity.

F. Exposed Hardware Finishes: For exposed hardware, provide finish that complies with ANSI/BHMA A156.18 for ANSI/BHMA finish number indicated.

1. Satin Chromium Plated: ANSI/BHMA 626 for brass or bronze base; ANSI/BHMA 652 for steel base.

G. For concealed hardware, provide manufacturer's standard finish that complies with product class requirements in ANSI/BHMA A156.9.

2.5 MISCELLANEOUS MATERIALS

A. Furring, Blocking, Shims, and Hanging Strips: Softwood or hardwood lumber , kiln-dried to less than 15 percent moisture content.

B. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide metal expansion sleeves or expansion bolts for post-installed anchors. Use nonferrous-metal or hot-dip galvanized anchors and inserts at inside face of exterior walls and at floors.

2.6 FABRICATION

A. Fabricate architectural cabinets to dimensions, profiles, and details indicated.

B. Complete fabrication, including assembly and hardware application, to maximum extent possible before shipment to Project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.

1. Notify Architect seven days in advance of the dates and times architectural cabinet fabrication will be complete.
2. Trial fit assemblies at manufacturer's shop that cannot be shipped completely assembled. Install dowels, screws, bolted connectors, and other fastening devices that can be removed after trial fitting. Verify that various parts fit as intended and check measurements of assemblies against field measurements before disassembling for shipment.

C. Shop-cut openings to maximum extent possible to receive hardware, appliances, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.

PART 3 - EXECUTION

3.1 PREPARATION

A. Before installation, condition cabinets to humidity conditions in installation areas for not less than 72 hours.

3.2 INSTALLATION

A. Architectural Woodwork Standards Grade: Install cabinets to comply with quality standard grade of item to be installed.

B. Assemble cabinets and complete fabrication at Project site to extent that it was not completed in the shop.

C. Anchor cabinets to anchors or blocking built in or directly attached to substrates. Secure with wafer-head cabinet installation screws.

D. Install cabinets level, plumb, and true in line to a tolerance of 1/8 inch in 96 inches using concealed shims.

1. Scribe and cut cabinets to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.
2. Install cabinets without distortion so doors and drawers fit openings and are accurately aligned. Adjust hardware to center doors and drawers in openings and to provide

unencumbered operation. Complete installation of hardware and accessory items as indicated.

3.3 ADJUSTING AND CLEANING

A. Repair damaged and defective cabinets, where possible, to eliminate functional and visual defects. Where not possible to repair, replace architectural cabinets. Adjust joinery for uniform appearance.

B. Clean, lubricate, and adjust hardware.

C. Clean cabinets on exposed and semiexposed surfaces.

END OF SECTION 064116

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SECTION 072100
THERMAL INSULATION

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. Extruded polystyrene foam-plastic board.
2. Glass-fiber blanket.

B. Related Requirements:

1. Section 042000 "Unit Masonry" for insulation installed in masonry cells.
2. Section 061600 "Sheathing"
3. Section 075419 "Polyvinyl-Chloride (PVC) Roofing" for insulation specified as part of roofing construction.
4. Section 098500 "Sound Transmission Control Materials" for sound attenuation blanket used as acoustic insulation.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Protect insulation materials from physical damage and from deterioration due to moisture, soiling, and other sources. Store inside and in a dry location. Comply with manufacturer's written instructions for handling, storing, and protecting during installation.

B. Protect foam-plastic board insulation as follows:

1. Do not expose to sunlight except to necessary extent for period of installation and concealment.
2. Protect against ignition at all times. Do not deliver foam-plastic board materials to Project site until just before installation time.
3. Quickly complete installation and concealment of foam-plastic board insulation in each area of construction.

PART 2 - PRODUCTS

2.1 EXTRUDED POLYSTYRENE FOAM-PLASTIC BOARD

A. Extruded Polystyrene Board, Type X: ASTM C578, Type X, 15-psi minimum compressive strength; unfaced; maximum flame-spread and smoke-developed indexes of 25 and 450, respectively, per ASTM E84.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. DiversiFoam Products.
b. Dow Chemical Company (The).
c. MBCI.
d. Owens Corning.

2. Fire Propagation Characteristics: Passes NFPA 285 testing as part of an approved assembly.

2.2 FIBERGLASS BATT INSULATION

A. Batts: Fiberglass batt insulation faced, complying with ASTM C665 and meeting the following criteria:

1. ASTM C 665 type II Class A (batt with non-reflective facing, flame spread 25 or less), or III Class A (batt with reflective facing, flame spread 25 or less].
2. Full width batt for use with steel studs spaced 16”, and 24” on center.
3. Thermal Resistance: Measured in accordance with ASTM C 518, R-value 19.
4. Factory-applied facing:
   a. FSK (foil-scrim-kraft, Type III Class A, Category 1, facer is a vapor retarder with 0.02 water vapor permeance)
   b. Surface burning characteristics, ASTM E 84, flame spread 25 or less.
5. Water Vapor Permeance: Permeance of vapor retarding facings measured in accordance with ASTM E 96.

B. Manufacturers: Subject to compliance with product criteria, the manufacturers whose products may be incorporated into the work include but are not limited to:

1. CertainTeed Corporation.
2. Guardian Building Products.
3. Johns Manville.
4. Owens Corning

2.3 INSULATION FASTENERS

A. Joint Sealing Tape: Pressure sensitive, self-adhering, acrylic adhesive joint sealing tape, complying with AAMA 711, and, meeting the following criteria:

1. Recommended by its manufacturer for sealing the joints of extruded polystyrene insulation board in vertical cavity wall construction
2. Peel Adhesion Strength: Compliant with ICC-ES AC 148 and AAMA 711

3. Water Resistance and Joint Sealing: Compliant with ICC-ES AC 71
4. Air Permeance: Air permeance less than or equal to 0.02 L/s/m2, tested in accordance with ASTM E 2178
5. Service Temperature: Service temperature range shall be at least 0oF to 120oF maximum
6. Width: Minimum 3.5 inches.

B. Manufacturers: Subject to compliance with product criteria, the manufacturers whose products may be incorporated into the work include but are not limited to:

1. Owens Corning.

C. Acceptable Products: Subject to compliance with product criteria, the products that may be incorporated into the work include but are not limited to:

D. JointSealR™ Foam Joint Tape; 3.5” wide, 90’ long, supplied in rolls

E. ACCESSORIES

F. Adhesive for Bonding Insulation: Product compatible with insulation and air and water barrier materials, and with demonstrated capability to bond insulation securely to substrates without damaging insulation and substrates.

PART 3 - EXECUTION

3.1 PREPARATION

A. Clean substrates of substances that are harmful to insulation, including removing projections capable of puncturing insulation or vapor retarders, or that interfere with insulation attachment.

3.2 INSTALLATION, GENERAL

A. Comply with insulation manufacturer's written instructions applicable to products and applications.

B. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed to ice, rain, or snow at any time.

C. Extend insulation to envelop entire area to be insulated. Fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.

D. Provide sizes to fit applications and selected from manufacturer's standard thicknesses, widths, and lengths. Apply single layer of insulation units unless multiple layers are otherwise shown or required to make up total thickness or to achieve R-value.

3.3 INSTALLATION OF FOUNDATION WALL INSULATION

A. Butt panels together for tight fit.

B. Anchor Installation: Install board insulation on concrete substrates by adhesively attached, spindle-type insulation anchors as follows:

1. Fasten insulation anchors to concrete substrates with insulation anchor adhesive according to anchor manufacturer's written instructions. Space anchors according to insulation manufacturer's written instructions for insulation type, thickness, and application.
2. Apply insulation standoffs to each spindle to create cavity width indicated on Drawings between concrete substrate and insulation.
3. After adhesive has dried, install board insulation by pressing insulation into position over spindles and securing it tightly in place with insulation-retaining washers, taking care not to compress insulation.
4. Where insulation will not be covered by other building materials, apply capped washers to tips of spindles.

C. Adhesive Installation: Install with adhesive or press into tacky waterproofing or dampproofing according to manufacturer's written instructions.

3.4 INSTALLATION OF CAVITY-WALL INSULATION

A. Foam-Plastic Board Insulation: Install pads of adhesive spaced approximately 24 inches o.c. both ways on inside face and as recommended by manufacturer.

1. Fit courses of insulation between wall ties and other obstructions, with edges butted tightly in both directions, and with faces flush.
2. Press units firmly against inside substrates.
3. Supplement adhesive attachment of insulation by securing boards with two-piece wall ties designed for this purpose and specified in Section 042000 "Unit Masonry."

B. Cellular-Glass Board Insulation: Install with closely fitting joints using adhesive pad attachment method according to manufacturer's written instructions.

3.5 PROTECTION

A. Protect installed insulation from damage due to harmful weather exposures, physical abuse, and other causes. Provide temporary coverings or enclosures where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

END OF SECTION 072100

SECTION 072119
FOAMED-IN-PLACE INSULATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Closed-cell spray polyurethane foam insulation.
2. Accessories.

B. Related Requirements:

1. Section 072100 "Thermal Insulation" for foam-plastic board insulation.
2. Section 075700 "Coated Foamed Roofing" for spray polyurethane foam insulation used for roofing applications.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.3 INFORMATIONAL SUBMITTALS

A. Field Quality-Control Submittals:

1. Field quality-control reports.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: An authorized representative who is trained and approved by manufacturer.

PART 2 - PRODUCTS

2.1 CLOSED-CELL SPRAY POLYURETHANE FOAM INSULATION

A. Closed-Cell Spray Polyurethane Foam: ASTM C1029, Type II, minimum density of 1.5 lb/cu. ft. and minimum aged R-value at 1-inch thickness of 6.2 deg F x h x sq. ft./Btu at 75 deg F.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. Carlisle Spray Foam Insulation.

b. Johns Manville; a Berkshire Hathaway company.
c. Master Builders Solutions.

2. Surface-Burning Characteristics: Comply with ASTM E84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
   a. Flame-Spread Index: 75 or less.
   b. Smoke-Developed Index: 450 or less.
3. Fire Propagation Characteristics: Passes NFPA 285 testing as part of an approved assembly.

PART 3 - EXECUTION

3.1 PREPARATION

A. Verify that substrates are clean, dry, and free of substances that are harmful to insulation.

B. Priming: Prime substrates where recommended by insulation manufacturer. Apply primer to comply with insulation manufacturer's written instructions. Confine primers to areas to be insulated; do not allow spillage or migration onto adjoining surfaces.

3.2 INSTALLATION

A. Comply with insulation manufacturer's written instructions applicable to products and applications.

B. Spray insulation to envelop entire area to be insulated and fill voids.

C. Apply in multiple passes to not exceed maximum thicknesses recommended by manufacturer. Do not spray into rising foam.

D. Cavity Walls: Install into cavities to thickness indicated on Drawings .

E. Apply barrier coatings in accordance with manufacturer's written instructions and to comply with requirements for listing and labeling for fire-propagation characteristics and surface-burning characteristics specified.

1. Use equipment and techniques best suited for substrate and type of material applied as recommended by coating manufacturer.
2. Apply coatings to prepared surfaces as soon as practical after preparation and before subsequent surface soiling or deterioration.
3. Apply coatings to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Produce sharp lines and color breaks.

3.3 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect spray foam insulation installation, including accessories. Report results in writing.

3.4 PROTECTION

A. Protect installed insulation from damage due to harmful weather exposures, physical abuse, and other causes.

END OF SECTION 072119

Section 072400 – StoCreativ Brick Finish

PART 1 GENERAL

1.01 SUMMARY

A. Provide EIFS for vertical above grade concrete, masonry and exterior wall sheathing.

B. RELATED SECTIONS-Other specification sections which relate directly to the work of this section include the following):

1. Section 095400.1 – STO Cleaning Preparation

1.02 SUBMITTALS

A. Manufacturer's specifications, details, installation instructions and product data.

B. Manufacturer’s code compliance report.

C. Manufacturer's standard warranty.

D. Manufacturer's certificate of compliance with EIMA standards.

E. Applicator's certificate of instruction.

F. Finish and Color Samples for approval by architect or owner.

G. Field Sample, minimum 48”x48” sample must be constructed by the Installer and approved prior to installation of the StoCreativ® Brick Finish. Sample can become part of finish construction.

H. Prepare and submit project-specific shop drawing.

1.03 REFERENCES

A. ASTM Standards:

1. B 117 Test Method for Salt Spray (Fog) Testing
2. C 1396 Standard Specification for Gypsum Board
3. C 150 Specification for Portland Cement
4. C 297 Test Method for Tensile Strength of Flat Sandwich Constructions in Flatwise Plane
5. C 578 Specification for Preformed, Cellular Polystyrene Thermal Insulation
6. C 1177 Specification for Glass Mat Gypsum for Use as Sheathing
7. C 1382 Test Method for Determining Tensile Adhesion Properties of Sealants When Used in Exterior Insulation and Finish Systems (EIFS) Joints
8. D 968 Test Method for Abrasion Resistance of Organic Coatings by Falling Abrasive
9. D 2247 Practice for Testing Water Resistance of Coatings in 100% Relative Humidity
10. D 3273 Test for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber
11. D 4258 Standard Practice for Surface Cleaning Concrete for Coating
12. D 4261 Standard Practice for Surface Cleaning Concrete Unit Masonry for Coating
13. E 84 Test Method for Surface Burning Characteristics of Building Materials
14. E 96 Test Methods for Water Vapor Transmission of Materials
15. E 108 Method for Fire Tests of Roof Coverings
16. E 119 Method for Fire Tests of Building Construction and Materials

17. E 283 Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors under Specified Pressure Differences Across the Specimen.
18. E 330 Test Method for Structural Performance of Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference.
19. E 331 Test Method for Water Penetration of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference.
20. E 2430 Standard Specification for the use of Expanded Polystyrene (EPS) Insulation Board in External Insulation and Finish Systems (EIFS).
21. G 153 Recommended Practice for Operating Light-and Water-Exposure Apparatus (Carbon-Arc Type) for Exposure of Nonmetallic Materials.
22. G 154 Recommended Practice for Operating Light-and Water-Exposure Apparatus (Fluorescent UV-Condensation Type) for Exposure of Nonmetallic Materials.

B. Building Code Standards

1. UBC Standard 26-4 (formerly 17-6), “Method of Test for the Evaluation of Flammability Characteristics of Exterior, Nonload-Bearing Wall Panel Assemblies Using Foam Plastic Insulation,” International Conference of Building Officials (ICBO), Inc.
2. Section 1407.0, 1999 National Building Code, Building Officials and Code Administrators International (BOCA), Inc.
3. Section 2603.4.7, 1997 Standard Building Code, Southern Building Code Congress International (SBCCI), Inc.
4. AC24 Interim Criteria for Exterior Insulation and Finish Systems (EIFS) (July 1, 2003)
5. AC219 Acceptance Criteria for Exterior Insulation and Finish systems (March 1, 2004)

C. National Fire Protection Association (NFPA) Standards

1. NFPA 268, “Standard Test Method for Determining Ignitability of Exterior Wall Assemblies Using a Radiant Heat Energy Source”
2. NFPA 285, “Standard Method of Test for the Evaluation of Flammability Characteristics of Exterior Non-Load-Bearing Wall Assemblies containing Combustible Components Using the Intermediate-Scale, Multistory Test Apparatus”

D. EIMA (EIFS Industry Members Association) Standards and Publications

1. 101.01 Standard Test Method for Freeze-Thaw Resistance of Exterior Insulation and Finish Systems (EIFS), Class PB (Modified ASTM C 67)
2. 101.02 Standard Test Method for Resistance to Water Penetration of Exterior Insulation and Finish Systems (EIFS), Class PB (Modified ASTM E 331)
3. ASTM E 2134.01 Standard Test Method for Evaluating the Tensile-Adhesion Performance of an Exterior Insulation and Finish System (EIFS) (101.03 Standard Test Method for Determining tensile Adhesion Strength of Exterior Insulation and Finish System (EIFS)., and Components, Class PB (Modified ASTM C 297)
4. 101.86 Standard Test Method for Resistance of Exterior Insulation and Finish Systems (EIFS), Class PB, to the Effects of Rapid Deformation (Impact)
5. ASTM E 2098 Standard Test Method for Determining Tensile Breaking Strength of Glass Fiber Reinforcing Mesh for Use in Class PB Exterior Insulation and Finish System after Exposure to a Sodium Hydroxide Solution (105.01 Standard Test Method for Alkali Resistance of Glass Fiber Reinforcing Mesh for use in Exterior Insulation and Finishing Systems (EIFS), Class PB)

E. Gypsum Association

1. GA-253 Recommended Specifications for the Application of Gypsum Sheathing
2. GA-254 Fire Resistant Gypsum Sheathing

3. GA-600 Fire Resistance Design Manual

F. APA Engineered Wood Association

1. E 30 Residential and Commercial Construction Guide

G. Proprietary Specifications

1. 101514 Georgia-Pacific Corporation, “Dens Glass® Gold Sheathing”

1.04 DESIGN REQUIREMENTS

A. Wind Load

1. Design for maximum allowable system deflection, normal to the plane of the wall, of L/240.

2. Design for wind load in conformance with code requirements.

B. Moisture Control

1. Prevent the accumulation of water behind the EIF system, either by condensation or leakage through the wall construction, in the design and detailing of the wall assembly.

a. Provide flashing to direct water to the exterior where it is likely to penetrate components in the wall assembly, including, above window and door heads, beneath window and door sills, at roof/wall intersections, decks, abutments of lower walls with higher walls, above projecting features, and at the base of the wall.

b. Air Leakage Prevention—see Sto Specification A100G if an air barrier is desired or required in the wall construction.

c. Vapor Diffusion and Condensation-- perform a dew point analysis of the wall assembly to determine the potential for accumulation of moisture in the wall assembly as a result of water vapor diffusion and condensation. Adjust insulation thickness and/or other wall assembly components accordingly to minimize the risk of condensation. Avoid the use of vapor retarders on the interior side of the wall in warm, humid climates.

C. Impact Resistance

1. Provide ultra-high impact resistance to a minimum height of 6'-0" (1.8 m) above finished grade at all areas accessible to pedestrian traffic and other areas exposed to abnormal stress or impact. Indicate the areas with impact resistance other than “Standard” on contract drawings.

D. Color Selection:

1. Brick Face - 10511 Pacific Sand
2. “Mortar Line” – 10609 French Vanilla

E. Joints

1. Design minimum ¾ inch (19 mm) wide expansion joints in the EIFS where they exist in the substrate or supporting construction, where the EIFS adjoins dissimilar

construction or materials, at changes in building height, and at floor lines in multi-level wood frame construction.

2. *Design minimum ½ inch (13 mm) wide sealant joints at all penetrations through the EIFS (windows, doors, etc.).*
3. *Specify compatible backer rod and sealant that has been evaluated in accordance with ASTM C 1382 and that meets minimum 50% elongation after conditioning.*
4. *Design joints with secondary moisture protection and drain joints to the exterior.*

1.05 PERFORMANCE REQUIREMENTS

A. EIF System Performance (StoCreativ® Brick Finish)

1.06 QUALITY ASSURANCE

A. Manufacturer requirements

1. Member in good standing of the EIFS Industry Members Association (EIMA).
2. System manufacturer for a minimum of twenty-five (25) years.
3. Manufacturing facilities ISO 9001:2000 Certified Quality System.
4. Manufacturer's wall assembly listed in Gypsum Association Fire Resistance Design Manual.

B. Contractor requirements

1. Engaged in application of EIFS for a minimum of three (3) years.
2. Knowledgeable in the proper use and handling of Sto materials and listed by Sto as having attended Sto EIFS continuing education.
3. Employ skilled mechanics who are experienced and knowledgeable in EIFS application, and familiar with the requirements of the specified work.
4. Successful completion of minimum of three (3) projects of similar size and complexity to the specified project.
5. Provide the proper equipment, manpower and supervision on the job site to install the system in compliance with Sto's published specifications and details and the project plans and specifications.

C. Insulation board manufacturer requirements

1. Recognized by Sto as capable of producing insulation board to meet system requirements, and hold a valid licensing agreement with Sto.
2. Listed by an approved agency.
3. Label insulation board with information required by Sto, the approved listing agency and the applicable building code.

D. Mock-up Testing

1. Construct full-scale mock-up of typical EIFS/window wall assembly with specified tools and materials and test air and water infiltration and structural performance in accordance with ASTM E 283, E 331 and E 330, respectively, through independent laboratory. Mock-up shall comply with requirements of project specifications. Where mock-up is tested at job site maintain approved mock-up at site as reference standard. If tested off-site accurately record construction detailing and sequencing of approved mock-up for replication during construction.

E. Inspections

1. Provide independent third party inspection where required by code or contract documents.
2. Conduct inspections in accordance with code requirements and contract documents.

1.07 DELIVERY, STORAGE AND HANDLING

A. Deliver all materials in their original sealed containers bearing manufacturer's name and identification of product.

B. Protect coatings (pail products) from freezing and temperatures in excess of 90°F (32° C). Store away from direct sunlight.

C. Protect Portland cement based materials (bag products) from moisture and humidity. Store under cover off the ground in a dry location.

1.08 PROJECT/SITE CONDITIONS

(Weather conditions affect application and drying time. Hot or dry conditions limit working time and accelerate drying and may require adjustments in the scheduling of work to achieve desired results; cool or damp conditions extend working time and retard drying and may require added measures of protection against wind, dust, dirt, rain and freezing)

A. Maintain ambient and surface temperatures above 40°F (4°C) during application and drying period, minimum 24 hours after application of EIFS.

B. Provide supplementary heat for installation in temperatures less than 40°F (4°C).

C. Provide protection of surrounding areas and adjacent surfaces from application of materials.

1.09 COORDINATION/SCHEDULING

(The work in this section requires close coordination with related sections and trades. Sequence work to provide protection of construction materials from weather deterioration)

A. Provide site grading such that EIFS terminates above finished grade a minimum of 8 inches (203 mm) or as required by code.

B. Provide protection of rough openings before installing windows, doors, and other penetrations through the wall and provide sill flashing.

C. Install window and door head flashing immediately after windows and doors are installed.

D. Install diverter flashings wherever water can enter the wall assembly to direct water to the exterior.

E. Install copings and sealant immediately after installation of the EIF system and when EIFS coatings are dry.

F. Attach penetrations through EIFS to structural support and provide water tight seal at penetrations.

1.10 WARRANTY

A. Provide manufacturer's standard limited labor and materials warranty for system type.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Provide EIFS and accessories from single source manufacturer or approved supplier.

B. The following are acceptable manufacturers:

1. Sto Corp.— EIF System with StoCreativ® Brick Stencils

2.02 SURFACE PREPARATION *(optional components, depending on substrate condition)*

A. Conditioner

1. Sto Plex W - an acrylic based surface conditioner (used for chalking surfaces or excessively absorptive concrete, plaster or masonry).

B. Leveler (select one)

1. Sto BTS-Plus - one-component, polymer-modified cement-based leveler with fiber reinforcement (used for concrete, or plaster surfaces; for leveling up to ⅛ inch [3 mm]).
2. Sto Leveler - one-component, polymer modified, cement based leveler with fiber reinforcement (used for concrete, masonry or plaster surfaces; for leveling up to ¼ inch [6 mm]).

2.03 ADHESIVE

A. Cementitious Adhesives

1. Sto BTS Plus—one-component, polymer-modified, cement based high build adhesive (for use over Exterior gypsum sheathing, Dens Glass® Gold sheathing, Exterior Cementitious sheathing, concrete, masonry or plaster surfaces)
2. Sto BTS Silo—one-component , polymer-modified, cement based high build adhesive designed for use with StoSilo spray equipment (for use over Exterior gypsum sheathing, Dens Glass® Gold sheathing, Exterior cementitious sheathing, concrete, masonry or plaster surfaces).
3. Sto Primer/Adhesive--acrylic based leveler mixed with portland cement *(for concrete, masonry or plaster surfaces; for leveling up to 1/16 inch [1.6 mm]. Not recommended over wood surfaces).*
4. Sto Primer/Adhesive-B--one-component, polymer modified, cement-based leveler *(for concrete, masonry or plaster surfaces; for leveling up to 1/16 inch [1.6mm]. Not recommended over wood surfaces).*

2.04 INSULATION BOARD (if needed for preparation/repair of existing substrate)

A. Nominal 1.0 lb/ft^3 (16 kg/m^3) Expanded Polystyrene (EPS) Insulation Board in compliance with ASTM C 578 Type I requirements, and ASTM E 2430 Standard Specification for the use of Expanded Polystyrene (EPS) Insulation Board in External Insulation and Finish Systems (EIFS). *(Note: minimum required thickness is 1inch [25 mm]and maximum allowable thickness is typically 4 inches [100 mm] unless thicker dimensions are approved by the code official).*

2.05 BASE COAT *(select one)*

A. Cementitious Base Coats

1. Sto BTS® Plus—one-component polymer modified cement based high build base coat with less than 33 percent Portland cement content by weight and capable of achieving minimum 1/16 inch (1.6 mm) thickness in one pass.
2. Sto BTS® Silo—one component polymer modified cement based high build base coat designed for use with StoSilo spray equipment and capable of achieving minimum 1/16 inch (1.6 mm) thickness in one pass.
3. Sto Primer/Adhesive--acrylic based base coat mixed with portland cement. (for concrete, masonry or plaster surfaces. Not recommended over wood surfaces).
4. Sto Primer/Adhesive-B--one-component, polymer modified, cement-based base coat (for concrete, masonry or plaster surfaces. Not recommended over wood surfaces).

C. Waterproof Base Coat

1. Sto Flexyl—two component fiber reinforced acrylic based waterproof base coat mixed with Portland cement (for use as a waterproof base coat to waterproof foundations, parapets, splash areas, trim and other projecting architectural features).

2.06 REINFORCING MESHES

A. High Impact Mesh

1. Sto Intermediate Mesh--nominal 11.2 oz./yd² (380 g/m²), high impact, interwoven, open weave glass fiber fabric with alkaline resistant coating for compatibility with Sto materials (achieves High Impact Classification).

2.07 PRIMER

A. Sto Primer Creativ 806--acrylic based tinted primer.

2.08 FINISH COAT

A. Stolit® 1.5, 2.0, 3.0, R1.5, R2 or R3 —acrylic based StoCreativ® Brick Finish textured coating.

B. Stolit® Freeform —acrylic based StoCreativ® Brick sand textured coating.

2.09 COATINGS

A. Sto Maxicryl---acrylic based smooth coating.

B. StoTique---acrylic based coating which can be applied to Sto Finish to achieve an Antiquated or Mottled appearance.

2.10 JOB MIXED INGREDIENTS

A. Water--Clean and potable.

B. Portland cement--Type I in conformance with ASTM C 150.

2.11 MIXING

A. Sto Plex W: add water as directed on labeling.

B. Sto Leveler: mix ratio with water: 3.5-5 quarts (3.3-4.7 L) of water per 60 pound (27.kg) bag. Mix automatically using StoSilo, Sto's S-25 continuous mixer, or mix ½ bag at a time by adding Sto Leveler to 3.5-5 pints (1.7-2.4 L) of clean, potable water in a clean mixing pail. Mix with a clean, rust-free electric drill and paddle. Allow to set approximately five minutes, adjust mix if necessary by adding up the ½ pint (.24 L) of water, remix to a uniform consistency. Avoid retempering after mixing of product.

C. Sto BTS® Plus--mix ratio with water: 5-6.5 quarts (4.7-6.2 L) of water per 47 pound (21.3 kg) bag of Sto BTS® Plus. Pour clean potable water into a clean mixing pail. Add Sto BTS® Plus, mix to a uniform consistency and allow to set for approximately 5 minutes. Adjust mix if necessary with additional Sto BTS Plus or water and remix to a uniform trowel consistency. Avoid retempering. Keep mix ratio consistent. Do not exceed maximum water amount in mix ratio.

D. Sto BTS® Silo--mix by machine with StoSilo spray equipment at a water flow rate setting of 450-600 L/hr.

E. Primer/Adhesive: mix ratio with portland cement is 1:1 by volume. Pour Sto Primer/Adhesive into a clean mixing pail. Add portland cement, mix to a uniform consistency and allow to set for approximately five minutes. Adjust mix if necessary by adding up to 8 fl. oz. (.24L) of water per pail and remix to a uniform trowel consistency. Avoid retempering. Keep mix ratio consistent.

F. Primer/Adhesive B: mix ratio with water: 5-6.5 quarts (4.7-6.2 L) of water per 50 pound (23 kg) bag of Sto Primer/Adhesive-B. Pour water into a clean mixing pail. Add Sto Primer/Adhesive-B, mix to a uniform consistency and allow to set for approximately 5 minutes. Adjust mix if necessary by adding up to 12 fl. oz. (.35L) of water per bag and re-mix to a uniform trowel consistency. Avoid re-tempering. Keep mix ratio consistent. Do not exceed maximum amount of water in mix ratio.

G. Sto Dispersion Adhesive--mix with a clean, rust-free high speed mixer to a uniform consistency.

H. Sto Flexyl--mix ratio with Portland cement: 1:1 ratio by weight. Pour Sto Flexyl into a clean mixing pail. Add Portland cement, mix to a uniform consistency and allow to set for approximately five minutes. Adjust mix if necessary with additional Sto Flexyl and remix to a uniform trowel consistency. Avoid retempering. Keep mix ratio consistent.

I. Sto Primer Creativ 806—mix with a clean, rust-free high speed mixer to a uniform consistency.

J. Stolit 1.5, 2.0, 3.0, R1.5, R2, R3 and Freeform—mix with a clean, rust-free high speed mixer to a uniform consistency. A small amount of water may be added to adjust workability. Limit addition of water to amount needed to achieve the finish texture.

K. Sto Maxicryl---mix with rust free electric drill.

L. StoTique---Add clean potable water to the level equal to the second rib from the top of the pail and mix thoroughly.

M. Mix only as much material as can readily be used.

N. Do not use anti-freeze compounds or other additives.

PART 3 EXECUTION

3.01 ACCEPTABLE INSTALLERS

A. Prequalify under Quality Assurance requirements of this specification (section 1.06.B).

3.02 EXAMINATION

A. Inspect surfaces for:

1. Contamination -- algae, chalkiness, dirt, dust, efflorescence, form oil, fungus, grease, laitance, mildew or other foreign substances.
2. Surface absorption and chalkiness.
3. Cracks -- measure crack width and record location of cracks.
4. Damage and deterioration.
5. Moisture content and moisture damage -- use a moisture meter to determine if the surface is dry enough to receive the EIFS and record any areas of moisture damage.
6. Compliance with specification tolerances -- record areas that are out of tolerance (greater than ¼ inch in 8-0 feet [6mm in 2438 mm] deviation in plane).

B. Inspect sheathing application for compliance with applicable requirement:

1. Exterior gypsum sheathing--GA-253
2. Exterior Grade and Exposure I wood based sheathing--APA Engineered Wood Association E 30
3. Glass mat faced gypsum sheathing--Georgia Pacific Publication 101514
4. Cementitious sheathing--Consult manufacturer's published recommendations

C. Report deviations from the requirements of project specifications or other conditions that might adversely affect the EIFS installation to the General Contractor. Do not start work until deviations are corrected.

3.03 SURFACE PREPARATION

A. Remove surface contaminants on concrete and concrete masonry surfaces (refer to ASTM D 4258 and D 4261).

B. Apply conditioner by sprayer or roller to chalking or excessively absorptive surfaces.

C. Replace weather-damaged sheathing and repair damaged or cracked surfaces.

D. Level surfaces to comply with required tolerances.

3.04 INSTALLATION

(Note: the coordination of work with other trades is important for the performance of the wall assembly, in particular the installation of flashing above window and door heads, beneath window and door sills, at roof/wall intersections, decks, intersections of lower walls with higher walls, projecting features, and

at the base of the wall to ensure that where water is likely to penetrate the wall assembly, it will be drained to the exterior at the source of the leak).

A. Backwrapping

1. Apply a strip of detail mesh to the substrate at the base of the wall and at all system terminations (windows, doors, expansion joints, etc.). The mesh must be wide enough to adhere approximately 4 inches (100 mm) of mesh onto the wall, be able to wrap around the insulation board edge and cover a minimum of 2 ½ inches (64 mm) on the outside surface of the insulation board. Adhere mesh strips to the supporting substrate and allow them to dangle until the backwrap procedure is completed (paragraph F.1).

B. Adhesive Application and Installation of Insulation Board *(for all adhesives except Sto BTS® Silo)*

1. Apply adhesive to the back of the insulation board with the proper size stainless steel notched trowel. Apply uniform ribbons of adhesive horizontally or vertically.
2. Start at base of wall from a level line. Immediately place insulation boards in a running bond pattern on the wall with the long dimension horizontal. Apply firm pressure over the entire surface of the boards to ensure uniform contact of adhesive. Bridge sheathing joints by a minimum of 6 inches (152 mm). Interlock inside and outside corners.
3. Butt all board joints tightly together to eliminate any thermal breaks in the EIFS. Care must be taken to prevent any adhesive from getting between the joints of the boards.
4. Cut insulation board in an L-shaped pattern to fit around openings. Do not align board joints with corners of openings.
5. Remove individual boards periodically while the adhesive is still wet to check for satisfactory contact with the substrate and the back of the insulation board. An equal amount of adhesive must be on the substrate and the board when they are removed, as an indication of adequate adhesion. Do not use nails, screws, or any other type of non-thermal mechanical fastener.

C. Adhesive Application and Installation of EPS Board with StoSilo Spray Equipment

(Note: spray application will progress faster than application by hand. Pre-cut EPS board as needed and adjust crew size and job staging to install EPS board so it follows immediately after the spray application of adhesive)

1. Apply material to the prepared sheathing to a rough thickness of 1/4” (6 mm). Form uniform vertical or horizontal ribbons of adhesive by directing the proper size stainless steel notched trowel from the bottom of the wall upward. Immediately install insulation boards in accordance with steps C.2-C.5 above. If adhesive develops a “skin” before the insulation board is installed remove the adhesive and replace with fresh material.

D. Slivering and Rasping of Insulation Board Surface

(Note: EPS insulation board exposed to sunlight will develop a powdery residue on the surface. This residue must be entirely removed by rasping the surface)

1. After insulation boards are firmly adhered to the substrate, fill any open joints in the insulation board layer with slivers of insulation or approved spray foam.
2. Rasp the insulation board surface to achieve a smooth, even surface and to remove any ultraviolet ray damage.

E. Trim, Reveals and Projecting Aesthetic Features

(Note: Reveals/aesthetic grooves may be designed into the system to accommodate workability on multi-level buildings or lengthy wall sections)

1. Attach features and trim where designated on drawings with adhesive to the insulation board or sheathing surface. Slope the top surface of all trim/features minimum 1:2 (27°) and the bottom of all horizontal reveals minimum 1:2 (27°).
2. Cut reveals/aesthetic grooves with a hot-knife, router or groove-tool in locations indicated on drawings.
3. Offset reveals/aesthetic grooves minimum 3 inches (75 mm) from insulation board joints.
4. Do not locate reveals/aesthetic grooves at high stress areas such as corners of windows, doors, etc.
5. A minimum ¾ inch (19 mm) thickness of insulation board must remain at the bottom of the reveals/aesthetic grooves.

F. Completion of Backwrapping

1. Complete the backwrapping procedure by applying base coat to exposed edges of insulation board and approximately 4 inches (100 mm) onto the face of the insulation board. Pull mesh tight around the board and embed it in the base coat with a stainless steel trowel. Use a corner trowel for clean, straight lines. Smooth any wrinkles or gaps in the mesh.

G. Base Coat and Reinforcing Mesh Application

1. Apply minimum 9x12 inch (225x300 mm) diagonal strips of detail mesh at corners of windows, doors, and all penetrations through the system. Embed the strips in wet base coat and trowel from the center to the edges of the mesh to avoid wrinkles.
2. Apply detail mesh at trim, reveals and projecting architectural features. Embed the mesh in the wet base coat. Trowel from the base of reveals to the edges of the mesh.
3. Ultra-High impact mesh application (recommended to a minimum height of 6'-0" [1.8 m] above finished grade at all areas accessible to pedestrian traffic and other areas exposed to abnormal stress or impact, and where indicated on contract drawings): apply base coat over the insulation board with StoSilo spray equipment or a stainless steel trowel to a uniform thickness of approximately ⅛ inch (3 mm). Work horizontally or vertically in strips of 40 inches (1016 mm), and immediately embed the mesh into the wet base coat by troweling from the center to the edge of the mesh. Butt the mesh at seams. Allow the base coat to dry.
4. Standard mesh application: Apply base coat over the insulation board, including areas with Ultra-High impact mesh, with StoSilo spray equipment or a stainless steel trowel to a uniform thickness of approximately ⅛ inch (3 mm). Work horizontally or vertically in strips of 40 inches (1016mm), and immediately embed the mesh into the wet base coat by troweling from the center to the edge of the mesh. Overlap mesh not less than 2-½ inches (64 mm) at mesh seams and at overlaps of detail mesh. Feather seams and edges. Double wrap all inside and outside corners with minimum 2-½ inch (64 mm) overlap in each direction. (Alternate corner treatment: embed corner mat in base coat, allow to dry, then overlap up to corner with standard reinforcing mesh embedded in base coat). Avoid wrinkles in the mesh. The mesh must be fully embedded so that no mesh color or pattern shows through the base coat when it is dry. Re-skim with additional base coat if mesh color or pattern is visible.
5. Sloped Surfaces: for trim, reveals, aesthetic bands, cornice profiles, sills or other architectural features that project beyond the vertical wall plane more than 2 inches (51 mm) apply waterproof base coat with a stainless steel trowel to the weather exposed sloped surface and minimum four inches (100 mm) above and below it. Embed standard mesh or detail mesh in the waterproof base coat and overlap mesh seams a minimum of 2-½ inches (65 mm).
6. Allow base coat to thoroughly dry before applying primer or finish.

Note: All trim and projecting architectural features must have a minimum 1:2 [27°] slope along their top surface. All horizontal reveals must have a minimum 1:2 [27°] slope along their bottom surface. Increase slope for northern climates to prevent accumulation of ice/snow and water on surface. Where trim/feature or bottom surface of reveal projects more than 2 inches (51 mm) from the face of the EIFS wall plane, protect the weather exposed sloped surface with waterproof base coat. Avoid the use of trim and features that exceed the maximum allowable thickness of EPS permitted by code (typically 4 inches [100 mm]) unless approved by the code official. Periodic inspections and increased maintenance may be required to maintain surface integrity of EIFS on sloped weather exposed surfaces. Limit projecting features to easily accessible areas and limit total area to facilitate maintenance and minimize maintenance burden. Refer to Sto details 1.04a and 1.04b.

Do not use EIFS on weather exposed projecting ledges, sills, or other projecting features unless supported by framing or other structural support and protected with metal coping or flashing. Refer to Sto detail 1.61.

H. Primer Application

1. Apply Sto Primer Creativ 806 (the grout color) evenly with brush, roller or proper spray equipment over the clean, dry base coat and allow to dry thoroughly before applying finish. Additionally, StoTique may be applied to the dry primer to create a weathered appearance.

I. Stencil Application

1. Apply StoCreativ Brick self-adhesive stencils to wall surface only after the Primer has completely dried.
2. Mark a level horizontal line parallel to the bottom of the wall at the approximate mid-point of wall height. The line should represent several increments of stencil height. Depending on building height several parallel lines may need to be marked to serve as guides to keep stencil placement parallel.
3. Mark a vertical line perpendicular to the horizontal line(s) at the mid-point of wall length to serve as a plumb line. The line should represent several increments of stencil length. Depending on building length several parallel lines may need to be marked to serve as guides to keep stencil placement parallel.
4. After verifying lines for squareness, adhere templates to the wall to achieve the desired pattern. Remove the stencil backing, and start the template at the intersection of the level line and plumb line. Place additional templates using reference lines and adjacent templates as guides to ensure squareness.
5. At abutting stencil joints place filament tape over the joints.
6. Install only as many stencils as can be covered with finish the same day.

J. Finish Coat Application

1. Apply finish directly over the stencil and previously coated base coat when dry. Apply finish by spraying or troweling with a stainless steel trowel. Follow these general rules for application of finish:
   a. Avoid application in direct sunlight.
   b. Apply finish in a continuous application, and work to an architectural break in the wall.
   c. Weather conditions affect application and drying time. Hot or dry conditions limit working time and accelerate drying. Adjustments in the scheduling of work may be required to achieve desired results; cool or damp conditions extend working time and retard drying and may require added measures of protection against wind, dust, dirt, rain and freezing. Adjust work schedule and provide protection.
   d. Do not install separate batches of finish side-by-side.

e. Do not apply finish into or over sealant joints. Apply finish to outside face of wall only.
f. Do not apply finish over irregular or unprepared surfaces, or surfaces not in compliance with the requirements of the project specifications.

K. Mottled Finish Appearance

1. After finish coat is dry and the stencil removed, apply Sto Maxicryl with a $^{1}/_{16}$" or ⅛ (1.6-3mm) nap roller to specific areas of the brick (not the brick joints) in the colors as depicted in the required sample. Foam pads or rags may also be used.

L. Weathered Appearance

1. After finish coat is dry and the stencil removed, apply Sto Tique with brush roller or rag to specific areas of the brick (not the brick joints) in the colors as depicted in the requested sample.

M. Removal of Stencils

1. Remove stencils after the finish has dried. Lift stencils carefully to avoid tears into the edges of the finish.
2. At any areas where finish has seeped beneath the stencil, clean with a narrow edging tool and touch up the area with a small paint brush and primer.

3.05 PROTECTION

A. Provide protection of installed materials from water infiltration into or behind them.

B. Provide protection of installed materials from dust, dirt, precipitation, freezing and continuous high humidity until they are fully dry.

END OF SECTION

SECTION 074213.23 - METAL COMPOSITE MATERIAL WALL PANELS

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 MCM wall panels.

1.3 DEFINITIONS

A. MCM: Metal Composite Material is two sheets of smooth metal continuously thermo-bonded to a solid Fire Retardant (FR) core under precise temperature, pressure, and tension.

B. DBVR: Drained & Back-Ventilated Rainscreen is a system designed to manage and limit water from contacting the air/water barrier and allowing for the subsequent drying within the cavity via ventilation.

C. PER: Pressure Equalized Rainscreen is a system designed to equalize pressure between interior cavities to prevent water from contacting the air/water barrier and allowing for the subsequent drying within the cavity via ventilation.

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference:

1. Meet with Owner, Architect, Owner's insurer if applicable, MCM panel Fabricator and Installer, MCM sheet manufacturer's representative, structural-support Installer, and installers whose work interfaces with or affects MCM panels, including installers of doors, windows, and louvers.
2. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
3. Examine support conditions for compliance with requirements, including alignment between and attachment to structural members.
4. Review flashings, special siding details, wall penetrations, openings, and condition of other construction that affect MCM panels.
5. Review governing regulations and requirements for insurance, certificates, and tests and inspections if applicable.
6. Review temporary protection requirements for MCM panel assembly during and after installation.
7. Review procedures for repair of panels damaged after installation.
8. Document proceedings, including corrective measures and actions required, and furnish copy of record to each participant.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of panel and accessory.

B. Shop Drawings:

1. MCM system fabricator to provide shop drawings including fabrication and installation layouts of MCM panels; details of edge conditions, joints, panel profiles, corners, attachment assembly, trim, flashings, closures, and accessories.
2. Accessories: Include details of the flashing, trim and anchorage, at a scale of not less than 1-1/2 inches per 12 inches (1:10).

C. Samples for Initial Selection: For each type of MCM panel indicated with factory-applied color finishes.

1. Include similar Samples of trim and accessories involving color selection.

D. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below.

1. MCM Panels: 12 inches (305 mm) long by actual panel width. Include fasteners, closures, and other MCM panel accessories. Submit custom color samples in paint manufacturer's standard size.

1.6 INFORMATIONAL SUBMITTALS

A. Product Test Reports: For each product, tests performed by a qualified testing agency.

1. MCM Manufacturer's Material Test Reports: Certified test reports showing compliance with specific performance or third-party listing documenting compliance to comparable code sections IBC 1407.14 and IBC 1703.5.
2. MCM System Fabricator's Certified System Tests Reports: Certified system test reports showing system compliance with specific performance or third-party listing documenting compliance code section. Base performance requirements on MCM system type provided.
    a. DBVR System: Tested to AAMA 509.
    b. PER System: Tested to AAMA 508.
    c. NFPA 285.

B. Environmental Product Declaration (EPD): Provide the Product-Specific or Industry-Wide Type III EPD in compliance with ISO 14025.

C. Field quality-control reports.

D. Sample Warranties.

1.7 CLOSEOUT SUBMITTALS

A. Maintenance Data: For MCM panels to include in maintenance manuals.

1.8 QUALITY ASSURANCE

A. MCM Manufacturer Qualifications: An entity that has successfully manufactured MCM at a domestically located factory for a minimum of 5 years.

B. MCM Fabricator Qualifications: An entity that has successfully fabricated and assembled MCM panels and approved by the MCM manufacturer.

C. MCM Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by MCM Fabricator.

D. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for MCM fabrication and installation.

1. Build mockup of typical MCM panel assembly including supports, attachments, and accessories.
2. Water-Spray Test: Conduct water-spray test of mockup of MCM panel assembly, testing for water penetration in accordance with AAMA 501.2.
3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Deliver components, MCM panels, and other manufactured items so as not to be damaged or deformed. Package MCM panels for protection during transportation and handling.

B. Unload, store, and erect MCM panels in a manner to prevent bending, warping, twisting, and surface damage.

C. Stack MCM panels on platforms or pallets, covered with suitable weathertight and ventilated covering. Store MCM panels to ensure dryness, with positive slope for drainage of water. Do not store MCM panels in contact with other materials that might cause staining, denting, or other surface damage.

D. Retain strippable protective covering on MCM panels during installation.

1.10 FIELD CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit assembly of MCM panels to be performed in accordance with manufacturers' written instructions and warranty requirements.

1.11 COORDINATION

A. Coordinate MCM panel installation with rain drainage work, flashing, trim, construction of soffits, and other adjoining work to provide a leakproof, secure, and noncorrosive installation.

1.12 WARRANTY

A. Refer to Manufacturer’s standard terms and conditions.

B. Material Warranty: Submit the Manufacturer’s standard form agreeing to furnish fabrication, labor and material to repair or replace MCM that exhibits defects within the specified warranty period.

1. Coverage Includes:

a. Delamination of metal bond to the fire retardant core.

2. Warranty Period: 10 years from date of Substantial Completion

C. Workmanship Warranty: Submit the Fabricator/Installer’s standard form agreeing to furnish fabrication, labor and material required to repair or replace work which exhibits workmanship defects within the specific warranty period.

1. Warranty Period: 2 years from the date of Substantial Completion.

D. Warranty on Panel Finishes: Submit the Manufacturer's standard form agreeing to furnish fabrication, labor and material to repair or replace MCM panels that show evidence of deterioration of factory-applied finishes within specified warranty period.

1. Coverage includes:

a. Color fading more than (5) Delta E units when tested according to ASTM D 2244.
b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
c. Cracking, checking, peeling, or failure of the paint to adhere to the bare metal substrate.

2. Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide MCM panel systems capable of withstanding the effects of the following loads, based on testing in accordance with ASTM E330:

1. Wind Loads: As indicated on Drawings.
2. Panel Deflection Limit: For wind loads, no greater than 1/60 of the span.
3. Framing Member Deflection Limits: For wind loads, no greater than 1/175 of the span.

B. Air Infiltration: Air leakage of not more than 0.06 cfm/sq. ft. (0.3 L/s per sq. m) of wall area when tested in accordance with ASTM E283 at a test-pressure difference of 6.24 lbf/sq. ft. (300 Pa).

C. Water Penetration under Static Pressure: No water penetration to room side of assembly when tested for 15 minutes in accordance with ASTM E331 a test-pressure difference of 6.24 lbf/sq. ft. (300 Pa).

D. Thermal Movements: Locate expansion and contraction points to allow for free and noiseless thermal movements from surface temperature changes at a range of 20 deg F to 180 deg F (minus 29 to 82.2 deg C), material surfaces.

E. Fire Propagation Characteristics: MCM wall assembly passes NFPA 285 testing.

F. Rainscreen Cladding Performance:

1. AAMA 508: Water mist or water droplets appearing in less than 5% of the air/water barrier surface, and no continuous streaming at any location on the air/water barrier. Pressure equalization lag time between the cavity and cyclic wind pressure shall not exceed 0.08 sec^2. The maximum differential between the cavity and the cyclic wind pressure shall not exceed 50% of the maximum test pressure.

2. AAMA 509: Dynamic water penetration classification no greater than W1 or 1.0oz/ft^2 and air flow ventilation classification no less than V4 or 6.0 cfm/ft^2.

2.2 MCM WALL PANELS

A. MCM Wall Panel Systems: Provide -shop formed and assembled MCM panels formed into profiles for the installation method indicated and per the construction drawings. Include attachment assembly components**,** panel stiffeners, and accessories required.

1. Basis-of-Design Product: Subject to compliance with requirements, provide ALUCOBOND® PLUS manufactured by 3A Composites USA, Inc., or comparable product by:

   a. Arconic Architectural Products.
   b. Mitsubishi Chemical America.

B. Aluminum-Faced Composite Wall Panels: Formed with 0.020-inch- (0.50-mm-) thick aluminum sheet facings.

1. Panel Thickness: 4mm (0.157”)
2. Core: Fire retardant.
3. Exterior Finish: Acceptable coating resins are polyvinylidene difluoride (PVDF), fluorinated ethylene vinyl ether (FEVE), super-durable polyester (SDP), siliconized polyester (SMP) & anodized. The number of coats and film thicknesses shall comply with the specified warranty period and specified basis-of-design finish(es):

   a. Basis-of-design finish(es):

      1) MP1 – Custom Color to Match Owner’s “Bangor Blue”

4. Peel Strength: 22.5 in-lb/in. (100 N x mm/mm) when tested for bond integrity in accordance with ASTM D1781.
5. Fire Performance: Flame spread less than 25 and smoke developed less than 450, in accordance with ASTM E84.

C. Attachment Assembly Components: Formed from extruded aluminum or other compatible material per the construction drawings and in compliance with all required performance testing.

2.3 MISCELLANEOUS MATERIALS

A. Miscellaneous Metal Sub-framing and Furring: ASTM C645, cold-formed, metallic-coated steel sheet ASTM A653/A653M, G90 (Z275 hot-dip galvanized) coating designation or ASTM A792/A792M, Class AZ50 (Class AZM150) aluminum-zinc-alloy coating designation unless otherwise indicated. Provide Fabricator's standard sections as required for support and alignment of MCM panel system.

B. Panel Accessories: Provide components required for a rainscreen panel system including trim and flashing as indicated on the constructions drawings. Match material and finish of MCM panels unless otherwise indicated.

C. Flashing and Trim: Provide flashing and trim formed from same material as MCM panels as required to seal against weather and to provide finished appearance. Locations include, but are not limited to, bases, drips, sills, jambs, corners, end walls, framed openings, rakes, fasciae, and parapet caps.

1. Basis-of-Design Product: Subject to compliance with requirements, provide ALUCOBOND® AXCENT™ manufactured by 3A Composites USA Inc., or comparable product by one of the following:

    a. Arconic Architectural Products.
    b. Mitsubishi Chemical Composites.

2. Aluminum Trim: Formed with minimum 0.040-inch (1.00-mm-) thick, coil-coated aluminum sheet unless otherwise indicated on the construction drawings.

3. Basis-of-design Finish: To match MCM wall panel system unless otherwise indicated in the construction drawings.

D. Panel Fasteners: Self-tapping screws designed to withstand design loads. Provide exposed fasteners with heads matching color of MCM panels by means of plastic caps or factory-applied coating. Provide EPDM or PVC sealing washers for exposed fasteners.

E. Panel Sealants: ASTM C920; elastomeric polyurethane or silicone sealant; of type, grade, class, and use classifications required to seal joints in MCM panels and remain weathertight; and as recommended in writing by MCM panel manufacturer.

2.4 FABRICATION

A. General: Fabricate and finish MCM panels and accessories to fulfill indicated performance requirements demonstrated by laboratory testing. Comply with indicated profiles and dimensions as indicated on the construction drawings.

B. Fabricate MCM panel joints to fulfill indicated performance requirements demonstrated by laboratory testing. Comply with indicated profiles and dimensions as indicated on the construction drawings.

C. Sheet Metal Flashing and Trim: Fabricate flashing and trim to comply with manufacturer's recommendations or recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of item indicated.

1. Form exposed sheet metal accessories that are without excessive oil canning, buckling, and tool marks and that are true to line and levels indicated, with exposed edges folded back to form hems.
2. Seams for Aluminum: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with epoxy seam sealer. Rivet joints for additional strength.
3. Seams for Other Than Aluminum: Fabricate nonmoving seams in accessories with flat-lock seams. Tin edges to be seamed, form seams, and solder.
4. Sealed Joints: Form non-expansion, but movable, joints in metal to accommodate sealant and to comply with SMACNA standards.
5. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces of accessories exposed to view.
6. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal recommended in writing by metal panel manufacturer.

    a. Size: As recommended by SMACNA's "Architectural Sheet Metal Manual" or metal wall panel manufacturer for application but not less than thickness of metal being secured.

2.5 FINISHES

A. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

B. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces provided by others is acceptable. Variation in appearance from different production batches of finish effects including but not limited to anodized, brushed coil, mica flake, metallic flake, and texture is expected.

C. Allowable finishes for MCM Panels and Accessories: See basis-of-design finish selection and warranty requirements. Prepare, pretreat, and apply coatings to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

1. Coil Coated Finishes:
    a. PVDF Fluoropolymer: AAMA 2605. Containing not less than 70 percent PVDF resin by weight in color coat.

b. FEVE Fluoropolymer: AAMA 2605. F 100 percent fluorinated ethylene vinyl ether resin in color coat.
c. SDP Super-durable Polyester: AAMA 2605. Containing carboxyl or hydroxyl functional resin in the color coat.
d. SMP Siliconized Polyester: AAMA 2604. Containing silicone-modified, polyester-enamel in the color coat. .

2. Anodized Finish

a. Clear Anodic Finish: AAMA 611, AA-M12C22A41, Class I, 0.018 mm or thicker.
b. Color Anodic Finish: AAMA 611, AA-M12C22A42/A44, Class I, 0.018 mm or thicker.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, MCM panel supports, and other conditions affecting performance of the Work.

1. Examine wall framing to verify that girts, angles, channels, studs, and other structural panel support members and anchorage have been installed within alignment tolerances required by MCM wall panel manufacturer.
2. Examine wall sheathing to verify that sheathing joints are supported by framing or blocking and that installation is within flatness tolerances required by MCM wall panel manufacturer.

a. Verify that air- or water-resistive barriers have been installed over sheathing or backing substrate to prevent air infiltration or water penetration.

B. Examine roughing-in for components and assemblies penetrating MCM panels to verify actual locations of penetrations relative to seam locations of MCM panels before installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Miscellaneous Supports: Install sub framing, furring, and other miscellaneous panel support members and anchorages in accordance with ASTM C754 and MCM panel manufacturer's written recommendations.

3.3 MCM PANEL INSTALLATION

A. General: Install MCM panels in accordance with Fabricator's written instructions in orientation, sizes, and locations indicated on Drawings. Install panels perpendicular to supports unless

otherwise indicated. Anchor MCM panels and other components of the Work securely in place, with provisions for thermal and structural movement.

1. Shim or otherwise plumb substrates receiving MCM panels.
2. Flash and seal MCM panels at perimeter of all openings. Fasten with self-tapping screws. Do not begin installation until air- or water-resistive barriers and flashings that will be concealed by MCM panels are installed.
3. Install screw fasteners in predrilled holes.
4. Locate and space fastenings in uniform vertical and horizontal alignment.
5. Install flashing and trim as MCM panel work proceeds.
6. Locate panel splices over, but not attached to, structural supports. Stagger panel splices and end laps to avoid a four-panel lap splice condition.
7. Align bottoms of MCM panels and fasten with blind rivets, bolts, or self-tapping screws. Fasten flashings and trim around openings and similar elements with self-tapping screws.
8. Provide weathertight escutcheons for pipe- and conduit-penetrating panels.

B. Fasteners:

1. Aluminum Panels: Use aluminum or stainless steel fasteners for surfaces exposed to the exterior; use aluminum or galvanized-steel fasteners for surfaces exposed to the interior.

C. Metal Protection: Where dissimilar metals contact each other or corrosive substrates, protect against galvanic action as recommended in writing by MCM panel manufacturer.

D. Attachment Assembly, General: Install attachment assembly required to support MCM wall panels, including sub girts, perimeter flashing components, , and panel clips as indicated in the construction drawings.

E. Panel Installation: Attach MCM wall panels to supports at locations, spacings, and with fasteners to achieve performance requirements specified.

F. Accessory Installation: Install accessories with positive anchorage to building and weathertight mounting, and provide for thermal expansion. Coordinate installation with flashings and other components.

1. Install components required for a complete MCM panel assembly including trim, copings, corners, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items. Provide types indicated by MCM panel Fabricator; or, if not indicated, provide types recommended in writing by MCM system Fabricator.

G. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, or SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints, and seams that are permanently watertight.

1. Install exposed flashing and trim that is without buckling and tool marks and that is true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal flashing and trim to fit substrates and to result in waterproof performance.
2. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet (3 m) with no joints allowed within 24 inches (605 mm) of corner or intersection. Where lapped expansion provisions cannot be used or

would not be sufficiently waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch (25 mm) deep, filled with mastic sealant (concealed within joints).

3.4 PROJECT CONDITIONS

A. Field Measurements: Verify locations of wall framing members and wall opening dimensions by field measurements prior to the fabrication of the MCM system. Field measurements to be acquired once all substrate materials and adjacent materials are installed to use as-built data to submit “As Built Shop Drawings” with required adjustments to panel dimensions and layouts.

3.5 FIELD QUALITY CONTROL

A. Additional tests and inspections, at Contractor's expense, are performed to determine compliance of replaced or additional work with specified requirements.

B. Prepare test and inspection reports.

3.6 CLEANING AND PROTECTION

A. Remove temporary protective coverings and strippable films, if any, as MCM panels are installed, unless otherwise indicated in manufacturer's written installation instructions. On completion of MCM panel installation, clean finished surfaces as recommended by MCM panel manufacturer. Maintain in a clean condition during construction.

B. After MCM panel installation, clear weep holes and drainage channels of obstructions, dirt, and sealant.

C. Replace MCM panels that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 074213.23

SECTION 075323
EPDM THERMOSET SINGLE-PLY ROOFING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. EPDM thermoset single-ply roofing.

B. Membrane flashings.

C. Metal flashings.

D. Roof insulation.

1.2 EXTENT OF WORK

A. Provide all labor, material, tools, equipment, and supervision necessary to complete the installation of a non-reinforced 60-mil EPDM membrane Fully Adhered Roofing System including flashings and insulation as specified herein and as indicated on the drawings in accordance with the manufacturer's most current specifications and details.

1. Existing Building:

Existing membrane to be removed as required for modifications in area of connection. New fully adhered, non-reinforced .060 mil EPDM with new ½" SecureShield HD cover board installed over existing insulation.

2. New construction to receive a fully adhered, non-reinforced EPDM with rigid insulation over metal decking.

B. The roofing contractor shall be fully knowledgeable of all requirements of the contract documents and shall make themselves aware of all job site conditions that will affect their work.

C. The roofing contractor shall confirm all given information and advise the building owner, prior to bid, of any conflicts that will affect their cost proposal.

D. Any contractor who intends to submit a bid using a roofing system other than the approved manufacturer must submit for pre-qualification in writing per Division 1.

1.3 REFERENCES

A. American Society of Civil Engineers (ASCE) - ASCE 7 - Minimum Design Loads for Buildings and Other Structures, Current Revision.

B. International Code Council (ICC):
1. International Building Code (IBC).

C. ANSI/ASHRAE/IESNA Standard 90.1 (2007): Energy Standard for Buildings Except Low-Rise Residential Buildings

1.4 DESIGN CRITERIA

A. Wind Uplift Performance:
1. Roof system is designed to withstand wind uplift forces as calculated using the current revision of ASCE-7.

B. Fire Resistance Performance:
   1. Roof system will achieve a UL Class A rating when tested in accordance with UL-790.

C. Thermal Performance: Roof system will achieve a minimum R value not less than 30.

D. Drainage: Provide a roof system with positive drainage where all standing water dissipates within 48 hours after precipitation ends.

E. Building Codes:
   1. Roof system will meet the requirements of all federal, state and local code bodies having jurisdiction.

1.5 SUBMITTALS

A. Submit under provisions of Section 013000.

B. Product Data: Manufacturer's data sheets on each product to be used, including:
   1. Preparation instructions and recommendations.
   2. Storage and handling requirements and recommendations.
   3. Installation methods.

C. Detail Drawings:
   1. Submit approved plan, section, elevation or isometric drawings which detail the appropriate methods for all flashing conditions found on the project.
   2. Coordinate approved drawings with locations found on the Contract Drawings.

D. Selection Samples: For each finish product specified, two complete sets of chips representing manufacturer's full range of available colors, membranes, and thicknesses.

E. Verification Samples: For each finish product specified, two samples, minimum size 4 inches (100 mm) square representing actual product, color, and patterns.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: All products specified in this section will be supplied by a single manufacturer with a minimum of twenty (20) years' experience.

B. Installer Qualifications:
   1. All products listed in this section are to be installed by a single installer with a minimum of five (5) years demonstrated experience in installing products of the same type and scope as specified.
   2. Installer must be capable of extending the Manufacturer's Labor and Materials guarantee.
   3. Installer must be capable of extending the Manufacturer's No Dollar Limit guarantee.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

B. Store and dispose of hazardous materials, and materials contaminated by hazardous materials, in accordance with requirements of local authorities having jurisdiction.

1.8 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.

B. Refer to Carlisle's Roofing System specification, Part II - Application, for General Job Site Considerations.

C. Safety Data Sheets (SDS) must be on location at all times during the transportation, storage and application of materials.

D. When positioning membrane sheets, exercise care to locate all field splices away from low spots and out of drain sumps. All field splices should be shingled to prevent bucking of water.

E. When loading materials onto the roof, the Carlisle Authorized Roofing Applicator must comply with the requirements of the building owner to prevent overloading and possible disturbance to the building structure.

F. Proceed with roofing work only when weather conditions are in compliance with the manufacturer's recommended limitations, and when conditions will permit the work to proceed in accordance with the manufacturer's requirements and recommendations.

G. Proceed with work so new roofing materials are not subject to construction traffic. When necessary, new roof sections shall be protected and inspected upon completion for possible damage.

H. Provide protection, such as 3/4 inch thick plywood, for all roof areas exposed to traffic during construction. Plywood must be smooth and free of fasteners and splinters.

I. The surface on which the insulation or roofing membrane is to be applied shall be clean, smooth, dry, and free of projections or contaminants that would prevent proper application of or be incompatible with the new installation, such as fins, sharp edges, foreign materials, oil and grease.

J. New roofing shall be complete and weathertight at the end of the work day.

K. Contaminants such as grease, fats and oils shall not be allowed to come in direct contact with the roofing membrane.

1.9 WARRANTY

A. At project closeout, provide to Owner or Owners Representative an executed copy of the manufacturer's Total-System warranty, outlining its terms, conditions, and exclusions from coverage.

1. 20 years.
2. Coverage to be extended to include roof edge metal water tightness in accordance with terms stated in the Warranty document. Carlisle Golden Seal – Edge to Edge Warranty

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Basis of Design: Carlisle SynTec Systems, which is located at: P. O. Box 7000; Carlisle, PA 17013, Basis of design.

B. Approved Manufacturers:
1. Firestone Building Products
2. Johns Manville Products
3. Versico Roofing Systems

2.2 SCOPE / APPLICATION

A. Roof System: Provide a waterproof roof system, capable of withstanding uplift forces as specified in Design Criteria.

B. Base Flashing: Provide a waterproof, fully adhered base flashing system at all penetrations, plane transitions and terminations.

C. Insulation: Provide a roof insulation system beneath the finish membrane.

2.3 INSULATION

A. Polyisocyanurate InsulBase: Carlisle InsulBase. Rigid board with glass fiber reinforced facers (GRF) on both sides, meeting or exceeding the requirements of ASTM C 1289, Type II, Class 1.
   Compressive Strength: Grade 2 (20 psi).

B. SecurShield HD Cover board: Rigid board with coated glass facers on both sides, meeting or exceeding the requirements of ASTM C 1289, Type II, Class 4, Grade 1.
   1. Compressive Strength: 80 psi min. (751 kPa).
   2. Board Thickness: 1/2 inch (13 mm).

2.4 ETHYLENE, PROPYLENE, DIENE TERPOLYMER (EPDM) MEMBRANE

A. Sure-Seal Membrane: Cured, non-reinforced EPDM membrane meeting the requirements of ASTM D 4637.
   1. Attachment Method: Fully adhered.
   2. Color: Black.
   3. Membrane Thickness: 60 mil nominal

2.5 FLASHING ACCESSORIES

A. Sure-Seal (black Pressure-Sensitive Pipe Seals with Factory-Applied TAPE on the deck flange are available for use with Sure-Seal Roofing systems.

B. Sure-Seal/ Pressure-Sensitive Pourable Sealer Pocket: Pre-fabricated Pourable Sealer Pocket consisting of a 2 inch (51 mm) wide plastic support strip with Pressure-Sensitive, Factory-Applied, adhesive backed uncured Elastoform Flashing.

C. Sure-Seal/ Pressure-Sensitive (PS) Inside/Outside Corner: A 7 inch by 9 inch precut 60-mil thick Elastoform Flashing with a 30-mil Factory-Applied TAPE.

D. Sure-Seal/ Pressure-Sensitive (PS) Curb Flashing - A 60-mil thick, 20 inch (508 mm) wide cured EPDM membrane with 5 inch (126 mm) wide Factory-Applied Pressure-Sensitive TAPE along one edge to be used to flash curbs/skylights, etc.

E. Sure-Seal 20" pressure-Sensitive Cured Flashing - A 20" wide (508 mm) cured EPDM membrane with Pressure-Sensitive TAPE the full width, factory applied, used to flash curbs/skylights, etc.

F. Sure-Seal/ Pressure-Sensitive Cured Cover Strip: Sure-Seal or 60-mil cured EPDM membrane laminated to a nominal 35-mil cured Factory-Applied TAPE.

G. Sure-Seal/ Pressure-Sensitive "T" Joint Covers: A factory cut uncured 60-mil thick EPDM flashing laminated to a nominal 35-mil Factory-Applied TAPE, used to overlay field splice intersections and to cover field splices at angle changes. Available in 6 inch by 6 inch and 12 inch by 12 inch for Sure-Seal applications, and 6 inch by 6 inch for applications.

H. Sure-Seal/ Pressure-Sensitive Elastoform Flashing: 60-mil thick uncured EPDM Flashing laminated to a 30-mil Factory-Applied Pressure-Sensitive TAPE used in conjunction with Sure-Seal Primer.

I. Sure-Seal Pressure-Sensitive RUSS (Reinforced Universal Securement Strip):
   1. 6 inch (152 mm) RUSS: A nominal 6 inch (152 mm) wide, 45-mil thick reinforced EPDM membrane with a nominal 3 inch (76 mm) wide 30-mil thick cured synthetic rubber pressure-sensitive adhesive laminated to one edge. This product provides perimeter securement, and additional membrane securement at angle changes for Adhered, Ballasted, and Mechanically Fastened Roofing Systems.
   2. 9 inch (228 mm) RUSS: A nominal 9 inch (228 mm) wide, 45-mil thick reinforced EPDM membrane with a nominal 3 inch (76 mm) wide 30-mil thick cured synthetic rubber pressure-sensitive adhesive laminated to both edges. This product is used in place of narrow sheets to secure the membrane in the perimeter roof area. The use of this product allows field membrane to be utilized over the entire roof area.

2.6 CLEANERS, PRIMERS, ADHESIVES AND SEALANTS

A. Carlisle Weathered Membrane Cleaner: Clear, solvent-based cleaner used to loosen and remove contaminants from the surface of exposed EPDM membrane prior to applying EPDM Primer.

B. Sure-Seal SecurTAPE: 3 inch (76 mm) or 6 inch (152 mm) wide by 100 foot (30.5 M) long splice tape used for splicing adjoining sections of EPDM membrane.

C. SecurTAPE: A 3 inch (76 mm) or 6 inch wide (152 mm) wide by 100 foot (30.5 M) long, white colored splice tape used with Systems.

D. Sure-Seal HP-250 Primer: A solvent-based primer used to prepare the surface of EPDM membrane for application of Splice Tape or Pressure-Sensitive products.

E. Sure-Seal/ Lap Sealant: A heavy-bodied material (trowel or gun-consistency) used to seal the exposed edges of a membrane splice.
   1. Sure-Seal Lap Sealant: Black sealant for use with Sure-Seal (black) Roofing Systems.

F. 90-8-30A Bonding Adhesive: A high-strength, yellow colored, synthetic rubber adhesive used for bonding Sure-Seal/ EPDM membranes to various surfaces.

G. Flexible FAST Adhesive: A spray or extruded applied, two-component, polyurethane, low-rise expanding foam adhesive used to securely bond FleeceBACK membranes to a variety of substrates.

H. Water Cut-Off Mastic: A one-component, low viscosity, self-wetting, Butyl blend mastic used as a compression sealing agent between EPDM membranes and applicable substrates.

I. Two-Part Pourable Sealer: A black, two-component, solvent-free, polyurethane based product used for tie-ins and as a sealant around hard-to-flash membrane penetrating objects such as clusters of pipes and for a daily seal when the completion of flashings and terminations cannot be completed by the end of each work day. Can also be used for attaching lightning rod bases and ground cable clips to the membrane surface.

J. Sure-Seal/ One-Part Pourable Sealer: A one-component, moisture curing, elastomeric polyether sealant used as a sealant around hard-to-flash penetrations such as clusters of pipes, and is available in white or black.

K. Universal Single-Ply Sealant: A 100 percent solids, solvent free, one-part, polyether sealant that provides a weather tight sealant to a variety of building substrates; used as a termination bar sealant. Available in white only.

L. CAV-GRIP III Low-VOC Aerosol Contact Adhesive/Primer: a low-VOC, methylene chloride-free adhesive that can be used for a variety of applications including: Priming unexposed asphalt prior to applying Flexible FAST Adhesive, adhering Sure-Seal EPDM, horizontally, for the field of the roof, Sure-Seal EPDM membrane to vertical walls. Coverage rate is approximately 2,000-2,500 sq. ft. per 40 lb cylinder and 4,000-5,000 sq. ft. per 85 lb cylinder as a primer, in a single-sided application and 750 sq. ft. per 40 lb cylinder and 1,500 sq. ft. per 85 lb cylinder as an adhesive for vertical walls, in a double-sided application; 1,000 sq. ft. per 40 lb cylinder and 2,000 sq. ft. per 85 lb cylinder as an adhesive, horizontally, for the field of the roof, in a double-sided application.

2.7 FASTENING COMPONENTS

A. HP Fastener: Threaded, black epoxy electro-deposition coated (E-Coat) fastener for use with steel, wood plank or oriented strand board (OSB).

B. InsulFast Fasteners: Threaded, #12 fastener with #3 Phillips head used with 3-inch (76 mm) diameter Insulation Plates. For insulation attachment into steel or wood decks.

C. Pre-Assembled ASAP Fasteners: InsulFast Fastener and pre-assembled 3-inch (76 mm) diameter Plastic Insulation Plate for insulation attachment on adhered and mechanically-fastened roofing systems.

D. HP Term Bar Nail-In: A 1 1/4 inch (32 mm) long expansion anchor with threaded drive pin used for fastening Sure-Seal Termination Bar or Seam Fastening Plates to concrete, brick or block walls.

E. Seam Fastening Plate: 2 inch (51 mm) diameter metal plate for insulation, membrane and RUSS attachment.

F. Insulation Fastening Plate: Nominal 3 inch (76 mm) diameter FM approved metal plate used for insulation attachment.

G. Sure-Seal Metal Fastening Bar: 1 inch by 10 foot long (25 mm x 3048 mm) Galvalume-coated steel fastening bar pre-punched 6 inches (152 mm) on center for membrane securement on Mechanically Fastened Roofing Systems.

2.8 EDGINGS AND TERMINATIONS

A. SecurEdge 400: A 24-gauge galvanized metal water dam. Finish as noted on the Finish Schedule of the Contract Drawings.

B. SecurEdge 400 Coping: An anchor cleat with pre-slotted holes, a concealed joint cover, and 10 or 12 foot sections of coping cap. Kynar 500 finish as noted on the Finish Schedule of the Contract Drawings.

C. Sure-Seal Termination Bar: 1 inch (13 mm) wide, .098 inch (2.5 mm) thick extruded aluminum bar pre-punched 6 inches (152 mm) on center with sealant ledge to support Lap Sealant.

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 the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

C. Do not commence work until all other work trades have completed jobs that require them to traverse the deck on foot or with equipment.

3.3 INSULATION PLACEMENT

A. Install insulation or membrane underlayment in multiple layers over the substrate with boards butted tightly together with no joints or gaps greater than 1/4 inch (6 mm). Stagger joints both horizontally and vertically.

B. Secure insulation to the substrate with the required mechanical fasteners or insulation adhesive in accordance with the manufacturer's current application guidelines.

C. Do not install wet, damaged or warped insulation boards.

D. Stagger joints in one direction unless joints are to be taped. Install insulation boards snug. Gaps between board joints shall not exceed 1/4 inch (6 mm). Fill all gaps in excess of 1/4 inch (6 mm) with same insulation material.

E. Wood nailers must be at least 3 1/2 inches (89 mm) wide or 1 inch (25 mm) wider than adjacent metal flange. Thickness must equal that of insulation but not less than 1 inch (25 mm) thickness.

F. Miter and fill the edges of the insulation boards at ridges, valleys and other changes in plane to prevent open joints or irregular surfaces. Avoid breaking or crushing of the insulation at the corners.

G. Do not install any more insulation than will be completely waterproofed each day.

3.4 INSULATION ATTACHMENT

A. Securely attach insulation to the roof deck for Adhered or Mechanically Fastened Roofing Systems. Attachment must have been successfully tested to meet or exceed the calculated uplift pressure required by the International Building Code (ASCE-7) or ANSI/SPRI WD-1.

B. Enhance the perimeter and corner areas in accordance with the International Building Code (ASCE-7-10) or ANSI/SPRI WD-1.

3.5 MEMBRANE PLACEMENT AND ATTACHMENT (Fully Adhered)

A. Unroll and position membrane without stretching. Allow the membrane to relax for approximately 1/2 hour before bonding. Fold the sheet back onto itself so half the underside of the membrane is exposed.

B. Apply the Bonding Adhesive in accordance with the manufacturer's published instructions, to both the underside of the membrane and the substrate. Allow the adhesive to dry until it is tacky but will not string or stick to a dry finger touch.

C. Roll the coated membrane into the coated substrate while avoiding wrinkles. Brush down the bonded half of the membrane sheet with a soft bristle push broom to achieve maximum contact.

D. Fold back the unbonded half of the membrane sheet and repeat the bonding procedure.

E. Install adjoining membrane sheets in the same manner, overlapping edges appropriately to provide for the minimum splice width. It is recommended that all splices be shingled to avoid bucking of water.

3.6 MEMBRANE SPLICING (Adhesive Splice)

A. Fold the top sheet back and clean the dry splice area (minimum 3 inches wide) of both membrane sheets by scrubbing with clean natural fiber rags saturated with Splice Cleaner or HP-250 Primer. When using Sure-Seal (black) PRE-KLEENED membrane, cleaning the splice area is not required unless contaminated with field dirt or other residue.

B. Apply Splicing Cement in accordance with the manufacturer's current application guidelines, and roll the top sheet onto the mating surface.

C. Roll the splice with a 2-inch-wide steel roller and wait at least 2 hours before applying Lap Sealant to the splice edge following the manufacturer's requirements.

D. Field splices without In-Seam Sealant must be overlaid with uncured flashing.

3.7 MEMBRANE SPLICING (Tape Splice)

A. Overlap adjacent sheets and mark a line 1/2 inch out from the top sheet.

B. Fold the top sheet back and clean the dry splice area (minimum 2 1/2 inches (64 mm wide) of both membrane sheets with Sure-Seal Primer as required by the membrane manufacturer.

C. Where Splice Tape is not Factory-Applied, apply Splice Tape to bottom sheet with the edge of the release film along the marked line. Press tape onto the sheet using hand pressure. Overlap tape roll ends a minimum of 1 inch (13 mm).

D. Remove the release film and press the top sheet onto the tape using hand pressure.

E. Roll the seam toward the splice edge with a 2 inch (51 mm) wide steel roller.

F. Install Pressure-Sensitive "T" Joint Cover, a 6 inch wide (152 mm) section of Pressure-Sensitive Elastoform Flashing over all field splice intersections.

G. When using non-Pressure-Sensitive Elastoform Flashing or Elastoform Flashing, seal edges of flashing with Lap Sealant.

H. The use of Lap Sealant with tape splices is optional except at tape overlaps and cut edges of reinforced membrane where Lap Sealant is required.

3.8 FLASHING

A. Wall and curb flashing shall be cured EPDM membrane. Continue the deck membrane as wall flashing where practicable.

B. Follow manufacturer's typical flashing procedures for all wall, curb, and penetration flashing including metal edging/coping and roof drain applications.

3.9 WALKWAYS

A. Install walkways at all traffic concentration points (such as roof hatches, access doors, rooftop ladders, etc.) and all locations as identified on the Contract Drawings.

B. Adhere walkways pads to the EPDM membrane in accordance with the manufacturer's current application guidelines.

3.10 DAILY SEALS

A. On phased roofing, when the completion of flashings and terminations is not achieved by the end of the work day, a daily seal must be performed to temporarily close the membrane to prevent water infiltration.

B. Use Sure-Seal Pourable Sealer or other acceptable membrane seal in accordance with the manufacturer's requirements.

3.11 CLEAN UP

A. Perform daily clean-up to collect all wrappings, empty containers, paper, and other debris from the project site. Upon completion, all debris must be disposed of in a legally acceptable manner.

B. Prior to the manufacturer's inspection for warranty, the applicator must perform a pre-inspection to review all work and to verify all flashing has been completed as well as the application of all caulking.

3.12 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

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SECTION 076200 - SHEET METAL FLASHING AND TRIM

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Manufactured reglets with counterflashing.
2. Formed roof-drainage sheet metal fabrications: Gutters, Scuppers, Splash Pans

1.2 ACTION SUBMITTALS

A. Product Data: For each of the following

1. Elastomeric sealant.
2. Butyl sealant.
3. Epoxy seam sealer.

B. Shop Drawings: For sheet metal flashing and trim.

1. Include plans, elevations, sections, and attachment details.
2. Detail fabrication and installation layouts, expansion-joint locations, and keyed details. Distinguish between shop- and field-assembled Work.
3. Include identification of material, thickness, weight, and finish for each item and location in Project.
4. Include details for forming, including profiles, shapes, seams, and dimensions.
5. Include details for joining, supporting, and securing, including layout and spacing of fasteners, cleats, clips, and other attachments. Include pattern of seams.
6. Include details of termination points and assemblies.
7. Include details of expansion joints and expansion-joint covers, including showing direction of expansion and contraction from fixed points.
8. Include details of roof-penetration flashing.
9. Include details of edge conditions, including eaves, ridges, valleys, rakes, crickets, flashings, and counterflashings.
10. Include details of special conditions.
11. Include details of connections to adjoining work.

C. Samples: For each exposed product and for each color and texture specified, 12 inches long by actual width.

1.3 INFORMATIONAL SUBMITTALS

1.4 CLOSEOUT SUBMITTALS

A. Maintenance data.

B. Special warranty.

1.5 QUALITY ASSURANCE

A. Fabricator Qualifications: Employs skilled workers who custom fabricate sheet metal flashing and trim similar to that required for this Project and whose products have a record of successful in-service performance.

1. For copings and roof edge flashings that are ANSI/SPRI/FM 4435/ES-1 tested and FM Approvals approved, shop is to be listed as able to fabricate required details as tested and approved.

1.6 WARRANTY

A. Special Warranty on Finishes: Manufacturer agrees to repair finish or replace sheet metal flashing and trim that shows evidence of deterioration of factory-applied finishes within specified warranty period.

1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:
   a. Color fading more than 5 Delta E units when tested in accordance with ASTM D2244.
   b. Chalking in excess of a No. 8 rating when tested in accordance with ASTM D4214.
   c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
2. Finish Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Sheet metal flashing and trim assemblies, including cleats, anchors, and fasteners, are to withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Completed sheet metal flashing and trim are not to rattle, leak, or loosen, and are to remain watertight.

B. Sheet Metal Standard for Flashing and Trim: Comply with NRCA's "The NRCA Roofing Manual: Architectural Metal Flashing, Condensation and Air Leakage Control, and Reroofing" and SMACNA's "Architectural Sheet Metal Manual" requirements for dimensions and profiles shown unless more stringent requirements are indicated.

C. Sheet Metal Standard for Copper: Comply with CDA's "Copper in Architecture Handbook." Conform to dimensions and profiles shown unless more stringent requirements are indicated.

D. SPRI Wind Design Standard: Manufacture and install copings roof edge flashings tested in accordance with ANSI/SPRI/FM 4435/ES-1 and capable of resisting the following design pressure:

1. Design Pressure: As indicated on Drawings .

E. FM Approvals Listing: Manufacture and install copings roof edge flashings that are listed in FM Approvals' "RoofNav" and approved for windstorm classification. Identify materials with name of fabricator and design approved by FM Approvals.

2.2 SHEET METALS

A. Protect mechanical and other finishes on exposed surfaces from damage by applying strippable, temporary protective film before shipping.

B. Aluminum Sheet: ASTM B209, alloy as standard with manufacturer for finish required, with temper as required to suit forming operations and performance required;

1. Exposed Coil-Coated Finish:
   a. Two-Coat Fluoropolymer: AAMA 2605. Fluoropolymer finish containing not less than 70 percent polyvinylidene fluoride (PVDF) resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
2. Color: Match Wall Panel Colors as indicated on drawings. Match existing where modifying existing system.
3. 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.

C. Metallic-Coated Steel Sheet: Provide aluminum-zinc alloy-coated steel sheet in accordance with ASTM A792/A792M, Class AZ50 coating designation, Grade 40; prepainted by coil-coating process to comply with ASTM A755/A755M.

1. Surface: Embossed .
2. Exposed Coil-Coated Finish:
   a. Two-Coat Fluoropolymer: AAMA 621. Fluoropolymer finish containing not less than 70 percent polyvinylidene fluoride (PVDF) resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
3. Color: Match Wall Panel Colors as indicated on drawings. Match existing where modifying existing system.
4. 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.

2.3 MISCELLANEOUS MATERIALS

A. Provide materials and types of fasteners, protective coatings, sealants, and other miscellaneous items as required for complete sheet metal flashing and trim installation and as recommended by manufacturer of primary sheet metal or manufactured item unless otherwise indicated.

B. Fasteners: Wood screws, annular threaded nails, self-tapping screws, self-locking rivets and bolts, and other suitable fasteners designed to withstand design loads and recommended by manufacturer of primary sheet metal or manufactured item.

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 Copper Sheet: Copper, hardware bronze or passivated Series 300 stainless steel.
3. Fasteners for Aluminum Sheet: Aluminum or Series 300 stainless steel.
4. Fasteners for Stainless Steel Sheet: Series 300 stainless steel.
5. Fasteners for Zinc-Coated (Galvanized) Steel Sheet: Series 300 stainless steel or hot-dip galvanized steel in accordance with ASTM A153/A153M or ASTM F2329/F2329M.

C. Sealant Tape: Pressure-sensitive, 100 percent solids, polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/2 inch wide and 1/8 inch thick.

D. Elastomeric Sealant: ASTM C920, elastomeric silicone polymer sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.

E. Butyl Sealant: ASTM C1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for hooked-type expansion joints with limited movement.

F. Epoxy Seam Sealer: Two-part, noncorrosive, aluminum seam-cementing compound, recommended by aluminum manufacturer for exterior nonmoving joints, including riveted joints.

G. Bituminous Coating: Cold-applied asphalt emulsion in accordance with ASTM D1187/D1187M.

H. Reglets: Units of type, material, and profile required, formed to provide secure interlocking of separate reglet and counterflashing pieces, and compatible with flashing indicated with factory-mitered and -welded corners and junctions and with interlocking counterflashing on exterior face, of same metal as reglet.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. Cheney Flashing Company.
   b. Fry Reglet Corporation.
   c. Heckmann Building Products, Inc.
   d. Hohmann & Barnard, Inc.
2. Material: Aluminum, 0.024 inch thick Galvanized steel, 0.022 inch thick.

3. Surface-Mounted Type: Provide with slotted holes for fastening to substrate, with neoprene or other suitable weatherproofing washers, and with channel for sealant at top edge.

4. Masonry Type: Provide with offset top flange for embedment in masonry mortar joint.
5. Accessories:
   a. Flexible-Flashing Retainer: Provide resilient plastic or rubber accessory to secure flexible flashing in reglet where clearance does not permit use of standard metal counterflashing or where Drawings show reglet without metal counterflashing.
   b. Counterflashing Wind-Restraint Clips: Provide clips to be installed before counterflashing to prevent wind uplift of counterflashing's lower edge.
6. Finish: With manufacturer's standard color coating .

2.4 FABRICATION, GENERAL

A. Custom fabricate sheet metal flashing and trim to comply with details indicated and recommendations in cited sheet metal standard that apply to design, dimensions, geometry, metal thickness, and other characteristics of item required.

1. Fabricate sheet metal flashing and trim in shop to greatest extent possible.
2. Fabricate sheet metal flashing and trim in thickness or weight needed to comply with performance requirements, but not less than that specified for each application and metal.
3. Verify shapes and dimensions of surfaces to be covered and obtain field measurements for accurate fit before shop fabrication.
4. Form sheet metal flashing and trim to fit substrates without excessive oil-canning, buckling, and tool marks; true to line, levels, and slopes; and with exposed edges folded back to form hems.
5. Conceal fasteners and expansion provisions where possible. Do not use exposed fasteners on faces exposed to view.

B. Fabrication Tolerances:

1. Fabricate sheet metal flashing and trim that is capable of installation to a tolerance of 1/4 inch in 20 feet on slope and location lines indicated on Drawings and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.
2. Fabricate sheet metal flashing and trim that is capable of installation to tolerances specified.

C. Expansion Provisions: Form metal for thermal expansion of exposed flashing and trim.

1. Form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with butyl sealant concealed within joints.
2. Use lapped expansion joints only where indicated on Drawings.

D. Sealant Joints: Where movable, nonexpansion-type joints are required, form metal in accordance with cited sheet metal standard to provide for proper installation of elastomeric sealant.

E. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal.

F. Fabricate cleats and attachment devices of sizes as recommended by cited sheet metal standard and by FM Global Property Loss Prevention Data Sheet 1-49 for application, but not less than thickness of metal being secured.

G. Seams:

1. Fabricate nonmoving seams with flat-lock seams. Tin edges to be seamed, form seams, and solder.
2. Fabricate nonmoving seams with flat-lock seams. Form seams and seal with elastomeric sealant unless otherwise recommended by sealant manufacturer for intended use. Rivet joints where necessary for strength.
3. Seams for Aluminum: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with epoxy seam sealer. Rivet joints where necessary for strength.

2.5 ROOF-DRAINAGE SHEET METAL FABRICATIONS

A. Hanging Gutters:

1. Fabricate to cross section required, complete with end pieces, outlet tubes, and other accessories as required.
2. Fabricate in minimum 96-inch- long sections.
3. Furnish flat-stock gutter brackets and flat-stock gutter spacers and straps fabricated from same metal as gutters, of size recommended by cited sheet metal standard, but with thickness not less than twice the gutter thickness .
4. Fabricate expansion joints, expansion-joint covers, gutter bead reinforcing bars, and gutter accessories from same metal as gutters. Shop fabricate interior and exterior corners.
5. Accessories: Continuous, removable leaf screen with sheet metal frame and hardware cloth screen .
6. Gutters with Girth up to 15 Inches: Fabricate from the following materials:
   a. Aluminum-Zinc Alloy-Coated Steel: 0.022 inch

B. Parapet Scuppers: Fabricate scuppers to dimensions required, with closure flange trim to exterior, 4-inch- wide wall flanges to interior, and base extending 4 inches beyond cant or tapered strip into field of roof. Fabricate from the following materials:

1. Aluminum-Zinc Alloy-Coated Steel: 0.028 inch thick.

C. Splash Pans: Fabricate to dimensions and shape required and from the following materials:

1. Aluminum: 0.040 inch .

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Install sheet metal flashing and trim to comply with details indicated and recommendations of cited sheet metal standard that apply to installation characteristics required unless otherwise indicated on Drawings.

1. Install fasteners, protective coatings, separators, sealants, and other miscellaneous items as required to complete sheet metal flashing and trim system.
2. Install sheet metal flashing and trim true to line, levels, and slopes. Provide uniform, neat seams with minimum exposure of solder welds sealant.
3. Anchor sheet metal flashing and trim and other components of the Work securely in place, with provisions for thermal and structural movement.
4. Install sheet metal flashing and trim to fit substrates and to result in watertight performance.
5. Install continuous cleats with fasteners spaced not more than 12 inches o.c.
6. Space individual cleats not more than 12 inches apart. Attach each cleat with at least two fasteners. Bend tabs over fasteners.
7. Install exposed sheet metal flashing and trim with limited oil-canning, and free of buckling and tool marks.
8. Do not field cut sheet metal flashing and trim by torch.

B. Metal Protection: Where dissimilar metals contact each other, or where metal contacts pressure-treated wood or other corrosive substrates, protect against galvanic action or corrosion by painting contact surfaces with bituminous coating or by other permanent separation as recommended by sheet metal manufacturer or cited sheet metal standard.

1. Coat concealed side of uncoated-aluminum and stainless steel sheet metal flashing and trim with bituminous coating where flashing and trim contact wood, ferrous metal, or cementitious construction.
2. Underlayment: Where installing sheet metal flashing and trim directly on cementitious or wood substrates, install underlayment and cover with slip sheet.

C. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim.

1. Space movement joints at maximum of 10 feet with no joints within 24 inches of corner or intersection.
2. Form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with sealant concealed within joints.
3. Use lapped expansion joints only where indicated on Drawings.

D. Fasteners: Use fastener sizes that penetrate wood blocking or sheathing not less than 1-1/4 inches for nails and not less than 3/4 inch for wood screws .

E. 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.

F. Seal joints as required for watertight construction.

1. Use sealant-filled joints unless otherwise indicated.
   a. Embed hooked flanges of joint members not less than 1 inch into sealant.
   b. Form joints to completely conceal sealant.
   c. When ambient temperature at time of installation is between 40 and 70 deg F, set joint members for 50 percent movement each way.
   d. Adjust setting proportionately for installation at higher ambient temperatures.
      1) Do not install sealant-type joints at temperatures below 40 deg F.
2. Prepare joints and apply sealants to comply with requirements in Section 079200 "Joint Sealants."

G. Soldered Joints: Clean surfaces to be soldered, removing oils and foreign matter.

1. Pretin edges of sheets with solder to width of 1-1/2 inches; however, reduce pretinning where pretinned surface would show in completed Work.
2. Do not solder metallic-coated steel and aluminum sheet.
3. Do not pretin zinc-tin alloy-coated copper.
4. Do not use torches for soldering.
5. Heat surfaces to receive solder, and flow solder into joint.
   a. Fill joint completely.
   b. Completely remove flux and spatter from exposed surfaces.
6. Stainless Steel Soldering:
   a. Tin edges of uncoated sheets, using solder for stainless steel and acid flux.
   b. Promptly remove acid-flux residue from metal after tinning and soldering.
   c. Comply with solder manufacturer's recommended methods for cleaning and neutralization.
7. Copper Soldering: Tin edges of uncoated sheets, using solder for copper.

H. Rivets: Rivet joints in uncoated aluminum zinc where necessary for strength.

3.2 INSTALLATION OF ROOF-DRAINAGE SYSTEM

A. Install sheet metal roof-drainage items to produce complete roof-drainage system in accordance with cited sheet metal standard unless otherwise indicated. Coordinate installation of roof perimeter flashing with installation of roof-drainage system.

B. Hanging Gutters:

1. Join sections with riveted and soldered joints or joints sealed with sealant.
2. Provide for thermal expansion.
3. Attach gutters at eave or fascia to firmly anchor them in position.
4. Provide end closures and seal watertight with sealant.
5. Slope to downspouts.
6. Install gutter with expansion joints at locations indicated on Drawings, but not exceeding, 50 feet apart. Install expansion-joint caps.
7. Install continuous gutter screens on gutters with noncorrosive fasteners, removable for cleaning gutters.

C. Splash Pans:

1. Install where parapet scuppers, gutters, or downspouts discharge on low-slope roofs .

2. Set in elastomeric sealant compatible with the substrate.

D. Parapet Scuppers:

1. Continuously support scupper, set to correct elevation, and seal flanges to interior wall face, over cants or tapered edge strips, and under roofing membrane.
2. Anchor scupper closure trim flange to exterior wall and solder or seal with elastomeric sealant to scupper.
3. Loosely lock front edge of scupper with conductor head.
4. Solder or seal with elastomeric sealant exterior wall scupper flanges into back of conductor head.

E. Expansion-Joint Covers: Install expansion-joint covers at locations and of configuration indicated on Drawings. Lap joints minimum of 4 inches in direction of water flow.

3.3 INSTALLATION TOLERANCES

A. Installation Tolerances: Shim and align sheet metal flashing and trim within installed tolerance of 1/4 inch in 20 feet on slope and location lines indicated on Drawings and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.

3.4 CLEANING

A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.

B. Clean and neutralize flux materials. Clean off excess solder.

C. Clean off excess sealants.

3.5 PROTECTION

A. Remove temporary protective coverings and strippable films as sheet metal flashing and trim are installed unless otherwise indicated in manufacturer's written installation instructions.

B. 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, as determined by Architect.

END OF SECTION 076200

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SECTION 078413
PENETRATION FIRESTOPPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Penetration firestopping systems for the following applications:
   a. Penetrations in fire-resistance-rated walls.
   b. Penetrations in horizontal assemblies.
   c. Penetrations in smoke barriers.

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site .

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Product Schedule: For each penetration firestopping system. Include location, illustration of firestopping system, and design designation of qualified testing and inspecting agency.

1. Engineering Judgments: Where Project conditions require modification to a qualified testing and inspecting agency's illustration for a particular penetration firestopping system, submit illustration, with modifications marked, approved by penetration firestopping system manufacturer's fire-protection engineer as an engineering judgment or equivalent fire-resistance-rated assembly. Obtain approval of authorities having jurisdiction prior to submittal.

1.4 CLOSEOUT SUBMITTALS

A. Installer Certificates: From Installer indicating that penetration firestopping systems have been installed in compliance with requirements and manufacturer's written instructions.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Test-Response Characteristics:

1. Perform penetration firestopping system tests by a qualified testing agency acceptable to authorities having jurisdiction.
2. Test per testing standards referenced in "Penetration Firestopping Systems" Article. Provide rated systems complying with the following requirements:
    a. Penetration firestopping systems shall bear classification marking of a qualified testing agency.
        1) UL in its "Fire Resistance Directory."
        2) Intertek Group in its "Directory of Listed Building Products."
        3) FM Approval in its "Approval Guide."

2.2 PENETRATION FIRESTOPPING SYSTEMS

A. Penetration Firestopping Systems: Systems that resist spread of fire, passage of smoke and other gases, and maintain original fire-resistance rating of construction penetrated. Penetration firestopping systems shall be compatible with one another, with the substrates forming openings, and with penetrating items if any.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
    a. 3M Fire Protection Products.
    b. Hilti, Inc.
    c. Tremco, Inc.

B. Penetrations in Fire-Resistance-Rated Walls: Penetration firestopping systems with ratings determined per ASTM E814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg.

1. F-Rating: Not less than the fire-resistance rating of constructions penetrated.

C. Penetrations in Horizontal Assemblies: Penetration firestopping systems with ratings determined per ASTM E814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg.

1. F-Rating: At least one hour, but not less than the fire-resistance rating of constructions penetrated.
2. T-Rating: At least one hour, but not less than the fire-resistance rating of constructions penetrated except for floor penetrations within the cavity of a wall.
3. W-Rating: Provide penetration firestopping systems showing no evidence of water leakage when tested according to UL 1479.

D. Exposed Penetration Firestopping Systems: Flame-spread and smoke-developed indexes of less than 25 and 450, respectively, per ASTM E84.

E. Accessories: Provide components for each penetration firestopping system that are needed to install fill materials and to maintain ratings required. Use only those components specified by penetration firestopping system manufacturer and approved by qualified testing and inspecting agency for conditions indicated.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for opening configurations, penetrating items, substrates, and other conditions affecting performance of the Work.

B. General: Install penetration firestopping systems to comply with manufacturer's written installation instructions and published drawings for products and applications.

C. Install forming materials and other accessories of types required to support fill materials during their application and in the position needed to produce cross-sectional shapes and depths required to achieve fire ratings.

1. After installing fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not forming permanent components of firestopping.

D. Install fill materials by proven techniques to produce the following results:

1. Fill voids and cavities formed by openings, forming materials, accessories and penetrating items to achieve required fire-resistance ratings.
2. Apply materials so they contact and adhere to substrates formed by openings and penetrating items.
3. For fill materials that will remain exposed after completing the Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.2 IDENTIFICATION

A. Wall Identification: Permanently label walls containing penetration firestopping systems with the words "FIRE AND/OR SMOKE BARRIER - PROTECT ALL OPENINGS," using lettering not less than 3 inches high and with minimum 0.375-inch strokes.

1. Locate in accessible concealed floor, floor-ceiling, or attic space at 15 feet from end of wall and at intervals not exceeding 30 feet.

B. Penetration Identification: Identify each penetration firestopping system with legible metal or plastic labels. Attach labels permanently to surfaces adjacent to and within 6 inches of penetration firestopping system edge so labels are visible to anyone seeking to remove penetrating items or firestopping systems. Use mechanical fasteners or self-adhering-type labels with adhesives capable of permanently bonding labels to surfaces on which labels are placed. Include the following information on labels:

1. The words "Warning - Penetration Firestopping - Do Not Disturb. Notify Building Management of Any Damage."
2. Contractor's name, address, and phone number.
3. Designation of applicable testing and inspecting agency.

4. Date of installation.
5. Manufacturer's name.
6. Installer's name.

3.3 FIELD QUALITY CONTROL

A. Owner will engage a qualified testing agency to perform tests and inspections according to ASTM E2174.

B. Where deficiencies are found or penetration firestopping system is damaged or removed because of testing, repair or replace penetration firestopping system to comply with requirements.

C. Proceed with enclosing penetration firestopping systems with other construction only after inspection reports are issued and installations comply with requirements.

END OF SECTION 078413

SECTION 079200
JOINT SEALANTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Silicone joint sealants.
2. Nonstaining silicone joint sealants.
3. Mildew-resistant joint sealants.
4. Latex joint sealants.

1.2 ACTION SUBMITTALS

A. Product data.

B. Manufacturers color selection sheets.

1.3 CLOSEOUT SUBMITTALS

A. Warranty Documentation:

1. Manufacturers' special warranties.
2. Installer's special warranties.

1.4 QUALITY ASSURANCE

A. Qualifications:

1. Installers: Authorized representative who is trained and approved by manufacturer.

1.5 WARRANTY

A. Special Installer's Warranty: Installer agrees to repair or replace joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.

1. Warranty Period: Two years from date of Substantial Completion.

B. Special Manufacturer's Warranty: Manufacturer agrees to furnish joint sealants to repair or replace those joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.

1. Warranty Period: Five years from date of Substantial Completion.

C. Special warranties specified in this article exclude deterioration or failure of joint sealants from the following:

1. Movement of the structure caused by stresses on the sealant exceeding sealant manufacturer's written specifications for sealant elongation and compression.
2. Disintegration of joint substrates from causes exceeding design specifications.
3. Mechanical damage caused by individuals, tools, or other outside agents.
4. Changes in sealant appearance caused by accumulation of dirt or other atmospheric contaminants.

PART 2 - PRODUCTS

2.1 JOINT SEALANTS, GENERAL

A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer, based on testing and field experience.

B. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range.

2.2 SILICONE JOINT SEALANTS

A. Silicone, S, NS, 100/50, T, NT: Single-component, nonsag, plus 100 percent and minus 50 percent movement capability, traffic- and nontraffic-use, neutral-curing silicone joint sealant; ASTM C920, Type S, Grade NS, Class 100/50, Uses T and NT.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. Pecora Corporation.
   b. Sika Corporation; Joint Sealants.
   c. The Dow Chemical Company.

B. Silicone, S, NS, 50, T, NT: Single-component, nonsag, plus 50 percent and minus 50 percent movement capability, traffic- and nontraffic-use, neutral-curing silicone joint sealant; ASTM C920, Type S, Grade NS, Class 50, Uses T and NT.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. Soudal USA.
   b. The Dow Chemical Company.

C. Silicone, S, NS, 25, T, NT: Single-component, nonsag, plus 25 percent and minus 25 percent movement capability, traffic- and nontraffic-use, neutral-curing silicone joint sealant; ASTM C920, Type S, Grade NS, Class 25, Uses T and NT.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. Pecora Corporation.
   b. Sika Corporation; Joint Sealants.

2.3 NONSTAINING SILICONE JOINT SEALANTS

A. Nonstaining Joint Sealants: No staining of substrates when tested in accordance with ASTM C1248.

B. Silicone, Nonstaining, S, NS, 50, NT: Nonstaining, single-component, nonsag, plus 50 percent and minus 50 percent movement capability, nontraffic-use, neutral-curing silicone joint sealant; ASTM C920, Type S, Grade NS, Class 50, Use NT.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. GE Construction Sealants; Momentive Performance Materials Inc.
   b. Pecora Corporation.
   c. The Dow Chemical Company.
   d. Tremco Incorporated.

C. Silicone, Nonstaining, S, NS, 100/50, T, NT: Nonstaining, single-component, nonsag, plus 100 percent and minus 50 percent movement capability, traffic- and nontraffic-use, neutral-curing silicone joint sealant; ASTM C920, Type S, Grade NS, Class 100/50, Uses T and NT.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. The Dow Chemical Company.

2.4 MILDEW-RESISTANT JOINT SEALANTS

A. Mildew-Resistant Joint Sealants: Formulated for prolonged exposure to humidity with fungicide to prevent mold and mildew growth.

B. Silicone, Mildew Resistant, Acid Curing, S, NS, 25, NT: Mildew-resistant, single-component, nonsag, plus 25 percent and minus 25 percent movement capability, nontraffic-use, acid-curing silicone joint sealant; ASTM C920, Type S, Grade NS, Class 25, Use NT.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. GE Construction Sealants; Momentive Performance Materials Inc.
   b. Pecora Corporation.
   c. The Dow Chemical Company.
   d. Tremco Incorporated.

2.5 LATEX JOINT SEALANTS

A. Acrylic Latex: Acrylic latex or siliconized acrylic latex, ASTM C834, Type OP, Grade NF.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. Pecora Corporation.
   b. Sherwin-Williams Company (The).
   c. Tremco Incorporated.

2.6 JOINT-SEALANT BACKING

A. Sealant Backing Material, General: Nonstaining; compatible with joint substrates, sealants, primers, and other joint fillers; and approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.

B. Cylindrical Sealant Backings: ASTM C1330, Type C (closed-cell material with a surface skin), Type O (open-cell material), Type B (bicellular material with a surface skin) or any of the preceding types, as approved in writing by joint-sealant manufacturer for joint application indicated, and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.

C. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint. Provide self-adhesive tape where applicable.

2.7 MISCELLANEOUS MATERIALS

A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.

B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.

PART 3 - EXECUTION

3.1 PREPARATION

A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions and the following requirements:

1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and

approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.

2. Clean porous joint substrate surfaces by brushing, grinding, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air. Porous joint substrates include the following:
   a. Concrete.
   b. Masonry.
   c. Unglazed surfaces of ceramic tile.
   d. Exterior insulation and finish systems.
3. Remove laitance and form-release agents from concrete.
4. Clean nonporous joint substrate surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants. Nonporous joint substrates include the following:
   a. Metal.
   b. Glass.
   c. Porcelain enamel.
   d. Glazed surfaces of ceramic tile.

B. Joint Priming: Prime joint substrates where recommended by joint-sealant manufacturer or as indicated by preconstruction joint-sealant-substrate tests or prior experience. 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.

C. 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.

3.2 INSTALLATION OF JOINT SEALANTS

A. General: Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.

B. Sealant Installation Standard: Comply with recommendations in ASTM C1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.

C. Install sealant backings of type indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.

1. Do not leave gaps between ends of sealant backings.
2. Do not stretch, twist, puncture, or tear sealant backings.
3. Remove absorbent sealant backings that have become wet before sealant application, and replace them with dry materials.

D. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.

E. Install sealants using proven techniques that comply with the following and at the same time backings are installed:

1. Place sealants so they directly contact and fully wet joint substrates.
2. Completely fill recesses in each joint configuration.
3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.

F. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified in subparagraphs below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.

1. Remove excess sealant from surfaces adjacent to joints.
2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
3. Provide concave joint profile in accordance with Figure 8A in ASTM C1193 unless otherwise indicated.
4. Provide flush joint profile in accordance with Figure 8B in ASTM C1193.
5. Provide recessed joint configuration of recess depth in accordance with Figure 8C in ASTM C1193.
    a. Use masking tape to protect surfaces adjacent to recessed tooled joints.

G. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

H. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out, remove, and repair damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from original work.

3.3 JOINT-SEALANT SCHEDULE

A. Exterior joints in vertical surfaces and horizontal nontraffic surfaces:

1. Joint Locations:
    a. Control and expansion joints in unit masonry.
    b. Joints in exterior insulation and finish systems.
    c. Joints between metal panels.
    d. Joints between different materials listed above.
    e. Perimeter joints between materials listed above and frames of doors windows.
    f. Other joints as indicated on Drawings.
2. Joint Sealant: Silicone, nonstaining, S, NS, 50, NT
3. Joint-Sealant Color: Clear

B. Interior joints in vertical surfaces and horizontal nontraffic surfaces:

1. Joint Locations:

a. Vertical joints on exposed surfaces of unit masonry walls and partitions.
b. Joints on underside of plant-precast structural concrete.
c. .

2. Joint Sealant: Urethane, S, NS, 25, NT
3. Joint-Sealant Color: Clear

C. Interior joints in vertical surfaces and horizontal nontraffic surfaces not subject to significant movement:

1. Joint Locations:
   a. Control joints on exposed interior surfaces of exterior walls.
   b. Perimeter joints between interior wall surfaces and frames of interior doors windows and elevator entrances.
2. Joint Sealant: Acrylic latex
3. Joint-Sealant Color: Clear.

D. Mildew-resistant interior joints in vertical surfaces and horizontal nontraffic surfaces:

1. Joint Locations:
   a. Joints between plumbing fixtures and adjoining walls, floors, and counters.
   b. Tile control and expansion joints where indicated.
2. Joint Sealant: Silicone, mildew resistant, acid curing, S, NS, 25, NT
3. Joint-Sealant Color: Clear

END OF SECTION 079200

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PART 1 – GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section includes:
B. Scope of Work
    1. Interior expansion control systems
    2. Expansion Joint accessories including provisions for fire rated assemblies, moisture barriers, waterproofing, acoustic and thermal measures.
C. Provide all labor, materials and services to perform operations in connection with furnishing, delivery, and installation of work related to this section.

1.03 RELATED WORK

A. Related work includes but is not limited to:
    1. Unit Masonry: Section 04810.

1.04 REFERENCES

A. Work shall be performed following applicable Local, State, and Federal codes and regulations.
B. Publications listed herein are part of this specification. See below for standards where applicable to the product listed:
    1. American Society for Testing and Materials (ASTM):
        a. ASTM B221, “Standard Specifications for Aluminum and Aluminum-Alloy Extrusions.”
        b. ASTM B209, “Standard Specification for Aluminum and Aluminum Alloy Sheet and Plate.
        c. ASTM E1399 “Cyclic Movement and Measuring of Minimum/Maximum Joint Widths of Architectural Joint Systems.”
        d. ANSI/U.L. No. 263, UL2079, ULCS115, EN1366-4 Fire Rated Testing fort full rated period. Underwriter’s Laboratories shall classify adjacent substrate assemblies.
        e. ASTM E1612, Standard Specification for Preformed Architectural Compression Seals for Buildings and Parking Structures.
    2. American National Standards Institute (ANSI):
        a. ANSI A137.1/A326.3 (2018), “Method for Measuring Dynamic Coefficient of Friction on Hard Flooring Materials”

1.05 DEFINITIONS

A. Product Movement capabilities
    1. Product operating range defined as a percentage of the nominal joint width.
B. Product “Load” descriptions:
    1. Standard Loads

1.06 SYSTEM DESCRIPTION

A. Fire Rated Assemblies shall be tested by registered Third Party Testing Agencies in accordance with UL2079, ULC S115, or BS 476 classified systems. Expansion joint assembly fire rating shall match or exceed the fire rating of adjacent construction.

1.07 QUALITY ASSURANCE

A. Architectural Joint Cover Manufacturer: Furnish horizontal and vertical systems from a Manufacturer with a minimum of ten (10) years of experience in the design, engineering and fabrication of expansion joint systems.
B. Fire Rated Assembly Manufacturer: Furnish horizontal and vertical rated systems from a single Manufacturer to ensure compatibility. Intersection of/ or transition between dissimilar systems is not allowed unless reviewed and approved by AHJ.
C. Installer: Contractor with not less than three (3) years of successful experience in the installation of systems similar to those required by Project.

1.08 ACTION SUBMITTALS

A. Manufacturer's Specifications, technical data, installation instructions, and detail drawings for each proposed system.
B. Listings/ Certifications of all Fire Rated Assemblies secured through Registered Third Party Testing Agency.
C. Representative sample of specified systems 4" [100mm] minimum length (if required by Project Architect)
D. UL Environmental GreenGuard Gold Certification required for any Synthetic Rubber seals to be utilized in project. Ensure low VOC readings are reported by Third Party Registered Testing Agency for building projects with Health Care or Educational intent.

1.09 DELIVERY AND STORAGE

A. Manufacturer to provide protective film on all exposed cover plate components.
B. Deliver joint systems to jobsite in new, clean, unopened cartons or crates of sufficient size and strength to protect materials during transit.
C. Inspect materials upon arrival. Store components in original containers in a clean, dry location. Ensure temperature or moisture sensitive components are stored in a tempered location.
D. Contractor to provide temporary protective covers on all installed finished surfaces. Protection is required to guard against both surface abrasions as well as overloading of horizontal deck components by construction traffic.

1.10 SEQUENCING

A. Submittals shall be completed and remitted to the Project Architect within 4 weeks after award of subcontract.
B. Subcontract for the work of this section shall be planned to allow sufficient time for Manufacturer's production and delivery scheduling.

1.11 WARRANTY

A. Standard Manufacturer limited warranty against material and manufacturing defects for a period of not less than five (5) years when installed in accordance with Manufacturer's recommendations.

PART 2 – PRODUCTS

2.01 MANUFACTURER

A. Basis of Design Manufacturer is: Inpro Corporation
B. Manufacturer must be capable of providing a full range Interior Architectural Joint Cover systems as well as a full complement of expansion joint accessories.
C. Manufacturer must be capable of providing project specific details accurate to the building construction type.
D. Requests for substitutions will be considered in accordance with provisions of Section 016000

2.02 MATERIALS

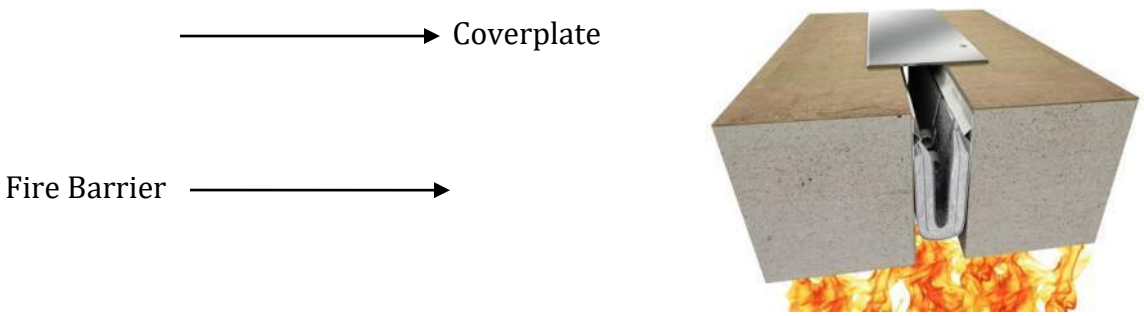
A. Aluminum: Alloy types of 6061-T6, 6063-T6, 6005A, or 5052-H32 sheet goods
    1. Walls: Standard Class II Clear Anodized

2.03.02 INTERIOR WALL JOINT SYSTEMS

A. Standard Surface Mount Coverplate
    1. Surface mounted profiles mechanically fastened to a single side of the expansion joint opening.
    2. Standard Nominal Joint applications 2-6” [50-150mm]
    3. Joint operating range 50%+- of total nominal joint width
    4. New and existing construction applications.
    5. Clear Anodized Class II Anodized Finish

2.03.06 ACCESSORY SYSTEMS

A. Fire Rated Barriers and Blanket Systems
    1. Rated Fire Barrier system options ranging from 1-4 Hour Rating requirements with options meeting the following requirements:
    2. Tested by Accredited Third Party Architectural Testing and Listing Agency in accordance with ASTM E814/119, E1966 and UL 2079 at its full rated period.
    3. Product selection options:
        d. Fireline F140 Series - 2 hour Fire Rated Blanket systems for small joint openings with 50%+- movement for seismic applications on joints 2- 4” [50-100mm] nominal width. Pre-attached flanges and male/female seam configuration. Patented compression installation spring system for non-invasive installation. Prefabricated male/ female seam configuration required for consistent fire protection. No mechanical fastening or continuous firecaulk required.



2.04 FABRICATION

A. Field assemble components provided in standard lengths with pre-packaged fasteners and accessories whenever possible.
B. Fabricate special transitions and corner fittings as required. Miter and heat weld elastomeric seals for monolithic splices and transitions.

PART 3 – EXECUTION

3.01 INSPECTION

A. Prior to starting work, verify that structural gap and blockout dimensions are in conformance with manufacturer's submittal data. Do not begin work until all unsatisfactory substrate conditions are resolved. See manufacturer for recommended tolerances.
B. Carefully inspect installed work of other Trades and verify that such work is complete to allow the work of this section to commence.
C. Schedule inspection of all Waterproofing measures and Fire Rated life safety product prior to
installation of coverplate systems –or- provide allowance for removal of 10% of coverplate systems for inspection before final acceptance.

3.02 INSTALLATION

A. Joint systems: Install in accordance with manufacturer's instructions.
B. Align work plumb, level and flush with adjacent surfaces. Mechanically anchor to substrate. Allowances should be made where actual structural gap at time of installation varies from nominal design gap. No shimming of frames is permitted.
C. Coordinate with work of other Sections.
D. If concrete blockouts (rebates) are required, ensure continuous support equal to surrounding substrate structural values.
E. Fire Rated Assemblies: Where required, install to manufacturer's instructions.
F. Moisture Barrier: Where required, install to manufacturer's instructions.

3.03 PROTECTION AND CLEANING

A. Protect the completed Expansion Control system work from damage during construction. Damage protection includes surface abrasion and overloading of coverplate by materials handling equipment and construction waste/debris,
B. Protection from environmental factors required throughout installation process until Project Closeout. Protection includes but is not limited to rain events, moisture protection, exposure to
temperature fluctuations or direct sunlight for temperature sensitive product offerings.
C. Prior to project closeout, clean all exposed surfaces with a suitable cleaner.

END OF SECTION

SECTION 081113
HOLLOW METAL DOORS AND FRAMES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:

1. Interior standard steel doors and frames.

B. Related Requirements:

1. Section 087100 "Door Hardware" for door hardware for hollow-metal doors.
2. Section 081416 "Flush Wood Doors" for wood doors in hollow metal frames.

1.2 DEFINITIONS

A. Minimum Thickness: Minimum thickness of base metal without coatings in accordance with NAAMM-HMMA 803 or ANSI/SDI A250.8.

1.3 COORDINATION

A. Coordinate anchorage installation 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. Coordinate requirements for installation of door hardware, electrified door hardware, and access control and security systems.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, core descriptions, fire-resistance ratings, temperature-rise ratings, and finishes.

B. Shop Drawings: Include the following:

1. Elevations of each door type.
2. Details of doors, including vertical- and horizontal-edge details and metal thicknesses.
3. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
4. Locations of reinforcement and preparations for hardware.
5. Details of each different wall opening condition.

6. Details of electrical raceway and preparation for electrified hardware, access control systems, and security systems.
7. Details of anchorages, joints, field splices, and connections.
8. Details of accessories.
9. Details of moldings, removable stops, and glazing.

1.5 CLOSEOUT SUBMITTALS

A. Record Documents: For fire-rated doors, list of door numbers and applicable room name and number to which door accesses.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver hollow-metal doors and frames palletized, packaged, or crated to provide protection during transit and Project-site storage. Do not use nonvented plastic.

1. Provide additional protection to prevent damage to factory-finished units.

B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.

C. Store hollow-metal doors and frames vertically under cover at Project site with head up. Place on minimum 4-inch- high wood blocking. Provide minimum 1/4-inch space between each stacked door to permit air circulation.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Rated Door Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction for fire-protection ratings and temperature-rise limits indicated on Drawings, based on testing at positive pressure in accordance with NFPA 252 or UL 10C.

1. Smoke- and Draft-Control Door Assemblies: Listed and labeled for smoke and draft control by a qualified testing agency acceptable to authorities having jurisdiction, based on testing in accordance with UL 1784 and installed in compliance with NFPA 105.
2. Oversize Fire-Rated Door Assemblies: For units exceeding sizes of tested assemblies, provide certification by a qualified testing agency that doors comply with standard construction requirements for tested and labeled fire-rated door assemblies except for size.
3. Temperature-Rise Limit: At vertical exit enclosures and exit passageways, provide doors that have a maximum transmitted temperature end point of not more than 450 deg F above ambient after 30 minutes of standard fire-test exposure.

2.2 INTERIOR STANDARD STEEL DOORS AND FRAMES

A. Construct hollow-metal doors and frames to comply with standards indicated for materials, fabrication, hardware locations, hardware reinforcement, tolerances, and clearances, and as specified.

B. Heavy-Duty Doors and Frames: ANSI/SDI A250.8, Level 2; ANSI/SDI A250.4, Level B. At locations indicated in the Door and Frame Schedule .

1. Doors:
   a. Type: As indicated in the Door and Frame Schedule.
   b. Thickness: 1-3/4 inches.
   c. Face: Uncoated steel sheet, minimum thickness of 0.042 inch.
   d. Edge Construction: Model 1, Full Flush .
   e. Edge Bevel: Provide manufacturer's standard beveled or square edges.
   f. Fire-Rated Core: Manufacturer's standard laminated mineral board core for fire-rated and temperature-rise-rated doors.
2. Frames:
   a. Materials: Uncoated steel sheet, minimum thickness of 0.053 inch.
   b. Construction: Full profile welded.
3. Exposed Finish: Prime .

2.3 FRAME ANCHORS

A. Jamb Anchors:

1. Type: Anchors of minimum size and type required by applicable door and frame standard, and suitable for performance level indicated.
2. Quantity: Minimum of three anchors per jamb, with one additional anchor for frames with no floor anchor. Provide one additional anchor for each 24 inches of frame height above 7 feet.
3. Postinstalled Expansion Anchor: Minimum 3/8-inch- diameter bolts with expansion shields or inserts, with manufacturer's standard pipe spacer.

B. Material: ASTM A879/A879M, Commercial Steel (CS), 04Z coating designation; mill phosphatized.

1. For anchors built into exterior walls, steel sheet complying with ASTM A1008/A1008M or ASTM A1011/A1011M; hot-dip galvanized in accordance with ASTM A153/A153M, Class B.

2.4 MATERIALS

A. Cold-Rolled Steel Sheet: ASTM A1008/A1008M, Commercial Steel (CS), Type B; suitable for exposed applications.

B. Hot-Rolled Steel Sheet: ASTM A1011/A1011M, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.

C. Metallic-Coated Steel Sheet: ASTM A653/A653M, Commercial Steel (CS), Type B.

D. Inserts, Bolts, and Fasteners: Hot-dip galvanized in accordance with ASTM A153/A153M.

E. Power-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hollow-metal frames of type indicated.

F. Mineral-Fiber Insulation: ASTM C665, Type I (blankets without membrane facing); consisting of fibers manufactured from slag or rock wool; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively; passing ASTM E136 for combustion characteristics.

G. Glazing: Comply with requirements in Section 088000 "Glazing."

2.5 FABRICATION

A. Door Astragals: Provide overlapping astragal 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 or as required to comply with published listing of qualified testing agency.

B. Hollow-Metal Frames: Fabricate in one piece except where handling and shipping limitations require multiple sections. Where frames are fabricated in sections, provide alignment plates or angles at each joint, fabricated of metal of same or greater thickness as frames.

1. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.
2. Door Silencers: Except on weather-stripped frames, drill stops to receive door silencers as follows. Keep holes clear during construction.
    a. Single-Door Frames: Drill stop in strike jamb to receive three door silencers.
    b. Double-Door Frames: Drill stop in head jamb to receive two door silencers.

C. Hardware Preparation: Factory prepare hollow-metal doors and frames to receive templated mortised hardware, and electrical wiring; include cutouts, reinforcement, mortising, drilling, and tapping in accordance with ANSI/SDI A250.6, the Door Hardware Schedule, and templates.

1. Reinforce doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.
2. Comply with BHMA A156.115 for preparing hollow-metal doors and frames for hardware.

D. Glazed Lites: Provide stops and moldings around glazed lites where indicated. Form corners of stops and moldings with butted or mitered hairline joints.

1. Provide stops and moldings flush with face of door, and with square stops unless otherwise indicated.
2. Multiple Glazed Lites: Provide fixed and removable stops and moldings so that each glazed lite is capable of being removed independently.

3. Provide fixed frame moldings on outside of exterior and on secure side of interior doors and frames. Provide loose stops and moldings on inside of hollow-metal doors and frames.
4. Coordinate rabbet width between fixed and removable stops with glazing and installation types indicated.
5. Provide stops for installation with countersunk flat- or oval-head machine screws spaced uniformly not more than 9 inches o.c. and not more than 2 inches o.c. from each corner.

2.6 STEEL FINISHES

A. Prime Finish: Clean, pretreat, and apply manufacturer's standard primer.

1. Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying with ANSI/SDI A250.10; recommended by primer manufacturer for substrate; compatible with substrate and field-applied coatings despite prolonged exposure.

PART 3 - EXECUTION

3.1 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. Touch up factory-applied finishes where spreaders are removed.

B. Drill and tap doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.

3.2 INSTALLATION

A. Install hollow-metal doors and frames plumb, rigid, properly aligned, and securely fastened in place. Comply with approved Shop Drawings and with manufacturer's written instructions.

B. Hollow-Metal Frames: Comply with ANSI/SDI A250.11 NAAMM-HMMA 840.

1. Set frames accurately in position; plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces without damage to completed Work.
   a. Where frames are fabricated in sections, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces. Touch-up finishes.
   b. Install frames with removable stops located on secure side of opening.
2. Fire-Rated Openings: Install frames in accordance with NFPA 80.
3. Floor Anchors: Secure with postinstalled expansion anchors.
   a. Floor anchors may be set with power-actuated fasteners instead of postinstalled expansion anchors if so indicated and approved on Shop Drawings.
4. Solidly pack mineral-fiber insulation inside frames.

5. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with grout or mortar.
6. In-Place Concrete or Masonry Construction: Secure frames in place with postinstalled expansion anchors. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.
7. Installation Tolerances: Adjust hollow-metal frames to the following tolerances:
    a. Squareness: Plus or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
    b. Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.
    c. Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
    d. Plumbness: Plus or minus 1/16 inch, measured at jambs at floor.

C. Hollow-Metal Doors: Fit and adjust hollow-metal doors accurately in frames, within clearances specified below.

1. Non-Fire-Rated Steel Doors: Comply with ANSI/SDI A250.8 NAAMM-HMMA 841 and NAAMM-HMMA guide specification indicated.
2. Fire-Rated Doors: Install doors with clearances in accordance with NFPA 80.
3. Smoke-Control Doors: Install doors in accordance with NFPA 105.

D. Glazing: Comply with installation requirements in Section 088000 "Glazing" and with hollow-metal manufacturer's written instructions.

3.3 REPAIR

A. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying, rust-inhibitive primer.

B. Metallic-Coated Surface Touchup: Clean abraded areas and repair with galvanizing repair paint according to manufacturer's written instructions.

C. Factory-Finish Touchup: Clean abraded areas and repair with same material used for factory finish according to manufacturer's written instructions.

D. Touchup Painting: Cleaning and touchup painting of abraded areas of paint are specified in painting Sections.

END OF SECTION 081113

SECTION 081416
FLUSH WOOD DOORS

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. Five-ply flush wood veneer-faced doors for transparent finish.
2. Factory finishing flush wood doors.
3. Factory fitting flush wood doors to frames and factory machining for hardware.

B. Related Requirements:

1. Section 088000 "Glazing" for glass view panels in flush wood doors.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product, including the following:

1. Door core materials and construction.
2. Door edge construction
3. Door face type and characteristics.
4. Door trim for openings.
5. Door frame construction.
6. Factory-machining criteria.
7. Factory- finishing specifications.

B. Shop Drawings: Indicate location, size, and hand of each door; elevation of each type of door; construction details not covered in Product Data; and the following:

1. Door schedule indicating door location, type, size, fire protection rating, and swing.
2. Door elevations, dimension and locations of hardware, lite and louver cutouts, and glazing thicknesses.
3. Details of frame for each frame type, including dimensions and profile.
4. Details of electrical raceway and preparation for electrified hardware, access control systems, and security systems.
5. Dimensions and locations of blocking for hardware attachment.
6. Dimensions and locations of mortises and holes for hardware.
7. Clearances and undercuts.

8. Requirements for veneer matching.
9. Doors to be factory finished and application requirements.

C. Samples for Verification:

1. Factory finishes applied to actual door face materials, approximately 8 by 10 inches, for each material and finish.

1.4 CLOSEOUT SUBMITTALS

A. Record Documents: For fire-rated doors, list of door numbers and applicable room name and number to which door accesses.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Comply with requirements of referenced standard and manufacturer's written instructions.

B. Package doors individually in plastic bags or cardboard cartons.

C. Mark each door on top and bottom rail with opening number used on Shop Drawings.

1.6 FIELD CONDITIONS

A. Environmental Limitations: Do not deliver or install doors until spaces are enclosed and weathertight, wet-work in spaces is complete and dry, and HVAC system is operating and maintaining temperature and relative humidity at levels designed for building occupants for the remainder of construction period.

1.7 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace doors that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:
   a. Delamination of veneer.
   b. Warping (bow, cup, or twist) more than 1/4 inch in a 42-by-84-inch section.
   c. Telegraphing of core construction in face veneers exceeding 0.01 inch in a 3-inch span.
2. Warranty shall also include installation and finishing that may be required due to repair or replacement of defective doors.
3. Warranty Period for Solid-Core Interior Doors: Life of installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain flush wood doors from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. Smoke- and Draft-Control Door Assemblies: Listed and labeled for smoke and draft control by a qualified testing agency acceptable to authorities having jurisdiction, based on testing in accordance with UL 1784 and installed in compliance with NFPA 105.

2.3 FLUSH WOOD DOORS, GENERAL

A. Quality Standard: In addition to requirements specified, comply with AWI/AWMAC/WI's "Architectural Woodwork Standards."

2.4 SOLID-CORE FIVE-PLY FLUSH WOOD VENEER-FACED DOORS FOR TRANSPARENT FINISH

A. Interior Doors :

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. VT Industries Inc.
   b. Graham Wood Doors
   c. Lambton Doors.
   d. Masonite Architectural.

2. Performance Grade: ANSI/WDMA I.S. 1A Extra Heavy Duty .
3. Architectural Woodwork Standards ANSI/WDMA I.S. 1A Grade: Custom.
4. Faces: Single-ply wood veneer not less than 1/50 inch thick.
   a. Species: Select white maple .
   b. Cut: Plain sliced (flat sliced) .
   c. Match between Veneer Leaves: Book match.
   d. Assembly of Veneer Leaves on Door Faces: Center-balance match.
   e. Pair and Set Match: Provide for doors hung in same opening.
   f. Room Match: Match door faces within each separate room or area of building. Corridor-door faces do not need to match where they are separated by 20 feet or more.
   g. Room Match: Provide door faces of compatible color and grain within each separate room or area of building.
5. Exposed Vertical Edges: Same species as faces or a compatible species - Architectural Woodwork Standards edge Type B Minimum 1/16” thick. Edge before facing. Chamfered corners.
6. Core for Non-Fire-Rated Doors:

a. ANSI A208.1, particleboard.
   1) Blocking: Provide wood blocking in particleboard-core doors as needed to eliminate through-bolting hardware.
      a) 5-inch top-rail blocking, in doors indicated to have closers.
      b) 5-inch bottom-rail blocking, in exterior doors and doors indicated to have kick, mop, or armor plates.
   2) Provide doors with glued-wood-stave or WDMA I.S. 10 structural-composite-lumber cores instead of particleboard cores for doors scheduled to receive exit devices in Section 087100 "Door Hardware."
b. Glued wood stave.
c. WDMA I.S. 10 structural composite lumber.
   1) Screw Withdrawal, Door Face: 550 lbf .
   2) Screw Withdrawal, Vertical Door Edge: 550 lbf .
d. Either glued wood stave or WDMA I.S. 10 structural composite lumber.

7. Construction: Five plies, hot-pressed bonded (vertical and horizontal edging is bonded to core), with entire unit abrasive planed before veneering.

2.5 LIGHT FRAMES AND LOUVERS

A. Wood Beads for Light Openings in Wood Doors: Provide manufacturer's standard wood beads unless otherwise indicated.

1. At wood-core doors with 20-minute fire-protection ratings, provide wood beads and metal glazing clips approved for such use.

2.6 FABRICATION

A. Factory fit doors to suit frame-opening sizes indicated.

1. Comply with clearance requirements of referenced quality standard for fitting unless otherwise indicated.
2. Comply with NFPA 80 requirements for fire-rated doors.

B. Factory machine doors for hardware that is not surface applied.

1. Locate hardware to comply with DHI-WDHS-3.
2. Comply with final hardware schedules, door frame Shop Drawings, ANSI/BHMA-156.115-W, and hardware templates.
3. Coordinate with hardware mortises in metal frames, to verify dimensions and alignment before factory machining.
4. For doors scheduled to receive electrified locksets, provide factory-installed raceway and wiring to accommodate specified hardware.
5. Metal Astragals: Factory machine astragals and formed-steel edges for hardware for pairs of fire-rated doors.

C. Openings: Factory cut and trim openings through doors.

1. Light Openings: Trim openings with moldings of material and profile indicated.

2. Glazing: Factory install glazing in doors indicated to be factory finished. Comply with applicable requirements in Section 088000 "Glazing."
3. Louvers: Factory install louvers in prepared openings.

2.7 FACTORY FINISHING

A. Comply with referenced quality standard for factory finishing.

1. Complete fabrication, including fitting doors for openings and machining for hardware that is not surface applied, before finishing.
2. Finish faces, all four edges, edges of cutouts, and mortises.
3. Stains and fillers may be omitted on top and bottom edges, edges of cutouts, and mortises.

B. Factory finish doors.

C. Transparent Finish:

1. Architectural Woodwork Standards Grade: Premium.
2. Finish: Architectural Woodwork Standards System-9, UV Curable, Acrylated Epoxy, Polyester or Urethane.
3. Staining: As selected by Architect from manufacturer's full range .
4. Effect: Filled finish .
5. Sheen: Satin .

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine doors and installed door frames, with Installer present, before hanging doors.

1. Verify that installed frames comply with indicated requirements for type, size, location, and swing characteristics and have been installed with level heads and plumb jambs.
2. Reject doors with defects.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Hardware: For installation, see Section 087100 "Door Hardware."

B. Install doors and frames to comply with manufacturer's written instructions and referenced quality standard, and as indicated.

C. Install frames level, plumb, true, and straight.

1. Shim as required with concealed shims. Install level and plumb to a tolerance of 1/8 inch in 96 inches.
2. Anchor frames to anchors or blocking built in or directly attached to substrates.

a. Secure with countersunk, concealed fasteners and blind nailing.
b. Use fine finishing nails for exposed fastening, countersunk and filled flush with woodwork.
1) For factory-finished items, use filler matching finish of items being installed.

3. Install fire-rated doors and frames in accordance with NFPA 80.
4. Install smoke- and draft-control doors in accordance with NFPA 105.

D. Job-Fitted Doors:

1. Align and fit doors in frames with uniform clearances and bevels as indicated below.
a. Do not trim stiles and rails in excess of limits set by manufacturer or permitted for fire-rated doors.
2. Machine doors for hardware.
3. Seal edges of doors, edges of cutouts, and mortises after fitting and machining.
4. Clearances:
a. Provide 1/8 inch at heads, jambs, and between pairs of doors.
b. Provide 1/8 inch from bottom of door to top of decorative floor finish or covering unless otherwise indicated on Drawings.
c. Where threshold is shown or scheduled, provide1/4 inch from bottom of door to top of threshold unless otherwise indicated.
d. Comply with NFPA 80 for fire-rated doors.
5. Bevel non-fire-rated doors 1/8 inch in 2 inches at lock and hinge edges.
6. Bevel fire-rated doors 1/8 inch in 2 inches at lock edge; trim stiles and rails only to extent permitted by labeling agency.

E. Factory-Fitted Doors: Align in frames for uniform clearance at each edge.

F. Factory-Finished Doors: Restore finish before installation if fitting or machining is required at Project site.

3.3 ADJUSTING

A. Operation: Rehang or replace doors that do not swing or operate freely.

B. Finished Doors: Replace doors that are damaged or that do not comply with requirements. Doors may be repaired or refinished if Work complies with requirements and shows no evidence of repair or refinishing.

END OF SECTION 081416

SECTION 081743
FRP/ALUMINUM HYBRID DOORS AND FRAMES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. SL-17 Pebble Grain FRP/ Aluminum Hybrid Door.
B. SL-17 Pebble Grain FRP/ Aluminum Hybrid Door installed in Aluminum Framing.
C. SL-17 Pebble Grain FRP/ Aluminum Hybrid Door installed in Thermally Broken Aluminum Framing.
D. SL-17 Pebble Grain FRP/ Aluminum Hybrid Door installed in Retrofit Aluminum Framing.

1.02 RELATED SECTIONS

A. Section 08 01 17 – Operation and Maintenance of Integrated Door Opening Assemblies.
B. Section 08 06 71 – Door Hardware Schedule.
C. Section 08 06 80 – Glazing Schedule.
D. Section 08 10 00 – Doors and Frames.
E. Section 08 12 16 – Aluminum Frames.
F. Section 08 42 13 – Aluminum-Framed Entrances.
G. Section 08 71 00 – Door Hardware.
H. Section 08 91 26 – Door Louvers.

1.03 REFRENCES

A. AAMA 1304 – Voluntary Specification for Forced Entry Resistance of Side-Hinged Door Systems.
B. AAMA 1503-98 – Thermal Transmittance and Condensation Resistance of Windows, Doors and Glazed Wall Sections.
C. ANSI A250.4 – Test Procedure and Acceptance Criteria for Physical Endurance of Steel Doors and Hardware Reinforcing.
D. ASTM-B117 – Standard Practices for Operating Salt Spray (Fog) Apparatus.
E. ASTM-B209 – Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
F. ASTM-B221 – Standard Specification for Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
G. ASTM-C518 – Standard test Method for Steady-State Thermal Transmission Properties by Means of Heat Flow Meter Apparatus.
H. ASTM-D256 – Standard Test Methods for Determining the Pendulum Impact Resistance of Plastics.
I. ASTM-D570 – Standard Test Method for Water Absorption of Plastics.
J. ASTM-D638 – Standard Test Method for Tensile Properties of Plastics.
K. ASTM-D790 – Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials.
L. ASTM-D1621 – Standard Test Method for Compressive Properties of Rigid Cellular Plastics.
M. ASTM-D1622 – Standard Test Method for Apparent Density of Rigid Cellular Plastics.
N. ASTM-D1623 – Standard Test Method for Tensile and Tensile Adhesion Properties of Rigid Cellular Plastics.
O. ASTM-D2126 – Standard Test Method for Response of Rigid Cellular Plastics to Thermal and Humid Aging.
P. ASTM-D2583 – Standard Test Method for Indentation Hardness of Rigid Plastics by Means of a Barcol Impressor.
Q. ASTM-D3029 – Test Methods for Impact Resistance of Flat Rigid Plastic Specimens by Means of a Tup (Falling Weight) (Withdrawn 1995) (Replaced by ASTM-D5420).
R. ASTM-D5116 – Standard Guide for Small-Scale Environmental Chamber Determinations of Organic Emissions from Indoor Materials/ Products.
S. ASTM-D5420 – Standard Test Method for Impact Resistance of Flat, Rigid Plastic Specimen by Means of a Striker Impacted by a Falling Weight (Gardner Impact).
T. ASTM-D6670 – Standard Practice for Full-Scale Chamber Determination of Volatile Organic Emissions from Indoor Materials/ Products.
U. ASTM-E84 – Standard Test Method for Surface Burning Characteristics of Building Materials.
V. ASTM-E90 – Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions.
W. ASTM-E283 – Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen.
X. ASTM-E330 – Standard Test Method for Structural Performance of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference.
Y. ASTM-E1886 – Standard Test Method for Performance of Exterior Windows, Curtain Walls, Doors and Storm Shutters Impacted by Missile(s) and Exposed to Cyclic Pressure Differentials.

Z. ASTM-E1996 – Standard Specification for Performance of Exterior Windows, Glazed Curtain Walls, Doors and Storm Shutters Impacted by Wind Borne Debris in Hurricanes.
AA. ASTM-F476 – Standard Test Methods for Security of Swinging Door Assemblies.
BB. ASTM-F1642-04 – Standard Test Method for Glazing Systems Subject to Air Blast Loading.
CC. NWWDA T.M. 7-90 – Cycle Slam Test Method.
DD. NFRC 100 – Procedure for Determining Fenestration Products U-Factors.
EE. NFRC 400 – Procedure for Determining Fenestration Products Air Leakage.
FF. TAS 201 – Impact Test Procedures.
GG. TAS 202 – Criteria for Testing Impact & Nonimpact Resistant Building Envelope Components Using Uniform Static Air Pressure.
HH. TAS 203 – Criteria for Testing Products Subject to Cyclic Wind Pressure Loading.

1.04 SUBMITTALS

A. Must comply with Section 01 33 00 – Submittal Procedures.
B. Action Submittals/ Informational Submittals.
    1. Product Data.
        a. Submit manufacturer's product data sheets, catalog pages illustrating the products, description of materials, components, fabrication, finishes, installation instructions, and applicable test reports.
    2. Shop Drawings.
        a. Submit manufacturer's shop drawings, including elevations, sections, and details indicating dimensions, tolerances, materials, fabrication, doors, panels, framing, hardware schedule, and finish.
    3. Samples.
        a. Submit manufacturer's door sample composed of door face sheet, core, framing and finish.
        b. Submit manufacturer's sample of standard colors for door face and frame.
    4. Testing and Evaluation Reports.
        a. Submit testing reports and evaluations provided by manufacturer conducted by and accredited independent testing agency certifying doors and frames comply with specified performance requirements listed in Section 2.04.
    5. Manufacturer Reports.
        a. Manufacturer's Project References.
            1. Submit list of successfully completed projects including project name, location, name of architect, type, and quantity of doors manufactured.
C. Closeout Submittals.
    1. Operation and Maintenance Manual.
        a. Submit manufacturer's maintenance and cleaning instructions for doors and frames, including maintenance and operating instructions for hardware.
    2. Warranty Documentation.
        a. Submit manufacturer's standard warranty.

1.05 QUALITY ASSURANCE

A. Manufacturer's Qualifications.
    1. Continuously engaged in manufacturing of doors of similar type to that specified, with a minimum of 25 years concurrent successful experience.
    2. Door and frame components must be fabricated by same manufacturer.
    3. Evidence of a documented complaint resolution quality management system.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Delivery.
    1. Deliver materials to site in manufacturer's original, unopened, containers and packaging.
    2. Labels clearly identifying opening, door mark, and manufacturer.
B. Storage.
    1. Store materials in a clean, dry area, indoors in accordance with manufacturer's instructions.
C. Handling.
    1. Protect materials and finish from damage during handling and installation.

1.07 WARRANTY

A. Warrant doors, frames, and factory installed hardware against failure in materials and workmanship, including excessive deflection, faulty operation, defects in hardware installation, and deterioration of finish or construction in excess of normal weathering.

B. Standard Period.
   1. Ten years starting on date of shipment.
C. Limited lifetime
   1. Covers failure of corner joinery, core deterioration, and delamination or bubbling of door skin and corrosion of all-fiberglass products while the door is in its specified application in its original installation.
D. Finish
   1. Fluropan painted aluminum: 10 years.
   2. Painted SL-17, SL-18, SL-19, SL-19-1, and SL-20 face sheets: 5 years.
   3. Painted AF-150 frames, AF-250 frames: 3 years.
   4. Anodized, aluminum:10 years.
   5. Thresholds do not have a finish warranty.

PART 2 PRODUCTS

2.01 FRP/ALUMINUM HYBRID DOORS

A. Manufacturer.
   1. Special-Lite, Inc.
      a. PO Box 6, Decatur, Michigan 49045.
      b. Toll Free (800) 821-6531, Phone (269) 423-7068, Fax (800) 423-7610.
      c. Web Site www.special-lite.com.
      d. E-Mail info@special-lite.com.

2.02 DESCRIPTION

A. Model.
   1. SL-17 Pebble Grain FRP/ Aluminum Hybrid Door.
B. Door Opening Size.
   1. **Per Door & Frame Schedule**
C. Construction.
   1. Door Thickness.
      a. 1-3/4".
   2. Stiles & Rails.
      a. Aluminum extrusions made from 6063 aluminum alloys with a minimum temper of T5.
      b. Minimum 2-5/16" deep one-piece extrusion with have integral reglets to accept face sheet on both interior and exterior side of door which secure face sheet into place and permit flush appearance.
      c. Screw or snap in place applied caps are not acceptable.
      d. Top rails must have integral legs for interlocking continuous extruded aluminum flush cap.
      e. Bottom rails must have integral legs for interlocking continuous weather bar with single nylon brush weather stripping or manually adjustable SL-301 door bottom with two nylon brush weather stripping.
      f. Meeting stiles to include integral pocket to accept pile brush weather seal.
   3. Corners.
      a. Mitered.
      b. Secured with 3/8" diameter full-width steel tie rod through extruded splines top and bottom which are integral to standard tubular shaped rails.
      c. 1-1/4" x 1-1/4" x 3/16" 6061 aluminum angle reinforcement at corner to give strong, flat surface for locking hex nut to bear on.
      d. Weld, glue, or other methods of corner joinery are not acceptable.
   4. Core.
      a. Poured-in-place polyurethane foam.
      b. Laid in foam cores are not acceptable.
      c. Foam Plastic Insulated Doors: IBC 2603.4.
         1. Foam plastic shall be separated from the interior of a building by an approved thermal barrier.
         2. Approved thermal barrier must meet the acceptance criteria of the Temperature Transmission Fire Test and Integrity Fire Test as stated in NFPA 275.
         3. IBC 2603.4.1.7 foam plastic insulation, having a flame spread index less than 75 and a smoke developed index of not more than 450 shall be permitted as a door core when the face is metal minimum 0.032" aluminum or 0.016" steel.
         4. Standard door assembly can be tested to show it meets these requirements without the use of thermal barrier. If no independent testing conducted all doors with foam plastic core must have a thermal barrier.
   5. Face Sheet.
      a. Exterior

1. 0.120” thick, pebble texture, through color with SpecLite 3® integral surfaseal film FRP sheet.
2. Optional painted finish consult manufacturer.
3. Class C standard.

b. Interior
1. 0.120” thick, pebble texture, through color with SpecLite 3® integral surfaseal film FRP sheet.
2. Optional painted finish consult manufacturer.
3. Class C standard optional Class A available consult manufacturer.

c. Attachment of face sheet.
1. Extruded stiles and rails to have integral reglets to accept face sheet on both interior and exterior side of door which secure face sheet into place and permit flush appearance.
2. Use of glue to bond face sheet to core or extrusions is not acceptable.

6. Cutouts.
a. Manufacture doors with cutouts for required vision lites, louvers, and panels.

7. Hardware.
a. Pre-machine doors in accordance with templates from specified hardware manufacturers.
b. Surface mounted closures will be reinforced for but not prepped or installed at factory.
c. Factory install door hardware.

8. Reinforcements.
a. Aluminum extrusions made from 6061 or 6063 aluminum alloys.
b. Sheet and plate to conform to ASTM-B209.
c. Alloy and temper to be selected by manufacturer for strength, corrosion resistance, and application of required finish, and control of color.
d. Bars and tubes to meet ASTM-B221.

D. Sustainability Characteristics.
1. LEED Declaration.
a. Entrance Products contribute to point calculations for the following credits:
1. MR Credit 4.1 Recycled Content 10% (post-consumer = ½ pre-consumer) 1 point.
2. MR Credit 4.2 Recycled Content 20% (post-consumer = ½ pre-consumer) 1 point.

b. All aluminum extrusions are produced using prime-equivalent billet produced from 100% reprocessed 6063-T6 alloy recovered from industrial processes. The USGBC classifies these extrusions as pre-consumer recycled material.
c. Manufacturing facility located within 500 miles of major components and materials, including aluminum extrusions.
d. The point of recovery and smelting of pre-consumer recycled material within 500 miles of the manufacturing facility.

2.03 FRAMING

A. Framing
1. Thermally Broken Aluminum Framing.
a. Model.
1. SL-600TB.

b. Materials.
1. See 2.05.A.

c. Perimeter Frame Members.
1. Storefront frame with thermally broken pocket filler.
2. Factory fabricated.
3. Open-back framing is not acceptable.

d. Thermal Strut.
1. Fiber reinforced plastic, no other materials will be accepted.

e. Applied Door Stops.
1. 5/8” x 1-1/4” or 5/8” x 1-3/4”, 0.125” wall thickness, with screws and weather-stripping.
2. Provide solid ½” aluminum bar behind door stop for closer shoe attachment.
3. Pressure gasketing for weathering seal.
4. Counterpunch fastener holes in door stop to preserve full-metal thickness under fastener head.
5. Minimum ½” aluminum bar reinforcement under doorstop for required hardware attachments, aluminum to meet ASTM-B221.

f. Caulking.
1. Caulk joints before assembling frame members.

g. Frame Member to Member Connections.
1. Secure joints with fasteners.
2. Provide hairline butt joint appearance.

3. Shear block construction only, no screw spline allowed.

h. Hardware
   1. Pre-machine and reinforce frame members for hardware in accordance with manufacturer's standards and door hardware schedule.
   2. Surface mounted closures will be reinforced for but not prepped or installed at factory.
   3. Factory install door hardware.

i. Anchors:
   1. Anchors appropriate for wall conditions to anchor framing to wall materials.
   2. Door Jamb and Header Mounting Holes: Maximum of 24-inch centers.
   3. Secure head and sill members of transom, side lites, and similar conditions.

2.04 PERFORMANCE

A. Face Sheet.

1. Standard Interior and Exterior Class C 0.120" thick, pebble texture, through color with SpecLite 3® integral surfaseal film FRP sheet.
   a. Flexural Strength, ASTM-D790: 21 x 10^3 psi.
   b. Flexural Modulus, ASTM-D790: 0.7 x 10^6 psi.
   c. Tensile Strength, ASTM-D638: 13 x 10^3 psi.
   d. Tensile Modulus, ASTM-D638: 1.2 x 10^6 psi.
   e. Barcol Hardness, ASTM-D2583: 55.
   f. Izod Impact, ASTM-D256: 14.0 ft-lb/in.
   g. Gardner Impact Strength, ASTM-D5420: 120 in-lb.
   h. Water Absorption, ASTM-D570: 0.20%/24hrs at 77°F.
   i. Surface Burning, ASTM-E84: Flame Spread ≤ 200, Smoke Developed ≤ 450.
   j. Taber Abrasion Resistance, Taber Test: 0.007% Max Wt. Loss, cs-17 wheels, 1000g. Wt., 25 cycles.
   k. Chemical Resistance.
      1. Excellent Rating.
         a. Acetic Acid, Concentrated.
         b. Acetic Acid, 5%.
         c. Bleach Solution.
         d. Detergent Solution.
         e. Distilled Water.
         f. Ethyl Acetate.
         g. Formaldehyde.
         h. Heptane.
         i. Hydrochloric Acid, 10%.
         j. Hydrogen Peroxide, 3%.
         k. Isooctane.
         l. Lactic Acid, 10%.
   l. USDA/FSIS Requirements.
      1. FRP face sheet with SpecLite 3® integral surfaseal is a finished outer surface material that is rigid; durable; non-toxic; non-corrosive; moisture resistant; a light, solid color such as white; easily inspected; smooth or an easily cleaned texture.
      2. FRP face sheet with SpecLite 3® integral surfaseal does not contain any known carcinogen, mutagen, or teratogen classified as hazardous substances; heavy metals or toxic substances; antimicrobials; pesticides or substances with pesticidal characteristics.
2. Optional Interior Face Only Class A 0.120" thick, pebble texture, through color with SpecLite 3® integral surfaseal film FRP sheet.
   a. Flexural Strength, ASTM-D790: 13 x 10^3 psi.
   b. Flexural Modulus, ASTM-D790: 0.57 x 10^6 psi.
   c. Tensile Strength, ASTM-D638: 6.8 x 10^3 psi.
   d. Tensile Modulus, ASTM-D638: 0.90 x 10^6 psi.
   e. Barcol Hardness, ASTM-D2583: 40.
   f. Izod Impact, ASTM-D256: 12.0 ft-lb/in notched.
   g. Gardner Impact Strength, ASTM-D3029: 45 in-lb.
   h. Water Absorption, ASTM-D570: 0.32%/24hrs at 77°F.
   i. Surface Burning, ASTM-E84: Flame Spread ≤ 25, Smoke Developed ≤ 450.
   j. Taber Abrasion Resistance, Taber Test: 0.02% Max Wt. Loss, cs-17 wheels, 1000g. Wt., 25 cycles.

B. Door Core.

1. Density, ASTM-D1622: ≤ 5.0 pcf.

2. Compressive Properties, ASTM-D1621: Compressive Strength ≥ 60 psi, Compressive Modulus ≥ 1948 psi.
3. Tensile and Tensile Adhesion Properties, ASTM-D1623: Tensile Adhesion, 3” x 3” FRP Facers ≥ 53 psi, Tensile Adhesion, 1” x 1” Foam ≥ 104 psi.
4. Thermal and Humid Aging, ASTM-D2126: Volume Change at 158 °F, 100% humidity, 14 days ≤ 13%.
5. Thermal Conductivity, ASTM-C518, Thermal Resistance ≥ 0.10 m^2K/W.

C. Door Panel.
1. Thermal Transmittance, AAMA 1503-98: U-Factor = 0.29 $Btu/hr \cdot ft^2 \cdot °F$, CRFp = 55.
2. Indoor Air Quality, ASTM-D5116, ASTM-D6607: GreenGuard, GreenGuard Gold.

D. Door and Aluminum Tube Frame Assembly.
1. Physical Endurance, ANSI A250.4: 25,000,000 Cycles, No Damage.
2. Salt Spray, ASTM-B117: 500 hours minimum exposure.
3. Air Leakage, NFRC 400, ASTM-E283.
   a. Opaque Swinging Door (< than 50% glass)
      1. 0.01 cfm/sqft @ 1.57 psf.
      2. 0.01 cfm/sqft @ 6.24 psf.
   b. Commercially Glazed Swinging Entrance Door (> than 50% glass)
      1. 0.38 cfm/sqft @ 1.57 psf.
      2. 0.73 cfm/sqft @ 6.24 psf.
4. Structural Performance, ASTM E-330.
   a. Single or Pair of Doors, 8’4” x 8’2” overall size, single point latching.
      1. ± 75 psf design pressure, pass.
5. Impact and Cycle Test, ASTM-E1886.
   a. Single or Pair of Doors, 6’8” x 7’8” overall size, 3-point latching.
      1. 9 lbs. missile @ 50 fps, minimum 3 impacts, no rips, tears, or penetrations.
      2. ± 75 psf design pressure, pass.
6. Forced Entry, AAMA 1304.
   a. Single or Pair of Doors, 6’8” x 7’8” overall size, 3-point latching.
      1. 300lb Pull Test, pass.
7. Impact Test, TAS 201.
   a. Single or Pair of Doors, 6’8” x 7’8” overall size, 3-point latching.
      1. 9 lbs. missile @ 50 fps, minimum 3 impacts, no rips, tears, or penetrations.
8. Static Air Pressure, TAS 202.
   a. Single or Pair of Doors, 6’8” x 7’8” overall size, 3-point latching.
      1. ± 65 psf design pressure, pass.
      2. Forced Entry, 300lb Pull Test, pass.
9. Cyclic Wind Pressure Loading, TAS 203.
   a. Single or Pair of Doors, 6’8” x 7’8” overall size, 3-point latching.
      1. ± 65 psf design pressure, pass.
10. Security Test, ASTM-F476: Minimum Grade 40.
11. Blast Test, ASTM-F1642.
   a. 6 psi @ 45 psi-msec, minimal hazard, operable.

E. Door and Thermally Broken Aluminum Frame Assembly.
1. Thermal Transmittance, NFRC 100.
   a. Opaque Swinging Door (< than 50% glass)
      1. U-Factor = 0.31 $Btu/hr \cdot ft^2 \cdot °F$.
   b. Commercially Glazed Swinging Entrance Door (> than 50% glass)
      1. U-Factor = 0.64 $Btu/hr \cdot ft^2 \cdot °F$.
2. Air Leakage, NFRC 400, ASTM-E283.
   a. Opaque Swinging Door (< than 50% glass)
      1. 0.01 cfm/sqft @ 1.57 psf.
      2. 0.01 cfm/sqft @ 6.24 psf.
   b. Commercially Glazed Swinging Entrance Door (> than 50% glass)
      1. 0.38 cfm/sqft @ 1.57 psf.
      2. 0.73 cfm/sqft @ 6.24 psf.
3. Sound Transmission, ASTM-E90: STC = 30, OITC = 29.

2.05 MATERIALS

A. Aluminum Members.
1. Aluminum extrusions made 6061 or 6063 aluminum alloys.
2. Sheet and plate to conform to ASTM-B209.

3. Alloy and temper to be selected by manufacturer for strength, corrosion resistance, and application of required finish, and control of color.

B. Fiberglass.
   1. See 2.02.C.5.

C. Fasteners.
   1. All exposed fasteners will have a finish to match material being fastened.
   2. 410 stainless steel or other non-corrosive metal.
   3. Must be compatible with items being fastened.

2.06 FABRICATION

A. Factory Assembly.
   1. Door and frame components from the same manufacturer.
   2. Required size for door and frame units, shall be as indicated on the drawings.
   3. Complete cutting, fitting, forming, drilling, and grinding of metal before assembly.
   4. All cut edges to be free of burs.
   5. Welding of doors or frames is not acceptable.
   6. Maintain continuity of line and accurate relation of planes and angles.
   7. Secure attachments and support at mechanical joints with hairline fit at contact surfaces.

B. Shop Fabrication
   1. All shop fabrication to be completed in accordance with manufactures process work instructions.
   2. Quality control to be performed before leaving each department.

2.07 FINISHES

A. Door.
   a. Anodizing.
      1. Class 1 Anodizing, minimum 0.7 mils thick.
         a. Color. – Refer to Drawings

   2. FRP Face Sheets
      a. Through color.
         1. Color.
            a. Slate Grey #5572.

B. Frame

   1. Aluminum.
      a. Anodizing.
         1. Class 1 Anodizing, minimum 0.7 mils thick.
            a. Color – Refer to Drawings

2.08 ACCESSORIES

A. Vision Lites.
   1. Factory Glazing.
      a. Model.
         1. FL Standard.
         2. Alternate for **"Secure Lite Kits for Insulated Glass"** See Alternate Request in Glass Specification.
      b. Glazing Thickness.
         1. 1".
      c. Rectangular Lites.
            a. Size, as indicated on drawings.
               1. Factory installed.
   2. Size.
      a. Custom Size, see drawings for size.
   3. Pre-machine doors in accordance with templates from specified hardware manufactures and hardware schedule.
   4. Factory install hardware.
   5. Hardware Schedule
      a. As specified in Section 08 71 00.
         1. Door Pulls.
            a. SL-86.
         2. Concealed adjustable bottom brush.

a. SL-301.
1. Not for use with CVR type hardware.

3. Mullions.
a. Model – Keyed Removable
1. SL-60.

PART 3 EXECUTION

3.01 EXAMINATION
A. Examine areas to receive doors.
B. Notify architect of conditions that would adversely affect installation or subsequent use.
C. Do no proceed with installation until unsatisfactory conditions are corrected.

3.02 PREPARATION
A. Ensure openings to receive frames are plumb, level, square, and in tolerance.

3.03 ERECTION
A. Install doors in accordance with manufacturer's instructions.
B. Install doors plumb, level, square, true to line, and without warp or rack.
C. Anchor frames securely in place.
D. Separate aluminum from other metal surfaces with bituminous coatings or other means approved by architect.
E. Set thresholds in bed of mastic and back seal.
F. Install exterior doors to be weathertight in closed position.
G. Repair minor damages to finish in accordance with manufacturer's instructions and as approved by architect.
H. Remove and replace damaged components that cannot be successfully repaired as determined by architect.

3.04 FIELD QUALITY CONTROL
A. Manufacture's Field Services.
1. Manufacturer's representative shall provide technical assistance and guidance for installation of doors.

3.05 ADJUSTING
A. Adjust doors, hinges, and locksets for smooth operation without binding.

3.06 CLEANING
A. Clean doors promptly after installation in accordance with manufacturer's instructions.
B. Do not use harsh cleaning materials or methods that would damage finish.

3.07 PROTECTION
A. Protect installed doors to ensure that, except for normal weathering, doors will be without damage or deterioration at time of substantial completion.

END OF SECTION

SECTION 084113
ALUMINUM-FRAMED STOREFRONTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Aluminum-framed storefront systems.

B. Related Requirements:

1. Section 088000 "Glazing"
2. Section 081743 “FRP/Aluminum Hybrid Doors and Frames”
3.

1.2 ALLOWANCES

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Shop Drawings: For aluminum-framed storefronts. Include plans, elevations, sections, full-size details, and attachments to other work.

1. Include details of provisions for assembly expansion and contraction and for draining moisture occurring within the assembly to the exterior.
2. Include full-size isometric details of each type of vertical-to-horizontal intersection of aluminum-framed entrances and storefronts, showing the following:
   a. Joinery, including concealed welds.
   b. Anchorage.
   c. Expansion provisions.
   d. Glazing.
   e. Flashing and drainage.
3. Show connection to and continuity with adjacent thermal, weather, air, and vapor barriers.
4. Include point-to-point wiring diagrams showing the following:
   a. Power requirements for each electrically operated door hardware.
   b. Location and types of switches, signal device, conduit sizes, and number and size of wires.

C. Samples for Initial Selection: For units with factory-applied color finishes.

D. Delegated Design Submittal: For aluminum-framed entrances and storefronts including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.4 INFORMATIONAL SUBMITTALS

A. Certificates:

1. Energy Performance Certificates: For aluminum-framed entrances and storefronts, accessories, and components, from manufacturer.
    a. Basis for Certification: NFRC-certified energy performance values for each aluminum-framed entrance and storefront.

B. Sample warranties.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For aluminum-framed entrances and storefronts.

1.6 QUALITY ASSURANCE

A. Qualifications:

1. Installers: An entity that employs installers and supervisors who are trained and approved by manufacturer and that employs a qualified glazing contractor for this Project who is certified under the North American Contractor Certification Program (NACC) for Architectural Glass & Metal (AG&M) contractors.
2. Delegated Design Engineer: A professional engineer who is legally qualified to practice in state where Project is located and who is experienced in providing engineering services of the type indicated.

1.7 WARRANTY

A. Special Warranty: Installer agrees to repair or replace components of aluminum-framed entrances and storefronts that do not comply with requirements or that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:
    a. Structural failures, including, but not limited to, excessive deflection.
    b. Noise or vibration created by wind and thermal and structural movements.
    c. Deterioration of metals , metal finishes, and other materials beyond normal weathering.
    d. Water penetration through fixed glazing and framing areas.
    e. Failure of operating components.
2. Warranty Period: Five years from date of Substantial Completion.

B. Special Finish Warranty, Anodized Finishes: Standard form in which manufacturer agrees to repair finishes or replace aluminum that shows evidence of deterioration of anodized finishes within specified warranty period.

1. Deterioration includes, but is not limited to, the following:
   a. Color fading more than 5 Delta E units when tested in accordance with ASTM D 2244.
   b. Chalking in excess of a No. 8 rating when tested in accordance with ASTM D 4214.
   c. Cracking, peeling, or chipping.
2. Warranty Period: Ten years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain all components of aluminum-framed entrance and storefront system, including framing and accessories, from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design aluminum-framed entrances and storefronts.

B. General Performance: Comply with performance requirements specified, as determined by testing of aluminum-framed entrances and storefronts representing those indicated for this Project without failure due to defective manufacture, fabrication, installation, or other defects in construction.

1. Aluminum-framed entrances and storefronts shall withstand movements of supporting structure, including, but not limited to, twist, column shortening, long-term creep, and deflection from uniformly distributed and concentrated live loads.
2. Failure also includes the following:
   a. Thermal stresses transferring to building structure.
   b. Glass breakage.
   c. Noise or vibration created by wind and thermal and structural movements.
   d. Loosening or weakening of fasteners, attachments, and other components.
   e. Failure of operating units.

C. Structural Loads:

1. Wind Loads: As indicated on Drawings.
2. Other Design Loads: As indicated on Drawings .

D. Structural: Test in accordance with ASTM E330/E330M as follows:

1. When tested at positive and negative wind-load design pressures, storefront assemblies, including entrance doors, do not evidence deflection exceeding specified limits.
2. When tested at 150 percent of positive and negative wind-load design pressures, storefront assemblies, including entrance doors and anchorage, do not evidence material failures, structural distress, or permanent deformation of main framing members exceeding 0.2 percent of span.
3. Test Durations: As required by design wind velocity, but not less than 10 seconds.

E. Water Penetration under Static Pressure: Test in accordance with ASTM E331 as follows:

1. No evidence of water penetration through fixed glazing and framing areas, including entrance doors, when tested in accordance with a minimum static-air-pressure differential of 20 percent of positive wind-load design pressure, but not less than 6.24 lbf/sq. ft. .

F. Water Penetration under Dynamic Pressure: Test in accordance with AAMA 501.1 as follows:

1. Maximum Water Leakage: In accordance with AAMA 501.1 . Water leakage does not include water controlled by flashing and gutters, or water that is drained to exterior.

2.3 STOREFRONT SYSTEMS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. EFCO Corporation.
2. Kawneer North America, an Arconic company.
3. Oldcastle BuildingEnvelope (OBE); CRH Americas.
4. Tubelite

B. Framing Members: Manufacturer's extruded- or formed-aluminum framing members of thickness required and reinforced as required to support imposed loads.

1. Exterior Framing Construction: Thermally broken .
2. Glazing System: Retained mechanically with gaskets on four sides .
3. Glazing Plane: Front .
4. Finish: Color Anotic Finish – As Shown on Drawings
5. Fabrication Method: Field-fabricated stick system.
6. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.
7. Steel Reinforcement: As required by manufacturer, glazing contractor to account for any additional reinforcement within system.

C. Backer Plates: Manufacturer's standard, continuous backer plates for framing members, if not integral, where framing abuts adjacent construction.

D. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims for aligning system components.

2.4 MATERIALS

A. Sheet and Plate: ASTM B209.

B. Extruded Bars, Rods, Profiles, and Tubes: ASTM B221.

C. Structural Profiles: ASTM B308/B308M.

D. Steel Reinforcement:

1. Structural Shapes, Plates, and Bars: ASTM A36/A36M.
2. Cold-Rolled Sheet and Strip: ASTM A1008/A1008M.
3. Hot-Rolled Sheet and Strip: ASTM A1011/A1011M.

E. Steel Reinforcement Primer: Manufacturer's standard zinc-rich, corrosion-resistant primer complying with SSPC-PS Guide No. 12.00; applied immediately after surface preparation and pretreatment. Select surface preparation methods in accordance with recommendations in SSPC-SP COM, and prepare surfaces in accordance with applicable SSPC standard.

2.5 ACCESSORIES

A. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials.

1. Use self-locking devices where fasteners are subject to loosening or turning out from thermal and structural movements, wind loads, or vibration.
2. Reinforce members as required to receive fastener threads.

B. Anchors: Three-way adjustable anchors with minimum adjustment of 1 inch that accommodate fabrication and installation tolerances in material and finish compatible with adjoining materials and recommended by manufacturer.

1. Concrete and Masonry Inserts: Hot-dip galvanized cast-iron, malleable-iron, or steel inserts complying with ASTM A123/A123M or ASTM A153/A153M requirements.

C. Concealed Flashing: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding flashing compatible with adjacent materials .

D. Bituminous Paint: Cold-applied asphalt-mastic paint containing no asbestos, formulated for 30-mil thickness per coat.

E. Rigid PVC filler.

2.6 FABRICATION

A. Form or extrude aluminum shapes before finishing.

B. Weld in concealed locations to greatest extent possible to minimize distortion or discoloration of finish. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.

C. Fabricate components that, when assembled, have the following characteristics:

1. Profiles that are sharp, straight, and free of defects or deformations.
2. Accurately fitted joints with ends coped or mitered.
3. Physical and thermal isolation of glazing from framing members.
4. Accommodations for thermal and mechanical movements of glazing and framing to maintain required glazing edge clearances.
5. Provisions for field replacement of glazing from interior .
6. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.

D. Mechanically Glazed Framing Members: Fabricate for flush glazing without projecting stops.

E. After fabrication, clearly mark components to identify their locations in Project in accordance with Shop Drawings.

2.7 ALUMINUM FINISHES

A. Color Anodic Finish: AAMA 611, or thicker.

1. Color: As shown on drawings.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

A. Comply with manufacturer's written instructions.

B. Do not install damaged components.

C. Fit joints to produce hairline joints free of burrs and distortion.

D. Rigidly secure nonmovement joints.

E. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration and to prevent impeding movement of moving joints.

F. Seal perimeter and other joints watertight unless otherwise indicated.

G. Metal Protection:

1. Where aluminum is in contact with dissimilar metals, protect against galvanic action by painting contact surfaces with materials recommended by manufacturer for this purpose or by installing nonconductive spacers.
2. Where aluminum is in contact with concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.

H. Set continuous sill members and flashing in full sealant bed, as specified in Section 079200 "Joint Sealants," to produce weathertight installation.

I. Install joint filler behind sealant as recommended by sealant manufacturer.

J. Install components plumb and true in alignment with established lines and grades.

3.3 INSTALLATION OF OPERABLE UNITS

A. Install operable units level and plumb, securely anchored, and without distortion. Adjust weather-stripping contact and hardware movement to produce proper operation.

3.4 INSTALLATION OF GLAZING

A. Install glazing as specified in Section 088000 "Glazing."

3.5 INSTALLATION OF WEATHERSEAL SEALANT

A. After structural sealant has completely cured, remove temporary retainers and insert backer rod between lites of glass as recommended by sealant manufacturer.

B. Install weatherseal sealant to completely fill cavity, in accordance with sealant manufacturer's written instructions, to produce weatherproof joints.

3.6 INSTALLATION OF ALUMINUM-FRAMED ENTRANCE DOORS

A. Install entrance doors to produce smooth operation and tight fit at contact points.

1. Exterior Doors: Install to produce weathertight enclosure and tight fit at weather stripping.
2. Field-Installed Entrance Door Hardware: Install surface-mounted entrance door hardware in accordance with entrance door hardware manufacturers' written instructions using concealed fasteners to greatest extent possible.

3.7 ERECTION TOLERANCES

A. Install aluminum-framed entrances and storefronts to comply with the following maximum tolerances:

1. Plumb: 1/8 inch in 10 feet; 1/4 inch in 40 feet.
2. Level: 1/8 inch in 20 feet; 1/4 inch in 40 feet.
3. Alignment:
   a. Where surfaces abut in line or are separated by reveal or protruding element up to 1/2 inch wide, limit offset from true alignment to 1/16 inch.
   b. Where surfaces are separated by reveal or protruding element from 1/2 to 1 inch wide, limit offset from true alignment to 1/8 inch.
   c. Where surfaces are separated by reveal or protruding element of 1 inch wide or more, limit offset from true alignment to 1/4 inch.
4. Location: Limit variation from plane to 1/8 inch in 12 feet; 1/2 inch over total length.

3.8 MAINTENANCE SERVICE

A. Entrance Door Hardware Maintenance:

1. 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 entrance door hardware.
2. Initial Maintenance Service: Beginning at Substantial Completion, provide six months' full maintenance by skilled employees of entrance door hardware Installer. Include quarterly preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper entrance door hardware operation at rated speed and capacity. Use parts and supplies that are the same as those used in the manufacture and installation of original equipment.

END OF SECTION 084113

SECTION 085113
ALUMINUM WINDOWS

PART 1 GENERAL

1.01SECTION INCLUDES

A. Extruded aluminum windows with fixed sash, operating sash, and infill panels.

B. Factory glazing.

C. Operating hardware.

D. Insect screens.

1.02 RELATED REQUIREMENTS

A. Section 072500 - Weather Barriers: Sealing frame to water-resistive barrier installed on adjacent construction.

B. Section 079200 - Joint Sealants: Sealing joints between window frames and adjacent construction.

C. Section 088000 - Glazing.

1.03 REFERENCE STANDARDS

A. AAMA/WDMA/CSA 101/I.S.2/A440 - North American Fenestration Standard/Specification for Windows, Doors, and Skylights; 2022, with Errata (2023).

B. AAMA CW-10 - Care and Handling of Architectural Aluminum from Shop to Site; 2015.

C. AAMA 502 - Voluntary Specification for Field Testing of Newly Installed Fenestration Products; 2021.

D. AAMA 609 & 610 - Cleaning and Maintenance Guide for Architecturally Finished Aluminum (Combined Document); 2015.

E. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2021.

F. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric); 2021.

G. ASTM E783 - Standard Test Method for Field Measurement of Air Leakage Through Installed Exterior Windows and Doors; 2002 (Reapproved 2018).

H. ASTM E1105 - Standard Test Method for Field Determination of Water Penetration of Installed Exterior Windows, Skylights, Doors, and Curtain Walls, by Uniform or Cyclic Static Air Pressure Difference; 2015 (Reapproved 2023).

1.04 SUBMITTALS

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

B. Product Data: Include component dimensions, information on glass and glazing, internal drainage details, and descriptions of hardware and accessories.

C. Shop Drawings: Indicate opening dimensions, elevations of different types, framed opening tolerances, anchorage locations,and installation requirements.

D. Samples:
   1. Framing: Two samples, 12 by 12 inch (300 by 300 mm) in size illustrating typical corner construction, accessories, and finishes.

E. Grade Substantiation: Prior to submitting shop drawings or starting fabrication, submit one of the following showing compliance with specified grade:
   1. Evidence of AAMA Certification.
   2. Evidence of WDMA Certification.
   3. Evidence of CSA Certification.

4. Test report(s) by independent testing agency itemizing compliance and acceptable to authorities having jurisdiction.

F. Test Reports: Prior to submitting shop drawings or starting fabrication, submit test report(s) by independent testing agency showing compliance with performance requirements in excess of those prescribed by specified grade.

G. Manufacturer's Installation Instructions: Include complete preparation, installation, and cleaning requirements.

H. Field Quality Control Submittals: Report of field testing for water penetration and air leakage.

1.05 QUALITY ASSURANCE

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

B. Installer Qualifications: Company specializing in performing work of type specified and with at least three years of documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Comply with requirements of AAMA CW-10.

B. Protect finished surfaces with wrapping paper or strippable coating during installation. Do not use adhesive papers or sprayed coatings that bond to substrate when exposed to sunlight or weather.

1.07 FIELD CONDITIONS

A. Do not install sealants when ambient temperature is less than 40 degrees F (5 degrees C).

B. Maintain this minimum temperature during and 24 hours after installation of sealants.

1.08 WARRANTY

A. See Section 017800 - Closeout Submittals for additional warranty requirements.

B. Correct defective work within a five year period after Date of Substantial Completion.

C. 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 manufacturer.

D. Manufacturer 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 manufacturer.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Provide Operable Window within Storefront Glazing System (Coordinate w/ Sections 081743 / 084113). Acceptable Aluminum Window Manufacturers:
   1. Manko Window Systems, Inc: www.mankowindows.com/#sle.
   2. Peerless Products, Inc www.peerlessproducts.com/#sle.
   3. Kawneer Window Systems; https://www.kawneer.us/
   4. Substitutions: See Section 016000 - Product Requirements.

2.02 ALUMINUM WINDOWS

A. Aluminum Windows: Extruded aluminum frame and sash, factory fabricated, factory finished, with operating hardware, related flashings, and anchorage and attachment devices.
   1. Frame Depth: 3-1/2 inch (89 mm).
   2. Operable Units: Double weatherstripped.
   3. Provide factory-glazed units.
   4. Fabrication: Joints and corners flush, hairline, and weatherproof, accurately fitted and secured; prepared to receive anchors; fasteners and attachments concealed from view; reinforced as required for operating hardware and imposed loads.

5. Perimeter Clearance: Minimize space between framing members and adjacent construction while allowing expected movement.
6. Movement: Accommodate movement between window and perimeter framing and deflection of lintel, without damage to components or deterioration of seals.
7. System Internal Drainage: Drain to the exterior by means of a weep drainage network any water entering joints, condensation occurring in glazing channel, and migrating moisture occurring within system.
8. Provide Window Screens where window is NOT marked as required for Egress.
9. Refer to Drawings for Window Operation Type: Horizontal Sliding, Vertical Sliding, Awning.

2.03 MATERIALS

A. Extruded Aluminum: ASTM B221 (ASTM B221M), 6063 alloy, T6 temper.

2.04 HARDWARE

A. Include Manufacturer's Standard Hardware for Window Operation

2.05 FINISHES

A. Finish Color: As selected by Architect from manufacturer's standard range.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that wall openings and adjoining water-resistive barrier materials are ready to receive aluminum windows; see Section 072500.

3.02 PRIME WINDOW INSTALLATION

A. Install windows in accordance with manufacturer's instructions.

B. Attach window frame and shims to perimeter opening to accommodate construction tolerances and other irregularities.

C. Align window plumb and level, free of warp or twist. Maintain dimensional tolerances and alignment with adjacent work.

D. Install sill and sill end angles.

E. Provide thermal isolation where components penetrate or disrupt building insulation. Pack fibrous insulation in shim spaces at perimeter of assembly to maintain continuity of thermal barrier.

F. Install operating hardware not pre-installed by manufacturer.

G. Install glass and infill panels in accordance with requirements; see Section 088000.

3.03 FIELD QUALITY CONTROL

A. Provide services of aluminum window manufacturer's field representative to observe for proper installation of system and submit report.

B. See Section 014000 - Quality Requirements for independent field testing and inspection requirements, and requirements for monitoring quality of specified product installations.

C. Provide field testing of installed aluminum windows by independent laboratory in accordance with AAMA 502 and AAMA/WDMA/CSA 101/I.S.2/A440 during construction process and before installation of interior finishes.
   1. Field test for water penetration in accordance with ASTM E1105 using Procedure B - cyclic static air pressure difference; test pressure shall not be less than 1.9 psf (91 Pa).
   2. Field test for air leakage in accordance with ASTM E783 with uniform static air pressure difference of 1.57 psf (75 Pa).

D. Repair or replace fenestration components that have failed designated field testing, and retest to verify performance complies with specified requirements.

3.04 ADJUSTING

A. Adjust hardware for smooth operation and secure weathertight closure.

3.05 CLEANING

A. Remove protective material from factory finished aluminum surfaces.

B. Upon completion of installation, thoroughly clean aluminum surfaces in accordance with AAMA 609 & 610.

C. Remove excess glazing sealant by moderate use of mineral spirits or other solvent acceptable to sealant and window manufacturer.

END OF SECTION

SECTION 087100 - DOOR HARDWARE

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes:

1. Mechanical and electrified door hardware
2. Electronic access control system components

B. Section excludes:

1. Windows
2. Cabinets (casework), including locks in cabinets
3. Signage
4. Toilet accessories
5. Overhead doors

C. Related Sections:

1. Division 01 Section "Alternates" for alternates affecting this section.
2. Division 06 Section "Rough Carpentry"
3. Division 06 Section "Finish Carpentry"
4. Division 07 Section "Joint Sealants" for sealant requirements applicable to threshold installation specified in this section.
5. Division 08 Sections:
   a. "Metal Doors and Frames"
   b. "Flush Wood Doors"
   c. "Stile and Rail Wood Doors"
   d. "Interior Aluminum Doors and Frames"
   e. "Aluminum-Framed Entrances and Storefronts"
   f. "Stainless Steel Doors and Frames"
   g. "Special Function Doors"
   h. "Entrances"
6. Division 26 "Electrical" sections for connections to electrical power system and for low-voltage wiring.
7. Division 28 "Electronic Safety and Security" sections for coordination with other components of electronic access control system and fire alarm system.

1.02 REFERENCES

A. UL LLC

1. UL 10B - Fire Test of Door Assemblies
2. UL 10C - Positive Pressure Test of Fire Door Assemblies
3. UL 1784 - Air Leakage Tests of Door Assemblies
4. UL 305 - Panic Hardware

B. DHI - Door and Hardware Institute

1. Sequence and Format for the Hardware Schedule

2. Recommended Locations for Builders Hardware
3. Keying Systems and Nomenclature
4. Installation Guide for Doors and Hardware

C. NFPA – National Fire Protection Association

1. NFPA 70 – National Electric Code
2. NFPA 80 – 2016 Edition – Standard for Fire Doors and Other Opening Protectives
3. NFPA 101 – Life Safety Code
4. NFPA 105 – Smoke and Draft Control Door Assemblies
5. NFPA 252 – Fire Tests of Door Assemblies

D. ANSI - American National Standards Institute

1. ANSI A117.1 – 2017 Edition – Accessible and Usable Buildings and Facilities
2. ANSI/BHMA A156.1 - A156.29, and ANSI/BHMA A156.31 - Standards for Hardware and Specialties
3. ANSI/BHMA A156.28 - Recommended Practices for Keying Systems
4. ANSI/WDMA I.S. 1A - Interior Architectural Wood Flush Doors
5. ANSI/SDI A250.8 - Standard Steel Doors and Frames

1.03 SUBMITTALS

A. General:

1. Submit in accordance with Conditions of Contract and Division 01 Submittal Procedures.
2. Prior to forwarding submittal:
   a. Review drawings and Sections from related trades to verify compatibility with specified hardware.
   b. Highlight, encircle, or otherwise specifically identify on submittals: deviations from Contract Documents, issues of incompatibility or other issues which may detrimentally affect the Work.

B. Action Submittals:

1. Product Data: Submit technical product data for each item of door hardware, installation instructions, maintenance of operating parts and finish, and other information necessary to show compliance with requirements.
2. Riser and Wiring Diagrams: After final approval of hardware schedule, submit details of electrified door hardware, indicating:
   a. Wiring Diagrams: For power, signal, and control wiring and including:
      1) Details of interface of electrified door hardware and building safety and security systems.
      2) Schematic diagram of systems that interface with electrified door hardware.
      3) Point-to-point wiring.
      4) Risers.

3. Samples for Verification: If requested by Architect, submit production sample of requested door hardware unit in finish indicated and tagged with full description for coordination with schedule.
   a. Samples will be returned to supplier. Units that are acceptable to Architect may, after final check of operations, be incorporated into Work, within limitations of key coordination requirements.

4. Door Hardware Schedule:

a. Submit concurrent with submissions of Product Data, Samples, and Shop Drawings. Coordinate submission of door hardware schedule with scheduling requirements of other work to facilitate fabrication of other work critical in Project construction schedule.
b. Submit under direct supervision of a Door Hardware Institute (DHI) certified Architectural Hardware Consultant (AHC) or Door Hardware Consultant (DHC) with hardware sets in vertical format as illustrated by Sequence of Format for the Hardware Schedule published by DHI.
c. Indicate complete designations of each item required for each opening, include:
    1) Door Index: door number, heading number, and Architect's hardware set number.
    2) Quantity, type, style, function, size, and finish of each hardware item.
    3) Name and manufacturer of each item.
    4) Fastenings and other pertinent information.
    5) Location of each hardware set cross-referenced to indications on Drawings.
    6) Explanation of all abbreviations, symbols, and codes contained in schedule.
    7) Mounting locations for hardware.
    8) Door and frame sizes and materials.
    9) Degree of door swing and handing.
    10) Operational Description of openings with electrified hardware covering egress, ingress (access), and fire/smoke alarm connections.

5. Key Schedule:
    a. After Keying Conference, provide keying schedule that includes levels of keying, explanations of key system's function, key symbols used, and door numbers controlled.
    b. Use ANSI/BHMA A156.28 "Recommended Practices for Keying Systems" as guideline for nomenclature, definitions, and approach for selecting optimal keying system.
    c. Provide 3 copies of keying schedule for review prepared and detailed in accordance with referenced DHI publication. Include schematic keying diagram and index each key to unique door designations.
    d. Index keying schedule by door number, keyset, hardware heading number, cross keying instructions, and special key stamping instructions.
    e. Provide one complete bitting list of key cuts and one key system schematic illustrating system usage and expansion. Forward bitting list, key cuts and key system schematic directly to Owner, by means as directed by Owner.
    f. Prepare key schedule by or under supervision of supplier, detailing Owner's final keying instructions for locks.

C. Informational Submittals:

1. Provide Qualification Data for Supplier, Installer and Architectural Hardware Consultant.
2. Provide Product Data:
    a. Certify that door hardware approved for use on types and sizes of labeled fire-rated doors complies with listed fire-rated door assemblies.
    b. Include warranties for specified door hardware.

D. Closeout Submittals:

1. Operations and Maintenance Data: Provide in accordance with Division 01 and include:
    a. Complete information on care, maintenance, and adjustment; data on repair and replacement parts, and information on preservation of finishes.
    b. Catalog pages for each product.
    c. Final approved hardware schedule edited to reflect conditions as installed.
    d. Final keying schedule

e. Copy of warranties including appropriate reference numbers for manufacturers to identify project.
f. As-installed wiring diagrams for each opening connected to power, both low voltage and 110 volts.

E. Inspection and Testing:

1. Submit written reports to the Owner and Authority Having Jurisdiction (AHJ) of the results of functional testing and inspection for:
   a. Fire door assemblies, in compliance with NFPA 80.
   b. Required egress door assemblies, in compliance with NFPA 101.

1.04 QUALITY ASSURANCE

A. Qualifications and Responsibilities:

1. Supplier: Recognized architectural hardware supplier with a minimum of 5 years documented experience supplying both mechanical and electromechanical door hardware similar in quantity, type, and quality to that indicated for this Project. Supplier to be recognized as a factory direct distributor by the manufacturer of the primary materials with a warehousing facility in the Project's vicinity. Supplier to have on staff, a certified Architectural Hardware Consultant (AHC) or Door Hardware Consultant (DHC) available to Owner, Architect, and Contractor, at reasonable times during the Work for consultation.
2. Installer: Qualified tradesperson skilled in the application of commercial grade hardware with experience installing door hardware similar in quantity, type, and quality as indicated for this Project.
3. Architectural Hardware Consultant: Person who is experienced in providing consulting services for door hardware installations that are comparable in material, design, and extent to that indicated for this Project and meets these requirements:
   a. For door hardware: DHI certified AHC or DHC.
   b. Can provide installation and technical data to Architect and other related subcontractors.
   c. Can inspect and verify components are in working order upon completion of installation.
   d. Capable of producing wiring diagram and coordinating installation of electrified hardware with Architect and electrical engineers.

4. Single Source Responsibility: Obtain each type of door hardware from single manufacturer.

B. Certifications:

1. Fire-Rated Door Openings:
   a. Provide door hardware for fire-rated openings that complies with NFPA 80 and requirements of authorities having jurisdiction.
   b. Provide only items of door hardware that are listed products tested by UL LLC, Intertek Testing Services, or other testing and inspecting organizations acceptable to authorities having jurisdiction for use on types and sizes of doors indicated, based on testing at positive pressure and according to NFPA 252 or UL 10C and in compliance with requirements of fire-rated door and door frame labels.

2. Smoke and Draft Control Door Assemblies:
   a. Provide door hardware that meets requirements of assemblies tested according to UL 1784 and installed in compliance with NFPA 105

b. Comply with the maximum air leakage of 0.3 cfm/sq. ft. (3 cu. m per minute/sq. m) at tested pressure differential of 0.3-inch wg (75 Pa) of water.

3. Electrified Door Hardware
   a. Listed and labeled as defined in NFPA 70, Article 100, by testing agency acceptable to authorities having jurisdiction.

4. Accessibility Requirements:
   a. Comply with governing accessibility regulations cited in "REFERENCES" article 087100, 1.02.D3 herein for door hardware on doors in an accessible route. This project must comply with all Federal Americans with Disability Act regulations and all Local Accessibility Regulations.

C. Pre-Installation Meetings

1. Keying Conference
   a. Incorporate keying conference decisions into final keying schedule after reviewing door hardware keying system including:
      1) Function of building, flow of traffic, purpose of each area, degree of security required, and plans for future expansion.
      2) Preliminary key system schematic diagram.
      3) Requirements for key control system.
      4) Requirements for access control.
      5) Address for delivery of keys.

2. Pre-installation Conference
   a. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
   b. Inspect and discuss preparatory work performed by other trades.
   c. Inspect and discuss electrical roughing-in for electrified door hardware.
   d. Review sequence of operation for each type of electrified door hardware.
   e. Review required testing, inspecting, and certifying procedures.
   f. Review questions or concerns related to proper installation and adjustment of door hardware.

3. Electrified Hardware Coordination Conference:
   a. Prior to ordering electrified hardware, schedule and hold meeting to coordinate door hardware with security, electrical, doors and frames, and other related suppliers.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Inventory door hardware on receipt and provide secure lock-up for hardware delivered to Project site. Promptly replace products damaged during shipping.

B. Tag each item or package separately with identification coordinated with final door hardware schedule, and include installation instructions, templates, and necessary fasteners with each item or package. Deliver each article of hardware in manufacturer's original packaging.

C. Maintain manufacturer-recommended environmental conditions throughout storage and installation periods.

D. Provide secure lock-up for door hardware delivered to Project. Control handling and installation of hardware items so that completion of Work will not be delayed by hardware losses both before and after installation.

E. Handle hardware in manner to avoid damage, marring, or scratching. Correct, replace or repair products damaged during Work. Protect products against malfunction due to paint, solvent, cleanser, or any chemical agent.

F. Deliver keys to manufacturer of key control system for subsequent delivery to Owner.

1.06 COORDINATION

A. Coordinate layout and installation of floor-recessed door hardware with floor construction. Cast anchoring inserts into concrete.

B. Installation Templates: Distribute for doors, frames, and other work specified to be factory or shop prepared. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.

C. Security: Coordinate installation of door hardware, keying, and access control with Owner's security consultant.

D. Electrical System Roughing-In: Coordinate layout and installation of electrified door hardware with connections to power supplies and building safety and security systems.

1.07 WARRANTY

A. Manufacturer's standard form in which manufacturer agrees to repair or replace components of door hardware that fail in materials or workmanship within published warranty period.

1. Warranty does not cover damage or faulty operation due to improper installation, improper use or abuse.
2. Warranty Period: Beginning from date of Substantial Completion, for durations indicated in manufacturer's published listings.
    a. Mechanical Warranty
        1) Locks
            a) 3 years
        2) Exit Devices
            a) 3 years
        3) Closers
            a) 30 years
        4) Automatic Operators
            a) 2 years
    b. Electrical Warranty
        1) Locks
            a) 1 year
        2) Exit Devices
            a) 1 year

1.08 MAINTENANCE

A. Furnish complete set of special tools required for maintenance and adjustment of hardware, including changing of cylinders.

B. Turn over unused materials to Owner for maintenance purposes.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. The Owner requires use of certain products for their unique characteristics and project suitability to ensure continuity of existing and future performance and maintenance standards. After investigating available product offerings, the Awarding Authority has elected to prepare proprietary specifications. These products are specified with the notation: "No Substitute."

1. Where "No Substitute" is noted, submittals and substitution requests for other products will not be considered.

B. Approval of alternate manufacturers and/or products other than those listed as "Scheduled Manufacturer" or "Acceptable Manufacturers" in the individual article for the product category are only to be considered by official substitution request in accordance with section 01 25 00.

C. Approval of products from manufacturers indicated in "Acceptable Manufacturers" is contingent upon those products providing all functions and features and meeting all requirements of scheduled manufacturer's product.

D. Where specified hardware is not adaptable to finished shape or size of members requiring hardware, furnish suitable types having same operation and quality as type specified, subject to Architect's approval.

2.02 MATERIALS

A. Fabrication

1. Provide door hardware manufactured to comply with published templates generally prepared for machine, wood, and sheet metal screws. provide screws according to manufacturer’s recognized installation standards for application intended.
2. Finish exposed screws to match hardware finish, or, if exposed in surfaces of other work, to match finish of this other work including prepared for paint surfaces to receive painted finish.
3. Provide concealed fasteners wherever possible for hardware units exposed when door is closed. Coordinate with “Metal Doors and Frames”, “Flush Wood Doors”, “Stile and Rail Wood Doors” to ensure proper reinforcements. Advise the Architect where visible fasteners, such as thru bolts, are required.

B. Provide screws, bolts, expansion shields, drop plates and other devices necessary for hardware installation.

1. Where fasteners are exposed to view: Finish to match adjacent door hardware material.

C. Cable and Connectors:

1. Where scheduled in the hardware sets, provide each item of electrified hardware and wire harnesses with number and gage of wires enough to accommodate electric function of specified hardware.
2. Provide Molex connectors that plug directly into connectors from harnesses, electric locking and power transfer devices.

3. Provide through-door wire harness for each electrified locking device installed in a door and wire harness for each electrified hinge, electrified continuous hinge, electrified pivot, and electric power transfer for connection to power supplies.

2.03 HINGES

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product:
   a. Ives 5BB series

2. Acceptable Manufacturers and Products:
   a. McKinney TB series
   b. Best FBB series

B. Requirements:

1. Provide hinges conforming to ANSI/BHMA A156.1.
2. Provide five knuckle, ball bearing hinges.
3. 1-3/4 inch (44 mm) thick doors, up to and including 36 inches (914 mm) wide:
   a. Exterior: Standard weight, bronze or stainless steel, 4-1/2 inches (114 mm) high
   b. Interior: Standard weight, steel, 4-1/2 inches (114 mm) high

4. 1-3/4 inch (44 mm) thick doors over 36 inches (914 mm) wide:
   a. Exterior: Heavy weight, bronze/stainless steel, 5 inches (127 mm) high
   b. Interior: Heavy weight, steel, 5 inches (127 mm) high

5. 2 inches or thicker doors:
   a. Exterior: Heavy weight, bronze or stainless steel, 5 inches (127 mm) high
   b. Interior: Heavy weight, steel, 5 inches (127 mm) high

6. Adjust hinge width for door, frame, and wall conditions to allow proper degree of opening.
7. Provide three hinges per door leaf for doors 90 inches (2286 mm) or less in height, and one additional hinge for each 30 inches (762 mm) of additional door height.
8. Hinge Pins: Except as otherwise indicated, provide hinge pins as follows:
   a. Steel Hinges: Steel pins
   b. Non-Ferrous Hinges: Stainless steel pins
   c. Out-Swinging Exterior Doors: Non-removable pins
   d. Out-Swinging Interior Lockable Doors: Non-removable pins
   e. Interior Non-lockable Doors: Non-rising pins

9. Provide hinges with electrified options as scheduled in the hardware sets. Provide with number and gage of wires enough to accommodate electric function of specified hardware. Locate electric hinge at second hinge from bottom or nearest to electrified locking component. Provide mortar guard for each electrified hinge specified.

2.04 CONTINUOUS HINGES

A. Manufacturers:

1. Scheduled Manufacturer:
   a. Ives

2. Acceptable Manufacturers:
   a. Select

b. Best

B. Requirements:

1. Provide aluminum geared continuous hinges conforming to ANSI/BHMA A156.26, Grade 1.
2. Provide aluminum geared continuous hinges, where specified in the hardware sets, fabricated from 6063-T6 aluminum.
3. Provide split nylon bearings at each hinge knuckle for quiet, smooth, self-lubricating operation.
4. Provide hinges capable of supporting door weights up to 450 pounds, and successfully tested for 1,500,000 cycles.
5. On fire-rated doors, provide aluminum geared continuous hinges classified for use on rated doors by testing agency acceptable to authority having jurisdiction.
6. Provide aluminum geared continuous hinges with electrified option scheduled in the hardware sets. Provide with number and gage of wires enough to accommodate electric function of specified hardware.
7. Provide hinges 1 inch (25 mm) shorter in length than nominal height of door, unless otherwise noted or door details require shorter length and with symmetrical hole pattern.

2.05 ELECTRIC POWER TRANSFER

A. Manufacturers:

1. Scheduled Manufacturer and Product:
   a. Von Duprin EPT-10

2. Acceptable Manufacturers and Products:
   a. Securitron CEPT-10
   b. Security Door Controls PTM

B. Requirements:

1. Provide power transfer with electrified options as scheduled in the hardware sets. Provide with number and gage of wires enough to accommodate electric function of specified hardware.
2. Locate electric power transfer per manufacturer's template and UL requirements, unless interference with operation of door or other hardware items.

2.06 FLUSH BOLTS

A. Manufacturers:

1. Scheduled Manufacturer:
   a. Ives

2. Acceptable Manufacturers:
   a. Burns
   b. Rockwood

B. Requirements:

1. Provide automatic, constant latching, and manual flush bolts with forged bronze or stainless-steel face plates, extruded brass levers, and with wrought brass guides and strikes. Provide 12 inch (305 mm) steel or brass rods at doors up to 90 inches (2286 mm) in height. For doors over 90 inches (2286 mm) in height increase top rods by 6 inches (152 mm) for each additional 6 inches (152 mm) of door height. Provide dust-proof strikes at each bottom flush bolt.

2.07 COORDINATORS

A. Manufacturers:

1. Scheduled Manufacturer:
   a. Ives

2. Acceptable Manufacturers:
   a. Burns
   b. Trimco

B. Requirements:

1. Where pairs of doors are equipped with automatic flush bolts, an astragal, or other hardware that requires synchronized closing of the doors, provide bar-type coordinating device, surface applied to underside of stop at frame head.
2. Provide filler bar of correct length for unit to span entire width of opening, and appropriate brackets for parallel arm door closers, surface vertical rod exit device strikes, or other stop mounted hardware. Factory-prepared coordinators for vertical rod devices as specified.

2.08 MORTISE LOCKS

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product:
   a. Schlage L9000 series

2. Acceptable Manufacturers and Products:
   a. Sargent 8200 series
   b. Best 45H series

B. Requirements:

1. Provide mortise locks conforming to ANSI/BHMA A156.13 Series 1000, Grade 1, and UL Listed for 3-hour fire doors.
2. Indicators: Where specified, provide indicator window measuring a minimum 2-inch x 1/2 inch with 180-degree visibility. Provide messages color-coded with full text and/or symbols, as scheduled, for easy visibility.
3. Provide locks manufactured from heavy gauge steel, containing components of steel with a zinc dichromate plating for corrosion resistance.
4. Provide lock case that is multi-function and field reversible for handing without opening case. Cylinders: Refer to "KEYING" article, herein.
5. Provide locks with standard 2-3/4 inches (70 mm) backset with full 3/4 inch (19 mm) throw stainless steel mechanical anti-friction latchbolt. Provide deadbolt with full 1-inch (25 mm) throw, constructed of stainless steel.

6. Provide standard ASA strikes unless extended lip strikes are necessary to protect trim. Provide electrified options as scheduled in the hardware sets. Where scheduled, provide switches and sensors integrated into the locks and latches.
7. Provide motor based electrified locksets that comply with the following requirements:
   a. Universal input voltage – single chassis accepts 12 or 24VDC to allow for changes in the field without changing lock chassis.
   b. Fail Safe/Fail Secure – changing mode between electrically locked (fail safe) and electrically unlocked (fail secure) is field selectable without opening the lock case.
   c. Low maximum current draw – maximum 0.4 amps to allow for multiple locks on a single power supply.
   d. Low holding current – maximum 0.01 amps to produce minimal heat, eliminate "hot levers" in electrically locked applications, and to provide reliable operation in wood doors that provide minimal ventilation and air flow.
   e. Connections – provide quick-connect Molex system standard.

8. Lever Trim: Solid brass, bronze, or stainless steel, cast or forged in design specified, with wrought roses and external lever spring cages. Provide thru-bolted levers with 2-piece spindles.
   a. Lever Design: 06A

2.09 EXIT DEVICES

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product:
   a. Von Duprin 98/35A series

2. Acceptable Manufacturers and Products:
   a. Detex Advantex series
   b. Precision APEX 2000 series

B. Requirements:

1. Provide exit devices tested to ANSI/BHMA A156.3 Grade 1 and UL listed for Panic Exit or Fire Exit Hardware.
2. Cylinders: Refer to "KEYING" article, herein.
3. Provide smooth touchpad type exit devices, fabricated of brass, bronze, stainless steel, or aluminum, plated to standard architectural finishes to match balance of door hardware.
4. Touchpad must extend a minimum of one half of door width. No plastic inserts are allowed in touchpads.
5. Provide exit devices with deadlatching feature for security and for future addition of alarm kits and/or other electrified requirements.
6. Provide exit devices with weather resistant components that can withstand harsh conditions of various climates and corrosive cleaners used in outdoor pool environments.
7. Provide flush end caps for exit devices.
8. Provide exit devices with manufacturer's approved strikes.
9. Provide exit devices cut to door width and height. Install exit devices at height recommended by exit device manufacturer, allowable by governing building codes, and approved by Architect.
10. Mount mechanism case flush on face of doors or provide spacers to fill gaps behind devices. Where glass trim or molding projects off face of door, provide glass bead kits.
11. Provide cylinder or hex-key dogging as specified at non fire-rated openings.
12. Removable Mullions: 2 inches (51 mm) x 3 inches (76 mm) steel tube. Where scheduled as keyed removable mullion, provide type that can be removed by use of a keyed cylinder, which is self-locking when re-installed.

13. Provide factory drilled weep holes for exit devices used in full exterior application, highly corrosive areas, and where noted in hardware sets.
14. Provide electrified options as scheduled.
15. Top latch mounting: double- or single-tab mount for steel doors, face mount for aluminum doors eliminating requirement of tabs, and double tab mount for wood doors.
16. Provide exit devices with optional trim designs to match other lever and pull designs used on the project.

2.10 POWER SUPPLIES

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product:
   a. Schlage/Von Duprin PS900 Series

2. Acceptable Manufacturers and Products:
   a. Securitron BPS series
   b. Security Door Controls 600 series

B. Requirements:

1. Provide power supplies approved by manufacturer of supplied electrified hardware.
2. Provide appropriate quantity of power supplies necessary for proper operation of electrified locking components as recommended by manufacturer of electrified locking components with consideration for each electrified component using power supply, location of power supply, and approved wiring diagrams. Locate power supplies as directed by Architect.
3. Provide regulated and filtered 24 VDC power supply, and UL class 2 listed.
4. Provide power supplies with the following features:
   a. 12/24 VDC Output, field selectable.
   b. Class 2 Rated power limited output.
   c. Universal 120-240 VAC input.
   d. Low voltage DC, regulated and filtered.
   e. Polarized connector for distribution boards.
   f. Fused primary input.
   g. AC input and DC output monitoring circuit w/LED indicators.
   h. Cover mounted AC Input indication.
   i. Tested and certified to meet UL294.
   j. NEMA 1 enclosure.
   k. Hinged cover w/lock down screws.
   l. High voltage protective cover.

2.11 CYLINDERS

A. Manufacturers:

1. Scheduled Manufacturer and Product:
   a. Match Owner's existing system

2. Acceptable Manufacturers and Products:
   a. No Substitute

B. Requirements:

1. Provide cylinders/cores to match Owner's existing key system, compliant with ANSI/BHMA A156.5; latest revision; cylinder face finished to match lockset, manufacturer's series as indicated. Refer to "KEYING" article, herein.

2.12 KEYING

A. Scheduled System:

1. Existing factory registered system:
   a. Provide cylinders/cores keyed into Owner's existing factory registered keying system. Comply with guidelines in ANSI/BHMA A156.28, incorporating decisions made at keying conference.

B. Requirements:

1. Construction Keying:
   a. Replaceable Construction Cores.
      1) Provide temporary construction cores replaceable by permanent cores, furnished in accordance with the following requirements.
         a) 3 construction control keys
         b) 12 construction change (day) keys.
      2) Owner or Owner's Representative will replace temporary construction cores with permanent cores.

2. Permanent Keying:
   a. Provide permanent cylinders/cores keyed by the manufacturer according to the following key system.
      1) Master Keying system as directed by the Owner.
   b. Forward bitting list and keys separately from cylinders, by means as directed by Owner. Failure to comply with forwarding requirements will be cause for replacement of cylinders/cores involved at no additional cost to Owner.
   c. Provide keys with the following features:
      1) Material: Nickel silver; minimum thickness of .107-inch (2.3mm)
      2) Patent Protection: Keys and blanks protected by one or more utility patent(s).
   d. Identification:
      1) Mark permanent cylinders/cores and keys with applicable blind code for identification. Do not provide blind code marks with actual key cuts.
      2) Identification stamping provisions must be approved by the Architect and Owner.
      3) Stamp cylinders/cores and keys with Owner's unique key system facility code as established by the manufacturer; key symbol and embossed or stamped with "DO NOT DUPLICATE" along with the "PATENTED" or patent number to enforce the patent protection.
      4) Failure to comply with stamping requirements will be cause for replacement of keys involved at no additional cost to Owner.
      5) Forward permanent cylinders/cores to Owner, separately from keys, by means as directed by Owner.
   e. Quantity: Furnish in the following quantities.
      1) Permanent Control Keys: 3.
      2) Master Keys: 6.
      3) Change (Day) Keys: 3 per cylinder/core that is keyed differently
      4) Key Blanks: Quantity as determined in the keying meeting.

2.13 DOOR CLOSERS

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product:
   a. LCN 4010/4110/4020 series

2. Acceptable Manufacturers and Products:
   a. Corbin-Russwin DC8000 series
   b. Sargent 281 series

B. Requirements:

1. Provide door closers conforming to ANSI/BHMA A156.4 Grade 1 requirements by BHMA certified independent testing laboratory. Certify surface mounted mechanical closers to meet fifteen million (15,000,000) full load cycles. ISO 9000 certify closers. Stamp units with date of manufacture code.
2. Provide door closers with fully hydraulic, full rack and pinion action with high strength cast iron cylinder, and full complement bearings at shaft.
3. Cylinder Body: 1-1/2-inch (38 mm) diameter with 11/16-inch (17 mm) diameter double heat-treated pinion journal.
4. Hydraulic Fluid: Fireproof, passing requirements of UL10C, and requiring no seasonal closer adjustment for temperatures ranging from 120 degrees F to -30 degrees F.
5. Spring Power: Continuously adjustable over full range of closer sizes, and providing reduced opening force as required by accessibility codes and standards.
6. Hydraulic Regulation: By tamper-proof, non-critical valves, with separate adjustment for latch speed, general speed, and backcheck.
7. Provide closers with solid forged steel main arms and factory assembled heavy-duty forged forearms for parallel arm closers. When closers are parallel arm mounted, provide closers which mount within 6-inch (152 mm) top rail without use of mounting plate so that closer is not visible through vision panel from pull side.
8. Pressure Relief Valve (PRV) Technology: Not permitted.
9. Finish for Closer Cylinders, Arms, Adapter Plates, and Metal Covers: Powder coating finish which has been certified to exceed 100 hours salt spray testing as described in ANSI/BHMA Standard A156.4 and ASTM B117, or has special rust inhibitor (SRI).
10. Provide special templates, drop plates, mounting brackets, or adapters for arms as required for details, overhead stops, and other door hardware items interfering with closer mounting.

2.14 ELECTRO-HYDRAULIC AUTOMATIC OPERATORS

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product:
   a. LCN 4600 series

2. Acceptable Manufacturers and Products:
   a. Norton 6000 series
   b. Besam Power Swing

B. Requirements:

1. Provide low energy automatic operator units with hydraulic closer complying with ANSI/BHMA A156.19.
2. Provide automatic operator units complying with 2022 California Building Code Section 11B-404.2.9, Exception 2.

3. Hydraulic Fluid: Fireproof, passing requirements of UL10C, and requiring no seasonal closer adjustment for temperatures ranging from 120 degrees F to -30 degrees F.
4. Provide units with conventional door closer opening and closing forces unless power operator motor is activated. Provide door closer assembly with adjustable spring size, back-check, and opening and closing speed adjustment valves to control door
5. Provide units with on/off switch for manual operation, motor start up delay, vestibule interface delay, electric lock delay, and door hold open delay.
6. Provide drop plates, brackets, and adapters for arms as required for details.
7. Provide actuator switches and receivers for operation as specified.
8. Provide weather-resistant actuators at exterior applications.
9. Provide key switches with LED's, recommended and approved by manufacturer of automatic operator as required for function described in operation description of hardware group below. Cylinders: Refer to "KEYING" article, herein.
10. Provide complete assemblies of controls, switches, power supplies, relays, and parts/material recommended and approved by manufacturer of automatic operator for each individual leaf. Actuators control both doors simultaneously at pairs. Sequence operation of exterior and vestibule doors with automatic operators to allow ingress or egress through both sets of openings as directed by Architect. Locate actuators, key switches, and other controls as directed by Architect.
11. Provide units with vestibule inputs that allow sequencing operation of two units, and SPDT relay for interfacing with latching or locking devices.

2.15 DOOR TRIM

A. Manufacturers:

1. Scheduled Manufacturer:
   a. Ives

2. Acceptable Manufacturers:
   a. Trimco
   b. Rockwood

B. Requirements:

1. Provide push plates, push bars, pull plates, pulls, and hands-free reversible door pulls with diameter and length as scheduled.

2.16 PROTECTION PLATES

A. Manufacturers:

1. Scheduled Manufacturer:
   a. Ives

2. Acceptable Manufacturers:
   a. Trimco
   b. Rockwood

B. Requirements:

1. Provide protection plates with a minimum of 0.050 inch (1 mm) thick, beveled four edges as scheduled. Furnish with sheet metal or wood screws, finished to match plates.

2. Sizes plates 2 inches (51 mm) less width of door on single doors, pairs of doors with a mullion, and doors with edge guards. Size plates 1 inch (25 mm) less width of door on pairs without a mullion or edge guards.
3. At fire rated doors, provide protection plates over 16 inches high with UL label.

2.17 OVERHEAD STOPS AND OVERHEAD STOP/HOLDERS

A. Manufacturers:

1. Scheduled Manufacturers:
   a. Glynn-Johnson

2. Acceptable Manufacturers:
   a. Rixson
   b. ABH

B. Requirements:

1. Provide overhead stop at any door where conditions do not allow for a wall stop or floor stop presents tripping hazard.

2.18 DOOR STOPS AND HOLDERS

A. Manufacturers:

1. Scheduled Manufacturer:
   a. Ives

2. Acceptable Manufacturers:
   a. Trimco
   b. Rockwood

B. Provide door stops at each door leaf:

1. Provide wall stops wherever possible. Provide concave type where lockset has a push button of thumbturn.
2. Where a wall stop cannot be used, provide universal floor stops.
3. Where wall or floor stop cannot be used, provide overhead stop.
4. Provide roller bumper where doors open into each other and overhead stop cannot be used.

2.19 THRESHOLDS, SEALS, DOOR SWEEPS, AUTOMATIC DOOR BOTTOMS, AND GASKETING

A. Manufacturers:

1. Scheduled Manufacturer:
   a. Zero International

2. Acceptable Manufacturers:
   a. National Guard
   b. Legacy

B. Requirements:

1. Provide thresholds, weather-stripping, and gasketing systems as specified and per architectural details. Match finish of other items.
2. Smoke- and Draft-Control Door Assemblies: Where smoke- and draft-control door assemblies are required, provide door hardware that meets requirements of assemblies tested according to UL 1784 and installed in compliance with NFPA 105.
3. Provide door sweeps, seals, astragals, and auto door bottoms only of type where resilient or flexible seal strip is easily replaceable and readily available.
4. Size thresholds 1/2 inch (13 mm) high by 5 inches (127 mm) wide by door width unless otherwise specified in the hardware sets or detailed in the drawings.

2.20 SILENCERS

A. Manufacturers:

1. Scheduled Manufacturer:
   a. Ives

2. Acceptable Manufacturers:
   a. Rockwood
   b. Trimco

B. Requirements:

1. Provide "push-in" type silencers for hollow metal or wood frames.
2. Provide one silencer per 30 inches (762 mm) of height on each single frame, and two for each pair frame.
3. Omit where gasketing is specified.

2.21 DOOR POSITION SWITCHES

A. Manufacturers:

1. Scheduled Manufacturer:
   a. Schlage

2. Acceptable Manufacturers:
   a. GE-Interlogix
   b. Sargent

B. Requirements:

1. Provide recessed or surface mounted type door position switches as specified.
2. Coordinate door and frame preparations with door and frame suppliers. If switches are being used with magnetic locking device, provide minimum of 4 inches (102 mm) between switch and magnetic locking device.

2.22 DOOR VIEWERS

A. Manufacturers:

1. Scheduled Manufacturer:

a. Ives

2. Acceptable Manufacturers:
   a. Auth Chimes
   b. Burns
   c. Rockwood

B. Provide appropriate door viewer for door type and rating with minimum of 180-degree view area.

2.23 FINISHES

A. FINISH: BHMA 626/652 (US26D); EXCEPT:

1. Hinges at Exterior Doors: BHMA 630 (US32D)
2. Aluminum Geared Continuous Hinges: BHMA 628 (US28)
3. Push Plates, Pulls, and Push Bars: BHMA 630 (US32D)
4. Protection Plates: BHMA 630 (US32D)
5. Overhead Stops and Holders: BHMA 630 (US32D)
6. Door Closers: Powder Coat to Match
7. Wall Stops: BHMA 630 (US32D)
8. Latch Protectors: BHMA 630 (US32D)
9. Weatherstripping: Clear Anodized Aluminum
10. Thresholds: Mill Finish Aluminum

B. FINISH: BHMA 643E/716 (US11); EXCEPT:

1. Door Closers: Powder Coat to Match.
2. Weatherstripping: Dark Bronze Anodized Aluminum.
3. Thresholds: Extruded Architectural Bronze, Oil-Rubbed

C. FINISH: BHMA 622/631 (US19); EXCEPT:

1. Door Closers: Powder Coat to Match
2. Weatherstripping: Black
3. Thresholds: Mill Finish Black

PART 3 - EXECUTION

3.01 EXAMINATION

A. Prior to installation of hardware, examine doors and frames, with Installer present, for compliance with requirements for installation tolerances, labeled fire-rated door assembly construction, wall and floor construction, and other conditions affecting performance. Verify doors, frames, and walls have been properly reinforced for hardware installation.

B. Examine roughing-in for electrical power systems to verify actual locations of wiring connections before electrified door hardware installation.

C. Submit a list of deficiencies in writing and proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. Mount door hardware units at heights to comply with the following, unless otherwise indicated or required to comply with governing regulations.

1. Standard Steel Doors and Frames: ANSI/SDI A250.8.
2. Custom Steel Doors and Frames: HMMA 831.
3. Interior Architectural Wood Flush Doors: ANSI/WDMA I.S. 1A
4. Installation Guide for Doors and Hardware: DHI TDH-007-20

B. Install door hardware in accordance with NFPA 80, NFPA 101 and provide post-install inspection, testing as specified in section 1.03.E unless otherwise required to comply with governing regulations.

C. Install each hardware item in compliance with manufacturer's instructions and recommendations, using only fasteners provided by manufacturer.

D. Do not install surface mounted items until finishes have been completed on substrate. Protect all installed hardware during painting.

E. Set units level, plumb and true to line and location. Adjust and reinforce attachment substrate as necessary for proper installation and operation.

F. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors according to industry standards.

G. Install operating parts so they move freely and smoothly without binding, sticking, or excessive clearance.

H. Hinges: Install types and in quantities indicated in door hardware schedule but not fewer than quantity recommended by manufacturer for application indicated.

I. Lock Cylinders:

1. Install construction cores to secure building and areas during construction period.
2. Replace construction cores with permanent cores as indicated in keying section.
3. Furnish permanent cores to Owner for installation.

J. Wiring: Coordinate with Division 26, ELECTRICAL and Division 28 ELECTRONIC SAFETY AND SECURITY sections for:

1. Conduit, junction boxes and wire pulls.
2. Connections to and from power supplies to electrified hardware.
3. Connections to fire/smoke alarm system and smoke evacuation system.
4. Connection of wire to door position switches and wire runs to central room or area, as directed by Architect.
5. Connections to panel interface modules, controllers, and gateways.
6. Testing and labeling wires with Architect's opening number.

K. Key Control System: Tag keys and place them on markers and hooks in key control system cabinet, as determined by final keying schedule.

L. Door Closers & Auto Operators: Mount closers/operators on room side of corridor doors, inside of exterior doors, and stair side of stairway doors from corridors. Mount closers/operators so they are not visible in corridors, lobbies and other public spaces unless approved by Architect.

M. Overhead Stops/Holders: Mount overhead stops/holders on room side of corridor doors, inside of exterior doors, and stair side of stairway doors.

N. Power Supplies: Locate power supplies as indicated or, if not indicated, above accessible ceilings or in equipment room, or alternate location as directed by Architect.

O. Thresholds: Set thresholds in full bed of sealant complying with requirements specified in Division 07 Section "Joint Sealants."

P. Stops: Provide floor stops for doors unless wall or other type stops are indicated in door hardware schedule. Do not mount floor stops where they may impede traffic or present tripping hazard.

Q. Perimeter Gasketing: Apply to head and jamb, forming seal between door and frame.

R. Meeting Stile Gasketing: Fasten to meeting stiles, forming seal when doors are closed.

S. Door Bottoms and Sweeps: Apply to bottom of door, forming seal with threshold when door is closed.

3.03 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.

   1. Door Closers: Adjust sweep period to comply with accessibility requirements and requirements of authorities having jurisdiction.

B. Occupancy Adjustment: Approximately three to six months after date of Substantial Completion, examine and readjust each item of door hardware, including adjusting operating forces, as necessary to ensure function of doors and door hardware.

3.04 CLEANING AND PROTECTION

A. Clean adjacent surfaces soiled by door hardware installation.

B. Clean operating items per manufacturer's instructions to restore proper function and finish.

C. Provide final protection and maintain conditions that ensure door hardware is without damage or deterioration at time of Substantial Completion.

3.05 DOOR HARDWARE SCHEDULE

A. The intent of the hardware specification is to specify the hardware for interior and exterior doors, and to establish a type, continuity, and standard of quality. However, it is the door hardware supplier's responsibility to thoroughly review existing conditions, schedules, specifications, drawings, and other Contract Documents to verify the suitability of the hardware specified.

B. Discrepancies, conflicting hardware, and missing items are to 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.

C. Hardware items are referenced in the following hardware schedule. Refer to the above specifications for special features, options, cylinders/keying, and other requirements.

D. Hardware Sets:

HARDWARE GROUP NO. 01

HARDWARE GROUP NO. 01

For use on Door #(s):
A100 B117 D105 E100.2

Provide each PR door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
1	EA	CONT. HINGE	112XY		313AN	IVE
1	EA	CONT. HINGE	112XY EPT		313AN	IVE
1	EA	POWER TRANSFER	EPT10		695	VON
1	EA	PANIC HARDWARE	LD-98-EO		643E	VON
1	EA	ELEC PANIC HARDWARE	QEL-98-NL-OP		643E	VON
1	EA	MORTISE CYLINDER/PERMANENT CORE	MATCH OWNER'S EXISTING SYSTEM		643e	
1	EA	RIM CYLINDER/PERMANENT CORE	MATCH OWNER'S EXISTING SYSTEM		643e	
2	EA	FLUSH PULL	BY DOOR/FRAME MANF.			B/O
2	EA	OH STOP	100S		643E/716	GLY
2	EA	SURFACE CLOSER	4021		695	LCN
2	EA	TJ MOUNTING PLATE	4020-18G (AS REQ'D)		695	LCN
1	EA	MULLION SEAL	8780NBK PSA		BK	ZER
1	EA	THRESHOLD	655D-223		D	ZER
1	EA	CARD READER	BY OTHERS		BLK	SCE
2	EA	DOOR CONTACT	679-05HM (AS REQ'D)		BLK	SCE
1	EA	POWER SUPPLY	PS902 900-2RS		LGR	SCE

KEYED REMOVABLE MULLION BY DOOR/FRAME MANUFACTURER

PERIMETER SEALS & SWEEP BY DOOR/FRAME MANUFACTURER

DOOR NORMALLY CLOSED AND LOCKED. PRESENTING VALID CREDENTIAL TO READER MOMENTARILY RETRACTS PANIC DEVICE LATCH ALLOWING ENTRY. FREE EGRESS AT ALL TIMES.

HARDWARE GROUP NO. 02

For use on Door #(s):
B127 C111 C119

Provide each PR door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER			FINISH	MFR
1	EA	CONT. HINGE	112XY			313AN	IVE
1	EA	CONT. HINGE	112XY EPT			313AN	IVE
1	EA	POWER TRANSFER	EPT10		✓	695	VON
1	EA	PANIC HARDWARE	LD-98-EO			643E	VON
1	EA	ELEC PANIC HARDWARE	QEL-98-NL-OP		✓	643E	VON
1	EA	MORTISE CYLINDER/PERMANENT CORE	MATCH OWNER'S EXISTING SYSTEM			643e	
1	EA	RIM CYLINDER/PERMANENT CORE	MATCH OWNER'S EXISTING SYSTEM			643e	
2	EA	FLUSH PULL	BY DOOR/FRAME MANF.				B/O
2	EA	OH STOP	100S			643E/716	GLY
2	EA	SURFACE CLOSER	4021			695	LCN
2	EA	TJ MOUNTING PLATE	4020-18G (AS REQ'D)			695	LCN
2	EA	WALL STOP	WS443/447			643E/716	IVE
1	EA	MULLION SEAL	8780NBK PSA			BK	ZER
1	EA	THRESHOLD	655D-223			D	ZER
1	EA	CARD READER	BY OTHERS		✓	BLK	SCE
2	EA	DOOR CONTACT	679-05HM (AS REQ'D)		✓	BLK	SCE
1	EA	POWER SUPPLY	PS902 900-2RS		✓	LGR	SCE

KEYED REMOVABLE MULLION BY DOOR/FRAME MANUFACTURER

PERIMETER SEALS & SWEEP BY DOOR/FRAME MANUFACTURER

DOOR NORMALLY CLOSED AND LOCKED. PRESENTING VALID CREDENTIAL TO READER MOMENTARILY RETRACTS PANIC DEVICE LATCH ALLOWING ENTRY. FREE EGRESS AT ALL TIMES.

HARDWARE GROUP NO. 03

For use on Door #(s):

A105	B115	B116	B124	E101.2	E102.2
E103.2	E104.2				

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
1	EA	CONT. HINGE	112XY		313AN	IVE
1	EA	PANIC HARDWARE	LD-98-EO		643E	VON
1	EA	OH STOP	100S		643E/716	GLY
1	EA	SURFACE CLOSER	4021		695	LCN
1	EA	TJ MOUNTING PLATE	4020-18G (AS REQ'D)		695	LCN
1	EA	THRESHOLD	655D-223		D	ZER

PERIMETER SEALS & SWEEP BY DOOR/FRAME MANUFACTURER

HARDWARE GROUP NO. 04

For use on Door #(s):

C120.2

Provide each PR door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
2	EA	CONT. HINGE	112XY		313AN	IVE
2	EA	PANIC HARDWARE	SD-98-EO		643E	VON
3	EA	MORTISE CYLINDER/PERMANENT CORE	MATCH OWNER'S EXISTING SYSTEM		643e	
2	EA	FLUSH PULL	BY DOOR/FRAME MANF.			B/O
2	EA	OH STOP	100S		643E/716	GLY
2	EA	SURFACE CLOSER	4021		695	LCN
1	EA	TJ MOUNTING PLATE	4020-18G (AS REQ'D)		695	LCN
1	EA	MULLION SEAL	8780NBK PSA		BK	ZER
1	EA	THRESHOLD	655D-223		D	ZER
2	EA	DOOR CONTACT	679-05HM (AS REQ'D)		BLK	SCE

KEYED REMOVABLE MULLION BY DOOR/FRAME MANUFACTURER

PERIMETER SEALS & SWEEP BY DOOR/FRAME MANUFACTURER

HARDWARE GROUP NO. 05

For use on Door #(s):
C141

Provide each PR door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
2	EA	CONT. HINGE	112XY		313AN	IVE
2	EA	PANIC HARDWARE	CD-OUT-98-EO-WH		711	VON
3	EA	MORTISE CYLINDER/PERMANENT CORE	MATCH OWNER'S EXISTING SYSTEM		643e	
2	EA	FLUSH PULL	BY DOOR/FRAME MANF.			B/O
2	EA	OH STOP	100S		643E/716	GLY
2	EA	SURFACE CLOSER	4011 ST-1544		689	LCN
2	EA	MOUNTING PLATE	4020-18 (AS REQ'D)		689	LCN
1	EA	MULLION SEAL	8780NBK PSA		BK	ZER
1	EA	THRESHOLD	655D-223		D	ZER
2	EA	DOOR CONTACT	679-05HM (AS REQ'D)		BLK	SCE

KEYED REMOVABLE MULLION BY DOOR/FRAME MANUFACTURER

PERIMETER SEALS & SWEEP BY DOOR/FRAME MANUFACTURER

HARDWARE GROUP NO. 06

For use on Door #(s):
C120.1

Provide each PR door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
1	EA	CONT. HINGE	112XY		313AN	IVE
1	EA	CONT. HINGE	112XY EPT		313AN	IVE
1	EA	POWER TRANSFER	EPT10		695	VON
1	EA	PANIC HARDWARE	SD-98-EO		643E	VON
1	EA	ELEC PANIC HARDWARE	SD-RX-QEL-98-NL-OP		643E	VON
3	EA	MORTISE CYLINDER/PERMANENT CORE	MATCH OWNER'S EXISTING SYSTEM		643e	
1	EA	RIM CYLINDER/PERMANENT CORE	MATCH OWNER'S EXISTING SYSTEM		643e	
2	EA	FLUSH PULL	BY DOOR/FRAME MANF.			B/O
2	EA	OH STOP	100S		643E/716	GLY
1	EA	SURFACE CLOSER	4021		695	LCN
1	EA	SURF. AUTO OPERATOR	4640		695	LCN
1	EA	TJ MOUNTING PLATE	4020-18G (AS REQ'D)		695	LCN
1	EA	WEATHER RING	8310-802		PLA	LCN
2	EA	ACTUATOR, TOUCH	8310-852T		630	LCN
2	EA	MOUNT BOX	8310-869F			LCN
1	EA	MULLION SEAL	8780NBK PSA		BK	ZER
1	EA	THRESHOLD	655D-223		D	ZER
1	EA	CARD READER	BY OTHERS		BLK	SCE
2	EA	DOOR CONTACT	679-05HM (AS REQ'D)		BLK	SCE
1	EA	POWER SUPPLY	PS902 900-4RL		LGR	SCE

KEYED REMOVABLE MULLION BY DOOR/FRAME MANUFACTURER

PERIMETER SEALS & SWEEP BY DOOR/FRAME MANUFACTURER

DOOR NORMALLY CLOSED AND LOCKED. EXTERIOR ACTUATOR DISABLED. PRESENTING VALID CREDENTIAL TO READER MOMENTARILY RETRACTS PANIC DEVICE LATCH AND ENABLES EXTERIOR ACTUATOR. PRESSING EXTERIOR ACTUATOR WHEN ENABLED SIGNALS AUTOMATIC OPERATOR TO OPEN DOOR. INTERIOR ACTUATOR ENABLED AT ALL TIMES. PRESSING INTERIOR ACTUATOR RETRACTS PANIC DEVICE LATCH AND SIGNALS AUTOMATIC OPERATOR TO OPEN DOOR. FREE EGRESS AT ALL TIMES.

HARDWARE GROUP NO. 07

For use on Door #(s):
C117

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
1	EA	CONT. HINGE	112XY EPT		313AN	IVE
1	EA	POWER TRANSFER	EPT10		695	VON
1	EA	EU MORTISE LOCK	L9092LEU 06A		643e	SCH
1	EA	MORTISE CYLINDER/PERMANENT CORE	MATCH OWNER'S EXISTING SYSTEM		643e	
1	EA	OH STOP	100S		643E/716	GLY
1	EA	SURFACE CLOSER	4021		695	LCN
1	EA	TJ MOUNTING PLATE	4020-18G (AS REQ'D)		695	LCN
1	EA	THRESHOLD	655D-223		D	ZER
1	EA	VIEWER	U698		B643E/716	IVE
1	EA	CARD READER	BY OTHERS		BLK	SCE
1	EA	POWER SUPPLY	PS902 900-2RS		LGR	SCE

PERIMETER SEALS & SWEEP BY DOOR/FRAME MANUFACTURER

DOOR NORMALLY CLOSED AND LOCKED. PRESENTING VALID CREDENTIAL TO READER MOMENTARILY UNLOCKS OUTSIDE LEVER ALLOWING ENTRY. FREE EGRESS AT ALL TIMES.

HARDWARE GROUP NO. 08

For use on Door #(s):
B123.1

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER			FINISH	MFR
1	EA	CONT. HINGE	112XY			313AN	IVE
1	EA	PANIC HARDWARE	LD-98-NL-OP-110MD			643E	VON
1	EA	RIM CYLINDER/PERMANENT CORE	MATCH OWNER'S EXISTING SYSTEM			643e	
1	EA	FLUSH PULL	BY DOOR/FRAME MANF.				B/O
1	EA	OH STOP	100S			643E/716	GLY
1	EA	SURFACE CLOSER	4021			695	LCN
1	EA	TJ MOUNTING PLATE	4020-18G (AS REQ'D)			695	LCN
1	EA	THRESHOLD	655D-223			D	ZER
1	EA	DOOR CONTACT	679-05HM (AS REQ'D)		✓	BLK	SCE

PERIMETER SEALS & SWEEP BY DOOR/FRAME MANUFACTURER

HARDWARE GROUP NO. 09

For use on Door #(s):
A108 B111

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER			FINISH	MFR
1	EA	CONT. HINGE	112XY			313AN	IVE
1	EA	STOREROOM LOCK	L9080L 06A			643e	SCH
1	EA	MORTISE CYLINDER/PERMANENT CORE	MATCH OWNER'S EXISTING SYSTEM			643e	
1	EA	OH STOP	100S			643E/716	GLY
1	EA	SURFACE CLOSER	4021			695	LCN
1	EA	TJ MOUNTING PLATE	4020-18G (AS REQ'D)			695	LCN
1	EA	THRESHOLD	655D-223			D	ZER

PERIMETER SEALS & SWEEP BY DOOR/FRAME MANUFACTURER

HARDWARE GROUP NO. 10

For use on Door #(s):
E101.1 E102.1 E103.1 E104.1

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1HW 4.5 X 4.5 NRP		652	IVE
1	EA	OFFICE W/SIM RETRACT W/ INSIDE INDICATOR	L9056L 06A 09-544 IS-LOC XL13-439		626	SCH
1	EA	MORTISE CYLINDER/PERMANENT CORE	MATCH OWNER'S EXISTING SYSTEM		626	
1	EA	SURFACE CLOSER	4111 EDA		689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
1	EA	WALL STOP	WS33/WS33X		626	IVE
1	EA	GASKETING	488SBK PSA		BK	ZER

HARDWARE GROUP NO. 11

For use on Door #(s):
E101.3

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1HW 4.5 X 4.5		652	IVE
1	EA	STOREROOM LOCK	L9080L 06A		626	SCH
1	EA	MORTISE CYLINDER/PERMANENT CORE	MATCH OWNER'S EXISTING SYSTEM		626	
1	EA	OH STOP	100S		630	GLY
1	EA	SURFACE CLOSER	4011 ST-1544		689	LCN
1	EA	MOUNTING PLATE	4020-18 (AS REQ'D)		689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
1	EA	GASKETING	488SBK PSA		BK	ZER

HARDWARE GROUP NO. 12

For use on Door #(s):
B110 E100.1

Provide each PR door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
2	EA	CONT. HINGE	224XY		628	IVE
2	EA	FIRE EXIT HARDWARE	9849-EO-F-LBLAFL		626	VON
2	EA	SURFACE CLOSER	4111 EDA		689	LCN
2	EA	KICK PLATE	8400 10" X 1" LDW B-CS		630	IVE
2	EA	FIRE/LIFE WALL MAGNET	SEM7800 SERIES		689	LCN
1	EA	GASKETING	488SBK PSA		BK	ZER
2	EA	MEETING STILE SEAL	8194AA		AA	ZER
1	SET	FIRE ALARM CONTACTS	PROVIDED BY FIRE ALARM CONTRACTOR			B/O

END OF SECTION

SECTION 088000
GLAZING

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Double-Glazed Solar Control Insulating Glass Units.

1.2 RELATED SECTIONS

A. Section 081416 – FLUSH WOOD DOORS

B. Section 084113 – ALUMINUM FRAMED ENTRANCES AND STOREFRONTS

1.3 REFERENCES

A. ANSI Z 97.1 - Glazing Materials Used in Buildings, Safety Performance Specifications and Methods of Test.

B. ASTM C 1036 - Standard Specification for Flat Glass.

C. ASTM C 1048 - Standard Specification for Heat-Treated Flat Glass--Kind HS, Kind FT Coated and Uncoated Glass.

D. ASTM C 1376 - Standard Specification for Pyrolytic and Vacuum Deposition Coatings on Glass.

E. ASTM E 773 - Standard Test Method for Accelerated Weathering of Sealed Insulating Glass Units.

F. ASTM E 774 - Standard Specification for the Classification of the Durability of Sealed Insulating Glass Units

G. ASTM E 2188 – Standard Test Method for Insulating Glass Unit Performance.

H. ASTM E 2190 - Standard Specification for Insulating Glass Unit Performance and Evaluation.

I. CPSC 16CFR-1201 - Safety Standard for Architectural Glazing Materials.

J. Glass Association of North America (GANA) Glazing Manual.

1.4 DEFINITIONS

A. Sealed Insulating Glass Unit Surfaces:
   1. Surface No. 1: Exterior surface of outer lite.
   2. Surface No. 2: Interior surface of outer lite.

3. Surface No. 3: Exterior surface of inner lite.
4. Surface No. 4: Interior surface of inner lite.

B. Airspace: Space between lites of an insulating glass unit that contains dehydrated air or other inert specified gas.

1.5 SUBMITTALS

A. Comply with Section 013300 - Submittal Procedures.

B. Product Data: Submit manufacturer's product data, including performance characteristics and installation instructions.

C. Shop Drawings: Submit manufacturer's or fabricator's shop drawings, including plans, elevations, sections, and details, indicating glass dimensions, tolerances, types, thicknesses, and coatings.

D. Samples: Submit manufacturer's samples of each type, thickness, and coating.

E. Fabricator's Certification: Submit fabricator's certification by manufacturer.

F. Cleaning Instructions: Submit manufacturer's cleaning instructions.

G. Warranty: Submit manufacturer's standard warranty for sealed insulating glass units.

1.6 QUALITY ASSURANCE

A. Manufacturer's Qualifications: Minimum of 5 years experience manufacturing solar control coated glass.

B. Fabricator's Qualifications:
1. Minimum of 5 years experience manufacturing sealed insulating glass units meeting ASTM E 2190, Class CBA.
2. Certified by manufacturer.

C. Mock-Ups:
1. Comply with Section 014500 - Quality Control.
2. Obtain acceptance of mock-ups by Architect before proceeding with work.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Delivery:
1. Deliver glass to site in accordance with manufacturer's instructions.
2. Deliver glass in manufacturer's or fabricator's original containers and packaging, with labels clearly identifying product name and manufacturer.

B. Storage:
1. Store glass in accordance with manufacturer's instructions.
2. Store glass in clean, dry area indoors.
3. Protect from exposure to direct sunlight and freezing temperatures.

4. Apply temporary coverings loosely to allow adequate ventilation.
5. Protect from contact with corrosive chemicals.
6. Avoid placement of glass edge on concrete, metal, and other hard objects.
7. Rest glass on clean, cushioned pads at 1/4-points.

C. Handling:
1. Handle glass in accordance with manufacturer's instructions.
2. Protect glass from damage during handling and installation.
3. Do not slide 1 lite of glass against another.
4. Do not use sharp objects near unprotected glass.

PART 2 - PRODUCTS

2.1 MANUFACTURER

A. The basis for this specification is for products manufactured by Guardian Glass. Other manufacturers may bid this project provided they comply with all of the performance requirements of this specification and submit evidence thereof. Listing other manufacturers' names in this specification does not constitute approval of their products or relieve them of compliance with all the performance requirements contained herein

B. Basis of Design: Guardian Glass, 2300 Harmon Road, Auburn Hills, Michigan 48326.

2.2 FABRICATORS

A. Sealed Insulating Glass Units, Heat-Strengthened Glass, Tempered Glass, and Spandrel Glass:
1. Acceptable Fabricators: Certified by Guardian Industries Corp. to fabricate SunGuard Solar Control Coated Glass products.

2.3 MATERIALS

GL- 1 A. Double-Glazed Sputter-Coated Insulating Glass Units:
1. Conformance: ASTM E 2190, Class CBA.
2. Outboard Lite: Sputter-coated clear float glass.
   a. Annealed Clear Float Glass: ASTM C 1036, Type 1, Class 1, Quality q3.
   b. Vacuum Deposition Sputtered Coating: ASTM C 1376.
   c. Coating on Surface No. 2: SunGuard SuperNeutral 68 (SN 68).
   d. Glass Thickness: 6 mm (1/4 inch).
   e. Heat Treatment: Tempered as required.
3. Air Space: 12 mm (1/2 inch) wide, hermetically sealed, dehydrated air space.
4. Inboard Lite: Clear float glass.
   a. Annealed Clear Float Glass: ASTM C 1036, Type 1, Class 1, Quality q3.
   b. Glass Thickness: 6 mm (1/4 inch).
   c. Heat-Treatment: Tempered as required.
5. Glass Unit Performance Characteristics:
   a. Visible Light Transmittance: 68 percent
   b. Visible Light Reflectance Outdoors: 11 percent
   c. Direct Solar Energy Transmittance: 33 percent

d. Direct Solar Energy Reflectance Outdoors: 33 percent
e. Winter U-Value Nighttime: 0.29
f. Summer U-Value Daytime: 0.28
g. Solar Heat Gain Coefficient: 0.38
h. Summer Relative Heat Gain: 90

6. Edge Seals: ASTM E 773, with aluminum spacers and silicone sealant for glass-to-spacer seals.
7. Sealant: Approved by glass manufacturer.

GL- 2 A. Double-Glazed Sputter-Coated Insulating Glass Units:

1. Conformance: ASTM E 2190, Class CBA.
2. Outboard Lite: Sputter-coated clear float glass.
   a. Annealed Clear Float Glass: ASTM C 1036, Type 1, Class 1, Quality q3.
   b. Vacuum Deposition Sputtered Coating: ASTM C 1376.
   c. Coating on Surface No. 2: SunGuard SuperNeutral 68 (SN 68).
   d. Glass Thickness: 6 mm (1/4 inch).
   e. Heat Treatment: NA
3. Air Space: 12 mm (1/2 inch) wide, hermetically sealed, dehydrated air space.
4. Inboard Lite: Clear float glass.
   a. Annealed Clear Float Glass: ASTM C 1036, Type 1, Class 1, Quality q3.
   b. Glass Thickness: 6 mm (1/4 inch).
   c. Heat-Treatment: NA
5. Glass Unit Performance Characteristics:
   a. Visible Light Transmittance: 68 percent
   b. Visible Light Reflectance Outdoors: 11 percent
   c. Direct Solar Energy Transmittance: 33 percent
   d. Direct Solar Energy Reflectance Outdoors: 33 percent
   e. Winter U-Value Nighttime: 0.29
   f. Summer U-Value Daytime: 0.28
   g. Solar Heat Gain Coefficient: 0.38
   h. Summer Relative Heat Gain: 90
6. Edge Seals: ASTM E 773, with aluminum spacers and silicone sealant for glass-to-spacer seals.
7. Sealant: Approved by glass manufacturer.

GL-3 NON-INSULATED SAFETY GLAZING

Uncoated Clear Fully Tempered Float Glass: Interior applications, provide Type I (transparent glass, flat), Class 1 (clear) glass lites.

EXECUTION

3.1 EXAMINATION

A. Examine areas to receive glass. Notify Architect of conditions that would adversely affect installation. Do not proceed with installation until unsatisfactory conditions are corrected.

3.2 PREPARATION

A. Verify glazing openings are correct size and within tolerance.

B. Verify glazing channels, recesses, and weeps are clean and free of obstructions.

3.3 GLAZING

A. Install glass in accordance with manufacturer's instructions, except where local codes or GANA Glazing Manual indicate more stringent requirements.

3.4 FIELD QUALITY CONTROL

A. Coated glass, when viewed from minimum of 10 feet, exhibiting slightly different hue or color not apparent in hand samples, will not be cause of rejection of glass units, as determined by Architect.

B. Verify glass is free of chips, cracks, and other inclusions that could inhibit structural or aesthetic integrity.

3.5 CLEANING

A. Clean glass promptly after installation in accordance with manufacturer's instructions.

B. Remove labels from glass surface.

C. Do not use harsh cleaning materials or methods that would damage glass.

3.6 PROTECTION

A. Protect installed glass from damage during construction.

B. Protect installed glass from contact with contaminating substances resulting from construction operations.

C. Remove and replace glass that is broken, chipped, cracked, abraded, or damaged in other ways during construction period, including natural causes, accidents, and vandalism.

END OF SECTION 088000

SECTION 092216
NON-STRUCTURAL METAL FRAMING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Non-load-bearing steel framing systems for interior partitions.
2. Suspension systems for interior ceilings and soffits.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Test-Response Characteristics: For fire-resistance-rated assemblies that incorporate non-load-bearing steel framing, provide materials and construction identical to those tested in assembly indicated, according to ASTM E 119 by an independent testing agency.

B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated on Drawings, according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.

2.2 FRAMING SYSTEMS

A. Framing Members, General: Comply with ASTM C 754 for conditions indicated.

1. Steel Sheet Components: Comply with ASTM C 645 requirements for steel unless otherwise indicated.
2. Protective Coating: ASTM A 653/A 653M, G40 ASTM A 653/A 653M, G60 Coating with equivalent corrosion resistance of ASTM A 653/A 653M, G40 , hot-dip galvanized unless otherwise indicated.

B. Studs and Tracks: ASTM C 645. Use either conventional steel studs and tracks or embossed, high-strength steel studs and tracks.

1. Minimum Base-Steel Thickness: As required by performance requirements for horizontal deflection .

2. Depth: As indicated on Drawings .

C. Slip-Type Head Joints: Where indicated, provide the following:

1. Deflection Track: Steel sheet top track manufactured to prevent cracking of finishes applied to interior partition framing resulting from deflection of structure above; in thickness not less than indicated for studs and in width to accommodate depth of studs.

D. Hat-Shaped, Rigid Furring Channels: ASTM C 645.

1. Minimum Base-Steel Thickness: As indicated on Drawings .
2. Depth: As indicated on Drawings 1-1/2 inches .

2.3 SUSPENSION SYSTEMS

A. 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.

B. Wire Hangers: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.16 inch in diameter.

C. Carrying Channels (Main Runners): Cold-rolled, commercial-steel sheet with a base-steel thickness of 0.0538 inch and minimum 1/2-inch- wide flanges.

1. Depth: 2 inches .

D. Furring Channels (Furring Members):

1. Steel Studs and Tracks: ASTM C 645. Use either conventional steel studs and tracks or embossed, high-strength steel studs and tracks.
   a. Minimum Base-Steel Thickness: As indicated on Drawings .
   b. Depth: As indicated on Drawings .
2. Hat-Shaped, Rigid Furring Channels: ASTM C 645, 7/8 inch deep.
   a. Minimum Base-Steel Thickness: As indicated on Drawings .
3. Resilient Furring Channels: 1/2-inch- deep members designed to reduce sound transmission.
   a. Configuration: hat shaped.

2.4 AUXILIARY MATERIALS

A. General: Provide auxiliary materials that comply with referenced installation standards.

1. Fasteners for Steel Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.

B. Isolation Strip at Exterior Walls: Provide one of the following:

1. Asphalt-Saturated Organic Felt: ASTM D 226/D 226M, 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.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Installation Standard: ASTM C 754.

1. Gypsum Plaster Assemblies: Also comply with requirements in ASTM C 841 that apply to framing installation.
2. Portland Cement Plaster Assemblies: Also comply with requirements in ASTM C 1063 that apply to framing installation.
3. Gypsum Veneer Plaster Assemblies: Also comply with requirements in ASTM C 844 that apply to framing installation.
4. Gypsum Board Assemblies: Also comply with requirements in ASTM C 840 that apply to framing installation.

B. Install framing and accessories plumb, square, and true to line, with connections securely fastened.

C. Install supplementary framing, and blocking to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction.

D. Install bracing at terminations in assemblies.

E. Do not bridge building control and expansion joints with non-load-bearing steel framing members. Frame both sides of joints independently.

3.2 INSTALLING FRAMED ASSEMBLIES

A. Install framing system components according to spacings indicated, but not greater than spacings required by referenced installation standards for assembly types.

B. Where studs are installed directly against exterior masonry walls or dissimilar metals at exterior walls, install isolation strip between studs and exterior wall.

C. Install studs so flanges within framing system point in same direction.

D. Install tracks at floors and overhead supports. Extend framing full height to structural supports or substrates above suspended ceilings except where partitions are indicated to terminate at suspended ceilings. Continue framing around ducts that penetrate partitions above ceiling.

1. Slip-Type Head Joints: Where framing extends to overhead structural supports, install to produce joints at tops of framing systems that prevent axial loading of finished assemblies.

2. Door Openings: Screw vertical studs at jambs to jamb anchor clips on door frames; install track section (for cripple studs) at head and secure to jamb studs.
   a. Install two studs at each jamb unless otherwise indicated.
   b. 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.
   c. Extend jamb studs through suspended ceilings and attach to underside of overhead structure.
3. Other Framed Openings: Frame openings other than door openings the same as required for door openings unless otherwise indicated. Install framing below sills of openings to match framing required above door heads.

E. Direct Furring:

1. Attach to concrete or masonry with stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches o.c.

F. Installation Tolerance: Install each framing member so fastening surfaces vary not more than 1/8 inch from the plane formed by faces of adjacent framing.

3.3 INSTALLING CEILING SUSPENSION SYSTEMS

A. Install suspension system components according to spacings indicated, but not greater than spacings required by referenced installation standards for assembly types.

B. Isolate suspension systems from building structure where they abut or are penetrated by building structure to prevent transfer of loading imposed by structural movement.

C. 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.
   a. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced installation standards .
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. Flat Hangers: Secure to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices and fasteners that are secure and appropriate for structure and hanger, and in a manner that will not cause hangers to deteriorate or otherwise fail.
5. Do not attach hangers to steel roof deck.

6. Do not attach hangers to permanent metal forms. Furnish cast-in-place hanger inserts that extend through forms.
7. Do not attach hangers to rolled-in hanger tabs of composite steel floor deck.
8. Do not connect or suspend steel framing from ducts, pipes, or conduit.

D. Fire-Resistance-Rated Assemblies: Wire tie furring channels to supports.

E. 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.

END OF SECTION 092216

SECTION 092900
GYPSUM BOARD

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Interior gypsum board.

1.2 ACTION SUBMITTALS

A. Product Data:

1. Gypsum wallboard.
2. Gypsum board, Type X.
3. Gypsum ceiling board.
4. Impact-resistant gypsum board.
5. Mold-resistant gypsum board.
6. Joint treatment materials.
7. Acoustical sealant.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E119 by an independent testing agency.

2.2 GYPSUM BOARD, GENERAL

A. Size: Provide maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.

2.3 INTERIOR GYPSUM BOARD

A. Gypsum Wallboard: ASTM C1396/C1396M.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Certainteed; SAINT-GOBAIN.
   b. Georgia-Pacific Gypsum LLC.

c. National Gypsum Company.
d. USG Corporation.

2. Thickness: 5/8 inch.
3. Long Edges: Tapered .

B. Gypsum Board, Type X: ASTM C1396/C1396M.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. Certainteed; SAINT-GOBAIN.
   b. Georgia-Pacific Gypsum LLC.
   c. National Gypsum Company.
   d. USG Corporation.
2. Thickness: 5/8 inch.
3. Long Edges: Tapered .

C. Gypsum Ceiling Board: ASTM C1396/C1396M.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. Certainteed; SAINT-GOBAIN.
   b. Georgia-Pacific Gypsum LLC.
   c. National Gypsum Company.
   d. USG Corporation.
2. Thickness: 1/2 inch.
3. Long Edges: Tapered.

D. Impact-Resistant Gypsum Board: ASTM C1396/C1396M gypsum board, tested according to ASTM C1629/C1629M.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. Certainteed; SAINT-GOBAIN.
   b. Georgia-Pacific Gypsum LLC.
   c. National Gypsum Company.
   d. USG Corporation.
2. Core: 5/8 inch , Type X.
3. Surface Abrasion: ASTM C1629/C1629M, meets or exceeds Level 2 requirements.
4. Indentation: ASTM C1629/C1629M, meets or exceeds Level 1 requirements.
5. Soft-Body Impact: ASTM C1629/C1629M, meets or exceeds Level 3 requirements.
6. Hard-Body Impact: ASTM C1629/C1629M, meets or exceeds Level 3 requirements according to test in Annex A1.
7. Long Edges: Tapered.
8. Mold Resistance: ASTM D3273, score of 10 as rated according to ASTM D3274.

E. Mold-Resistant Gypsum Board: ASTM C1396/C1396M. With moisture- and mold-resistant core and paper surfaces.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Certainteed; SAINT-GOBAIN.
   b. Georgia-Pacific Gypsum LLC.
   c. National Gypsum Company.
   d. USG Corporation.
2. Core: 5/8 inch , Type X.
3. Long Edges: Tapered.
4. Mold Resistance: ASTM D3273, score of 10 as rated according to ASTM D3274.

2.4 JOINT TREATMENT MATERIALS

A. General: Comply with ASTM C475/C475M.

B. Joint Tape:

1. Interior Gypsum Board: Paper.

C. Joint Compound for Interior Gypsum Board: For each coat, use formulation that is compatible with other compounds applied on previous or for successive coats.

1. Prefilling: At open joints , rounded or beveled panel edges, and damaged surface areas, use setting-type taping compound.
2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use setting-type taping drying-type, all-purpose compound.
3. Fill Coat: For second coat, use setting-type, sandable topping drying-type, all-purpose compound.
4. Finish Coat: For third coat, use setting-type, sandable topping drying-type, all-purpose compound.
5. Skim Coat: For final coat of Level 5 finish, use setting-type, sandable topping compound drying-type, all-purpose compound .

2.5 AUXILIARY MATERIALS

A. Provide auxiliary materials that comply with referenced installation standards and manufacturer's written instructions.

B. Steel Drill Screws: ASTM C1002 unless otherwise indicated.

1. Use screws complying with ASTM C954 for fastening panels to steel members from 0.033 to 0.112 inch thick.
2. For fastening cementitious backer units, use screws of type and size recommended by panel manufacturer.

C. Acoustical Sealant: As specified in Section 079219 "Acoustical Joint Sealants."

PART 3 - EXECUTION

3.1 INSTALLATION AND FINISHING OF PANELS

A. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.

B. Comply with ASTM C840.

C. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments. Provide 1/4- to 1/2-inch- wide spaces at these locations and trim edges with edge trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.

D. For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.

E. Prefill open joints , rounded or beveled edges, and damaged surface areas.

F. Apply joint tape over gypsum board joints, except for trim products specifically indicated as not intended to receive tape.

G. Gypsum Board Finish Levels: Finish panels to levels indicated below and according to ASTM C840:

1. Level 5: .
    a. Primer and its application to surfaces are specified in Section 099123 "Interior Painting."

3.2 PROTECTION

A. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.

B. Remove and replace panels that are wet, moisture damaged, and mold damaged.

END OF SECTION 092900

SECTION 093013
CERAMIC TILING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Glazed wall tile.
2. Crack isolation membranes.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Samples:

1. Each type and composition of tile and for each color and finish required. Provide 3 tile samples per color specified to show product color variation.
2. Assembled samples mounted on a rigid panel, with grouted joints, for each type and composition of tile and for each color and finish required.

1.3 INFORMATIONAL SUBMITTALS

1.4 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match and are from same production runs as products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Tile and Trim Units: Furnish quantity of full-size units equal to 3 percent of amount installed for each type, composition, color, pattern, and size indicated.

1.5 QUALITY ASSURANCE

A. Installer Qualifications:

1. Installer employs at least one installer for Project that has completed the Advanced Certification for Tile Installers (ACT) certification for installation of mud walls,membranes, andshower receptors .

B. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Build mockup of wall tile installation.
2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

PART 2 - PRODUCTS

2.1 PRODUCTS, GENERAL

A. ANSI Ceramic Tile Standard: Provide Standard-grade tile that complies with ANSI A137.1 for types, compositions, and other characteristics indicated.

B. 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.

2.2 TILE PRODUCTS – Refer to Drawings for Tile Selections

2.3 CRACK ISOLATION MEMBRANES

A. General: Manufacturer's standard product that complies with ANSI A118.12 for standard performance and is recommended by the manufacturer for the application indicated. Include reinforcement and accessories recommended by manufacturer.

B. Crack Isolation Membrane, Polyethylene Sheet: Polyethylene faced on both sides with fleece webbing; 0.008-inch nominal thickness.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. Schluter Systems L.P.

2.4 GROUT MATERIALS

A. Water-Cleanable Epoxy Grout: ANSI A118.3.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. Custom Building Products.
   b. Laticrete International, Inc.
   c. MAPEI Corporation.

2.5 MISCELLANEOUS MATERIALS

A. Trowelable Underlayments and Patching Compounds: Latex-modified, portland cement-based formulation provided or approved by manufacturer of tile-setting materials for installations indicated.

B. Metal Edge Strips: Cove or L-shape, height to match tile and setting-bed thickness, metal, designed specifically for flooring applications;

1. Manufacturers: Subject to compliance with requirements, provide products by the following:
   a. Schluter Systems L.P.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions where tile will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

1. Verify that substrates for setting tile are firm; dry; clean; free of coatings that are incompatible with tile-setting materials, including curing compounds and other substances that contain soap, wax, oil, or silicone; and comply with flatness tolerances required by ANSI A108.01 for installations indicated.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Blending: For tile exhibiting color variations, verify that tile has been factory blended and packaged so tile units taken from one package show same range of colors as those taken from other packages and match approved Samples. If not factory blended, either return to manufacturer or blend tiles at Project site before installing.

3.3 INSTALLATION

A. Comply with TCNA's "Handbook for Ceramic, Glass, and Stone Tile Installation" for TCNA installation methods specified in tile installation schedules. Comply with parts of the ANSI A108 series "Specifications for Installation of Ceramic Tile" that are referenced in TCNA installation methods, specified in tile installation schedules, and apply to types of setting and grouting materials used.

B. Extend tile work into recesses and under or behind equipment and fixtures to form complete covering without interruptions unless otherwise indicated. Terminate work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.

C. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish, or built-in items for straight aligned joints. Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so plates, collars, or covers overlap tile.

D. Provide trim by Schluter Systems, LP where necessary to eliminate exposed tile edges.

E. Jointing Pattern: Lay tile in grid pattern unless otherwise indicated. Lay out tile work and center tile fields in both directions in each space or on each wall area. Lay out tile work to minimize the use of pieces that are less than half of a tile. Provide uniform joint widths unless otherwise indicated.

F. Joint Widths: Unless otherwise indicated, install tile with the following joint widths: 1/8 inch.

G. Lay out tile wainscots to dimensions indicated or to next full tile beyond dimensions indicated.

H. Expansion Joints: Provide expansion joints and other sealant-filled joints, including control, contraction, and isolation joints, where indicated. Form joints during installation of setting materials, mortar beds, and tile. Do not saw-cut joints after installing tiles.

1. Where joints occur in concrete substrates, locate joints in tile surfaces directly above them.

I. Metal Edge Strips: Install at locations indicated .

J. Install tile backing panels and treat joints according to ANSI A108.11 and manufacturer's written instructions for type of application indicated. Use modified dry-set mortar for bonding material unless otherwise directed in manufacturer's written instructions.

K. Install waterproof membrane to comply with ANSI A108.13 and manufacturer's written instructions to produce waterproof membrane of uniform thickness that is bonded securely to substrate.

L. Install crack isolation membrane to comply with ANSI A108.17 and manufacturer's written instructions to produce membrane of uniform thickness that is bonded securely to substrate.

END OF SECTION 093013

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes

1. Acoustical ceiling panels
2. Exposed grid suspension system
3. Wire hangers, fasteners, main runners, cross tees, and wall angle moldings
4. Perimeter Trim

1.2 REFERENCES

A. American Society for Testing and Materials (ASTM):

1. ASTM A 1008 Standard Specification for Steel, Sheet, Cold Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability
2. ASTM A 641 Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire
3. ASTM A 653 Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process
4. ASTM C 635 Standard Specification for Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings
5. ASTM C 636 Recommended Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels
6. ASTM D 3273 Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber
7. ASTM E 84 Standard Test Method for Surface Burning Characteristics of Building Materials
8. ASTM E 119 Standard Test Methods for Fire Tests of Building Construction and Material

B. ASHRAE Standard 62.1-2004, Ventilation for Acceptable Indoor Air Quality

C. NFPA 70 National Electrical Code

D. ASCE 7 American Society of Civil Engineers, Minimum Design Loads for Buildings and Other Structures

1.3 SUBMITTALS

A. Product Data: Submit manufacturer's technical data for each type of acoustical ceiling unit and suspension system required.

B. Samples: Minimum 6 inch x 6 inch samples of specified acoustical panel; 8 inch long samples of exposed wall molding and suspension system, including main runner and 4 foot cross tees.

C. Shop Drawings: Layout and details of acoustical ceilings show locations of items that are to be coordinated with, or supported by the ceilings.

1.4 QUALITY ASSURANCE

A. Single-Source Responsibility: Provide acoustical panel units and grid components by a single manufacturer.

1. Fire Performance Characteristics: Identify acoustical ceiling components with appropriate markings of applicable testing and inspecting organization.
2. Surface Burning Characteristics: As follows, tested per ASTM E 84 and complying with ASTM E 1264 Classification.
3. Fire Resistance: As follows tested per ASTM E119 and listed in the appropriate floor or roof design in the Underwriters Laboratories Fire Resistance Directory

B. Acoustical Panels: As with other architectural features located at the ceiling, may obstruct or skew the planned fire sprinkler water distribution pattern through possibly delay or accelerate the activation of the sprinkler or fire detection systems by channeling heat from a fire either toward or away from the device. Designers and installers are advised to consult a fire protection engineer, NFPA 13, or their local codes for guidance where automatic fire detection and suppression systems are present.

C. Coordination of Work: Coordinate acoustical ceiling work with installers of related work including, but not limited to building insulation, gypsum board, light fixtures, mechanical systems, electrical systems, and sprinklers.

1.5 DELIVERY, STORAGE AND HANDLING

A. Deliver acoustical ceiling units to project site in original, unopened packages and store them in a fully enclosed space where they will be protected against damage from moisture, direct sunlight, surface contamination, and other causes.

B. Before installing acoustical ceiling units, permit them to reach room temperature and a stabilized moisture content.

C. Handle acoustical ceiling units carefully to avoid chipping edges or damaged units in any way.

1.6 PROJECT CONDITIONS

A. Space Enclosure:

1. Standard Ceilings: Do not install interior ceilings until space is enclosed and weatherproof; wet work in place is completed and nominally dry; work above ceilings is complete; and ambient conditions of temperature and humidity are continuously maintained at values near those intended for final occupancy. Building areas to receive ceilings shall be free of construction dust and debris.
2. HumiGuard Plus Ceilings: Building areas to receive ceilings shall be free of construction dust and debris. Products with HumiGuard Plus performance and hot dipped galvanized steel, aluminum or stainless steel suspension systems can be installed up to 120°F (49°C) and in spaces before the building is enclosed, where HVAC systems are cycled or not operating. Cannot be used in exterior applications where standing water is present or where moisture will come in direct contact with the ceiling.

1.7 WARRANTY

A. Acoustical Panel: Submit a written warranty executed by the manufacturer, agreeing to repair or replace panels that fail within the warranty period. Failures include, but are not limited to the following:

1. Acoustical Panels: Sagging and warping
2. Grid System: Rusting and manufacturer's defects

B. Warranty Period:

1. Acoustical panels: Ten (10) years from date of substantial completion
2. Suspension: Ten (10) years from date of substantial completion
3. Ceiling System: Thirty (30) years from date of substantial completion

C. The Warranty shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and will be in addition to and run concurrent with other warranties made by the Contractor under the requirements of the Contract Documents.

1.8 MAINTENANCE

A. Extra Materials: Deliver extra materials to Owner. Furnish extra materials described below that match products installed. Packaged with protective covering for storage and identified with appropriate labels.

1. Acoustical Ceiling Units: Furnish quality of full-size units equal to 5.0 percent of amount installed.
2. Exposed Suspension System Components: Furnish quantity of each exposed suspension component equal to 2.0 percent of amount installed.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Ceiling Panels:

1. USG.
2. Armstrong World Industries, Inc.
3. CertainTeed Corporation

B. Suspension Systems:

1. Armstrong World Industries, Inc.
2. Chicago Metallic
3. USG.

C. Perimeter Systems

1. Armstrong World Industries, Inc.
2. USG.
3. Chicago Metallic

2.2 ACOUSTICAL CEILING UNITS

A. ACT1: Acoustical Ceiling Tile

1. Armstrong Dune, basis of design.
2. Surface Texture: Fine
3. Color: White
4. Size: 24 in x 24 in
5. Edge Profile: Square Lay-In 15/16

6. Noise Reduction Coefficient (NRC): ASTM C 423; Classified with UL label on product carton 0.50
7. Ceiling Attenuation Class (CAC): ASTM C 1414; Classified with UL label on product carton 35
8. Flame Spread: ASTM E 1264; Class A (UL)

B. ACT2: Cleanable USDA Approved Tile
1. Basis of Design: Armstrong Kitchen Zone
2. Color: White
3. Panel Size: 24”x24”
4. Thickness: 5/8”
5. Edge: Square Lay-In 15/16
6. Acoustics: 33 CAC

2.3 METAL SUSPENSION SYSTEMS

A. Components:

1. Main beams and cross tees, base metal and end detail, fabricated from commercial quality hot dipped galvanized steel complying with ASTM A 653. Main beams and cross tees are double-web steel construction with type exposed flange design. Exposed surfaces chemically cleansed, capping prefinished galvanized steel in baked polyester paint. Main beams and cross tees shall have rotary stitching.

a. Structural Classification: ASTM C 635 Heavy Duty duty
b. Color: Blizzard White and match the actual color of the selected ceiling tile, unless noted otherwise.
c. Sustainability: Environmetal Product Declaration (EPD), Health Product Declaration (HPD)
d. Acceptable Product: PRELUDE XL 15/16" Exposed Tee as manufactured by Armstrong World Industries

B. Attachment Devices: Size for five times design load indicated in ASTM C 635, Table 1, Direct Hung unless otherwise indicated.

C. Wire for Hangers and Ties: ASTM A 641, Class 1 zinc coating, soft annealed, with a yield stress load of at least time three design load, but not less than 12 gauge.

D. Edge Moldings and Trim:

E. Accessories:

1. 15/16" Flush Act. to Drywall Transition Molding

PART 3 - EXECUTION

3.1 EXAMINATION

A. Do not proceed with installation until all wet work such as concrete, terrazzo, plastering and painting has been completed and thoroughly dried out, unless expressly permitted by manufacturer's printed recommendations. (Exception: HumiGuard Max Ceilings)

3.2 PREPARATION

A. Measure each ceiling area and establish layout of acoustical units to balance border widths at opposite edges of each ceiling. Avoid use of less than half width units at borders, and comply with reflected ceiling plans. Coordinate panel layout with mechanical and electrical fixtures.

B. Coordination: Furnish layouts for preset inserts, clips, and other ceiling anchors whose installation is specified in other sections.

1. Furnish concrete inserts and similar devices to other trades for installation well in advance of time needed for coordination of other work.

3.3 INSTALLATION

A. Follow manufacturer installation instructions.

B. Install suspension system and panels in accordance with the manufacturer's instructions, and in compliance with ASTM C 636 and with the authorities having jurisdiction.

C. Suspend main beam from overhead construction with hanger wires spaced 4-0 on center along the length of the main runner. Install hanger wires plumb and straight.

D. Install wall moldings at intersection of suspended ceiling and vertical surfaces. Miter corners where wall moldings intersect or install corner caps.

E. For reveal edge panels: Cut and reveal or rabbet edges of ceiling panels at border areas and vertical surfaces.

F. Install acoustical panels in coordination with suspended system, with edges resting on flanges of main runner and cross tees. Cut and fit panels neatly against abutting surfaces. Support edges by wall moldings.

3.4 ADJUSTING AND CLEANING

A. Replace damaged and broken panels.

B. Clean exposed surfaces of acoustical ceilings, including trim, edge moldings, and suspension members. Comply with manufacturer's instructions for cleaning and touch up of minor finish damage. Remove any ceiling products that cannot be successfully cleaned and or repaired. Replace with attic stock or new product to eliminate evidence of damage.

END OF SECTION 095100

SECTION 095154
SPRAY-ON ACOUSTICAL FINISH (SAF)

GENERAL

1.1 SUMMARY

A. Section Includes: Spray-on acoustical finish to be provided at underside of areas indicated in the drawings.

1.2 REFERENCES

A. ASTM C423 Test method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method.

B. ASTM C1338 Standard Test Method for Determining Fungi Resistance of Insulation Materials and Facings

C. ASTM D2244 Standard Practice for Calculation of Color Tolerances and Color Differences from Instrumentally Measured Color Coordinates

D. ASTM E84 Surface Burning Characteristics

E. ASTM E 736 B Standard Test Method for Cohesion/Adhesion of Sprayed Fire-Resistive Materials Applied to Structural Members

F. ASTM E795 Practices for Mounting Test Specimens During Sound Absorption Tests.

G. ASTM E1042 Standard Classification for Acoustically Absorptive Materials Applied by Trowel or Spray.

1.3 SUBMITTALS

A. Samples: Make 2 samples, each 12 inches square at locations directed by Architect.

B. Submit copy of Manufacturer’s ISO 9001 Certification.

C. Submit 2 copies of test reports indicating compliance with the following:

1. Minimum light reflectivity.

2. Sound absorption coefficient by octave band and NRC values per ASTM C-423 conducted by a NVLAP certified testing laboratory.

3. Flame Spread Index.

4. Smoke Development.

5. Bond Strength.

6. Compression Strength.

D. Submit Manufacturer's written certification that product contains no asbestos, fiberglass or other man-made mineral fibers.

1.4 QUALITY ASSURANCE

A. The installation company must be licensed by the Manufacturer.

B. Control Sample: Prior to installation of final coat, apply final coat to a 50 sq. ft. area in presence of Architect or Owner for approval of finish texture selected.

1.5 DELIVERY, STORAGE AND HANDLING

A. Delivery and Storage: Deliver manufactured materials in original, unopened packages bearing Manufacturer's name and brand. Store materials in dry areas, off ground and covered.

B. Protect liquid adhesive from freezing.

C. Water to be potable.

1.6 PROJECT CONDITIONS

A. Provide ventilation to properly dry material during and subsequent to application. In glazed areas keep windows open sufficiently to provide air circulation; in enclosed areas lacking normal ventilation, mechanically remove moisture laden air.

B. Do not apply spray-on acoustical finish below 44 degrees F. (ambient) temperature, or substrate is below 40 degree F.

1.7 PERFORMANCE REQUIREMENTS

A. Acoustic performance of spray-on acoustical product: Meet or exceed the following sound absorption performance when tested per ASTM C423 with Type A mounting on a solid backing per ASTM E795 in a NVLAP certified testing laboratory.

	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	NRC
1.5" thickness	0.15	0.51	0.95	1.06	0.99	0.98	0.90

B. Per ASTM E84: Smoke Development of 5 and Flame Spread of 10.

PART 2 - PRODUCTS

2.1 PRODUCTS AND MANUFACTURERS

A. Acceptable products and manufacturers

1. K-13 by International Cellulose Corporation

2.2 MATERIALS

A. Spray-on acoustical finish, coarse texture

1. 75% minimum recycled natural fiber cellulose base, binder, and fire, mold, and mildew resistant chemical treatment.

2. Spray-on acoustical finish, coarse texture – 1.5” thickness.

3. Standard Color: See Drawings

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine surfaces to receive spray-on acoustical finish before starting Work. Do not start until surfaces are acceptable per the Manufacturer’s installation instructions. Determine if priming/sealing is required to ensure bonding and/or to prevent discoloration caused by migratory stains. Starting Work under this Section implies acceptance of surfaces. Unsatisfactory surface conditions must be corrected prior to start of Work.

3.2 PREPARATION

A. Provide protective coverings and mask areas not indicated to receive spray-on acoustical finish. Protect floors, sills, and ledges below application from overspray and fallout of spray.

B. Fill voids, cracks, and offsets. Remove projections.

C. Prepare substrate according to the Manufacturer’s written instructions.

D. Assure substrate is free of oil, grease, dirt, paint, or other matter that would impair bond.

E. Determine if building surface will require priming, mechanical support, or other means of bonding assistance prior to being sprayed per the Manufacturer.

3.3 APPLICATION

A. Prepare and prime/seal or apply bonding agent to surfaces indicated to receive spray-on acoustical finish in compliance with Manufacturer's instructions or as necessitated by existing site conditions.

B. Mix and apply spray-on acoustical finish to areas indicated using powered spray equipment approved by Manufacturer.

C. Install spray-on acoustical finish per the Manufacturer's instructions to uniform texture and thickness as indicated on drawings, free of starved spots or other evidence of thin application.

1. Spray-on acoustical finish at specified thickness in all locations as indicated in the Construction Documents.

2. Taper as necessary to accommodate existing recessed sprinkler heads.

D. Cure insulation with continuous natural or mechanical ventilation.

E. Remove and dispose of overspray and masking materials.

3.4 FIELD QUALITY CONTROL

A. Coordination: In Work under this Section, coordinate with other Trades whose Work connects with, is affected or concealed by spray-on acoustical finish.

1. Clips, hangers, supports, sleeves, and other attachments to spray bases are to be placed by other trades prior to the application of spray-on acoustical finish.

2. Ducts, piping, conduit or other suspended equipment shall not be positioned until after the application of spray-on acoustical finish.

3. Roof and ceiling penetrations to be installed prior to application.

B. Before proceeding, make certain required inspections have been made. Cut and patch as required to accommodate Work of other Trades.

C. Mock-up: Apply a 50 square foot representative sample to be reviewed by the Architect and/or Owner prior to proceeding.

3.5 CLEANING

A. Cleaning and patching: Remove overspray and fall out material immediately upon completion of the Work in each area. Clean surfaces to remove evidence of soiling. Repair or replace damaged work surfaces to acceptable conditions.

B. Where spray-on acoustical finish is damaged by Work of other Trades, patch damaged areas by over spraying to match original application, or as otherwise recommended by Manufacturer to remove any evidence of damage.

END OF SECTION

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Sto Textured Wall Finish System for Existing EIFS

Section 095400

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Materials and installation of textured wall finish system for existing exterior wall surfaces.

1.02 DESIGN REQUIREMENTS

A. Structural (wind and axial loads)

1. Design for maximum allowable deflection, normal to the plane of the wall, of L/240.
2. Design for wind load in conformance with code requirements.

B. Moisture Control

1. Prevent the accumulation of water into or behind the finish, either by condensation or leakage into the wall construction, in the design and detailing of the wall assembly.

E. Joints

1. Indicate location of joints and joint type on architectural drawings.
2. Provide appropriate sealant at joints and terminations of finish with adjoining construction or dissimilar materials.
3. Prevent application of finish over isolation, expansion, cold or control joints in construction.
4. Prevent application of finish along inside edges of joint. Apply to outside face of wall only.

F. Substrates

1. Provide surface plane tolerance not to exceed 1/4 inch in 10 feet (6 mm in 3m). Provide for repair of surface defects and leveling or resurfacing of surfaces that do not meet required tolerances.
2. Concrete—prevent the use of form oil, curing compounds or other bond breakers that inhibit bond to the surface or provide for their removal.
3. Concrete Masonry—provide open texture concrete masonry units with flush joints.
4. Brick—provide absorbent brick with flush joints.

5. Portland Cement Plaster/Stucco—provide installation in conformance with ASTM C 926 (except omit finish installation and follow this specification).

1.03 QUALITY ASSURANCE

A. Manufacturer requirements

1. Textured wall finish system manufacturer for a minimum of twenty-five (25) years.
1. Manufacturing facilities ISO 9001:2000 certified.
2. Single source manufacturer of surface repair/leveler materials, waterproofing and textured wall finish.

B. Contractor requirements

1. Licensed, insured and engaged in application of textured wall finishes for a minimum of three (3) years.
2. Knowledgeable in the proper use and handling of Sto materials, and possessing a certificate of completion of Sto on-line application test.
3. Employ skilled mechanics who are experienced and knowledgeable in textured wall finish application, and familiar with the requirements of the specified work.
4. Successful completion of minimum three (3) projects of similar size and complexity to the specified project.
5. Provide the proper equipment, manpower and supervision on the job site to install the finish system in compliance with Sto's published specifications and details and the project plans and specifications.

C. Provide field sample, minimum 4’x 4’ of textured wall finish system as reference standard.

D. Manufacturers Material Warranty.

E. Installation Warranty

1.04 DELIVERY, STORAGE AND HANDLING

A. Deliver all materials in their original sealed containers bearing manufacturer's name and identification of product.

B. Protect finishes (pail products) from freezing and temperatures in excess of 90°F (32° C). Store away from direct sunlight.

C. Protect portland cement based materials (bag products) from moisture and humidity. Store under cover off the ground in a dry location.

1.05 COORDINATION/SCHEDULING

(The work in this section requires close coordination with related sections and trades. Sequence work to provide protection of construction materials from weather deterioration.)

A. Provide minimum 28 day cure of concrete, concrete masonry units, brick and stucco before the installation of finish system. (Except where Sto Hot Prime is used the cure time before application of the primer may be reduced to 7 days).

B. For load bearing concrete masonry and stud wall assemblies, commence the finish system installation after completion of all floor, roof construction and other construction that imposes dead loads on the walls to prevent excessive deflection (and potential cracking) of the substrate.

C. Sequence interior work such as drywall installation prior to finish installation to prevent stud distortion (and potential cracking) of stucco substrates.

D. Provide site grading such that the finish terminates above grade or finished grade a minimum of 6 inches (152 mm) or as required by code.

E. Install copings and sealant immediately after installation of the finish and when finish is dry.

F. Attach penetrations through finish to structural support and provide watertight seal at penetrations.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Provide textured wall finish and leveling, resurfacing, and waterproofing materials from single source manufacturer.

1. Approved Manufacturer: Sto Corp.

2.03 FABRIC REINFORCEMENT

A. Sto Mesh—nominal 4.5 oz/yd^2 (153 g/m^2), symmetrical, interlaced open-weave glass fiber fabric made with minimum 20 percent by weight alkaline resistant coating for compatibility with Sto materials.

2.04 Base Coat

A. Sto Sto factory blended one-component polymer modified portland cement base coats: Sto BTS Xtra

B. Sto Pre-mixed, acrylic base coat: Sto RFP

2.06 JOB MIXED INGREDIENTS

A. Water—clean and potable

B. Portland cement—in compliance with ASTM C 150, Type I, Type II, or Type I-II.

2.08 FINISH

A. Refer to Section 074200 StoCreativ Brick Finish or paint as called out on construction documents.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install textured wall finish system in compliance with manufacturer's published instructions.

3.02 PROTECTION

A. Provide protection of installed materials from water infiltration into or behind them.

B. Provide protection of installed leveler from dust, dirt, precipitation, and freezing.

C. Provide protection of installed waterproofing, primer and finish from dust, dirt, precipitation, freezing and continuous high humidity until fully dry.

ATTENTION

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Sto Specification No. RC100
Guideline Specifications for Cleaning Wall Surfaces

Section No. 090170
Surface preparation for Sto reStore Level 1 or Level 2 projects

Note: Depending on the size of the area to be cleaned and the tenacity of dirt or other accumulation on the surface, the tools used for cleaning will vary. Guideline specifications below may apply to all or part of a cleaning project, depending on the nature of the surface contaminants. In all cases, Sto recommends testing cleaning solutions and techniques on inconspicuous small areas to evaluate the effectiveness of the materials and methods that are proposed for use and to verify that unintended damage or adverse effects are not produced. Where commercially available cleaning products are to be used, verify applicability of the product for its intended use with the cleaning product manufacturer. The materials and techniques described below may be used on painted or coated concrete, masonry, stucco or EIFS. All materials and techniques are not necessarily appropriate for all substrates.

Notes in italics, such as this one, are explanatory and intended to guide the design/construction professional and user in the proper selection and use of materials. This specification should be modified where necessary to accommodate individual project conditions.

Table of Contents

PART 1 GENERAL

1.1 Summary

A. Provide cleaning of existing wall surface in preparation for resurfacing and/or recoating.

1.2 Related Documents

ASTM D 4258	Standard Practice for Surface Cleaning of Concrete for Coating
SSPC-SP 13/NACE 6	Surface Preparation of Concrete
ICRI No. 03732	Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings, and Polymer Overlays
Sto Corp.	StoTherm® EIFS Reference Guide: Repair and Maintenance
Sto Corp.	1.01 Stucco Repair and Maintenance

1.3 Materials – Cleaning Solutions

A. General

1. Mix and use commercially available cleaning solutions in accordance with the cleaning product manufacturer's instructions.
2. Refer technical questions about specific commercial cleaning products to the cleaning product manufacturer.
3. Use and dispose of cleaning solutions and rinse water in accordance with applicable local regulations.
4. DO NOT USE solvent based cleaners (acetone, gasoline, ketones, mineral oils, or turpentine)

1.4 Mild Detergent Wash

A. Solution of 1 – 2 cups tri-sodium-phosphate (TSP) or TSP substitute per gallon of warm water

B. General Purpose Cleaner by Wind-lock Corp., www.wind-lock.com

C. Wash Down™ by Demand Products, www.demandproducts.com

D. EIFS Clean 'N Prep by PROSOCO, www.prosoco.com

E. Other commercial general cleaners as recommended by the cleaning material manufacturer for the surface to be cleaned.

1.5 Efflorescence Removal

A. Efflorescence and Scale Remover, by Demand Products

B. Sentry Efflorescence and Scale Remover, by Wind-lock Corp.

C. Other commercial efflorescence cleaners as recommended by the cleaning material manufacturer for the surface to be cleaned.

1.6 Algae and Mildew Removal

A. Solution of ½ to 1 quart household bleach to 1 gallon of water (may be added to TSP detergent solution for general cleaning)

B. Miracle Mildew Remover by Wind-lock Corp.

C. Other commercial algae and mildew cleaners as recommended by the cleaning material manufacturer for the surface to be cleaned.

NOTE: Bleach is not required if algae or mildew are not present, but existing algae or mildew will recur if bleach solution is not used)

PART 2 Execution

2.1 General

A. The techniques described in this section may be used on painted or coated concrete, stucco or EIFS surfaces. All techniques are not necessarily appropriate for all substrates.

B. Test method and material in an inconspicuous area to verify techniques and materials to be used.

C. Use the least aggressive means that produces effective results.

D. Use methods in compliance with applicable local regulations.

E. Protect adjacent construction, property and landscaping from overspray where cleaning solutions are used.

F. Follow applicable regulations for personal protective equipment when performing cleaning.

2.2 Application of Cleaning Solutions

A. Commercial cleaning products:

1. Select the appropriate cleaning solution and apply in accordance with the cleaning solution manufacturers recommendations.
2. Rinse thoroughly with clean water to remove all residue and surface contaminants.

B. Generic mild detergent wash:

1. Apply mild detergent solution to the wall area to be cleaned.
2. Rinse thoroughly with clean water to remove all residue and surface contaminants.

C. Generic algae and mildew removal:

1. Apply algae and mildew removal solution and allow to soak for minimum 15 minutes. (Reapplication may be necessary for severe growth).
2. Use hand-scrubbing technique to remove streaking or other localized growth.
3. Rinse thoroughly using clean water to remove all residue and surface contaminants.

2.3 Hand-Scrubbing

A. Use hand scrubbing technique for localized stubborn stains that are resistant to low pressure washing techniques or otherwise require special treatment.

B. Use soft to medium bristled brush

C. Avoid overly aggressive scrubbing which could damage the existing coatings.

NOTE: DO NOT USE stiff-bristled or wire brushes.

2.4 Pressure Washing (as means of cleaning existing coating)

A. Use cool or warm water. DO NOT USE steam or high temperature methods when existing coatings are to remain in-place

B. Use minimum 30 degree fan tip

C. Determine distance from wall and pressure required to provide satisfactory results without damage to existing coatings or substrates based on test area.

1. Use pressure in the range of 2500 psi to 3000 psi for coatings applied to solid substrates (concrete, masonry, and stucco), unless undesirable effects are produced. If damage to existing coating occurs, adjust pressure, distance of tip from wall, or fan tip angle to achieve satisfactory results.

NOTE: DO NOT USE high pressure on EIFS claddings. Limit pressure to 500 psi, maximum, when EIFS is the substrate.

2. Determine if architectural features are foam shapes to protect against accidental damage in cases where they are attached to solid substrates such as stucco, masonry or concrete. Limit pressure to 500 psi, maximum, for foam trim features.

2.5 Pressure Washing (as a means of removing existing coating layers)

A. Determine pressure, fan tip angle and tip distance from wall as required to remove loose coatings or excess coating applications on solid substrates.

B. Verify that the technique does not produce damage to the substrate and adjust as necessary.

C. Dispose of rinse-water and waste in accordance with appropriate local regulations.

NOTE: A chemical paint stripper may be an option to improve efficiency in combination with pressure washing when existing coatings are to be removed. Consult with the paint stripper manufacturer for proper use and disposal of rinse-water and waste.

END OF SECTION

ATTENTION

Sto products are intended for use by qualified professional contractors, not consumers, as a component of a larger construction assembly as specified by a qualified design professional, general contractor or builder. They should be installed in accordance with those specifications and Sto's instructions. Sto Corp. disclaims all, and assumes no, liability for on-site inspections, for its products applied improperly, or by unqualified persons or entities, or as part of an improperly designed or constructed building, for the nonperformance of adjacent building components or assemblies, or for other construction activities beyond Sto's control. Improper use of Sto products or use as part of an improperly designed or constructed larger assembly or building may result in serious damage to Sto products, and to the structure of the building or its components. **STO CORP. DISCLAIMS ALL WARRANTIES EXPRESS OR IMPLIED EXCEPT FOR EXPLICIT LIMITED WRITTEN WARRANTIES ISSUED TO AND ACCEPTED BY BUILDING OWNERS IN ACCORDANCE WITH STO'S WARRANTY PROGRAMS WHICH ARE SUBJECT TO CHANGE FROM TIME TO TIME.** For the fullest, most current information on proper application, clean-up, mixing and other specifications and warranties, cautions and disclaimers, please refer to the Sto Corp. website, www.stocorp.com.

SECTION 096513
RESILIENT BASE AND ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Rubber base.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Samples: For each exposed product and for each color and texture specified.

PART 2 - PRODUCTS

2.1 RUBBER BASE (RB1 & RB2)

A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product.

B. Height: As indicated on Drawings – RB1 (4 inch) | RB2 (6 inch).

C. Lengths: Coils in manufacturer's standard length .

D. Outside Corners: Preformed .

E. Inside Corners: Preformed .

F. Colors and Patterns: As indicated on Drawings.

2.2 RUBBER MOLDING ACCESSORY

A. Description: Rubber nosing for carpet nosing for resilient floor covering reducer strip for resilient floor covering transition strips .

B. Profile and Dimensions: As indicated .

C. Locations: Provide rubber molding accessories in areas indicated .

D. Colors and Patterns: As selected from manufacturer's standards.

2.3 INSTALLATION MATERIALS

A. Adhesives: Water-resistant type recommended by resilient-product manufacturer for resilient products and substrate conditions indicated.

B. Stair-Tread Nose Filler: Two-part epoxy compound recommended by resilient stair-tread manufacturer to fill nosing substrates that do not conform to tread contours.

PART 3 - EXECUTION

3.1 PREPARATION

A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of resilient products.

B. Concrete Substrates for Resilient Stair Accessories: Prepare horizontal surfaces according to ASTM F 710.

1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.
3. Alkalinity and Adhesion Testing: Perform tests recommended by manufacturer. Proceed with installation only after substrate alkalinity falls within range on pH scale recommended by manufacturer in writing, but not less than 5 or more than 10 pH.
4. Moisture Testing: Perform tests so that each test area does not exceed 200 sq. ft. , and perform no fewer than three tests in each installation area and with test areas evenly spaced in installation areas.
    a. Anhydrous Calcium Chloride Test: ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. in 24 hours.
    b. Relative Humidity Test: Using in-situ probes, ASTM F 2170. Proceed with installation only after substrates have a maximum 75 percent relative humidity level measurement.

C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.

D. Do not install resilient products until materials are the same temperature as space where they are to be installed.

E. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient products.

3.2 RESILIENT BASE INSTALLATION

A. Comply with manufacturer's written instructions for installing resilient base.

B. Apply resilient base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.

C. Install resilient base in lengths as long as practical without gaps at seams and with tops of adjacent pieces aligned.

D. Tightly adhere resilient base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.

E. Do not stretch resilient base during installation.

F. On masonry surfaces or other similar irregular substrates, fill voids along top edge of resilient base with manufacturer's recommended adhesive filler material.

G. Preformed Corners: Install preformed corners before installing straight pieces.

3.3 RESILIENT ACCESSORY INSTALLATION

A. Comply with manufacturer's written instructions for installing resilient accessories.

B. Resilient Stair Accessories:

1. Use stair-tread-nose filler to fill nosing substrates that do not conform to tread contours.
2. Tightly adhere to substrates throughout length of each piece.
3. For treads installed as separate, equal-length units, install to produce a flush joint between units.

C. Resilient Molding Accessories: Butt to adjacent materials and tightly adhere to substrates throughout length of each piece. Install reducer strips at edges of floor covering that would otherwise be exposed.

3.4 CLEANING AND PROTECTION

A. Comply with manufacturer's written instructions for cleaning and protecting resilient products.

B. Cover resilient products subject to wear and foot traffic until Substantial Completion.

END OF SECTION 096513

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SECTION 096519 - RESILIENT TILE FLOORING

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. Luxury Vinyl floor tile.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For each type of resilient floor tile.

1. Include floor tile layouts, edges, columns, doorways, enclosing partitions, built-in furniture, cabinets, and cutouts.
2. Show details of special patterns.

C. Samples for Verification: Full-size units of each color and pattern of floor tile required.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance Data: For each type of floor tile to include in maintenance manuals.

1.5 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials , from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Floor Tile: Furnish one box for every 50 boxes or fraction thereof, of each type, color, and pattern of floor tile installed.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are competent in techniques required by manufacturer for floor tile installation and seaming method indicated.

1. Engage an installer who employs workers for this Project who are trained or certified by floor tile manufacturer for installation techniques required.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Store floor tile and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F or more than 90 deg F. Store floor tiles on flat surfaces.

1.8 FIELD CONDITIONS

A. Maintain ambient temperatures within range recommended by manufacturer in spaces to receive floor tile during the following periods:

1. 48 hours before installation.
2. During installation.
3. 48 hours after installation.

B. After installation and until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, 95 deg F .

C. Close spaces to traffic during floor tile installation.

D. Close spaces to traffic for 48 hours after floor tile installation.

E. Install floor tile after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

2.2 LUXURY VINYL FLOOR TILE LVT1

A. Refer to finish schedule on drawings for Manufacturer and Color information.

2.3 INSTALLATION MATERIALS

A. Trowelable Leveling and Patching Compounds: Latex-modified, portland-cement-based or blended hydraulic-cement-based formulation provided or approved by floor tile manufacturer for applications indicated.

B. Adhesives: Water-resistant type recommended by floor tile and adhesive manufacturers to suit floor tile and substrate conditions indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of floor tile.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Prepare substrates according to floor tile manufacturer's written instructions to ensure adhesion of resilient products.

B. Concrete Substrates: Prepare according to ASTM F 710.

1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by floor tile manufacturer. Do not use solvents.
3. Alkalinity and Adhesion Testing: Perform tests recommended by floor tile manufacturer. Proceed with installation only after substrate alkalinity falls within range on pH scale recommended by manufacturer in writing.
4. Moisture Testing: Perform tests so that each test area does not exceed [**1000 sq. ft.**]1000SF<**insert area>**, and perform no fewer than three tests in each installation area and with test areas evenly spaced in installation areas.

C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.

D. Do not install floor tiles until materials are the same temperature as space where they are to be installed.

1. At least 48 hours in advance of installation, move resilient floor tile and installation materials into spaces where they will be installed.

E. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient floor tile.

3.3 FLOOR TILE INSTALLATION

A. Comply with manufacturer's written instructions for installing floor tile.

B. Lay out floor tiles from center marks established with principal walls, discounting minor offsets, so tiles at opposite edges of room are of equal width. Adjust as necessary to avoid using cut widths that equal less than one-half tile at perimeter.

1. Lay tiles square with room axis .

C. Match floor tiles for color and pattern by selecting tiles from cartons in the same sequence as manufactured and packaged, if so numbered. Discard broken, cracked, chipped, or deformed tiles.

D. Scribe, cut, and fit floor tiles to butt neatly and tightly to vertical surfaces and permanent fixtures including built-in furniture, cabinets, pipes, outlets, and door frames.

E. Extend floor tiles into toe spaces, door reveals, closets, and similar openings. Extend floor tiles to center of closed door location in door openings.

F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on floor tiles as marked on substrates. Use chalk or other nonpermanent marking device.

G. Install floor tiles on covers for telephone and electrical ducts, building expansion-joint covers, and similar items in installation areas. Maintain overall continuity of color and pattern between pieces of tile installed on covers and adjoining tiles. Tightly adhere tile edges to substrates that abut covers and to cover perimeters.

H. Adhere floor tiles to substrates using a full spread of adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.

3.4 CLEANING AND PROTECTION

A. Comply with manufacturer's written instructions for cleaning and protecting floor tile.

B. Perform the following operations immediately after completing floor tile installation:

1. Remove adhesive and other blemishes from surfaces.
2. Sweep and vacuum surfaces thoroughly.
3. Damp-mop surfaces to remove marks and soil.

C. Protect floor tile from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.

D. Cover floor tile until Substantial Completion.

END OF SECTION 096519

SECTION 096723
RESINOUS FLOORING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes:
   1. High-performance resinous flooring systems.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated.
B. Installer Certificates for Qualification: Signed by manufacturer stating that installers comply with specified requirements.
C. Material Certificates: For each resinous flooring component, from manufacturer.
D. Maintenance Data: For maintenance manuals.
E. Samples: Submit two 6” X 6” samples of each resinous flooring system applied to a rigid backing. Provide sample which is a true representation of proposed field applied finish. Provide sample color and texture for approval from Owner in writing or approved by General Contractor prior to installation.
F. Product Schedule: For resinous flooring.

1.3 QUALITY ASSURANCE

A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of flooring systems required for this Project.
   1. Engage an installer who is approved in writing by resinous flooring manufacturer as qualified to apply resinous flooring systems indicated.
   2. Installer Letter of Qualification: Installer to provide letter stating that they have been in business for at least 5 years and listing 5 projects in the last 2 years of similar scope. For each project provide: project name, location, date of installation, contact information, size of project, and manufacturer of materials with system information.
B. Source Limitations: Obtain primary resinous flooring materials, including primers, resins, hardening agents, grouting coats, and topcoats, from single source from single manufacturer. Provide secondary materials, including patching and fill material, joint sealant, and repair materials, of type and from source recommended by manufacturer of primary materials.
C. Pre-installation Conference: Conduct conference at Project site before work and mockups begin.
D. Mockups: Apply mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution. Do not cover up mockup area.
   1. Apply full-thickness mockups on 16 square foot floor area selected by Architect.
   2. Finish surfaces for verification of products, color, texture, and sheen.
   3. Simulate finished lighting conditions for Architect's review of mockups.
   4. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.
   5. Mockup shall demonstrate desired slip resistance for review and approval by Owner’s representative in writing.

1.4 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.
   1. Maintain containers in clean condition, free of foreign materials and residue.
   2. Remove rags and waste from storage areas daily.

1.5 PROJECT CONDITIONS

A. Environmental Limitations: Comply with resinous flooring manufacturer's written instructions for substrate temperature, ambient temperature, moisture, ventilation, and other conditions affecting resinous flooring application.

B. Lighting: Provide permanent lighting or, if permanent lighting is not in place, simulate permanent lighting conditions during resinous flooring application.
C. Close spaces to traffic during resinous flooring application and for not less than 24 hours after application unless manufacturer recommends a longer period.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by:
1. The Sherwin Williams Company, Cleveland, OH. swflooring@sherwin.com

B. Resuflor Deco Flake BC, with integral cove 20-30 mils nominal thickness.
1. Primer: Resuprime 3579 at 200-300 sq. ft. per gallon.
2. Body Coat: Resuflor 3746 at 200-300 sq. ft. per gallon.
3. Broadcast: Decorative Flakes 6750 or 6755 to excess at 100-200 lbs. per 1,000 sq. ft.
4. Grout Coat: Resuflor 3746 at 160-250 sq. ft. per gallon.
5. Seal Coat: Resutile 4686 at 250-400 sq. ft. per gallon.

C. Resuflor Deco Flake BC, with integral cove, 20-30 mils nominal thickness over existing tile
1. Tack Coat: Resuprime 5531 Pre-Primer / Tack Coat at 500-1,000 sq. ft. per gallon
2. Primer: Resuprime 3504 at 300 sq. ft. per gallon.
3. Body Coat: Resuflor 3746 at 200-300 sq. ft. per gallon.
4. Broadcast: Decorative Flakes 6750 or 6755 to excess at 100-200 lbs. per 1,000 sq. ft.
5. Grout Coat: Resuflor 3746 at 160-250 sq. ft. per gallon.
6. Seal Coat: Resutile 4686 at 250-400 sq. ft. per gallon.

2.2 MATERIALS

A. VOC Content of Resinous Flooring: Provide resinous flooring systems, for use inside the weatherproofing system, that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24)].
1. Resinous Flooring: 100 g/L.

2.3 HIGH-PERFORMANCE RESINOUS FLOORING

A. Resinous Flooring: Abrasion-, impact- and chemical-resistant, high-performance, resin-based, monolithic floor surfacing designed to produce a seamless floor.
B. System Characteristics:
1. Color and Pattern: As indicated from manufacturers listed above.
2. Slip Resistance: Provide slip resistant finish.
3. Integral Cove: 6”

PART 3 - EXECUTION

3.1 PREPARATION

A. Inspection: Prior to commencing Work, thoroughly examine all underlying and adjoining work, surfaces and conditions upon which Work is in any way dependent for perfect results. Report all conditions which affect Work. No "waiver of responsibility" for incomplete, inadequate or defective underlaying and adjoining work, surfaces and conditions will be considered, unless notice of such unsatisfactory conditions has been filed and agreed to in writing before Work begins. Commencement of Work constitutes acceptance of surfaces.

B. Surface Preparation: Remove all surface contamination, loose or weakly adherent particles, laitance, grease, oil, curing compounds, paint, dust and debris by blast track method or approved mechanical means (acid etch not allowed). If surface is questionable, try a test patch. Create a minimum surface profile for the system specified in accordance with the methods described in ICRI No. 03732 to achieve profile numbers as follows:

C.

1.	**Thin film, to 10 mils**	**CSP-1 to CSP-3**
2.	Thin and medium films, 10 to 40 mils	CSP-3 to CSP-5
3.	Self-leveling mortars, to 3/16”	CSP-4 to CSP-6
4.	Mortars and laminates, to 1/4” or more	CSP-5 to CSP-10

D. Verify that concrete substrates are dry and moisture-vapor emissions are within acceptable levels according to manufacturer's written instructions.
1. Moisture Testing: Perform tests indicated below.

a. Calcium Chloride Test: Perform anhydrous calcium chloride test per ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lbs. of water/1000 sq. ft. in 24 hours. Perform tests so that each test area does not exceed 1000 sq. ft. and perform 3 tests for the first 1000 sq. ft. and one additional test for every additional 1000 sq ft.
b. In-Situ Probe Test: Perform relative-humidity test using in-situ probes per ASTM F 2170. Proceed with installation only after substrates have a maximum 75 percent relative-humidity-level measurement.

3.2 ENVIRONMENTAL CONDITIONS

A. All applicators and all other personnel in the area of the RF installation shall take all required and necessary safety precautions. All manufacturers’ installation instructions shall be implicitly instructions shall be implicitly followed.
B. Repair damaged and deteriorated concrete according to resinous flooring manufacturer's written instructions.
C. Alkalinity and Adhesion Testing: Verify that concrete substrates have pH within acceptable range. Perform tests recommended by manufacturer. Proceed with application only after substrates pass testing.
D. Resinous Materials: Mix components and prepare materials according to resinous flooring manufacturer's written instructions.
E. Use patching and fill material to fill holes and depressions in substrates according to manufacturer's written instructions.
F. Treat control joints and other nonmoving substrate cracks to prevent cracks from reflecting through resinous flooring according to manufacturer's written instructions.

3.3 APPLICATIONS

A. Install resinous floor over properly prepared concrete surface in strict accordance with the manufacturer's directions.
1. Install the primer and/or base coats over thoroughly cleaned and prepared concrete.
2. Install topcoat over flooring after excess aggregate has been removed.
3. Maintain a slab temperature of 60°F to 80°F for 24 hours minimum before applying floor topping, or as instructed by manufacturer.
B. Apply components of resinous flooring system according to manufacturer's written instructions to produce a uniform, monolithic wearing surface of thickness indicated.
1. Coordinate application of components to provide optimum adhesion of 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, comply with resinous flooring manufacturer's written instructions.

C. Sealant: Saw cut resinous floor topping at expansion joints in concrete slab. Fill sawcuts with sealant prior to final seal coat application. Follow manufacturer's written recommendations.
D. Apply primer over prepared substrate at manufacturer's recommended spreading rate.
E. Slip Resistant Finish: Provide grit for slip resistance.
F. Apply topcoats in number indicated for flooring system and at spreading rates recommended in writing by manufacturer.

3.4 COMPLETED WORK

A. Cleaning: Upon completion of the Work, clean up and remove from the premises surplus materials, tools, appliances, empty cans, cartons and rubbish resulting from the Work. Clean off all spattering and drippings, and all resulting stains.
B. Protection: Protect Work in accordance with manufacturer's directions from damage and wear during the remainder of the construction period. Use protective methods and materials, including temporary covering, recommended in writing by resinous flooring manufacturer.
C. Contractor shall insure that coating is protected from any traffic until it is fully cured to the satisfaction of the coating manufacturer.

END OF SECTION 096723

SECTION 096816
SHEET CARPETING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Walk Off Carpet.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For carpet installation, showing the following:

1. Columns, doorways, enclosing walls or partitions, built-in cabinets, and locations where cutouts are required in carpet.
2. Carpet type, color, and dye lot.
3. Locations where dye lot changes occur.
4. Seam locations, types, and methods.
5. Type of subfloor.
6. Type of installation.
7. Pattern type, repeat size, location, direction, and starting point.
8. Pile direction.
9. Types, colors, and locations of insets and borders.
10. Types, colors, and locations of edge, transition, and other accessory strips.
11. Transition details to other flooring materials.
12. Type of carpet cushion.

C. Samples: For each exposed product and for each color and texture required.

1.3 CLOSEOUT SUBMITTALS

A. Maintenance data.

1.4 WARRANTY

A. Special Warranty for Carpet: Manufacturer agrees to repair or replace components of carpet installation that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Lifetime years from date of Substantial Completion.

B. Special Warranty for Carpet Cushion: Manufacturer agrees to repair or replace components of carpet cushion installation that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Lifetime years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 Refer to finish schedule on drawings for CPT1 and CPT2 Manufacturer, Color, and Pattern information.

2.2 INSTALLATION ACCESSORIES

A. Adhesives: Water-resistant, mildew-resistant, nonstaining type to suit products and subfloor conditions indicated, that complies with flammability requirements for installed carpet and is recommended or provided by carpet and carpet cushion manufacturers.

B. Seam Adhesive: Hot-melt adhesive tape or similar product recommended by carpet manufacturer for sealing and taping seams and butting cut edges at backing to form secure seams and to prevent pile loss at seams.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Concrete Slabs:

1. Moisture Testing: Perform tests so that each test area does not exceed 1000 sq. ft. , and perform no fewer than three tests in each installation area and with test areas evenly spaced in installation areas.
   a. Anhydrous Calcium Chloride Test: ASTM F1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. in 24 hours.
   b. Relative Humidity Test: Using in situ probes, ASTM F2170. Proceed with installation only after substrates have a maximum 75 percent relative humidity level measurement.
   c. Perform additional moisture tests recommended in writing by adhesive and carpet manufacturers. Proceed with installation only after substrates pass testing.

3.2 PREPARATION

A. General: Comply with the Carpet and Rug Institute's CRI 104 and with carpet manufacturer's written installation instructions for preparing substrates.

B. Use trowelable leveling and patching compounds, according to manufacturer's written instructions, to fill cracks, holes, depressions, and protrusions in substrates. Fill or level cracks,

holes and depressions 1/8 inch wide or wider, and protrusions more than 1/32 inch, unless more stringent requirements are required by manufacturer's written instructions.

C. Concrete Substrates: 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 adhesive and carpet manufacturers.

D. Broom and vacuum clean substrates to be covered immediately before installing carpet.

3.3 INSTALLATION

A. Comply with the Carpet and Rug Institute's CRI 104 and carpet manufacturer's written installation instructions for the following:

1. Direct-glue-down installation.

B. Comply with carpet manufacturer's written instructions and Shop Drawings for seam locations and direction of carpet; maintain uniformity of carpet direction and lay of pile. At doorways, center seams under the door in closed position.

C. Install pattern parallel to walls and borders .

D. Install borders with mitered corner seams.

E. Do not bridge building expansion joints with carpet.

F. Cut and fit carpet to butt tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, edgings, thresholds, and nosings. Bind or seal cut edges as recommended by carpet manufacturer.

G. Extend carpet into toe spaces, door reveals, closets, open-bottomed obstructions, removable flanges, alcoves, and similar openings.

H. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on carpet as marked on subfloor. Use nonpermanent, nonstaining marking device.

I. Protect carpet against damage from construction operations and placement of equipment and fixtures during the remainder of construction period. Use protection methods recommended in writing by carpet manufacturer and carpet adhesive manufacturer .

END OF SECTION 096816

BLANK SHEET

SECTION 099100
PAINTING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Interior and exterior painting, including surface preparation for projects in the United States.

1.2 RELATED SECTIONS

A. Section 055000 - Metal Fabrications.

B. Section 062000 - Finish Carpentry.

C. Section 064000 - Architectural Woodwork.

1.3 REFERENCES

A. Occupational Safety and Health Act (OSHA) - Safety Standards.

B. American National Standards Institute (ANSI) - Performance Standards.

C. Paint Decorating Contractors of America (PDCA) - Application Standard.

D. National Paint and Coatings Association (NPCA) - Gloss Standard.

E. American Society for Testing Materials (ASTM) - Testing Methods.

F. Ozone Transmission Commission (OTC) - Established levels of Volatile Organic Compounds.

G. SSPC (PM1) - Steel Structures Painting Manual, Vol. 1, Good Painting Practice; Society for Protective Coatings; 1993, Third Edition.

H. SSPC (PM2) - Steel Structures Painting Manual, Vol. 2, Systems and Specifications; Society for Protective Coatings; 1995, Seventh Edition.

I. 40 CFR 59, Subpart D - National Volatile Organic Compound Emission Standards for Architectural Coatings; U.S. Environmental Protection Agency; current edition.

1.4 DEFINITIONS

A. Commercial as used in this Section refers to a product well suited for a commercial application.

B. DFT as used in this Section refers to the Dry Film Thickness of the coating.

C. Enamel refers to any acrylic or alkyd (oil) base paint which dries leaving an eggshell, pearl, satin, semi-gloss or high gloss enamel finish.

D. DTM as used in this Section refers to paint that is applied Direct To Metal.

E. OTC as used in this Section refers to the Ozone Transmission Commission. OTC has established the following VOC levels for the Northeastern United States. Products shall meet the following OTC limits for VOC's.

1. Interior flat paints: 100 grams per liter or less, per gallon.
2. Interior enamels: 150 grams per liter or less, per gallon.
3. Interior stains: 250 grams per liter or less, per gallon.
4. Interior primers: 200 grams per liter or less, per gallon.
5. Rust preventive coatings: 400 grams per liter or less, per gallon.
6. Dry fog coatings: 400 grams per liter or less, per gallon.
7. Floor coatings: 250 grams per liter or less, per gallon.

F. Premium as used in this Section refers to the best quality product "top of the line".

G. VOC as used in this Section refers to Volatile Organic Compounds found in primers, paints, sealers and stains. The level of VOCs appears after each product listed in the Schedule in grams per liter (g/L).

H. Paints are available in a wide range of sheens or glosses, as measured by a gloss meter from a 60 and/or 85 degree angle from vertical, as a percentage of the amount of light that is reflected. The following terms are used to describe the gloss of our products. The list below is provided for general guidance; refer to the technical data sheet for the actual gloss/sheen level for each product.
1. Flat - Less than 5 Percent.
2. Eggshell - 5 - 20 Percent.
3. Satin - 20 - 35 Percent.
4. Semi-Gloss - 30 - 65 Percent.
5. Gloss - Over 65 Percent.

1.5 SUBMITTALS

A. Submit under provisions of Section 013000 - Administrative Requirements.

B. Coordinate with Section 013000 - Administrative Requirements.

C. Product Data: Provide a complete list of all products to be used, with the following information for each:
1. Manufacturer's name, product name and/or catalog number, and general product category.
2. Cross-reference to specified paint system(s) that the product is to be used in; include description of each system.

D. Samples: Submit three paper samples, 5 inches by 7 inches (127mm x 178mm) in size, illustrating selected colors for each color and system selected with specified coats cascaded.

E. Manufacturer's Instructions: Indicate special surface preparation procedures.

F. Maintenance Data: Submit data on cleaning, touch-up, and repair of painted and coated surfaces.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: All primary products specified in this section will be supplied by a single manufacturer with a minimum of ten years experience.

B. Installer Qualifications: All products listed in this section are to be applied by a Painting Contractor with a minimum of five years demonstrated experience in surface preparation and field application of the same type and scope as specified.

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.

C. Disposal:
1. Never pour leftover coating down any sink or drain. Use up material on the job or seal can and store safely for future use.
2. Do not incinerate closed containers.
3. For specific disposal or recycle guidelines, contact the local waste management agency or district. Recycle whenever possible.

1.8 PROJECT CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's recommended limits.

1.9 WARRANTY

A. Inspection of all surfaces to be coated must be done by the manufacturer's representative to insure proper preparation prior to application. All thinners, fillers, primers and finish coatings shall be from the same manufacturer to support a product warranty. Products other than those submitted shall be accompanied by a letter stating its fitness for use and compatibility.

B. At project closeout, provide to the Owner or owner's representative an executed copy of the Manufacturer's standard form outlining the terms and conditions of and any exclusions to their Limited Warranty against Manufacturing Defect.

1.10 EXTRA MATERIALS

A. At project closeout, supply the Owner or owner's representative one gallon of each product for touch-up purposes. Cans shall be clearly marked with color name, number and type of paint.

B. At project closeout, provide the color mixture name and code to the Owner or owner's representative for accurate future color matching.

PART 2 PRODUCTS

2.1 SUPPLIER / MANUFACTURERS

A. Acceptable Manufacturer: Benjamin Moore and Co., which is located at: 101 Paragon Dr ; Montvale, NJ 07645; Toll Free Tel: 866-708-9181; Email: info@benjaminmoore.com; Web:www.benjaminmoore.com

B. Preferred Supplier: Northeastern Paint Supply Inc., is the local vendor that supplies paint to Bangor Township Schools and has their custom color codes for matching. Address: 3950 N. Euclid Avenue, Bay City, MI 48706 Tel: (989) 686-8190

2.2 MATERIALS - GENERAL

A. Volatile Organic Compound (VOC) Content:
1. Provide coatings 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. 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.

B. Compatibility: 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.

2.3 MIXING AND TINTING

A. Except where specifically noted in this section, all paint shall be ready-mixed and pre-tinted. Agitate all paint prior to and during application to ensure uniform color, gloss, and consistency.

B. Thinner addition shall not exceed manufacturer's printed recommendations. Do not use kerosene or other organic solvents to thin water-based paints.

2.4 INTERIOR PAINT SYSTEMS- UNITED STATES

A. CONCRETE - (Walls and Ceilings, Poured Concrete, Precast Concrete, Unglazed Brick, Cement Board, Tilt-Up, Cast-In-Place) including PLASTER - (Walls, Ceilings).
   1. Latex Systems:
      a. Gloss Finish High Performance:
         1) 1st Coat: Benjamin Moore Super Spec® Interior/Exterior Acrylic High Build Masonry Primer N068 (97 g/L), MPI # 3, LEED 2009.
         2) 2nd Coat: Benjamin Moore Ultra Spec D.T.M. Acrylic Gloss Enamel HP28 (142 g/L), MPI # 114, X-Green 114, 154, X-Green 154, 164, LEED 2009, LEED V4.
         3) 3rd Coat: Benjamin Moore Ultra Spec D.T.M. Acrylic Gloss Enamel HP28 (142 g/L), MPI # 114, X-Green 114, 154, X-Green 154, 164, LEED 2009, LEED V4.
      b. Semi-Gloss Finish:
         1) 1st Coat: Benjamin Moore Super Spec® Interior/Exterior Acrylic High Build Masonry Primer N068 (97 g/L), MPI # 3, LEED 2009.
         2) 2nd Coat: Benjamin Moore Ultra Spec 500 Interior Latex Gloss N540 (0 g/L), MPI # 54, X-Green 54, 147, X-Green 147, 141, X-Green 141, LEED 2009, LEED V4.
         3) 3rd Coat: Benjamin Moore Ultra Spec 500 Interior Latex Gloss N540 (0 g/L), MPI # 54, X-Green 54, 147, X-Green 147, 141, X-Green 141, LEED 2009, LEED V4.
      c. Semi-Gloss Finish:
         1) 1st Coat: Benjamin Moore Super Spec® Interior/Exterior Acrylic High Build Masonry Primer N068 (97 g/L), MPI # 3, LEED 2009.
         2) 2nd Coat: Benjamin Moore Ultra Spec 500 Interior Latex Gloss N540 (0 g/L), MPI # 54, X-Green 54, 147, 147 X-Green, 141, X-Green 141, LEED 2009, LEED V4, CHPS Certified.
         3) 3rd Coat: Benjamin Moore Ultra Spec 500 Interior Latex Gloss N540 (0 g/L), MPI # 54, X-Green 54, 147, X-Green 147, 141, X-Green 141, LEED 2009, LEED V4, CHPS Certified.
      d. Semi-Gloss Finish High Performance
         1) 1st Coat: Benjamin Moore Super Spec® Interior/Exterior Acrylic High Build Masonry Primer N068 (97 g/L), MPI # 3, LEED 2009.
         2) 2nd Coat: Benjamin Moore Ultra Spec 500 Interior Latex Gloss N540 (0 g/L), MPI # 54, X-Green 54, 147, X-Green 147, 141, X-Green 141, LEED 2009, LEED V4, CHPS Certified.
         3) 3rd Coat: Benjamin Moore Ultra Spec 500 Interior Latex Gloss N540 (0 g/L), MPI # 54, X-Green 54, 147, X-Green 147, 141, X-Green 141, LEED

2009, LEED V4, CHPS Certified.

e. Eggshell/ Satin Finish:
   1) 1st Coat: Benjamin Moore Super Spec® Interior/Exterior Acrylic High Build Masonry Primer N068 (97 g/L), MPI # 3, LEED 2009.
   2) 2nd Coat: Benjamin Moore Ultra Spec 500 Latex Eggshell N538 (0 g/L), MPI # 52, X-Green 52, 145, X-Green 145, 139, X-Green 139, LEED 2009, LEED V4, CHPS Certified.
   3) 3rd Coat: Benjamin Moore Ultra Spec 500 Latex Eggshell N538 (0 g/L), MPI # 52, X-Green 52, 145, X-Green 145, 139, X-Green 139, LEED 2009, LEED V4, CHPS Certified.

f. Low Sheen Finish:
   1) 1st Coat: Benjamin Moore Super Spec® Interior/Exterior Acrylic High Build Masonry Primer N068 (97 g/L), MPI # 3, LEED 2009.
   2) 2nd Coat: Benjamin Moore Ultra Spec 500 Interior Low Sheen N537 (0 g/L), MPI # 44, X-Green 44, 144, X-Green 144, LEED 2009, LEED V4, CHPS Certified.
   3) 3rd Coat: Benjamin Moore Ultra Spec 500 Interior Low Sheen N537 (0 g/L), MPI # 44, X-Green 44, 144, X-Green 144, LEED 2009, LEED V4, CHPS Certified.

g. Flat Finish:
   1) 1st Coat: Benjamin Moore Super Spec® Interior/Exterior Acrylic High Build Masonry Primer N068 (97 g/L), MPI # 3, LEED 2009.
   2) 2nd Coat: Benjamin Moore Ultra Spec 500 Interior Latex Flat N536 (0 g/L), MPI # 53, X-Green 53, 143, X-Green 143, LEED 2009, LEED V4, CHPS Certified.
   3) 3rd Coat: Benjamin Moore Ultra Spec 500 Interior Latex Flat N536 (0 g/L), MPI # 53, X-Green 53, 143, X-Green 143, LEED 2009, LEED V4, CHPS Certified.

2. Alkyd System:
   a. Gloss Finish (Water Base)
      1) 1st Coat: Benjamin Moore Super Spec® Interior/Exterior Acrylic High Build Masonry Primer N068 (97 g/L), MPI # 3, LEED 2009.
      2) 2nd Coat: Benjamin Moore Advance Waterborne Interior Alkyd High Gloss N794 (48 g/L), MPI # 157, X-Green 157, LEED 2009, LEED V4.
      3) 3rd Coat: Benjamin Moore Advance Waterborne Interior Alkyd High Gloss N794 (48 g/L), MPI # 157, X-Green 157, LEED 2009, LEED V4.
   b. Semi-Gloss Finish (Water Base):
      1) 1st Coat: Benjamin Moore Super Spec® Interior/Exterior Acrylic High Build Masonry Primer N068 (97 g/L), MPI # 3, LEED 2009.
      2) 2nd Coat: Benjamin Moore Advance Waterborne Interior Alkyd Semi-Gloss 793 (48 g/L), LEED 2009, LEED V4, CHPS Certified.
      3) 3rd Coat: Benjamin Moore Advance Waterborne Interior Alkyd Semi-Gloss 793 (48 g/L), LEED 2009, LEED V4, CHPS Certified.
   c. Eggshell Finish (Water Base):
      1) 1st Coat: Benjamin Moore Super Spec® Interior/Exterior Acrylic High Build Masonry Primer N068 (97g/L), MPI # 3, LEED 2009.
      2) 2nd Coat: Benjamin Moore Advance Waterborne Interior Alkyd Satin 792 (48 g/L), LEED 2009, LEED V4, CHPS Certified.
      3) 3rd Coat: Benjamin Moore Advance Waterborne Interior Alkyd Satin 792 (48 g/L), LEED 2009, LEED V4, CHPS Certified.
3. Epoxy Systems (Water Base):
   a. Gloss Finish:
      1) 1st Coat: Corotech 100% Solid Epoxy Pre-Primer V155 (6 g/L), LEED 2009.
      2) 2nd Coat: Corotech Waterborne Amine Epoxy V440 (206 g/L).
      3) 3rd Coat: Corotech Waterborne Amine Epoxy V440 (206 g/L).

b. Gloss Finish
   1) 1st Coat: Corotech 100% Solid Epoxy Pre-Primer V155 (6 g/L), LEED 2009.
   2) 2nd Coat: Corotech Acrylic Epoxy V450 (168 g/L).
   3) 3rd Coat: Corotech Acrylic Epoxy V450 (168 g/L).
c. Semi-Gloss Finish:
   1) 1st Coat: Benjamin Moore Super Spec® Interior/Exterior Acrylic High Build Masonry Primer N068 (97g/L), MPI # 3, LEED 2009.
   2) 2nd Coat: Corotech Pre-Catalyzed Waterborne Epoxy Semi-Gloss V341 (71 g/L), LEED 2009.
   3) 3rd Coat: Corotech Pre-Catalyzed Waterborne Epoxy Semi-Gloss V341 (71 g/L), LEED 2009.
d. Eggshell Finish
   1) 1st Coat: Benjamin Moore Super Spec® Interior/Exterior Acrylic High Build Masonry Primer N068 (97 g/L), MPI # 3, LEED 2009.
   2) 2nd Coat: Corotech Pre-Catalyzed Waterborne Epoxy Eggshell V342 (73 g/L), MPI # 151, LEED 2009.
   3) 3rd Coat: Corotech Pre-Catalyzed Waterborne Epoxy Eggshell V342 (73 g/L), MPI # 151, LEED 2009.

B. CONCRETE: Ceilings.
1. Dryfall Waterborne Systems:
   a. Semi-Gloss Finish:
      1) 1st Coat: Coronado Super Kote 5000 Dry Fall Latex Semi-Gloss 112 (67 g/L), MPI # 226.
      2) 2nd Coat: Coronado Super Kote 5000 Dry Fall Latex Semi-Gloss 112 (67 g/L), MPI # 226.
   b. Semi-Gloss Finish:
      1) 1st Coat: Benjamin Moore Dry Fall Latex Semi-Gloss 397 (43 g/L), MPI # 226.
      2) 2nd Coat: Benjamin Moore Dry Fall Latex Semi-Gloss 397 (43 g/L), MPI # 226.
   c. Flat Finish:
      1) 1st Coat: Coronado Super Kote 5000 Dry Fall Latex Flat N110 (46 g/L), MPI # 118.
      2) 2nd Coat: Coronado Super Kote 5000 Dry Fall Latex Flat N110 (46 g/L), MPI # 118.
   d. Flat Finish:
      1) 1st Coat: Benjamin Moore Dryfall Latex Flat 395 (46 g/L), MPI # 118.
      2) 2nd Coat: Benjamin Moore Dryfall Latex Flat 395 (46 g/L), MPI # 118.

C. MASONRY: CMU - Concrete, Split Face, Scored, Smooth, High Density, Low Density, Fluted.
1. Latex Systems:
   a. Gloss Finish High Performance:
      1) 1st Coat: Benjamin Moore Super Spec® Masonry Interior/Exterior Hi-Build Block Filler 206 (45 g/L), MPI # 4, X-Green 4, LEED 2009, LEED V4, CHPS Certified.
      2) 2nd Coat: Benjamin Moore Ultra Spec D.T.M. Acrylic Gloss Enamel HP28 (142 g/L) MPI # 114, X-Green 114, 154, X-Green 154, 164, LEED 2009, LEED V4.
      3) 3rd Coat: Benjamin Moore Ultra Spec D.T.M. Acrylic Gloss Enamel HP28 (142 g/L), MPI # 114, X-Green 114, 154, X-Green 154, 164, LEED 2009, LEED V4.
   b. Semi-Gloss Finish:
      1) 1st Coat: Benjamin Moore Super Spec® Masonry Interior/Exterior Hi-

Build Block Filler 206 (45 g/L), MPI # 4, X-Green 4, LEED 2009, LEED V4, CHPS Certified.

2) 2nd Coat: Benjamin Moore Ultra Spec 500 Interior Latex Semi-Gloss N539 (0 g/L), MPI # 43, X-Green 43, 146, X-Green 146, 140, X-Green 140, LEED 2009, LEED V4, CHPS Certified.
3) 3rd Coat: Benjamin Moore Ultra Spec 500 Interior Latex Semi-Gloss N539 (0 g/L), MPI # 43, X-Green 43, 146, X-Green 146, 140, X-Green 140, LEED 2009, LEED V4, CHPS Certified.

c. Semi-Gloss Finish:
1) 1st Coat: Benjamin Moore Super Spec® Masonry Interior/Exterior Hi-Build Block Filler 206 (45 g/L), MPI # 4, X-Green 4, LEED 2009, LEED V4, CHPS Certified.
2) 2nd Coat: Benjamin Moore Natura Waterborne Interior Semi-Gloss 514 (0 g/L), MPI # 54, X-Green 54, 141, X-Green 141, LEED 2009, LEED V4, CHPS Certified.
3) 3rd Coat: Benjamin Moore Natura Waterborne Interior Semi-Gloss 514 (0 g/L), MPI # 54, X-Green 54, 141, X-Green 141, LEED 2009, LEED V4, CHPS Certified.

d. Semi-Gloss Finish High Performance:
1) 1st Coat: Benjamin Moore Super Spec® Masonry Interior/Exterior Hi-Build Block Filler 206 (45 g/L), MPI # 4, X-Green 4, LEED 2009, LEED V4, CHPS Certified.
2) 2nd Coat: Benjamin Moore Ultra Spec HP D.T.M. Acrylic Semi-Gloss Enamel HP29 (147 g/L), MPI # 141, X-Green 141, 153, X-Green 153, LEED 2009, LEED V4.
3) 3rd Coat: Benjamin Moore Ultra Spec HP D.T.M. Acrylic Semi-Gloss Enamel HP29 (147 g/L), MPI # 141, X-Green 141, 153, X-Green 153, LEED 2009, LEED V4.

e. Eggshell / Satin Finish:
1) 1st Coat: Benjamin Moore Super Spec® Masonry Interior/Exterior Hi-Build Block Filler 206 (45 g/L), MPI # 4, X-Green 4, LEED 2009, LEED V4, CHPS Certified.
2) 2nd Coat: Benjamin Moore Ultra Spec 500 Latex Eggshell N538 (0 g/L), MPI # 52, X-Green 52, 145, X-Green 145, 139, X-Green 139, LEED 2009, LEED V4, CHPS Certified.
3) 3rd Coat: Benjamin Moore Ultra Spec 500 Latex Eggshell N538 (0 g/L), MPI # 52, X-Green 52, 145, X-Green 145, 139, X-Green 139, LEED 2009, LEED V4, CHPS Certified.

f. Eggshell / Satin Finish:
1) 1st Coat: Benjamin Moore Super Spec® Masonry Interior/Exterior Hi-Build Block Filler 206 (45 g/L), MPI # 4, X-Green 4, LEED 2009, LEED V4, CHPS Certified.
2) 2nd Coat: Benjamin Moore Natura Waterborne Interior Eggshell 513 (0 g/L), MPI # 144, X-Green 144, LEED 2009, LEED V4, CHPS Certified.
3) 3rd Coat: Benjamin Moore Natura Waterborne Interior Eggshell 513 (0 g/L), MPI # 144, X-Green 144, LEED 2009, LEED V4, CHPS Certified.

g. Low Sheen Finish:
1) 1st Coat: Benjamin Moore Super Spec® Masonry Interior/Exterior Hi-Build Block Filler 206 (45 g/L), MPI # 4, X-Green 4, LEED 2009, LEED V4, CHPS Certified.
2) 2nd Coat: Benjamin Moore Ultra Spec 500 Interior Low Sheen N537 (0 g/L), MPI # 44, X-Green 44, 144, X-Green 144, LEED 2009, LEED V4, CHPS Certified.
3) 3rd Coat: Benjamin Moore Ultra Spec 500 Interior Low Sheen N537 (0 g/L), MPI # 44, X-Green 44, 144, X-Green 144, LEED 2009, LEED V4, CHPS Certified.

h. Flat Finish:
   1) 1st Coat: Benjamin Moore Super Spec® Masonry Interior/Exterior Hi-Build Block Filler 206 (45 g/L), MPI # 4, X-Green 4, LEED 2009, LEED V4, CHPS Certified.
   2) 2nd Coat: Benjamin Moore Ultra Spec 500 Interior Latex Flat N536 (0 g/L), MPI # 53, X-Green 53, 143, X-Green 143, LEED 2009, LEED V4, CHPS Certified.
   3) 3rd Coat: Benjamin Moore Ultra Spec 500 Interior Latex Flat N536 (0 g/L), MPI # 53, X-Green 53, 143, X-Green 143, LEED 2009, LEED V4, CHPS Certified.

i. Flat Finish:
   1) 1st Coat: Benjamin Moore Super Spec® Masonry Hi-Build Block Filler 206 (45 g/L), MPI # 4, X-Green 4, LEED 2009, LEED V4.
   2) 2nd Coat: Benjamin Moore Natura Waterborne Interior Flat Finish 512 (0 g/L), MPI # 53, X-Green 53, 143, X-Green 143, LEED 2009, LEED V4, CHPS Certified.
   3) 3rd Coat: Benjamin Moore Natura Waterborne Interior Flat Finish 512 (0 g/L), MPI # 53, X-Green 53, 143, X-Green 143, LEED 2009, LEED V4, CHPS Certified.

2. Alkyd System:
   a. Gloss Finish High Performance:
      1) 1st Coat: Benjamin Moore Super Spec® Masonry Hi-Build Block Filler 206 (45 g/L), MPI # 4, X-Green 4, LEED 2009, LEED V4.
      2) 2nd Coat: Benjamin Moore Ultra Spec D.T.M. Acrylic Gloss Enamel HP28 (142 g/L), MPI # 114, X-Green 114, 154, X-Green 154, 164, LEED 2009, LEED V4.
      3) 3rd Coat: Benjamin Moore Ultra Spec D.T.M. Acrylic Gloss Enamel HP28 (142 g/L), MPI # 114, X-Green 114, 154, X-Green 154, 164, LEED 2009, LEED V4.
   b. Semi-Gloss Finish (Water Base):
      1) 1st Coat: Benjamin Moore Super Spec® Masonry Interior/Exterior Hi-Build Block Filler 206 (45 g/L), MPI # 4, X-Green 4, LEED 2009, LEED V4, CHPS Certified.
      2) 2nd Coat: Benjamin Moore Advance Waterborne Interior Alkyd Semi-Gloss 793 (48 g/L), LEED 2009, LEED V4, CHPS Certified.
      3) 3rd Coat: Benjamin Moore Advance Waterborne Interior Alkyd Semi-Gloss 793 (48 g/L), LEED 2009, LEED V4, CHPS Certified.
   c. Eggshell/Satin Finish (Water Base):
      1) 1st Coat: Benjamin Moore Super Spec® Masonry Interior/Exterior Hi-Build Block Filler 206 (45 g/L), MPI # 4, X-Green 4, LEED 2009, LEED V4, CHPS Certified.
      2) 2nd Coat: Benjamin Moore Advance Waterborne Interior Alkyd Satin 792 (48 g/L), LEED 2009, LEED V4, CHPS Certified.
      3) 3rd Coat: Benjamin Moore Advance Waterborne Interior Alkyd Satin 792 (48 g/L), LEED 2009, LEED V4, CHPS Certified.
3. Epoxy System (Water Base):
   a. Gloss Finish:
      1) 1st Coat: Corotech Acrylic Block Filler V114 (43 g/L), LEED 2009.
      2) 2nd Coat: Corotech Waterborne Amine Epoxy V440 (206 g/L).
      3) 3rd Coat: Corotech Waterborne Amine Epoxy V440 (206 g/L).
   b. Gloss Finish:
      1) 1st Coat: Corotech Acrylic Block Filler V114 (43 g/L), LEED 2009.
      2) 2nd Coat: Corotech Acrylic Epoxy V450 (168 g/L).
      3) 3rd Coat: Corotech Acrylic Epoxy V450 (168 g/L).
   c. Semi-Gloss Finish:
      1) 1st Coat: Corotech Acrylic Block Filler V114 (43 g/L), LEED 2009.

2) 2nd Coat: Corotech Acrylic Epoxy V450 (168 g/L).
3) 3rd Coat: Corotech Acrylic Epoxy V450 (168 g/L).

d. Semi-Gloss Finish:
1) 1st Coat: Corotech Acrylic Block Filler V114 (43 g/L), LEED 2009.
2) 2nd Coat: Corotech Pre-Catalyzed Waterborne Epoxy Semi-Gloss V341 (71 g/L), LEED 2009.
3) 3rd Coat: Corotech Pre-Catalyzed Waterborne Epoxy Semi-Gloss V341 (71 g/L), LEED 2009.

e. Eggshell/Low Luster Finish:
1) 1st Coat: Corotech Acrylic Block Filler V114 (43 g/L), LEED 2009.
2) 2nd Coat: Corotech Pre-Catalyzed Waterborne Epoxy Eggshell V342 (73 g/L), MPI # 151, LEED 2009.
3) 3rd Coat: Corotech Pre-Catalyzed Waterborne Epoxy Eggshell V342 (73 g/L), MPI # 151, LEED 2009.

D. METAL: Aluminum, Galvanized.
1. Latex Systems:
a. Semi-Gloss Finish High Performance:
1) 1st Coat: Benjamin Moore Super Spec® HP Acrylic Metal Primer P04 (47 g/L), MPI # 107, X-Green 107, 134, LEED 2009, CHPS Certified.
2) 2nd Coat: Benjamin Moore Ultra Spec 500 Interior Latex Gloss N540 (0 g/L), MPI # 54, X-Green 54, 147, X-Green 147, 141, X-Green 141, LEED 2009, LEED V4.
3) 3rd Coat: Benjamin Moore Ultra Spec 500 Interior Latex Gloss N540 (0 g/L), MPI # 54, X-Green 54, 147, X-Green 147, 141, X-Green 141, LEED 2009, LEED V4.

b. Gloss Finish High Performance:
1) 1st Coat: Benjamin Moore Super Spec® HP Acrylic Metal Primer P04 (47 g/L), MPI # 107, X-Green 107, 134, LEED 2009, CHPS Certified.
2) 2nd Coat: Benjamin Moore Ultra Spec D.T.M. Acrylic Gloss Enamel HP28 (142 g/L), MPI # 114, X-Green 114, 154, X-Green 154, 164, LEED 2009, LEED V4.
3) 3rd Coat: Benjamin Moore Ultra Spec D.T.M. Acrylic Gloss Enamel HP28 (142 g/L), MPI # 114, X-Green 114, 154, X-Green 154, 164, LEED 2009, LEED V4.

c. Satin Finish:
1) 1st Coat: Benjamin Moore Super Spec® HP Acrylic Metal Primer P04 (47 g/L), MPI # 107, X-Green 107, 134, LEED 2009, CHPS Certified.
2) 2nd Coat: Benjamin Moore Ultra Spec 500 Interior Latex Semi-Gloss N539 (0 g/L), MPI # 43, X-Green 43, 146, X-Green 146, 140, X-Green 140, LEED 2009, LEED V4, CHPS Certified.
3) 3rd Coat: Benjamin Moore Ultra Spec 500 Interior Latex Semi-Gloss N539 (0 g/L), MPI # 43, X-Green 43, 146, X-Green 146, 140, X-Green 140, LEED 2009, LEED V4, CHPS Certified.

d. Semi-Gloss High Performance:
1) 1st Coat: Benjamin Moore Super Spec® HP Acrylic Metal Primer P04 (47 g/L), MPI # 107, X-Green 107, 134, LEED 2009, CHPS Certified.
2) 2nd Coat: Benjamin Moore Ultra Spec HP D.T.M. Acrylic Semi-Gloss Enamel, HP29 (147 g/L), MPI # 141, X-Green 141, 153, X-Green 153, LEED 2009, LEED V4.
3) 3rd Coat: Benjamin Moore Ultra Spec HP D.T.M. Acrylic Semi-Gloss Enamel, HP29 (147 g/L), MPI # 141, X-Green 141, 153, X-Green 153, LEED 2009, LEED V4.

e. Eggshell Finish:
1) 1st Coat: Benjamin Moore Super Spec® HP Acrylic Metal Primer P04 (47 g/L), MPI # 107, X-Green 107, 134, LEED 2009, CHPS Certified.

2) 2nd Coat: Benjamin Moore Ultra Spec 500 Latex Eggshell N538 (0 g/L), MPI # 52, X-Green 52, 145, X-Green 145, 139, X-Green 139, LEED 2009, LEED V4, CHPS Certified.
3) 3rd Coat: Benjamin Moore Ultra Spec 500 Latex Eggshell N538 (0 g/L), MPI # 52, X-Green 52, 145, X-Green 145, 139, X-Green 139, LEED 2009, LEED V4, CHPS Certified.

f. Low Sheen Finish:
1) 1st Coat: Benjamin Moore Super Spec® HP Acrylic Metal Primer P04 (47 g/L), MPI # 107, X-Green 107, 134, LEED 2009, CHPS Certified.
2) 2nd Coat: Benjamin Moore Ultra Spec 500 Interior Low Sheen N537 (0 g/L), MPI # 44, X-Green 44, 144, X-Green 144, LEED 2009, LEED V4, CHPS Certified.
3) 3rd Coat: Benjamin Moore Ultra Spec 500 Interior Low Sheen N537 (0 g/L), MPI # 44, X-Green 44, 144, X-Green 144, LEED 2009, LEED V4, CHPS Certified.

g. Flat Finish:
1) 1st Coat: Benjamin Moore Super Spec® HP Acrylic Metal Primer P04 (47 g/L), MPI # 107, X-Green 107, 134, LEED 2009, CHPS Certified.
2) 2nd Coat: Benjamin Moore Ultra Spec 500 Interior Latex Flat N536 (0 g/L), MPI # 53, X-Green 53, 143, X-Green 143, LEED 2009, LEED V4, CHPS Certified.
3) 3rd Coat: Benjamin Moore Ultra Spec 500 Interior Latex Flat N536 (0 g/L), MPI # 53, X-Green 53, 143, X-Green 143, LEED 2009, LEED V4, CHPS Certified.

h. Flat Finish:
1) 1st Coat: Benjamin Moore Super Spec® HP Acrylic Metal Primer P04 (47 g/L), MPI # 107, X-Green 107, 134, LEED 2009, CHPS Certified.
2) 2nd Coat: Benjamin Moore Natura Waterborne Interior Flat Finish 512 (0 g/L), MPI # 53, X-Green 53, 143, X-Green 143, LEED 2009, LEED V4, CHPS Certified.
3) 3rd Coat: Benjamin Moore Natura Waterborne Interior Flat Finish 512 (0 g/L), MPI # 53, X-Green 53, 143, X-Green 143, LEED 2009, LEED V4, CHPS Certified.

2. Alkyd System:
a. Gloss Finish Waterborne Alkyd:
1) 1st Coat: Benjamin Moore Super Spec® HP Acrylic Metal Primer P04 (47 g/L), MPI # 107, X-Green 107, 134, LEED 2009, CHPS Certified.
2) 2nd Coat: Benjamin Moore Advance Waterborne Interior Alkyd High Gloss N794 (48 g/L), MPI # 157, X-Green 157, LEED 2009, LEED V4.
3) 3rd Coat: Benjamin Moore Advance Waterborne Interior Alkyd High Gloss N794 (48 g/L), MPI # 157, X-Green 157, LEED 2009, LEED V4.

b. Semi-Gloss Finish Waterborne Alkyd:
1) 1st Coat: Benjamin Moore Super Spec® HP Acrylic Metal Primer P04 (47 g/L), MPI # 107, X-Green 107, 134, LEED 2009, CHPS Certified.
2) 2nd Coat: Benjamin Moore Advance Waterborne Interior Alkyd Semi-Gloss 793 (48 g/L), LEED 2009, LEED V4, CHPS Certified.
3) 3rd Coat: Benjamin Moore Advance Waterborne Interior Alkyd Semi-Gloss 793 (48 g/L), LEED 2009, LEED V4, CHPS Certified.

3. Epoxy System (Water Base):
a. Gloss Finish:
1) 1st Coat: Corotech Acrylic Metal Primer V110 (199 g/L), LEED Credit.
2) 2nd Coat: Corotech Acrylic Epoxy V450 (168 g/L).
3) 3rd Coat: Corotech Acrylic Epoxy V450 (168 g/L).

b. Gloss Finish:
1) 1st Coat: Corotech Acrylic Metal Primer V110 (199 g/L), LEED Credit.
2) 2nd Coat: Corotech Waterborne Urethane Gloss V540 (10 g/L), LEED

Credit.
3) 3rd: Coat: Corotech Waterborne Urethane Gloss V540 (10 g/L), LEED Credit.
c. Semi-Gloss Finish:
1) 1st Coat: Corotech Acrylic Metal Primer V110 (199 g/L), LEED Credit.
2) 2nd Coat: Corotech Acrylic Epoxy V450 (168 g/L).
3) 3rd Coat: Corotech Acrylic Epoxy V450 (168 g/L).
d. Eggshell/Low Luster Finish:
1) 1st Coat: Corotech Acrylic Metal Primer V110 (199 g/L), LEED Credit.
2) 2nd Coat: Corotech Pre-Catalyzed Waterborne Epoxy Eggshell V342 (73 g/L), MPI # 151, LEED 2009.
3) 3rd Coat: Corotech Pre-Catalyzed Waterborne Epoxy Eggshell V342 (73 g/L), MPI # 151, LEED 2009.

E. METAL: Galvanized; Ceilings, Duct work.
1. Multi-Surface Acrylic Coating System:
a. Gloss Finish High Performance:
1) 1st Coat: Corotech Acrylic Metal Primer V110 (199 g/L), LEED Credit.
2) 2nd Coat: Corotech Acrylic DTM Enamel Gloss V330 (199 g/L), MPI # 154, 164, LEED 2009, LEED V4.
2. Dryfall Waterborne Topcoats:
a. Semi-Gloss Finish:
1) 1st Coat: Coronado Super Kote 5000 Dry Fall Latex Semi-Gloss 112 (67 g/L), MPI # 226.
2) 2nd Coat: Coronado Super Kote 5000 Dry Fall Latex Semi-Gloss 112 (67 g/L), MPI # 226.
b. Semi-Gloss Finish:
1) 1st Coat: Benjamin Moore Dry Fall Latex Semi-Gloss 397 (43 g/L), MPI # 226.
2) 2nd Coat: Benjamin Moore Dry Fall Latex Semi-Gloss 397 (43 g/L), MPI # 226.
c. Flat Finish:
1) 1st Coat: Coronado Super Kote 5000 Dry Fall Latex Flat N110 (46 g/L), MPI # 118.
2) 2nd Coat: Coronado Super Kote 5000 Dry Fall Latex Flat N110 (46 g/L), MPI # 118.

F. METAL - (Structural Steel Columns, Joists, Trusses, Beams, Miscellaneous and Ornamental Iron, Structural Iron, Ferrous Metal)
1. Latex Systems:
a. Gloss Finish High Performance:
1) 1st Coat: Corotech Acrylic Metal Primer V110 (199 g/L), LEED Credit.
2) 2nd Coat: Corotech Acrylic DTM Enamel Gloss V330 (199 g/L), MPI # 154, 164, LEED 2009, LEED V4.
3) 3rd Coat: Corotech Acrylic DTM Enamel Gloss V330 (199 g/L), MPI # 154, 164, LEED 2009, LEED V4.
b. Semi-Gloss Finish:
1) 1st Coat: Corotech Acrylic Metal Primer V110 (199 g/L), LEED Credit.
2) 2nd Coat: Corotech Acrylic DTM Enamel Semi-Gloss V331 (204 g/L), MPI # 153.
3) 3rd Coat: Corotech Acrylic DTM Enamel Semi-Gloss V331 (204 g/L), MPI # 153.
c. Semi-Gloss Finish High Performance:
1) 1st Coat: Corotech Acrylic Metal Primer V110 (199 g/L), LEED Credit.
2) 2nd Coat: Corotech Pre-Catalyzed Waterborne Epoxy Semi-Gloss V341 (71 g/L), LEED 2009.

3) 3rd Coat Corotech Pre-Catalyzed Waterborne Epoxy Semi-Gloss V341 (71 g/L), LEED 2009.

d. Eggshell Finish High Performance:
1) 1st Coat: Corotech Acrylic Metal Primer V110 (199 g/L), LEED Credit.
2) 2nd Coat: Corotech Pre-Catalyzed Waterborne Epoxy Eggshell V342 (73 g/L), MPI # 151, LEED 2009.
3) 3rd Coat: Corotech Pre-Catalyzed Waterborne Epoxy Eggshell V342 (73 g/L), MPI # 151, LEED 2009.

e. Low Sheen Finish:
1) 1st Coat: Benjamin Moore Super Spec® HP Acrylic Metal Primer P04 (47 g/L), MPI # 107, X-Green 107, 134, LEED 2009, CHPS Certified.
2) 2nd Coat: Benjamin Moore Ultra Spec 500 Interior Low Sheen N537 (0g/L), MPI # 44, X-Green 44, 144, X-Green 144, LEED 2009, LEED V4, CHPS Certified.
3) 3rd Coat: Benjamin Moore Ultra Spec 500 Interior Low Sheen N537 (0g/L), MPI # 44, X-Green 44, 144, X-Green 144, LEED 2009, LEED V4, CHPS Certified.

f. Flat Finish:
1) 1st Coat: Benjamin Moore Super Spec® HP Acrylic Metal Primer P04 (47 g/L), MPI # 107, X-Green 107, 134, LEED 2009, CHPS Certified.
2) 2nd Coat: Benjamin Moore Ultra Spec 500 Interior Latex Flat N536 (0 g/L), MPI # 53, X-Green 53, 143, X-Green 143, LEED 2009, LEED V4, CHPS Certified.
3) 3rd Coat: Benjamin Moore Ultra Spec 500 Interior Latex Flat N536 (0 g/L), MPI # 53, X-Green 53, 143, X-Green 143, LEED 2009, LEED V4, CHPS Certified.

2. Alkyd System:
a. Gloss Finish Waterborne Alkyd:
1) 1st Coat: Benjamin Moore Super Spec® HP Alkyd Metal Primer P06 (323 g/L), MPI # 79.
2) 2nd Coat: Benjamin Moore Advance Waterborne Interior Alkyd High Gloss N794 (48 g/L), MPI # 157, X-Green 157, LEED 2009, LEED V4.
3) 3rd Coat: Benjamin Moore Advance Waterborne Interior Alkyd High Gloss N794 (48 g/L), MPI # 157, X-Green 157, LEED 2009, LEED V4.

b. Semi-Gloss Finish Waterborne Alkyd:
1) 1st Coat: Benjamin Moore Super Spec® HP Alkyd Metal Primer P06 (323 g/L), MPI # 79.
2) 2nd Coat: Benjamin Moore Advance Waterborne Interior Alkyd Semi-Gloss 793 (48 g/L), LEED 2009, LEED V4, CHPS Certified.
3) 3rd Coat: Benjamin Moore Advance Waterborne Interior Alkyd Semi-Gloss 793 (48 g/L), LEED 2009, LEED V4, CHPS Certified.

3. Epoxy System (Water Base):
a. Gloss Finish:
1) 1st Coat: Corotech Acrylic Metal Primer V110 (199 g/L), LEED Credit.
2) 2nd Coat: Corotech Acrylic Epoxy V450 (168 g/L).
3) 3rd Coat: Corotech Acrylic Epoxy V450 (168 g/L).

b. Semi-Gloss Finish:
1) 1st Coat: Corotech Acrylic Metal Primer V110 (199 g/L), LEED Credit.
2) 2nd Coat: Corotech Acrylic Epoxy V450 (168 g/L).
3) 3rd Coat: Corotech Acrylic Epoxy V450 (168 g/L).

c. Eggshell Finish:
1) 1st Coat: Corotech Acrylic Metal Primer V110 (199 g/L), LEED Credit.
2) 2nd Coat: Corotech Pre-Catalyzed Waterborne Epoxy Eggshell V342 (73 g/L), MPI # 151, LEED 2009.
3) 3rd Coat: Corotech Pre-Catalyzed Waterborne Epoxy Eggshell V342 (73 g/L), MPI # 151, LEED 2009.

4. Urethane System (Water Base):
   a. Gloss Finish:
      1) 1st Coat: Corotech Acrylic Metal Primer V110 (199 g/L), LEED Credit.
      2) 2nd Coat: Corotech Waterborne Urethane Gloss V540 (10 g/L), LEED Credit.
      3) 3rd Coat: Corotech Waterborne Urethane Gloss V540 (10 g/L), LEED Credit.
5. Dryfall Waterborne Topcoats:
   a. Semi-Gloss Finish:
      1) 1st Coat: Corotech Acrylic Metal Primer V110 (199 g/L), LEED Credit.
      2) 2nd Coat: Coronado Super Kote 5000 Dry Fall Latex Semi-Gloss 112 (67 g/L), MPI # 226.
      3) 3rd Coat: Coronado Super Kote 5000 Dry Fall Latex Semi-Gloss 112 (67 g/L), MPI # 226.
   b. Flat Finish:
      1) 1st Coat: Corotech Acrylic Metal Primer V110 (199 g/L), LEED Credit.
      2) 2nd Coat: Coronado Super Kote 5000 Dry Fall Latex Flat N110 (46 g/L), MPI # 118.
      3) 3rd Coat: Coronado Super Kote 5000 Dry Fall Latex Flat N110 (46 g/L), MPI # 118.

G. WOOD - (Walls, Ceilings, Doors, Trim):
1. Latex Systems:
   a. Gloss Finish:
      1) 1st Coat: Benjamin Moore Fresh Start Multi-Purpose Primer N023 (44 g/L), MPI # 6, 17, X-Green 17, 39, 137, X-Green 137, LEED Credit, CHPS Certified.
      2) 2nd Coat: Coronado Rust Scat Waterborne Acrylic Gloss 80 (224 g/L), MPI # 114, 154, LEED Credit.
      3) 3rd Coat: Coronado Rust Scat Waterborne Acrylic Gloss 80 (224 g/L), MPI # 114, 154, LEED Credit.
   b. Semi - Gloss Finish:
      1) 1st Coat: Benjamin Moore Fresh Start Multi-Purpose Primer N023 (44 g/L), MPI # 6, 17, X-Green 17, 39, 137, X-Green 137, LEED Credit, CHPS Certified.
      2) 2nd Coat: Coronado Rust Scat Waterborne Acrylic Semi-Gloss 90 (134 g/L), MPI # 153, LEED Credit.
      3) 3rd Coat: Coronado Rust Scat Waterborne Acrylic Semi-Gloss 90 (134 g/L), MPI # 153, LEED Credit.
   c. Eggshell / Satin Finish:
      1) 1st Coat: Benjamin Moore Fresh Start Multi-Purpose Primer N023 (44 g/L), MPI # 6, 17, X-Green 17, 39, 137, X-Green 137, LEED Credit, CHPS Certified.
      2) 2nd Coat: Benjamin Moore Waterborne Satin Impervo N314 (137 g/L), MPI # 43, LEED Credit.
      3) 3rd Coat: Benjamin Moore Waterborne Satin Impervo N314 (137 g/L), MPI # 43, LEED Credit.
   d. Flat Finish:
      1) 1st Coat: Benjamin Moore Fresh Start Multi-Purpose Primer N023 (44 g/L), MPI # 6, 17, X-Green 17, 39, 137, X-Green 137, LEED Credit, CHPS Certified.
      2) 2nd Coat: Benjamin Moore Ultra Spec 500 Interior Latex Flat N536 (0 g/L), MPI # 53, X-Green 53, 143, X-Green 143, LEED 2009, LEED V4, CHPS Certified.
      3) 3rd Coat: Benjamin Moore Ultra Spec 500 Interior Latex Flat N536 (0 g/L), MPI # 53, X-Green 53, 143, X-Green 143, LEED 2009, LEED V4,

CHPS Certified.

2. Alkyd System:
   a. Gloss Finish (Water base):
      1) 1st Coat: Benjamin Moore Fresh Start Multi-Purpose Primer N023 (44 g/L), MPI # 6, 17, X-Green 17, 39, 137, X-Green 137, LEED Credit, CHPS Certified.
      2) 2nd Coat: Benjamin Moore Advance Waterborne Interior Alkyd High Gloss N794 (48 g/L), MPI # 157, X-Green 157, LEED 2009, LEED V4.
      3) 3rd Coat: Benjamin Moore Advance Waterborne Interior Alkyd High Gloss N794 (48 g/L), MPI # 157, X-Green 157, LEED 2009, LEED V4.
   b. Semi-Gloss Finish (Water Base):
      1) 1st Coat: Benjamin Moore Fresh Start Multi-Purpose Primer N023 (44 g/L), MPI # 6, 17, X-Green 17, 39, 137, X-Green 137, LEED Credit, CHPS Certified.
      2) 2nd Coat: Benjamin Moore Advance Waterborne Interior Alkyd Semi-Gloss 793 (48g/L), LEED 2009, LEED V4, CHPS Certified.
      3) 3rd Coat: Benjamin Moore Advance Waterborne Interior Alkyd Semi-Gloss 793 (48g/L), LEED 2009, LEED V4, CHPS Certified.
   c. Eggshell Finish (Water Base):
      1) 1st Coat: Benjamin Moore Fresh Start Multi-Purpose Primer N023 (44 g/L), MPI # 6, 17, X-Green 17, 39, 137, X-Green 137, LEED Credit, CHPS Certified.
      2) 2nd Coat: Benjamin Moore Advance Waterborne Interior Alkyd Satin 792 (48 g/L), LEED 2009, LEED V4, CHPS Certified.
      3) 3rd Coat: Benjamin Moore Advance Waterborne Interior Alkyd Satin 792 (48 g/L), LEED 2009, LEED V4, CHPS Certified.
3. Stain and Varnish System:
   a. Gloss Finish:
      1) 1st Coat: Lenmar Waterborne Interior Wiping Stain 1WB.1300 (240 g/L), MPI # 186 LEED Credit.
      2) 2nd Coat: Lenmar Waterborne Aqua-Plastic Urethane Gloss 1WB.1400 (322 g/L), MPI # 121, 130.
      3) 3rd Coat: Lenmar Waterborne Aqua-Plastic Urethane Gloss 1WB.1400 (322 g/L), MPI # 121, 130.
   b. Satin Finish:
      1) 1st Coat: Lenmar Waterborne Interior Wiping Stain 1WB.1300 (240 g/L), MPI # 186 LEED Credit.
      2) 2nd Coat: Lenmar Waterborne Aqua-Plastic Urethane Satin, 1WB.1427 (335 g/L), MPI # 121, 128.
      3) 3rd Coat: Lenmar Waterborne Aqua-Plastic Urethane Satin, 1WB.1427 (335 g/L), MPI # 121, 128.

H. DRYWALL - (Walls, Ceilings, Gypsum Board and similar items)
1. Latex Systems:
   a. Satin Finish:
      1) 1st Coat: Benjamin Moore Ultra Spec 500 Interior Latex Primer N534 (0 g/L), MPI # 50, X-Green 50, 149, X-Green 149, LEED 2009, LEED V4, CHPS Certified.
      2) 2nd Coat: Benjamin Moore Ultra Spec 500 Interior Latex Semi-Gloss N539 (0 g/L), MPI # 43, X-Green 43, 146, X-Green 146, 140, X-Green 140, LEED 2009, LEED V4, CHPS Certified
      3) 3rd Coat: Benjamin Moore Ultra Spec 500 Interior Latex Semi-Gloss N539 (0 g/L), MPI # 43, X-Green 43, 146, X-Green 146, 140, X-Green 140, LEED 2009, LEED V4, CHPS Certified
   b. Semi-Gloss System:
      1) 1st Coat: Benjamin Moore Eco Spec WB Primer N372 (0 g/L) MPI # 50,

X-Green 50, 149, X-Green 149, LEED V4 CHPS Certified.
2) 2nd Coat: Benjamin Moore Eco Spec WB Semi-Gloss N376 (0 g/L) MPI # 54, X-Green 54, LEED V4, CHPS Certified.
3) 3rd Coat: Benjamin Moore Eco Spec WB Semi-Gloss N376 (0 g/L) MPI # 54, X-Green 54, LEED V4, CHPS Certified.

c. Eggshell / Satin System:
1) 1st Coat: Benjamin Moore Ultra Spec 500 Interior Latex Primer N534 (0 g/L), MPI # 50, X-Green 50, 149, X-Green 149, LEED 2009, LEED V4, CHPS Certified.
2) 2nd Coat: Benjamin Moore Ultra Spec 500 Latex Eggshell N538 (0 g/L), MPI # 52, X-Green 52, 145, X-Green 145, 139, X-Green 139, LEED 2009 LEED V4, CHPS Certified.
3) 3rd Coat: Benjamin Moore Ultra Spec 500 Latex Eggshell N538 (0 g/L), MPI # 52, X-Green 52, 145, X-Green 145, 139, X-Green 139, LEED 2009, LEED V4, CHPS Certified.

d. Eggshell / Satin System:
1) 1st Coat: Benjamin Moore Eco Spec WB Primer N372 (0 g/L) MPI # 50, X-Green 50, 149, X-Green 149, LEED V4 CHPS Certified.
2) 2nd Coat: Benjamin Moore Eco Spec WB Eggshell N374 (0 g/L), MPI # 52, X-Green 52, 139, X-Green 139, X- Green 145, LEED V4, CHPS Certified.
3) 3rd Coat: Benjamin Moore Eco Spec WB Eggshell N374 (0 g/L), MPI # 52, X-Green 52, 139, X-Green 139, X-Green 145, LEED V4, CHPS Certified.

e. Low Sheen System:
1) 1st Coat: Benjamin Moore Ultra Spec 500 Interior Latex Primer N534 (0 g/L), MPI # 50, X-Green 50, 149, X-Green 149, LEED 2009, LEED V4, CHPS Certified.
2) 2nd Coat: Benjamin Moore Ultra Spec 500 Interior Low Sheen N537 (0 g/L), MPI # 44, X-Green 44, 144, X-Green 144, LEED 2009, LEED V4, CHPS Certified.
3) 3rd Coat: Benjamin Moore Ultra Spec 500 Interior Low Sheen N537 (0 g/L), MPI # 44, X-Green 44, 144, X-Green 144, LEED 2009, LEED V4, CHPS Certified.

f. Flat System
1) 1st Coat: Benjamin Moore Ultra Spec 500 Interior Latex Primer N534 (0 g/L), MPI # 50, X-Green 50, 149, X-Green 149, LEED 2009, LEED V4, CHPS Certified.
2) 2nd Coat: Benjamin Moore Ultra Spec 500 Interior Latex Flat N536 (0 g/L), MPI # 53, X-Green 53, 143, X-Green 143, LEED 2009, LEED V4, CHPS Certified.
3) 3rd Coat: Benjamin Moore Ultra Spec 500 Interior Latex Flat N536 (0 g/L), MPI # 53, X-Green 53, 143, X-Green 143, LEED 2009, LEED V4, CHPS Certified.

g. Flat System:
1) 1st Coat: Benjamin Moore Eco Spec WB Primer N372 (0 g/L) MPI # 50, X-Green 50, 149, X-Green 149, LEED V4 CHPS Certified.
2) 2nd Coat: Benjamin Moore Eco Spec WB Flat N373 (0 g/L), MPI # 53, X-Green 53, 143, X-Green 143, LEED V4.
3) 3rd Coat: Benjamin Moore Eco Spec WB Flat N373 (0 g/L), MPI # 53, X-Green 53, 143, X-Green 143, LEED V4.

2. Epoxy System (Water Base):
a. Gloss System:
1) 1st Coat: Benjamin Moore Ultra Spec 500 Interior Latex Primer N534 (0 g/L), MPI # 50, X-Green 50, 149, X-Green 149, LEED 2009, LEED V4, CHPS Certified.

2) 2nd Coat: Corotech Acrylic Epoxy V450 (168 g/L).
3) 3rd Coat: Corotech Acrylic Epoxy V450 (168 g/L).

b. Semi-Gloss System:
1) 1st Coat: Benjamin Moore Ultra Spec 500 Interior Latex Primer N534 (0 g/L), MPI # 50, X-Green 50, 149, X-Green 149, LEED 2009, LEED V4, CHPS Certified.
2) 2nd Coat: Corotech Acrylic Epoxy V450 (168 g/L).
3) 3rd Coat: Corotech Acrylic Epoxy V450 (168 g/L).

c. Semi-Gloss System:
1) 1st Coat: Benjamin Moore Ultra Spec 500 Interior Latex Primer N534 (0 g/L), MPI # 50, X-Green 50, 149, X-Green 149, LEED 2009, LEED V4, CHPS Certified.
2) 2nd Coat: Corotech Pre-Catalyzed Waterborne Epoxy Semi-Gloss V341 (71 g/L), LEED 2009.
3) 3rd Coat: Corotech Pre-Catalyzed Waterborne Epoxy Semi-Gloss V341 (71 g/L), LEED 2009.

d. Eggshell/Low Luster System:
1) 1st Coat: Benjamin Moore Ultra Spec 500 Interior Latex Primer N534 (0 g/L), MPI # 50, X-Green 50, 149, X-Green 149, LEED 2009, LEED V4, CHPS Certified.
2) 2nd Coat: Corotech Pre-Catalyzed Waterborne Epoxy Eggshell V342 (73 g/L), MPI # 151, LEED 2009.
3) 3rd Coat: Corotech Pre-Catalyzed Waterborne Epoxy Eggshell V342 (73 g/L), MPI # 151, LEED 2009.

I. Concrete - (Floors, non-vehicular):
1. Latex Systems:
a. Semi-Gloss System:
1) 1st Coat: Insl-X Tough Shield Floor and Patio TS-3 (167 g/L).
2) 2nd Coat: Insl-X Tough Shield Floor and Patio TS-3 (167 g/L).

b. Satin System:
1) 1st Coat: Insl-X Tough Shield Floor and Patio TS-3 (167 g/L).
2) 2nd Coat: Insl-X Tough Shield Floor and Patio TS-3 (167 g/L).

2.5 HIGH PERFORMANCE INTERIOR PAINT SYSTEMS - UNITED STATES

A. CONCRETE - Smooth (Walls and Ceilings, Poured Concrete, Precast Concrete, Unglazed Brick, Cement Board, Tilt-Up, Cast-In-Place).
1. Latex Systems:
a. Gloss Finish:
1) 1st Coat: Benjamin Moore Super Spec® Interior/Exterior Acrylic High Build Masonry Primer N068 (97 g/L), MPI # 3, LEED 2009.
2) 2nd Coat: Benjamin Moore Ultra Spec D.T.M. Acrylic Gloss Enamel HP28 (142 g/L), MPI # 114, X-Green 114, 154, X-Green 154, 164, LEED 2009, LEED V4.
3) 3rd Coat: Benjamin Moore Ultra Spec D.T.M. Acrylic Gloss Enamel HP28 (142 g/L), MPI # 114, X-Green 114, 154, X-Green 154, 164, LEED 2009, LEED V4.

b. Semi-Gloss Finish High Performance:
1) 1st Coat: Benjamin Moore Super Spec® Interior/Exterior Acrylic High Build Masonry Primer N068 (97 g/L), MPI # 3, LEED 2009.
2) 2nd Coat: Benjamin Moore Ultra Spec HP D.T.M. Acrylic Semi-Gloss Enamel, HP29 (147 g/L), MPI # 141, X-Green 141, 153, X-Green 153, LEED 2009, LEED V4.
3) 3rd Coat: Benjamin Moore Ultra Spec HP D.T.M. Acrylic Semi-Gloss Enamel, HP29 (147 g/L), MPI # 141, X-Green 141, 153, X-Green 153,

LEED 2009, LEED V4.

c. Eggshell/Low Sheen:
   1) 1st Coat: Benjamin Moore Super Spec® Interior/Exterior Acrylic High Build Masonry Primer N068 (97 g/L), MPI # 3, LEED 2009.
   2) 2nd Coat: Corotech Pre-Catalyzed Waterborne Epoxy Eggshell V342 (73 g/L), MPI # 151, LEED 2009.
   3) 3rd Coat: Corotech Pre-Catalyzed Waterborne Epoxy Eggshell V342 (73 g/L), MPI # 151, LEED 2009.

2. Alkyd System (Water Base):
   a. Gloss Finish (Water base):
      1) 1st Coat: Benjamin Moore Fresh Start Multi-Purpose Primer N023 (44 g/L), MPI # 6, 17, X-Green 17, 39, 137, X-Green 137, LEED Credit, CHPS Certified.
      2) 2nd Coat: Benjamin Moore Advance Waterborne Interior Alkyd High Gloss N794 (48 g/L), MPI # 157, X-Green 157, LEED 2009, LEED V4.
      3) 3rd Coat: Benjamin Moore Advance Waterborne Interior Alkyd High Gloss N794 (48 g/L), MPI # 157, X-Green 157, LEED 2009, LEED V4.
3. Alkyd System (Solvent Base Finish):
   a. Gloss Finish Urethane Modified:
      1) 1st Coat: Benjamin Moore Fresh Start Multi-Purpose Primer N023 (44 g/L), MPI # 6, 17, X-Green 17, 39, 137, X-Green 137, LEED Credit, CHPS Certified.
      2) 2nd Coat: Corotech Alkyd Urethane Gloss V200 (336 g/L), MPI # 9, 27, 48.
      3) 3rd Coat: Corotech Alkyd Urethane Gloss V200 (336 g/L), MPI # 9, 27, 48.
4. Epoxy Systems (Water Base):
   a. Gloss Finish:
      1) 1st Coat: Benjamin Moore Fresh Start Multi-Purpose Primer N023 (44 g/L), MPI # 6, 17, X-Green 17, 39, 137, X-Green 137, LEED Credit, CHPS Certified.
      2) 2nd Coat: Corotech Acrylic Epoxy V450 (168 g/L).
      3) 3rd Coat: Corotech Acrylic Epoxy V450 (168 g/L).
   b. Semi-Gloss/High Luster Finish:
      1) 1st Coat: Benjamin Moore Fresh Start Multi-Purpose Primer N023 (44 g/L), MPI # 6, 17, X-Green 17, 39, 137, X-Green 137, LEED Credit, CHPS Certified.
      2) 2nd Coat: Corotech Acrylic Epoxy V450 (168 g/L).
      3) 3rd Coat: Corotech Acrylic Epoxy V450 (168 g/L).
   c. Eggshell/Low Luster Finish:
      1) 1st Coat: Benjamin Moore Fresh Start Multi-Purpose Primer N023 (44 g/L), MPI # 6, 17, X-Green 17, 39, 137, X-Green 137, LEED Credit, CHPS Certified.
      2) 2nd Coat: Corotech Pre-Catalyzed Waterborne Epoxy Eggshell V342 (73 g/L), MPI # 151, LEED 2009.
      3) 3rd Coat: Corotech Pre-Catalyzed Waterborne Epoxy Eggshell V342 (73 g/L), MPI # 151, LEED 2009.
5. Epoxy Systems (Solvent Base):
   a. Gloss Finish:
      1) 1st Coat: Corotech Waterborne Bonding Primer V175, LEED Credit.
      2) 2nd Coat: Corotech Polyamide Epoxy V400 (341 g/L), MPI # 82, 98, 108, 177.
      3) 3rd Coat: Corotech Polyamide Epoxy V400 (341 g/L), MPI # 82, 98, 108, 177.
6. Urethane System (Water Base):
   a. Gloss Finish Single Component:

1) 1st Coat: Corotech Waterborne Bonding Primer V175, LEED Credit.
2) 2nd Coat: Corotech Waterborne Urethane Gloss V540 (10 g/L), LEED Credit.
3) 3rd Coat: Corotech Waterborne Urethane Gloss V540 (10 g/L), LEED Credit.

B. CONCRETE - (Ceilings).
1. MultiSurface Acrylic Coating:
a. Gloss Finish:
1) 1st Coat: Corotech Quick Dry Acrylic Spray DTM Gloss V300 (87 g/L), MPI # 114, LEED Credit, SSPC Paint Spec. 24.
2) 2nd Coat: Corotech Quick Dry Acrylic Spray DTM Gloss V300 (87 g/L), MPI # 114, LEED Credit, SSPC Paint Spec. 24.
2. Dryfall Waterborne Systems:
a. Semi-Gloss Finish:
1) 1st Coat: Coronado Super Kote 5000 Dry Fall Latex Semi-Gloss 112 (67g/L), MPI # 226.
2) 2nd Coat: Coronado Super Kote 5000 Dry Fall Latex Semi-Gloss 112 (67g/L), MPI # 226.
b. Flat Finish:
1) 1st Coat: Coronado Super Kote 5000 Dry Fall Latex Flat N110 (46 g/L), MPI # 118.
2) 2nd Coat: Coronado Super Kote 5000 Dry Fall Latex Flat N110 (46 g/L), MPI # 118.
3. Dryfall Alkyd Topcoats:
a. Flat Finish:
1) 1st Coat: Coronado Super Kote 5000 Dry Fall Alkyd Flat 105 (346 g/L), MPI # 55.
2) 2nd Coat: Coronado Super Kote 5000 Dry Fall Alkyd Flat 105 (346 g/L), MPI # 55.

C. MASONRY - (CMU - Concrete, Split Face, Scored, Smooth, High Density, Low Density, Fluted, Stucco).
1. Latex Systems:
a. Gloss Finish:
1) 1st Coat: Corotech Acrylic Block Filler V114 (43 g/L), LEED 2009.
2) 2nd Coat: Benjamin Moore Ultra Spec D.T.M. Acrylic Gloss Enamel HP28 (142 g/L), MPI # 114, X-Green 114, 154, X-Green 154, 164, LEED 2009, LEED V4.
3) 3rd Coat: Benjamin Moore Ultra Spec D.T.M. Acrylic Gloss Enamel HP28 (142 g/L), MPI # 114, X-Green 114, 154, X-Green 154, 164, LEED 2009, LEED V4.
b. Semi-Gloss Finish:
1) 1st Coat Corotech Acrylic Block Filler V114 (43 g/L), LEED 2009.
2) 2nd Coat: Benjamin Moore Ultra Spec HP D.T.M. Acrylic Semi-Gloss Enamel, HP29 (147 g/L), MPI # 141, X-Green 141, 153, X-Green 153, LEED 2009, LEED V4.
3) 3rd Coat: Benjamin Moore Ultra Spec HP D.T.M. Acrylic Semi-Gloss Enamel, HP29 (147 g/L), MPI # 141, X-Green 141, 153, X-Green 153, LEED 2009, LEED V4.
c. Low Sheen:
1) 1st Coat: Corotech Acrylic Block Filler V114 (43 g/L), LEED 2009.
2) 2nd Coat: Benjamin Moore Ultra Spec HP D.T.M. Acrylic Low Lustre Enamel HP25 (145 g/L), MPI # 141, X-Green 141, 153, X-Green 153, LEED 2009.
3) 3rd Coat: Benjamin Moore Ultra Spec HP D.T.M. Acrylic Low Lustre

Enamel HP25 (145 g/L), MPI # 141, X-Green 141, 153, X-Green 153, LEED 2009.

d. Flat Finish:
   1) 1st Coat: Corotech Acrylic Block Filler V114 (43 g/L), LEED 2009.
   2) 2nd Coat: Corotech Acrylic Metal Primer V110 (199 g/L), LEED Credit.
   3) 3rd Coat: Corotech Acrylic Metal Primer V110 (199 g/L), LEED Credit.

2. Alkyd System (Water Base):
   a. Gloss Finish:
      1) 1st Coat: Corotech Acrylic Block Filler V114 (43 g/L), LEED 2009.
      2) 2nd Coat: Corotech Water Reducible Alkyd Enamel V210 (331 g/L), MPI # 157.
      3) 3rd Coat: Corotech Water Reducible Alkyd Enamel V210 (331 g/L), MPI # 157.
3. Alkyd System (Solvent Base Finish):
   a. Urethane Modified:
      1) 1st Coat: Corotech Acrylic Block Filler V114 (43 g/L), LEED 2009.
      2) 2nd Coat: Corotech Alkyd Urethane Gloss V200 (336 g/L), MPI # 9, 27, 48.
      3) 3rd Coat: Corotech Alkyd Urethane Gloss V200 (336 g/L), MPI # 9, 27, 48.
4. Epoxy System (Water Base):
   a. Gloss Finish:
      1) 1st Coat: Corotech Acrylic Block Filler V114 (43 g/L), LEED 2009.
      2) 2nd Coat: Corotech Acrylic Epoxy V450 (168 g/L).
      3) 3rd Coat: Corotech Acrylic Epoxy V450 (168 g/L).
   b. Gloss Finish:
      1) 1st Coat: Corotech Acrylic Block Filler V114 (43 g/L), LEED 2009.
      2) 2nd Coat: Corotech Waterborne Amine Epoxy V440 (206 g/L).
      3) 3rd Coat: Corotech Waterborne Amine Epoxy V440 (206 g/L).
   c. Semi-Gloss/High Luster Finish:
      1) 1st Coat: Corotech Acrylic Block Filler V114 (43 g/L), LEED 2009.
      2) 2nd Coat: Corotech Waterborne Amine Epoxy V440 (206 g/L).
      3) 3rd Coat: Corotech Waterborne Amine Epoxy V440 (206 g/L).
   d. Semi-Gloss/High Luster Finish:
      1) 1st Coat: Corotech Acrylic Block Filler V114 (43 g/L), LEED 2009.
      2) 2nd Coat: Corotech Pre-Catalyzed Waterborne Epoxy Semi-Gloss V341 (71 g/L), LEED 2009.
      3) 3rd Coat: Corotech Pre-Catalyzed Waterborne Epoxy Semi-Gloss V341 (71 g/L), LEED 2009.
   e. Eggshell/Low Luster Finish:
      1) 1st Coat: Corotech Acrylic Block Filler V114 (43 g/L), LEED 2009.
      2) 2nd Coat: Corotech Pre-Catalyzed Waterborne Epoxy Eggshell V342 (73 g/L), MPI # 151, LEED 2009.
      3) 3rd Coat: Corotech Pre-Catalyzed Waterborne Epoxy Eggshell V342 (73 g/L), MPI # 151, LEED 2009.
5. Epoxy Systems (Solvent Base Finish):
   a. Gloss Finish:
      1) 1st Coat: Corotech Acrylic Block Filler V114 (43 g/L), LEED 2009.
      2) 2nd Coat: Corotech Polyamide Epoxy V400 (341 g/L), MPI # 82, 98, 108, 177.
      3) 3rd Coat: Corotech Polyamide Epoxy V400 (341 g/L), MPI # 82, 98, 108, 177.
6. Urethane Systems (Water Base).
   a. Gloss Finish:
      1) 1st Coat: Corotech Acrylic Block Filler V114 (43 g/L), LEED 2009.
      2) 2nd Coat: Corotech Waterborne Urethane Gloss V540 (10 g/L), LEED

Credit.
3) 3rd Coat: Corotech Waterborne Urethane Gloss V540 (10 g/L), LEED Credit.

7. Urethane Systems (Solvent Base Finish):
   a. Gloss Finish:
      1) 1st Coat: Corotech Acrylic Block Filler V114 (43 g/L), LEED 2009.
      2) 2nd Coat: Corotech Aliphatic Acrylic Urethane Gloss V500 (229 g/L), MPI # 72, 78, 83, 105.
      3) 3rd Coat: Corotech Aliphatic Acrylic Urethane Gloss V500 (229 g/L), MPI # 72, 78, 83, 105.
   b. Semi-Gloss Finish:
      1) 1st Coat: Corotech Acrylic Block Filler V114 (43 g/L), LEED 2009.
      2) 2nd Coat: Corotech Aliphatic Acrylic Urethane Semi-Gloss DFT (305 g/L), MPI # 83, 174.
      3) 3rd Coat: Corotech Aliphatic Acrylic Urethane Semi-Gloss DFT (305 g/L), MPI # 83, 174.

D. Non-Ferrous- (Galvanized and Aluminum):
   1. Latex Systems:
      a. Gloss Finish:
         1) 1st Coat: Benjamin Moore Super Spec® HP Acrylic Metal Primer P04 (47 g/L), MPI # 107, X-Green 107, 134, LEED 2009, CHPS Certified.
         2) 2nd Coat: Benjamin Moore Ultra Spec D.T.M. Acrylic Gloss Enamel HP28 (142 g/L), MPI # 114, X-Green 114, 154, X-Green 154, 164, LEED 2009, LEED V4.
         3) 3rd Coat: Benjamin Moore Ultra Spec D.T.M. Acrylic Gloss Enamel HP28 (142 g/L), MPI # 114, X-Green 114, 154, X-Green 154, 164, LEED 2009, LEED V4.
      b. Semi-Gloss Finish:
         1) 1st Coat: Benjamin Moore Ultra Spec D.T.M. Acrylic Gloss Enamel HP28 (142 g/L), MPI # 114, X-Green 114, 154, X-Green 154, 164, LEED 2009, LEED V4.
         2) 2nd Coat: Benjamin Moore Ultra Spec HP D.T.M. Acrylic Semi-Gloss Enamel, HP29 (147 g/L), MPI # 141, X-Green 141, 153, X-Green 153, LEED 2009, LEED V4.
         3) 3rd Coat: Benjamin Moore Ultra Spec HP D.T.M. Acrylic Semi-Gloss Enamel, HP29 (147 g/L), MPI # 141, X-Green 141, 153, X-Green 153, LEED 2009, LEED V4.
      c. Semi-Gloss Finish:
         1) 1st Coat: Corotech Acrylic Metal Primer V110 (199 g/L), LEED Credit.
         2) 2nd Coat: Corotech Acrylic DTM Enamel Semi-Gloss V331 (204 g/L), MPI # 153.
         3) 3rd Coat: Corotech Acrylic DTM Enamel Semi-Gloss V331 (204 g/L), MPI # 153.
      d. Low Sheen:
         1) 1st Coat: Benjamin Moore Super Spec® HP Acrylic Metal Primer P04 (47 g/L), MPI # 107, X-Green 107, 134, LEED 2009, CHPS Certified.
         2) 2nd Coat: Benjamin Moore Ultra Spec HP D.T.M. Acrylic Low Lustre Enamel HP25 (145 g/L), MPI # 141, X-Green 141, 153, X-Green 153, LEED 2009.
         3) 3rd Coat: Benjamin Moore Ultra Spec HP D.T.M. Acrylic Low Lustre Enamel HP25 (145 g/L), MPI # 141, X-Green 141, 153, X-Green 153, LEED 2009.
      e. Flat Finish:
         1) 1st Coat: Corotech Acrylic Metal Primer V110 (199 g/L), LEED Credit.
         2) 2nd Coat: Corotech Acrylic Metal Primer V110 (199 g/L), LEED Credit.

2. Alkyd System (Water Base):
   a. Gloss Finish:
      1) 1st Coat: Benjamin Moore Super Spec® HP Acrylic Metal Primer P04 (47 g/L), MPI # 107, X-Green 107, 134, LEED 2009, CHPS Certified.
      2) 2nd Coat: Corotech Acrylic Metal Primer V110 (199 g/L), LEED Credit.
      3) 3rd Coat: Corotech Acrylic Metal Primer V110 (199 g/L), LEED Credit.
3. Alkyd System (Solvent Base Finish):
   a. Gloss Finish Urethane Modified:
      1) 1st Coat: Benjamin Moore Super Spec® HP Acrylic Metal Primer P04 (47 g/L), MPI # 107, X-Green 107, 134, LEED 2009, CHPS Certified.
      2) 2nd Coat: Benjamin Moore Super Spec® HP Urethane Alkyd Gloss Enamel P22 (394 g/L), MPI # 9, 48.
      3) 3rd Coat: Benjamin Moore Super Spec® HP Urethane Alkyd Gloss Enamel P22 (394 g/L), MPI # 9, 48.
4. Epoxy Systems (Water Base):
   a. Gloss Finish:
      1) 1st Coat: Corotech Waterborne Amine Epoxy V440 (206 g/L).
      2) 2nd Coat: Corotech Waterborne Amine Epoxy V440 (206 g/L).
   b. Gloss Finish:
      1) 1st Coat: Benjamin Moore Super Spec® HP Acrylic Metal Primer P04 (47 g/L), MPI # 107, X-Green 107, 134, LEED 2009, CHPS Certified.
      2) 2nd Coat: Corotech Acrylic Epoxy V450 (168 g/L).
      3) 3rd Coat: Corotech Acrylic Epoxy V450 (168 g/L).
   c. Semi-Gloss Finish:
      1) 1st Coat: Benjamin Moore Super Spec® HP Acrylic Metal Primer P04 (47 g/L), MPI # 107, X-Green 107, 134, LEED 2009, CHPS Certified.
      2) 2nd Coat: Corotech Pre-Catalyzed Waterborne Epoxy Semi-Gloss V341 (71 g/L), LEED 2009.
      3) 3rd Coat: Corotech Pre-Catalyzed Waterborne Epoxy Semi-Gloss V341 (71 g/L), LEED 2009.
   d. Semi-Gloss Finish:
      1) 1st Coat: Benjamin Moore Super Spec® HP Acrylic Metal Primer P04 (47 g/L), MPI # 107, X-Green 107, 134, LEED 2009, CHPS Certified.
      2) 2nd Coat: Corotech Acrylic Epoxy V450 (168 g/L).
      3) 3rd Coat: Corotech Acrylic Epoxy V450 (168 g/L).
   e. Eggshell Finish:
      1) 1st Coat: Benjamin Moore Super Spec® HP Acrylic Metal Primer P04 (47 g/L), MPI # 107, X-Green 107, 134, LEED 2009, CHPS Certified.
      2) 2nd Coat: Corotech Pre-Catalyzed Waterborne Epoxy Eggshell V342 (73 g/L), MPI # 151, LEED 2009.
      3) 3rd Coat: Corotech Pre-Catalyzed Waterborne Epoxy Eggshell V342 (73 g/L), MPI # 151, LEED 2009.
5. Epoxy Systems (Solvent Base):
   a. Gloss Finish:
      1) 1st Coat: Corotech Polyamide Epoxy V400 (341 g/L), MPI # 82, 98, 108, 177.
      2) 2nd Coat: Corotech Polyamide Epoxy V400 (341 g/L), MPI # 82, 98, 108, 177.
   b. Semi-Gloss Finish:
      1) 1st Coat: Corotech Polyamide Epoxy V400 (341 g/L), MPI # 82, 98, 108, 177.
      2) 2nd Coat: Corotech Polyamide Epoxy V400 (341 g/L), MPI # 82, 98, 108, 177.
6. Urethane Systems (Water Base):
   a. Gloss Finish:
      1) 1st Coat: Corotech Waterborne Bonding Primer V175, LEED Credit.

2) 2nd Coat: Corotech Waterborne Urethane Gloss V540 (10 g/L), LEED Credit.
3) 3rd Coat: Corotech Waterborne Urethane Gloss V540 (10 g/L), LEED Credit.

7. Urethane Systems (Solvent Base):
   a. Gloss Finish:
      1) 1st Coat: Corotech Waterborne Bonding Primer V175, LEED Credit.
      2) 2nd Coat: Corotech Aliphatic Acrylic Urethane Gloss V500 (229 g/L), MPI # 72, 78, 83, 105.
      3) 3rd Coat: Corotech Aliphatic Acrylic Urethane Gloss V500 (229 g/L), MPI # 72, 78, 83, 105.
   b. Semi-Gloss Finish:
      1) 1st Coat: Corotech Waterborne Bonding Primer V175, LEED Credit.
      2) 2nd Coat: Corotech Aliphatic Acrylic Urethane Semi-Gloss V510 (305 g/L), MPI # 83, 174.
      3) 3rd Coat: Corotech Aliphatic Acrylic Urethane Semi-Gloss V510 (305 g/L) MPI # 83, 174.
8. Multi-Surface Acrylic Coating:
   a. Gloss Finish:
      1) 1st Coat: Corotech Quick Dry Acrylic Spray DTM Gloss V300 (87 g/L), MPI # 114, LEED Credit, SSPC Paint Spec. 24.
      2) 2nd Coat: Corotech Quick Dry Acrylic Spray DTM Gloss V300 (87 g/L), MPI # 114, LEED Credit, SSPC Paint Spec. 24.
9. Dryfall Waterborne Systems:
   a. Semi-Gloss Finish:
      1) 1st Coat: Benjamin Moore Dry Fall Latex Semi-Gloss 397 (43 g/L), MPI # 226.
      2) 2nd Coat: Benjamin Moore Dry Fall Latex Semi-Gloss 397 (43 g/L), MPI # 226.
   b. Flat Finish:
      1) 1st Coat: Benjamin Moore Dryfall Latex Flat 395 (46 g/L), MPI # 118.
      2) 2nd Coat: Benjamin Moore Dryfall Latex Flat 395 (46 g/L), MPI # 118.
10. Dryfall Alkyd Topcoats:
   a. Flat Finish:
      1) 1st Coat: Corotech Waterborne Bonding Primer V175, LEED Credit.
      2) 2nd Coat: Coronado Super Kote 5000 Dry Fall Alkyd Flat 105 (346 g/L), MPI # 55.

E. METAL - (Structural Steel Columns, Joists, Trusses, Beams, Miscellaneous and Ornamental Iron, Structural Iron, Ferrous Metal).
1. Latex Systems:
   a. Gloss Finish:
      1) 1st Coat: Corotech Acrylic Metal Primer V110 (199 g/L), LEED Credit.
      2) 2nd Coat: Corotech Acrylic DTM Enamel Gloss V330 (199 g/L), MPI # 154, 164, LEED 2009, LEED V4.
      3) 3rd Coat: Corotech Acrylic DTM Enamel Gloss V330 (199 g/L), MPI # 154, 164, LEED 2009, LEED V4.
   b. Gloss Finish:
      1) 1st Coat: Benjamin Moore Super Spec® HP Acrylic Metal Primer P04 (47 g/L), MPI # 107, X-Green 107, 134, LEED 2009, CHPS Certified.
      2) 2nd Coat: Benjamin Moore Ultra Spec D.T.M. Acrylic Gloss Enamel HP28 (142 g/L), MPI # 114, X-Green 114, 154, X-Green 154, 164, LEED 2009, LEED V4.
      3) 3rd Coat: Benjamin Moore Ultra Spec D.T.M. Acrylic Gloss Enamel HP28 (142 g/L), MPI # 114, X-Green 114, 154, X-Green 154, 164, LEED 2009, LEED V4.

c. Semi-Gloss Finish:
   1) 1st Coat: Corotech Acrylic Metal Primer V110 (199 g/L), LEED Credit.
   2) 2nd Coat: Corotech Acrylic DTM Enamel Semi-Gloss V331 (204 g/L), MPI # 153.
   3) 3rd Coat: Corotech Acrylic DTM Enamel Semi-Gloss V331 (204 g/L), MPI # 153.

d. Semi-Gloss Finish:
   1) 1st Coat: Benjamin Moore Super Spec® HP Acrylic Metal Primer P04 (47 g/L), MPI # 107, X-Green 107, 134, LEED 2009, CHPS Certified.
   2) 2nd Coat: Benjamin Moore Ultra Spec HP D.T.M. Acrylic Semi-Gloss Enamel, HP29 (147 g/L), MPI # 141, X-Green 141, 153, X-Green 153, LEED 2009, LEED V4.
   3) 3rd Coat: Benjamin Moore Ultra Spec HP D.T.M. Acrylic Semi-Gloss Enamel, HP29 (147 g/L), MPI # 141, X-Green 141, 153, X-Green 153, LEED 2009, LEED V4.

e. Low Sheen:
   1) 1st Coat: Benjamin Moore Super Spec® HP Acrylic Metal Primer P04 (47 g/L), MPI # 107, X-Green 107, 134, LEED 2009, CHPS Certified.
   2) 2nd Coat: Benjamin Moore Ultra Spec HP D.T.M. Acrylic Low Lustre Enamel HP25 (145 g/L), MPI # 141, X-Green 141, 153, X-Green 153, LEED 2009.
   3) 3rd Coat: Benjamin Moore Ultra Spec HP D.T.M. Acrylic Low Lustre Enamel HP25 (145 g/L), MPI # 141, X-Green 141, 153, X-Green 153, LEED 2009.

f. Flat Finish
   1) 1st Coat: Corotech Acrylic Metal Primer V110 (199 g/L), LEED Credit.
   2) 2nd: Coat: Corotech Acrylic Metal Primer V110 (199 g/L), LEED Credit.

2. Alkyd System (Water Base):
   a. Gloss Finish:
      1) 1st Coat: Corotech Acrylic Metal Primer V110 (199 g/L), LEED Credit.
      2) 2nd Coat: Corotech Water Reducible Alkyd Enamel V210 (331 g/L), MPI # 157.
      3) 3rd Coat: Corotech Water Reducible Alkyd Enamel V210 (331 g/L), MPI # 157.

3. Alkyd System (Solvent Base Finish):
   a. Gloss Finish Urethane Modified:
      1) 1st Coat: Corotech Acrylic Metal Primer V110 (199 g/L), LEED Credit.
      2) 2nd Coat: Corotech Alkyd Urethane Gloss V200 (336 g/L), MPI # 9, 27, 48.
      3) 3rd Coat: Corotech Alkyd Urethane Gloss V200 (336 g/L), MPI # 9, 27, 48.
   b. Gloss Finish Urethane Modified:
      1) 1st Coat: Benjamin Moore Super Spec® HP Acrylic Metal Primer P04 (47 g/L), MPI # 107, X-Green 107, 134, LEED 2009, CHPS Certified.
      2) 2nd Coat: Benjamin Moore Super Spec® HP Urethane Alkyd Gloss Enamel P22 (394 g/L), MPI # 9, 48.
      3) 3rd Coat: Benjamin Moore Super Spec® HP Urethane Alkyd Gloss Enamel P22 (394 g/L), MPI # 9, 48.

4. Epoxy Systems (Water Base):
   a. Gloss Finish
      1) 1st Coat: Corotech Acrylic Metal Primer V110 (199 g/L), LEED Credit.
      2) 2nd Coat: Corotech Acrylic Epoxy V450 (168 g/L).
      3) 3rd Coat: Corotech Acrylic Epoxy V450 (168 g/L).
   b. Gloss Finish
      1) 1st Coat: Corotech Acrylic Metal Primer V110 (199 g/L), LEED Credit.
      2) 2nd Coat: Corotech Waterborne Amine Epoxy V440 (206 g/L).

3) 3rd Coat: Corotech Waterborne Amine Epoxy V440 (206 g/L).

c. Semi-Gloss Finish:
1) 1st Coat: Corotech Acrylic Metal Primer V110 (199 g/L), LEED Credit..
2) 2nd Coat: Corotech Pre-Catalyzed Waterborne Epoxy Semi-Gloss V341 (71 g/L), LEED 2009.
3) 3rd Coat: Corotech Pre-Catalyzed Waterborne Epoxy Semi-Gloss V341 (71 g/L), LEED 2009.

d. Eggshell Finish:
1) 1st Coat: Corotech Acrylic Metal Primer V110 (199 g/L), LEED Credit.
2) 2nd Coat: Corotech Pre-Catalyzed Waterborne Epoxy Eggshell V342 (73 g/L), MPI # 151, LEED 2009
3) 3rd Coat: Corotech Pre-Catalyzed Waterborne Epoxy Eggshell V342 (73 g/L), MPI # 151, LEED 2009

5. Epoxy System (Solvent Base):
a. Semi-Gloss Finish:
1) 1st Coat: Corotech Polyamide Epoxy Primer V150 (330 g/L).
2) 2nd Coat Corotech Acrylic Metal Primer V110 (199 g/L), LEED Credit.

6. Urethane System (Water Base):
a. Gloss Finish:
1) 1st Coat: Corotech Acrylic Metal Primer V110 (199 g/L), LEED Credit.
2) 2nd Coat: Corotech Waterborne Urethane Gloss V540 (10 g/L), LEED Credit.
3) 3rd Coat: Corotech Waterborne Urethane Gloss V540 (10 g/L), LEED Credit.

7. Urethane System (Solvent Base):
a. Gloss Finish:
1) 1st Coat: Corotech Polyamide Epoxy Primer V150 (330 g/L).
2) 2nd Coat: Corotech Aliphatic Acrylic Urethane Gloss V500 (229 g/L), MPI # 72, 78, 83, 105.
3) 3rd Coat: Corotech Aliphatic Acrylic Urethane Gloss V500 (229 g/L), MPI # 72, 78, 83, 105.

b. Semi-Gloss Finish:
1) 1st Coat: Corotech Polyamide Epoxy Primer V150 (330 g/L).
2) 2nd Coat: Corotech Aliphatic Acrylic Urethane Semi-Gloss V510 (305 g/L), MPI # 83, 174.
3) 3rd Coat: Corotech Aliphatic Acrylic Urethane Semi-Gloss V510 (305 g/L), MPI # 83, 174.

F. METAL - (Ceilings - Structural Steel, Joists, Trusses, Beams).
1. MultiSurface Acrylic Coating:
a. Gloss Finish:
1) 1st Coat: Coronado Rust Scat Waterborne Acrylic Gloss 80 (224 g/L), MPI # 114, 154, LEED Credit.
2) 2nd Coat: Coronado Rust Scat Waterborne Acrylic 80 Line (224 g/L), MPI # 114, 154, LEED Credit.

b. Semi-Gloss Finish:
1) 1st Coat: Corotech Prep All Universal Metal Primer V132 (394 g/L).
2) 2nd Coat: Coronado Super Kote 5000 Dry Fall Latex Semi-Gloss 112 (67g/L), MPI # 226.
3) 3rd Coat: Coronado Super Kote 5000 Dry Fall Latex Semi-Gloss 112 (67g/L), MPI # 226.

c. Eggshell Finish:
1) 1st Coat: Corotech Prep All Universal Metal Primer V132 (394 g/L).
2) 2nd Coat: Coronado Super Kote 5000 Dry Fall Latex Flat N110 (46 g/L), MPI # 118.
3) 3rd Coat: Coronado Super Kote 5000 Dry Fall Latex Flat N110 (46 g/L),

MPI # 118.

d. Flat Finish:
   1) 1st Coat: Corotech Prep All Universal Metal Primer V132 (394 g/L).
   2) 2nd Coat: Coronado Super Kote 5000 Dry Fall Latex Flat N110 (46 g/L), MPI # 118.
   3) 3rd Coat: Coronado Super Kote 5000 Dry Fall Latex Flat N110 (46 g/L), MPI # 118.

2. Dryfall Alkyd Topcoats:
   a. Flat Finish:
      1) 1st Coat: Corotech Prep All Universal Metal Primer V132 (394 g/L).
      2) 2nd Coat: Coronado Super Kote 5000 Dry Fall Alkyd Flat 105 (346 g/L), MPI # 55.

G. WOOD - (Doors, Trim, Partitions, Frames).
   1. Latex Systems:
      a. Gloss Finish:
         1) 1st Coat: Benjamin Moore Fresh Start High-Hiding All Purpose Primer 046 (44 g/L), MPI # 6, 17, X-Green 17, 39, 50, X-Green 50, 137, X-Green 137, LEED Credit, CHPS Certified.
         2) 2nd Coat: Coronado Rust Scat Waterborne Acrylic Gloss 80 (224 g/L), MPI # 114, 154, LEED Credit.
         3) 3rd Coat: Coronado Rust Scat Waterborne Acrylic Gloss 80 (224 g/L), MPI # 114, 154, LEED Credit.
      b. Semi-Gloss Finish:
         1) 1st Coat: Benjamin Moore Fresh Start High-Hiding All Purpose Primer 046 (44 g/L), MPI # 6, 17, X-Green 17, 39, 50, X-Green 50, 137, X-Green 137, LEED Credit, CHPS Certified.
         2) 2nd Coat Coronado Rust Scat Waterborne Acrylic Semi-Gloss 90 (134 g/L), MPI # 153, LEED Credit.
         3) 3rd Coat: Coronado Rust Scat Waterborne Acrylic Semi-Gloss 90 (134 g/L), MPI # 153, LEED Credit.
      c. Low Sheen/Satin:
         1) 1st Coat: Benjamin Moore Fresh Start High-Hiding All Purpose Primer 046 (44 g/L), MPI # 6, 17, X-Green 17, 39, 50, X-Green 50, 137, X-Green 137, LEED Credit, CHPS Certified.
         2) 2nd Coat: Benjamin Moore Ultra Spec HP D.T.M. Acrylic Low Lustre Enamel HP25 (145 g/L), MPI # 141, X-Green 141, 153, X-Green 153, LEED 2009.
         3) 3rd Coat: Benjamin Moore Ultra Spec HP D.T.M. Acrylic Low Lustre Enamel HP25 (145 g/L), MPI # 141, X-Green 141, 153, X-Green 153, LEED 2009.
      d. Flat Finish:
         1) 1st Coat: Benjamin Moore Fresh Start High-Hiding All Purpose Primer 046 (44 g/L), MPI # 6, 17, X-Green 17, 39, 50, X-Green 50, 137, X-Green 137, LEED Credit, CHPS Certified.
         2) 2nd Coat: Corotech Acrylic Metal Primer V110 (199 g/L), LEED Credit.
   2. Alkyd System (Water Based):
      a. Gloss Finish:
         1) 1st Coat: Benjamin Moore Fresh Start High-Hiding All Purpose Primer 046 (44 g/L), MPI # 6, 17, X-Green 17, 39, 50, X-Green 50, 137, X-Green 137, LEED Credit, CHPS Certified.
         2) 2nd Coat: Corotech Water Reducible Alkyd Enamel V210 (331 g/L), MPI # 157.
         3) 3rd Coat: Corotech Water Reducible Alkyd Enamel V210 (331 g/L), MPI # 157.
   3. Alkyd System (Solvent Base Finish):

a. Gloss Finish Urethane Modified:
1) 1st Coat: Benjamin Moore Fresh Start High-Hiding All Purpose Primer 046 (44 g/L), MPI # 6, 17, X-Green 17, 39, 50, X-Green 50, 137, X-Green 137, LEED Credit, CHPS Certified.
2) 2nd Coat: Corotech Alkyd Urethane Gloss V200 (336 g/L), MPI # 9, 27, 48.
3) 3rd Coat: Corotech Alkyd Urethane Gloss V200 (336 g/L), MPI # 9, 27, 48.

4. Epoxy System (Water Base):
a. Gloss Finish:
1) 1st Coat: Benjamin Moore Fresh Start High-Hiding All Purpose Primer 046 (44 g/L), MPI # 6, 17, X-Green 17, 39, 50, X-Green 50, 137, X-Green 137, LEED Credit, CHPS Certified.
2) 2nd Coat: Corotech Acrylic Epoxy V450 (168 g/L).
3) 3rd Coat: Corotech Acrylic Epoxy V450 (168 g/L).
b. Gloss Finish:
1) 1st Coat: Benjamin Moore Fresh Start High-Hiding All Purpose Primer 046 (44 g/L), MPI # 6, 17, X-Green 17, 39, 50, X-Green 50, 137, X-Green 137, LEED Credit, CHPS Certified.
2) 2nd Coat: Corotech Waterborne Amine Epoxy V440 (206 g/L).
3) 3rd Coat: Corotech Waterborne Amine Epoxy V440 (206 g/L).
c. Semi-Gloss Finish:
1) 1st Coat: Benjamin Moore Fresh Start High-Hiding All Purpose Primer 046 (44 g/L), MPI # 6, 17, X-Green 17, 39, 50, X-Green 50, 137, X-Green 137, LEED Credit, CHPS Certified.
2) 2nd Coat: Corotech Pre-Catalyzed Waterborne Epoxy Semi-Gloss V341 (71 g/L), LEED 2009.
3) 3rd Coat: Corotech Pre-Catalyzed Waterborne Epoxy Semi-Gloss V341 (71 g/L), LEED 2009.
d. Eggshell Finish:
1) 1st Coat: Benjamin Moore Fresh Start High-Hiding All Purpose Primer 046 (44 g/L), MPI # 6, 17, X-Green 17, 39, 50, X-Green 50, 137, X-Green 137, LEED Credit, CHPS Certified.
2) 2nd Coat: Corotech Pre-Catalyzed Waterborne Epoxy Eggshell V342 (73 g/L), MPI # 151, LEED 2009.
3) 3rd Coat: Corotech Pre-Catalyzed Waterborne Epoxy Eggshell V342 (73 g/L), MPI # 151, LEED 2009.

5. Epoxy System (Solvent Base):
a. Gloss Finish:
1) 1st Coat: Corotech Waterborne Amine Epoxy V440 (206 g/L).
2) 2nd Coat: Corotech Waterborne Amine Epoxy V440 (206 g/L).
b. Gloss Finish:
1) 1st Coat: Corotech Polyamide Epoxy V400 (341 g/L), MPI # 82, 98, 108, 177.
2) 2nd Coat: Corotech Polyamide Epoxy V400 (341 g/L), MPI # 82, 98, 108, 177.

H. DRYWALL - (Walls, Ceilings, Gypsum Board)
1. Latex Systems:
a. Gloss Finish:
1) 1st Coat: Benjamin Moore Ultra Spec 500 Interior Latex Primer N534 (0 g/L), MPI # 50, X-Green 50, 149, X-Green 149, LEED 2009, LEED V4, CHPS Certified
2) 2nd Coat: Benjamin Moore Ultra Spec 500 Interior Latex Gloss N540 (0 g/L), MPI # 54, X-Green 54, 147, 147 X-Green, 141, X-Green 141, LEED 2009, LEED V4, CHPS Certified.

3) 3rd Coat: Benjamin Moore Ultra Spec 500 Interior Latex Gloss N540 (0 g/L), MPI # 54, X-Green 54, 147, 147 X-Green, 141, X-Green 141, LEED 2009, LEED V4, CHPS Certified.

b. Semi-Gloss Finish:
1) 1st Coat: Benjamin Moore Ultra Spec 500 Interior Latex Primer N534 (0 g/L), MPI # 50, X-Green 50, 149, X-Green 149, LEED 2009, LEED V4, CHPS Certified.
2) 2nd Coat: Benjamin Moore Ultra Spec 500 Interior Latex Semi-Gloss N539 (0 g/L), MPI # 43, X-Green 43, 146, X-Green 146, 140, X-Green 140, LEED 2009, LEED V4, CHPS Certified.
3) 3rd Coat: Benjamin Moore Ultra Spec 500 Interior Latex Semi-Gloss N539 (0 g/L), MPI # 43, X-Green 43, 146, X-Green 146, 140, X-Green 140, LEED 2009, LEED V4, CHPS Certified.

c. Low Sheen/ Eggshell:
1) 1st Coat: Benjamin Moore Ultra Spec 500 Interior Latex Primer N534 (0 g/L), MPI # 50, X-Green 50, 149, X-Green 149, LEED 2009, LEED V4, CHPS Certified.
2) 2nd Coat: Benjamin Moore Ultra Spec 500 Latex Eggshell N538 (0 g/L), MPI # 52, X-Green 52, 145, X-Green 145, 139, X-Green 139, LEED 2009, LEED V4, CHPS Certified.
3) 3rd Coat: Benjamin Moore Ultra Spec 500 Latex Eggshell N538 (0 g/L), MPI # 52, X-Green 52, 145, X-Green 145, 139, X-Green 139, LEED 2009, LEED V4, CHPS Certified.

d. Flat Finish:
1) 1st Coat: Benjamin Moore Ultra Spec 500 Interior Latex Primer N534 (0 g/L), MPI # 50, X-Green 50, 149, X-Green 149, LEED 2009, LEED V4, CHPS Certified.
2) 2nd Coat: Benjamin Moore Ultra Spec 500 Interior Latex Flat N536 (0 g/L), MPI # 53, X-Green 53, 143, X-Green 143, LEED 2009, LEED V4, CHPS Certified.

2. Epoxy Systems (Water Base):
a. Gloss Finish:
1) 1st Coat: Benjamin Moore Fresh Start Multi-Purpose Primer N023 (44 g/L), MPI # 6, 17, X-Green 17, 39, 137, X-Green 137, LEED Credit, CHPS Certified.
2) 2nd Coat: Corotech Acrylic Epoxy V450 (168 g/L).
3) 3rd Coat: Corotech Acrylic Epoxy V450 (168 g/L).

b. Semi-Gloss Finish:
1) 1st Coat: Benjamin Moore Fresh Start Multi-Purpose Primer N023 (44 g/L), MPI # 6, 17, X-Green 17, 39, 137, X-Green 137, LEED Credit, CHPS Certified.
2) 2nd Coat: Corotech Pre-Catalyzed Waterborne Epoxy Semi-Gloss V341 (71 g/L), LEED 2009.
3) 3rd Coat: Corotech Pre-Catalyzed Waterborne Epoxy Semi-Gloss V341 (71 g/L), LEED 2009.

c. Eggshell Finish:
1) 1st Coat: Benjamin Moore Fresh Start Multi-Purpose Primer N023 (44 g/L), MPI # 6, 17, X-Green 17, 39, 137, X-Green 137, LEED Credit, CHPS Certified.
2) 2nd Coat: Corotech Pre-Catalyzed Waterborne Epoxy Eggshell V342 (73 g/L), MPI # 151, LEED 2009.
3) 3rd Coat: Corotech Pre-Catalyzed Waterborne Epoxy Eggshell V342 (73 g/L), MPI # 151, LEED 2009.

I. PLASTER - (Walls, Ceilings)
1. Latex Systems:

a. Gloss Finish:
   1) 1st Coat: Benjamin Moore Super Spec® Interior/Exterior Acrylic High Build Masonry Primer N068 (97 g/L), MPI # 3, LEED 2009.
   2) 2nd Coat: Benjamin Moore Ultra Spec D.T.M. Acrylic Gloss Enamel HP28 (142 g/L L), MPI # 114, X-Green 114, 154, X-Green 154, 164, LEED 2009, LEED V4.
   3) 3rd Coat: Benjamin Moore Ultra Spec D.T.M. Acrylic Gloss Enamel HP28 (142 g/L), MPI # 114, X-Green 114, 154, X-Green 154, 164, LEED 2009, LEED V4.

b. Semi-Gloss Finish:
   1) 1st Coat: Benjamin Moore Super Spec® Interior/Exterior Acrylic High Build Masonry Primer N068 (97 g/L), MPI # 3, LEED 2009.
   2) 2nd Coat: Benjamin Moore Ultra Spec HP D.T.M. Acrylic Semi-Gloss Enamel, HP29 (147 g/L), MPI # 141, X-Green 141, 153, X-Green 153, LEED 2009, LEED V4.
   3) 3rd Coat: Benjamin Moore Ultra Spec HP D.T.M. Acrylic Semi-Gloss Enamel, HP29 (147 g/L), MPI # 141, X-Green 141, 153, X-Green 153, LEED 2009, LEED V4.

c. Low Sheen Finish:
   1) 1st Coat: Benjamin Moore Super Spec® Interior/Exterior Acrylic High Build Masonry Primer N068 (97g/L), MPI # 3, LEED 2009.
   2) 2nd Coat: Benjamin Moore Ultra Spec HP D.T.M. Acrylic Low Lustre Enamel HP25 (145 g/L), MPI # 141, X-Green 141, 153, X-Green 153, LEED 2009.
   3) 3rd Coat: Benjamin Moore Ultra Spec HP D.T.M. Acrylic Low Lustre Enamel HP25 (145 g/L), MPI # 141, X-Green 141, 153, X-Green 153, LEED 2009.

d. Flat Finish:
   1) 1st Coat: Benjamin Moore Super Spec® Interior/Exterior Acrylic High Build Masonry Primer N068 (97g/L), MPI # 3, LEED 2009.
   2) 2nd Coat: Corotech Acrylic Metal Primer V110 (199 g/L), LEED Credit.

2. Epoxy Systems (Water Base):
   a. Gloss Finish:
      1) 1st Coat: Benjamin Moore Super Spec® Interior/Exterior Acrylic High Build Masonry Primer N068 (97g/L), MPI # 3, LEED 2009.
      2) 2nd Coat: Corotech Acrylic Epoxy V450 (168 g/L).
      3) 3rd Coat: Corotech Acrylic Epoxy V450 (168 g/L).

   b. Semi-Gloss Finish:
      1) 1st Coat: Benjamin Moore Super Spec® Interior/Exterior Acrylic High Build Masonry Primer N068 (97g/L), MPI # 3, LEED 2009.
      2) 2nd Coat: Corotech Pre-Catalyzed Waterborne Epoxy Semi-Gloss V341 (71 g/L), LEED 2009. .
      3) 3rd Coat: Corotech Pre-Catalyzed Waterborne Epoxy Semi-Gloss V341 (71 g/L), LEED 2009.

   c. Eggshell Finish:
      1) 1st Coat: Benjamin Moore Super Spec® Interior/Exterior Acrylic High Build Masonry Primer N068 (97g/L), MPI # 3, LEED 2009.
      2) 2nd Coat: Corotech Pre-Catalyzed Waterborne Epoxy Eggshell V342 (73 g/L), MPI # 151, LEED 2009.
      3) 3rd Coat: Corotech Pre-Catalyzed Waterborne Epoxy Eggshell V342 (73 g/L), MPI # 151, LEED 2009.

2.6 EXTERIOR PAINT SYSTEMS - UNITED STATES

A. CONCRETE (Cementitious Siding, Flexboard, Transite Board, Shingles (Non-Roof), Common Brick, Stucco, Tilt-up, Precast, and Poured-in-place Cement).

1. Latex Systems:
   a. Gloss Finish:
      1) 1st Coat: Benjamin Moore Super Spec® Interior/Exterior Acrylic High Build Masonry Primer N068 (97g/L), MPI # 3, LEED 2009.
      2) 2nd Coat: Benjamin Moore Ben Waterborne Exterior Soft-Gloss 543 (45 g/L), MPI # 11.
      3) 3rd Coat: Benjamin Moore Ben Waterborne Exterior Soft-Gloss 543 (45 g/L), MPI # 11.
   b. Semi-Gloss Finish:
      1) 1st Coat: Benjamin Moore Super Spec® Interior/Exterior Acrylic High Build Masonry Primer N068 (97g/L), MPI # 3, LEED 2009.
      2) 2nd Coat: Benjamin Moore Regal Select Exterior High-Build Soft-Gloss N403 (43 g/L), MPI # 11, 311.
      3) 3rd Coat: Benjamin Moore Regal Select Exterior High-Build Soft-Gloss N403 (43 g/L), MPI # 11, 311.
   c. Satin Finish:
      1) 1st Coat: Benjamin Moore Super Spec® Interior/Exterior Acrylic High Build Masonry Primer N068 (97g/L), MPI # 3, LEED 2009.
      2) 2nd Coat: Benjamin Moore Ultra Spec EXT Satin N448 (46 g/L), MPI # 15.
      3) 3rd Coat: Benjamin Moore Ultra Spec EXT Satin N448 (46 g/L), MPI # 15.
   d. Satin Finish:
      1) 1st Coat: Benjamin Moore Super Spec® Interior/Exterior Acrylic High Build Masonry Primer N068 (97g/L), MPI # 3, LEED 2009.
      2) 2nd Coat: Benjamin Moore Regal Select Exterior High-Build Low Lustre N401 (40 g/L), MPI # 15, 315.
      3) 3rd Coat: Benjamin Moore Regal Select Exterior High-Build Low Lustre N401 (40 g/L), MPI # 15, 315.
   e. Flat Finish:
      1) 1st Coat: Benjamin Moore Super Spec® Interior/Exterior Acrylic High Build Masonry Primer N068 (97g/L), MPI # 3, LEED 2009.
      2) 2nd Coat: Benjamin Moore ben Waterborne Exterior Flat 541 (44 g/L), MPI # 10.
      3) 3rd Coat: Benjamin Moore ben Waterborne Exterior Flat 541 (44 g/L), MPI # 10.
   f. Flat Finish:
      1) 1st Coat: Benjamin Moore Super Spec® Interior/Exterior Acrylic High Build Masonry Primer N068 (97g/L), MPI # 3, LEED 2009.
      2) 2nd Coat: Benjamin Moore Regal Select Exterior High-Build Flat Finish N400 (42 g/L) MPI # 10.
      3) 3rd Coat: Benjamin Moore Regal Select Exterior High-Build Flat Finish N400 (42 g/L) MPI # 10.
   g. High Build Coating:
      1) 1st Coat: Coronado Texcrete WB Acrylic Masonry Waterproofer Smooth Finish 3194 (90 g/L), LEED Credit.
2. Elastomeric System: Not including cementitious siding, Flexboard, Transite board or shingles (non-roof).
   a. Flat Finish:
      1) 1st Coat: Benjamin Moore Super Spec® Interior/Exterior Acrylic High Build Masonry Primer N068 (97g/L), MPI # 3, LEED 2009.
      2) 2nd Coat: Benjamin Moore Super Spec® Masonry 100% Acrylic Elastomeric Coating Flat 056 (99 g/L).
      3) 3rd Coat: Benjamin Moore Super Spec® Masonry 100% Acrylic Elastomeric Coating Flat 056 (99 g/L).
3. Textured and Smooth Systems:

a. Textured (Water Based Finish):
1) 1st Coat: Coronado Texcrete WB Acrylic Masonry Waterproofer Smooth 3194 (90 g/L), LEED Credit.
2) 2nd Coat:
a) Finish Texture- Fine: Coronado Texcrete WB Acrylic Masonry Waterproofer Sand Finish 3192 (78 g/L), LEED Credit.
b) Finish Texture- Smooth: Coronado Texcrete WB Acrylic Masonry Waterproofer Smooth Finish 3194 Line (90 g/L), LEED Credit.
c) Finish Texture- Medium: Coronado Texcrete WB Acrylic Masonry Waterproofer Medium Finish 3196 Line (20 g/L), MPI # 42, LEED Credit.

b. Smooth (Water Based Finish):
1) 1st Coat: Coronado Texcrete WB Acrylic Masonry Waterproofer Smooth Finish 3194 (90 g/L), LEED Credit.
2) 2nd Coat: Coronado Texcrete WB Acrylic Masonry Waterproofer Smooth Finish 3194 (90 g/L), LEED Credit.

4. Stain System:
a. Solid Color Waterborne Finish:
1) 1st Coat: Coronado TuffCrete Waterborne Acrylic Concrete Stain CST-2000 (153 g/L), MPI # 58.
2) 2nd Coat: Coronado TuffCrete Waterborne Acrylic Concrete Stain CST-2000 (153 g/L), MPI # 58.

B. MASONRY: Concrete Masonry Units (CMU) - Cinder or Concrete Block.
1. Latex Systems:
a. Gloss Finish:
1) 1st Coat: Coronado Super Kote 5000 Production Block Filler 958-11 (35 g/L), MPI # 4, X-Green 4, LEED V4, CHPS Certified.
2) 2nd Coat: Coronado Cryli Cote 100% Acrylic Gloss House & Trim Paint 2 (94 g/L).
3) 3rd Coat: Coronado Cryli Cote 100% Acrylic Gloss House & Trim Paint 2 (94 g/L).

b. Gloss Finish - Early Moisture Resistant Finish:
1) 1st Coat: Benjamin Moore Super Spec® Masonry Interior/Exterior Hi-Build Block Filler 206 (45 g/L), MPI # 4, X-Green 4, LEED 2009, LEED V4, CHPS Certified.
2) 2nd Coat: Benjamin Moore Regal Select Exterior High-Build Soft-Gloss N403 (43 g/L), MPI # 11, 311.
3) 3rd Coat: Benjamin Moore Regal Select Exterior High-Build Soft-Gloss N403 (43 g/L), MPI # 11, 311.

c. Semi-Gloss Finish:
1) 1st Coat: Coronado Super Kote 5000 Production Block Filler 958-11 (35 g/L), MPI # 4, X-Green 4, LEED V4, CHPS Certified.
2) 2nd Coat: Benjamin Moore Ultra Spec HP D.T.M. Acrylic Semi-Gloss Enamel, HP29 (147 g/L), MPI # 141, X-Green 141, 153, X-Green 153, LEED 2009, LEED V4.
3) 3rd Coat: Benjamin Moore Ultra Spec HP D.T.M. Acrylic Semi-Gloss Enamel, HP29 (147 g/L), MPI # 141, X-Green 141, 153, X-Green 153, LEED 2009, LEED V4.

d. Satin Finish:
1) 1st Coat: Coronado Super Kote 5000 Production Block Filler 958-11 (35 g/L), MPI # 4, X-Green 4, LEED V4, CHPS Certified.
2) 2nd Coat: Coronado Cryli Cote 100% Acrylic Satin House & Trim Paint 410 (83 g/L).
3) 3rd Coat: Coronado Cryli Cote 100% Acrylic Satin House & Trim Paint 410 (83 g/L).

e. Satin Finish - Early Moisture Resistant Finish:
   1) 1st Coat: Benjamin Moore Super Spec® Masonry Interior/Exterior Hi-Build Block Filler 206 (45 g/L), MPI # 4, X-Green 4, LEED 2009, LEED V4, CHPS Certified.
   2) 2nd Coat: Benjamin Moore Regal Select Exterior High-Build Low Lustre N401 (40 g/L), MPI # 15, 315.
   3) 3rd Coat: Benjamin Moore Regal Select Exterior High-Build Low Lustre N401 (40 g/L), MPI # 15, 315.

f. Flat Finish:
   1) 1st Coat: Coronado Super Kote 5000 Production Block Filler 958-11 (35 g/L), MPI # 4, X-Green 4, LEED V4, CHPS Certified.
   2) 2nd Coat: Coronado Cryli Cote 100% Acrylic Flat House & Trim Paint 10 (44 g/L), MPI # 10.
   3) 3rd Coat: Coronado Cryli Cote 100% Acrylic Flat House & Trim Paint 10 (44 g/L), MPI # 10.

g. Flat-Early Moisture Resistant Finish:
   1) 1st Coat: Benjamin Moore Super Spec® Masonry Interior/Exterior Hi-Build Block Filler 206 (45 g/L), MPI # 4, X-Green 4, LEED 2009, LEED V4, CHPS Certified.
   2) 2nd Coat: Benjamin Moore Regal Select Exterior High-Build Flat Finish N400 (42 g/L) MPI # 10.
   3) 3rd Coat: Benjamin Moore Regal Select Exterior High-Build Flat Finish N400 (42 g/L) MPI # 10.

h. High Build Coating
   1) 1st Coat: Coronado Texcrete WB Acrylic Masonry Waterproofer Smooth Finish 3194 (90 g/L), LEED Credit.

2. Elastomeric System:
   a. Flat Finish
      1) 1st Coat: Benjamin Moore Super Spec® Masonry Interior/Exterior Hi-Build Block Filler 206 (45 g/L), MPI # 4, X-Green 4, LEED 2009, LEED V4, CHPS Certified.
      2) 2nd Coat: Benjamin Moore Super Spec® Masonry 100% Acrylic Elastomeric Coating Flat 056 (99 g/L).
      3) 3rd Coat: Benjamin Moore Super Spec® Masonry 100% Acrylic Elastomeric Coating Flat 056 (99 g/L).
3. Textured Masonry System:
   a. Textured (Water Based Finish)
      1) 1st Coat: Coronado Texcrete WB Acrylic Masonry Waterproofer Smooth Finish 3194 (90 g/L), LEED Credit.
      2) 2nd Coat: Coronado Texcrete WB Textured Waterproofer
         a) Finish Texture Sand: 3192 (78 g/L), LEED Credit.
         b) Finish Texture Medium: 3196 (20 g/L) MPI # 42, LEED Credit.
   b. Smooth (Water Based)
      1) 1st Coat: Coronado Texcrete WB Acrylic Masonry Waterproofer Smooth Finish 3194 (90 g/L), LEED Credit.
      2) 2nd Coat: Coronado Texcrete WB Acrylic Masonry Waterproofer Smooth Finish 3194 (90 g/L), LEED Credit.
4. Stain System:
   a. Solid Color Waterborne Stain Finish:
      1) 1st Coat: Insl-X TuffCrete Solvent Acrylic Concrete Stain & Waterproofing Sealer CST-5100 (651 g/L), MPI # 58, 104.
      2) 2nd Coat: Insl-X TuffCrete Solvent Acrylic Concrete Stain & Waterproofing Sealer CST-5100 (651 g/L), MPI # 58, 104.
5. Clear Water Repellant:
   a. Clear Finish
      1) 1st Coat: Coronado Texcrete Silicone Water Repellant 194 (21 g/L), MPI

117, LEED Credit.
2) 2nd Coat: Coronado Texcrete Silicone Water Repellant 194 (21 g/L), MPI # 117, LEED Credit.

C. CONCRETE: Concrete Floors (non-vehicular), Patios, Porches, Steps and Platforms.
1. Acrylic System Water-Based:
a. Floor Finish:
1) 1st Coat: Benjamin Moore Floor & Patio Latex Enamel Low Sheen N122 (45 g/L), LEED 2009.
2) 2nd Coat: Benjamin Moore Floor & Patio Latex Enamel Low Sheen N122 (45 g/L), LEED 2009.

D. METAL: Aluminum, Galvanized.
1. Latex Systems:
a. Gloss Finish:
1) 1st Coat: Benjamin Moore Ultra Spec EXT Gloss Finish N449 (46 g/L) MPI # 11.
2) 2nd Coat: Benjamin Moore Ultra Spec EXT Gloss Finish N449 (46 g/L) MPI # 11.
b. Gloss Finish- Early Moisture Resistant Finish
1) 1st Coat: Benjamin Moore Ultra Spec D.T.M. Acrylic Gloss Enamel HP28 (142 g/L), MPI # 114, X-Green 114, 154, X-Green 154, 164, LEED 2009, LEED V4.
2) 2nd Coat: Benjamin Moore Ultra Spec D.T.M. Acrylic Gloss Enamel HP28 (142 g/L), MPI # 114, X-Green 114, 154, X-Green 154, 164, LEED 2009, LEED V4.
c. Semi-Gloss Finish:
1) 1st Coat: Benjamin Moore Ultra Spec HP Acrylic DTM Semi-Gloss Enamel HP29 (147 g/L), MPI # 141, X-Green 141, 153, X-Green 153, LEED 2009.
2) 2nd Coat: Benjamin Moore Ultra Spec HP Acrylic DTM Semi-Gloss Enamel HP29 (147 g/L), MPI # 141, X-Green 141, 153, X-Green 153, LEED 2009.
d. Satin Finish:
1) 1st Coat: Benjamin Moore Ultra Spec EXT Satin N448 (46 g/L), MPI # 15.
2) 2nd Coat: Benjamin Moore Ultra Spec EXT Satin N448 (46 g/L), MPI # 15.
e. Satin Finish- Early Moisture Resistant Finish:
1) 1st Coat: Benjamin Moore Regal Select Exterior High-Build Low Lustre N401 (40 g/L), MPI # 15, 315.
2) 2nd Coat: Benjamin Moore Regal Select Exterior High-Build Low Lustre N401 (40 g/L), MPI # 15, 315.
f. Flat Finish:
1) 1st Coat: Benjamin Moore Ultra Spec Exterior Flat Finish N447 (45 g/L), MPI # 10.
2) 2nd Coat: Benjamin Moore Ultra Spec Exterior Flat Finish N447 (45 g/L), MPI # 10.
g. Flat Finish- Early Moisture Resistant Finish:
1) 1st Coat: Benjamin Moore Regal Select Exterior High-Build Flat Finish N400 (42 g/L) MPI # 10.
2) 2nd Coat: Benjamin Moore Regal Select Exterior High-Build Flat Finish N400 (42 g/L) MPI # 10.

E. METAL: Misc. Iron, Ornamental Iron, Structural Iron and Steel, Ferrous Metal.
1. Latex Systems:

a. Gloss Finish
   1) 1st Coat: Corotech Acrylic Metal Primer V110 (199 g/L), LEED Credit.
   2) 2nd Coat: Benjamin Moore Ultra Spec EXT Gloss Finish N449 (46 g/L) MPI # 11.
   3) 3rd Coat: Benjamin Moore Ultra Spec EXT Gloss Finish N449 (46 g/L) MPI # 11.

b. Semi-Gloss Finish
   1) 1st Coat: Corotech Acrylic Metal Primer V110 (199 g/L), LEED Credit.
   2) 2nd Coat: Benjamin Moore Ultra Spec HP D.T.M. Acrylic Semi-Gloss Enamel, HP29 (147 g/L), MPI # 141, X-Green 141, 153, X-Green 153, LEED 2009, LEED V4.
   3) 3rd Coat: Benjamin Moore Ultra Spec HP D.T.M. Acrylic Semi-Gloss Enamel, HP29 (147 g/L), MPI # 141, X-Green 141, 153, X-Green 153, LEED 2009, LEED V4.

F. WOOD: Decks, Exterior including pressure treated lumber, Floors (non-Vehicular), Platforms.
1. Acrylic Water-Based Floor System:
   a. Floor Finish:
      1) 1st Coat: Benjamin Moore Fresh Start Multi-Purpose Primer N023 (44 g/L), MPI # 6, 17, X-Green 17, 39, 137, X-Green 137, LEED Credit, CHPS Certified.
      2) 2nd Coat: Benjamin Moore Floor & Patio Latex Enamel Low Sheen N122 (45 g/L), LEED 2009.
2. Stain Systems:
   a. Solid Color Acrylic Latex:
      1) 1st Coat: Benjamin Moore Arborcoat Solid Deck & Siding Stain 640 (93 g/L), MPI # 16.
      2) 2nd Coat: Benjamin Moore Arborcoat Solid Deck & Siding Stain 640 (93 g/L), MPI # 16.
   b. Semi-Transparent Stain:
      1) 1st Coat: Benjamin Moore Arborcoat Semi-Transparent Deck & Siding Stain N638 (92 g/L), MPI # 156.
      2) 2nd Coat: Benjamin Moore Arborcoat Semi-Transparent Deck & Siding Stain N638 (92 g/L), MPI # 156.
   c. Clear Stain:
      1) 1st Coat: Benjamin Moore Arborcoat Waterproofer 320 (34 g/L).

G. WOOD: Siding, Trim, Shutters, Sashes, Hardboard-Bare/Primed.
1. Latex Systems:
   a. Gloss Finish:
      1) 1st Coat: Benjamin Moore Fresh Start High-Hiding All Purpose Primer 046 (44 g/L), MPI # 6, 17, X-Green 17, 39, 50, X-Green 50, 137, X-Green 137, LEED Credit, CHPS Certified.
      2) 2nd Coat: Benjamin Moore Ultra Spec EXT Gloss Finish N449 (46 g/L), MPI # 11.
      3) 3rd Coat: Benjamin Moore Ultra Spec EXT Gloss Finish N449 (46 g/L), MPI # 11.
   b. Gloss Finish - Early Moisture Resistant Finish:
      1) 1st Coat: Benjamin Moore Fresh Start High-Hiding All Purpose Primer 046 (44 g/L), MPI # 6, 17, X-Green 17, 39, 50, X-Green 50, 137, X-Green 137, LEED Credit, CHPS Certified.
      2) 2nd Coat: Benjamin Moore Regal Select Exterior High-Build Soft-Gloss N403 (43 g/L), MPI # 11, 311.
      3) 3rd Coat: Benjamin Moore Regal Select Exterior High-Build Soft-Gloss N403 (43 g/L), MPI # 11, 311.

c. Semi-Gloss Finish:
1) 1st Coat: Benjamin Moore Fresh Start High-Hiding All Purpose Primer 046 (44 g/L), MPI # 6, 17, X-Green 17, 39, 50, X-Green 50, 137, X-Green 137, LEED Credit, CHPS Certified.
2) 2nd Coat: Benjamin Moore Ultra Spec HP D.T.M. Acrylic Semi-Gloss Enamel, HP29 (147 g/L), MPI # 141, X-Green 141, 153, X-Green 153, LEED 2009, LEED V4.
3) 3rd Coat: Benjamin Moore Ultra Spec HP D.T.M. Acrylic Semi-Gloss Enamel, HP29 (147 g/L), MPI # 141, X-Green 141, 153, X-Green 153, LEED 2009, LEED V4.

d. Satin Finish:
1) 1st Coat: Benjamin Moore Fresh Start High-Hiding All Purpose Primer 046 (44 g/L), MPI # 6, 17, X-Green 17, 39, 50, X-Green 50, 137, X-Green 137, LEED Credit, CHPS Certified.
2) 2nd Coat: Benjamin Moore Ultra Spec EXT Satin N448 (46 g/L), MPI # 15.
3) 3rd Coat: Benjamin Moore Ultra Spec EXT Satin N448 (46 g/L), MPI # 15.

e. Satin Finish - Early Moisture Resistant Finish:
1) 1st Coat: Benjamin Moore Fresh Start High-Hiding All Purpose Primer 046 (44 g/L), MPI # 6, 17, X-Green 17, 39, 50, X-Green 50, 137, X-Green 137, LEED Credit, CHPS Certified.
2) 2nd Coat: Benjamin Moore Regal Select Exterior High-Build Low Lustre N401 (40 g/L), MPI # 15, 315.
3) 3rd Coat: Benjamin Moore Regal Select Exterior High-Build Low Lustre N401 (40 g/L), MPI # 15, 315.

f. Flat Finish:
1) 1st Coat: Benjamin Moore Fresh Start High-Hiding All Purpose Primer 046 (44 g/L), MPI # 6, 17, X-Green 17, 39, 50, X-Green 50, 137, X-Green 137, LEED Credit, CHPS Certified.
2) 2nd Coat: Benjamin Moore Ultra Spec Exterior Flat Finish N447 (45 g/L), MPI # 10.
3) 3rd Coat: Benjamin Moore Ultra Spec Exterior Flat Finish N447 (45 g/L), MPI # 10.

g. Flat Finish - Early Moisture Resistant Finish:
1) 1st Coat: Benjamin Moore Fresh Start High-Hiding All Purpose Primer 046 (44 g/L), MPI # 6, 17, X-Green 17, 39, 50, X-Green 50, 137, X-Green 137, LEED Credit, CHPS Certified.
2) 2nd Coat: Benjamin Moore Regal Select Exterior High-Build Flat Finish N400 (42 g/L) MPI # 10.
3) 3rd Coat: Benjamin Moore Regal Select Exterior High-Build Flat Finish N400 (42 g/L) MPI # 10.

2. Stain - Water Reducible Systems:
a. Semi-Transparent:
1) 1st Coat: Benjamin Moore Arborcoat Semi-Transparent Deck & Siding Stain N638 (92 g/L) MPI # 156.
2) 2nd Coat: Benjamin Moore Arborcoat Semi-Transparent Deck & Siding Stain N638 (92 g/L) MPI # 156.

b. Solid Color:
1) 1st Coat: Benjamin Moore Arborcoat Solid Deck & Siding Stain 640 (93 g/L) MPI # 16.
2) 2nd Coat: Benjamin Moore Arborcoat Solid Deck & Siding Stain 640 (93 g/L) MPI # 16.

H. ARCHITECTURAL PVC, PLASTIC, FIBERGLASS
1. Latex Systems:

a. Gloss Finish:
   1) 1st Coat: Insl-X Stix Waterborne Bonding Primer SXA-110 (47 g/L).
   2) 2nd Coat: Benjamin Moore Ultra Spec EXT Gloss Finish N449 (46 g/L) MPI # 11.
   3) 3rd Coat: Benjamin Moore Ultra Spec EXT Gloss Finish N449 (46 g/L) MPI # 11.
b. Semi-Gloss:
   1) 1st Coat: Insl-X Stix Waterborne Bonding Primer SXA-110 (47 g/L).
   2) 2nd Coat: Benjamin Moore Ben Waterborne Exterior Soft-Gloss 543 (45 g/L), MPI # 11.
   3) 3rd Coat: Benjamin Moore Ben Waterborne Exterior Soft-Gloss 543 (45 g/L), MPI # 11.
c. Satin Finish:
   1) 1st Coat: Insl-X Stix Waterborne Bonding Primer SXA-110 (47 g/L).
   2) 2nd Coat: Benjamin Moore Ultra Spec EXT Satin N448 (46 g/L), MPI # 15.
   3) 3rd Coat: Benjamin Moore Ultra Spec EXT Satin N448 (46 g/L), MPI # 15.
d. Flat Finish:
   1) 1st Coat: Insl-X Stix Waterborne Bonding Primer SXA-110 (47 g/L).
   2) 2nd Coat: Benjamin Moore Ultra Spec Exterior Flat Finish N447 (45 g/L), MPI # 10.
   3) 3rd Coat: Benjamin Moore Ultra Spec Exterior Flat Finish N447 (45 g/L), MPI # 10.

I. DRYWALL: Gypsum Board, Exterior Drywall.
1. Latex Systems:
a. Gloss Finish:
   1) 1st Coat: Benjamin Moore Fresh Start High-Hiding All Purpose Primer 046 (44 g/L), MPI # 6, 17, X-Green 17, 39, 50, X-Green 50, 137, X-Green 137, LEED Credit, CHPS Certified.
   2) 2nd Coat: Benjamin Moore Ben Waterborne Exterior Soft-Gloss 543 (45 g/L), MPI # 11.
   3) 3rd Coat: Benjamin Moore Ben Waterborne Exterior Soft-Gloss 543 (45 g/L), MPI # 11.
b. Gloss Finish - Early Moisture Resistant Finish:
   1) 1st Coat: Benjamin Moore Fresh Start High-Hiding All Purpose Primer 046 (44 g/L), MPI # 6, 17, X-Green 17, 39, 50, X-Green 50, 137, X-Green 137, LEED Credit, CHPS Certified.
   2) 2nd Coat: Benjamin Moore Regal Select Exterior High-Build Soft-Gloss N403 (43 g/L), MPI # 11, 311.
   3) 3rd Coat: Benjamin Moore Regal Select Exterior High-Build Soft-Gloss N403 (43 g/L), MPI # 11, 311.
c. Semi-Gloss Finish:
   1) 1st Coat: Benjamin Moore Fresh Start High-Hiding All Purpose Primer 046 (44 g/L), MPI # 6, 17, X-Green 17, 39, 50, X-Green 50, 137, X-Green 137, LEED Credit, CHPS Certified.
   2) 2nd Coat: Benjamin Moore Ultra Spec HP D.T.M. Acrylic Semi-Gloss Enamel, HP29 (147 g/L), MPI # 141, X-Green 141, 153, X-Green 153, LEED 2009, LEED V4.
   3) 3rd Coat: Benjamin Moore Ultra Spec HP D.T.M. Acrylic Semi-Gloss Enamel, HP29 (147 g/L), MPI # 141, X-Green 141, 153, X-Green 153, LEED 2009, LEED V4.
d. Satin Finish:
   1) 1st Coat: Benjamin Moore Fresh Start High-Hiding All Purpose Primer 046 (44 g/L), MPI # 6, 17, X-Green 17, 39, 50, X-Green 50, 137, X-

Green 137, LEED Credit, CHPS Certified.

2) 2nd Coat: Benjamin Moore ben Exterior Low Luster 542 (45 g/l), MPI # 15.

3) 3rd Coat: Benjamin Moore ben Exterior Low Luster (45 g/l), MPI # 15.

e. Satin Finish - Early Moisture Resistant Finish:

1) 1st Coat: Benjamin Moore Fresh Start High-Hiding All Purpose Primer 046 (44 g/L), MPI # 6, 17, X-Green 17, 39, 50, X-Green 50, 137, X-Green 137, LEED Credit, CHPS Certified.

2) 2nd Coat: Benjamin Moore Regal Select Exterior High-Build Low Lustre N401 (40 g/L), MPI # 15, 315.

3) 3rd Coat: Benjamin Moore Regal Select Exterior High-Build Low Lustre N401 (40 g/L), MPI # 15, 315.

f. Flat Finish:

1) 1st Coat: Benjamin Moore Fresh Start High-Hiding All Purpose Primer 046 (44 g/L), MPI # 6, 17, X-Green 17, 39, 50, X-Green 50, 137, X-Green 137, LEED Credit, CHPS Certified.

2) 2nd Coat: Benjamin Moore ben Waterborne Exterior Flat 541 (44 g/L), MPI # 10.

3) 3rd Coat: Benjamin Moore ben Waterborne Exterior Flat 541 (44 g/L), MPI # 10.

g. Flat Finish - Early Moisture Resistant Finish:

1) 1st Coat: Benjamin Moore Fresh Start High-Hiding All Purpose Primer 046 (44 g/L), MPI # 6, 17, X-Green 17, 39, 50, X-Green 50, 137, X-Green 137, LEED Credit, CHPS Certified.

2) 2nd Coat: Benjamin Moore Regal Select Exterior High-Build Flat Finish N400 (42 g/L) MPI # 10.

3) 3rd Coat: Benjamin Moore Regal Select Exterior High-Build Flat Finish N400 (42 g/L) MPI # 10.

J. VINYL SIDING EIFS, SYNTHETIC STUCCO:

1. Latex Systems:

a. Gloss Finish:

1) 1st Coat: Benjamin Moore Fresh Start Multi-Purpose Primer N023 (44 g/L), MPI # 6, 17, X-Green 17, 39, 137, X-Green 137, LEED Credit, CHPS Certified.

2) 2nd Coat: Benjamin Moore Ultra Spec EXT Gloss Finish N449 (46 g/L) MPI # 11.

3) 3rd Coat: Benjamin Moore Ultra Spec EXT Gloss Finish N449 (46 g/L) MPI # 11.

www.benjaminmoore.com/en-us/for-contractors/painting-vinyland-aluminum-siding Gloss Finish - Vinyl Safe Early Moisture Resistant Finish:

1) 1st Coat: Benjamin Moore Fresh Start Multi-Purpose Primer N023 (44 g/L), MPI # 6, 17, X-Green 17, 39, 137, X-Green 137, LEED Credit, CHPS Certified.

2) 2nd Coat: Benjamin Moore Ultra Spec EXT Gloss Finish N449 (46 g/L), MPI # 11.

3) 3rd: Coat: Benjamin Moore Ultra Spec EXT Gloss Finish N449 (46 g/L), MPI # 11.

c. Semi-Gloss Finish:

1) 1st Coat: Benjamin Moore Regal Select Exterior High-Build Soft-Gloss N403 (43 g/L), MPI # 11, 311.

2) 2nd Coat: Benjamin Moore Regal Select Exterior High-Build Soft-Gloss N403 (43 g/L), MPI # 11, 311.

d. Satin Finish:

1) 1st Coat: Benjamin Moore Fresh Start Multi-Purpose Primer N023 (44 g/L), MPI # 6, 17, X-Green 17, 39, 137, X-Green 137, LEED Credit,

CHPS Certified.
2) 2nd Coat: Benjamin Moore Ultra Spec EXT Satin N448 (46 g/L), MPI # 15.
3) 3rd Coat: Benjamin Moore Ultra Spec EXT Satin N448 (46 g/L), MPI # 15.

e. Satin Finish - Vinyl Safe Early Moisture Resistant Finish:
1) 1st Coat: Benjamin Moore Fresh Start Multi-Purpose Primer N023 (44 g/L), MPI # 6, 17, X-Green 17, 39, 137, X-Green 137, LEED Credit, CHPS Certified.
2) 2nd Coat: Regal Select Exterior Revive 544 (36 g/L).
3) 3rd Coat: Regal Select Exterior Revive 544 (36 g/L).

f. Flat Finish:
1) 1st Coat: Benjamin Moore Fresh Start Multi-Purpose Primer N023 (44 g/L), MPI # 6, 17, X-Green 17, 39, 137, X-Green 137, LEED Credit, CHPS Certified.
2) 2nd Coat: Benjamin Moore Ultra Spec Exterior Flat Finish N447 (45 g/L), MPI # 10.
3) 3rd Coat: Benjamin Moore Ultra Spec Exterior Flat Finish N447 (45 g/L), MPI # 10.

g. Flat Finish - Vinyl Safe Early Moisture Resistant Finish:
1) 1st Coat: Benjamin Moore Fresh Start Multi-Purpose Primer N023 (44 g/L), MPI # 6, 17, X-Green 17, 39, 137, X-Green 137, LEED Credit, CHPS Certified.
2) 2nd Coat: Benjamin Moore Ultra Spec Exterior Flat Finish N447 (45 g/L), MPI # 10.
3) 3rd Coat: Benjamin Moore Ultra Spec Exterior Flat Finish N447 (45 g/L), MPI # 10.

PART 3 EXECUTION

3.1 EXAMINATION

A. The Contractor shall review the product manufacturer's special instructions for surface preparation, application, temperature, re-coat times, and product limitations.

B. The Contractor shall review product health and safety precautions listed by the manufacturer.

C. The Contractor shall be responsible for enforcing on site health and safety requirements associated with the Work.

D. Do not begin installation until substrates have been properly prepared.

E. Ensure that surfaces to receive paint are dry immediately prior to application.

F. Ensure that moisture-retaining substrates to receive paint have moisture content within tolerances allowed by coating manufacturer. Where exceeding the following values, promptly notify Architect and obtain direction before beginning work.
1. Concrete and Masonry: 3-5 percent. Allow new concrete to cure a minimum of 28 days.
2. Exterior Wood: 17 percent.
3. Interior Wood: 15 percent.
4. Interior Finish Detail Woodwork, Including Trim, and Casework: 10 percent.
5. Plaster and Gypsum: 15 percent.
6. Concrete Slab-On-Grade: Perform calcium chloride test over 24 hour period or other acceptable test to manufacturer. Verify acceptable moisture transmission and pH levels.

G. Examine surfaces to receive coatings for surface imperfections and contaminants that could impair performance or appearance of coatings, including but not limited to, loose primer, rust, scale, oil, grease, mildew, algae, or fungus, stains or marks, cracks, indentations, or abrasions.

H. Correct conditions that could impair performance or appearance of coatings in accordance with specified surface preparation procedures before proceeding with coating application.

3.2 PREPARATION - GENERAL

A. Clean surfaces thoroughly prior to coating application.

B. Do not start work until surfaces to be finished are in proper condition to produce finished surfaces of uniform, satisfactory appearance.

C. Stains and Marks: Remove completely, if possible, using materials and methods recommended by coating manufacturer; cover stains and marks which cannot be completely removed with isolating primer or sealer recommended by coating manufacturer to prevent bleed-through.

D. Remove Mildew, Algae, and Fungus using materials and methods recommended by coating manufacturer.

E. Remove dust and loose particulate matter from surfaces to receive coatings immediately prior to coating application.

F. Remove or protect adjacent hardware, electrical equipment plates, mechanical grilles and louvers, lighting fixture trim, and other items not indicated to receive coatings.

G. Move or protect equipment and fixtures adjacent to surfaces indicated to receive coatings to allow application of coatings.

H. Protect adjacent surfaces not indicated to receive coatings.

I. Prepare surfaces in accordance with manufacturer's instructions for specified coatings and indicated materials, using only methods and materials recommended by coating manufacturer.

3.3 SURFACE PREPARATION

A. Concrete and Concrete Masonry: Clean surfaces free of loose particles, sand, efflorescence, laitance, form oil, curing compounds, and other substances which could impair coating performance or appearance.

B. Concrete Floors: Remove contaminants which could impair coating performance or appearance. Verify moisture transmission and alkaline-acid balance recommended by coating manufacturer; mechanically abrade surface to achieve 80-100 grit medium-sandpaper texture.

C. Existing Coatings:
1. Remove surface irregularities by scraping or sanding to produce uniform substrate for coating application; apply one coat primer of type recommended by coating manufacturer for maximum coating adhesion.
2. If presence of lead in existing coatings is suspected, cease surface preparation and notify Architect immediately.

D. Gypsum Board: Repair cracks, holes and other surface defects with joint compound to produce surface flush with adjacent surfaces.

E. Masonry Surfaces - Restored: Remove loose particles, sand, efflorescence, laitance, cleaning compounds and other substances that could impair coating performance or appearance.

F. Metals - Aluminum, Mill-Finish: Clean and etch surfaces with a phosphoric acid-water solution or water based industrial cleaner. Flush with clean water and allow to dry, before applying primer coat.

G. Metals - Copper: Clean surfaces with pressurized steam, pressurized water, or solvent washing.

H. Metals - Ferrous, Unprimed: Remove rust or scale, if present, by wire brush cleaning, power tool cleaning, or sandblast cleaning; remove grease, oil, and other contaminants which could impair coating performance or appearance by solvent cleaning, with phosphoric-acid solution cleaning of welds, bolts and nuts; spot-prime repaired welds with specified primer.

I. Metals - Ferrous, Shop-Primed: Remove loose primer and rust, if present, by scraping and sanding, feathering edges of cleaned areas to produce uniform flat surface; solvent-clean surfaces and spot-prime bare metal with specified primer, feathering edges to produce uniform flat surface.

J. Metals - Galvanized Steel (not passivated): Clean with a water-based industrial strength cleaner, apply an adhesion promoter followed by a clean water rinse. Alternately, wipe down surfaces using clean, lint-free cloths saturated with xylene or lacquer thinner; followed by wiping the surface dry using clean, lint-free cloths.

K. Metals - Galvanized Steel, Passivated: Clean with water-based industrial strength cleaner. After the surface has been prepared, apply recommended primer to a small area. Allow primer to cure for 7 days, and test adhesion using the "cross-hatch adhesion tape test" method in accordance with ASTM D 3359. If the adhesion of the primer is positive, proceed with a recommended coating system for galvanized metal.

L. Metals - Stainless Steel: Clean surfaces with pressurized steam, pressurized water, or water-based industrial cleaner.

M. Plaster: Repair cracks, holes and other surface defects as required to maintain proper surface adhesion. Apply patching plaster or Joint compound and sand to produce surface flush with adjacent undamaged surface. Allow a full cure prior to coating application as recommended by the patching compound manufacturer's recommendations.

N. Polyvinyl Chloride (PVC) Pipe: remove contaminants and markings with denatured alcohol scuff sand and wipe with solvent for maximum adhesion. Test adhesion before starting the job.

O. Fiberglass Doors - remove contaminants with cleaning solvent (alcohol) scuff sand and wipe. Test adhesion of primer before starting job.

P. Textiles - Insulated Coverings, Canvas or Cotton: Clean using high-pressure air and solvent of type recommended for material.

Q. Wood:
1. Seal knots, pitch streaks, and sap areas with sealer recommended by coating manufacturer; fill nail recesses and cracks with filler recommended by coating manufacturer; sand surfaces smooth.
2. Remove mill marks and ink stamped grade marks.
3. Apply primer coat to back of wood trim and paneling.

R. Wood Doors: Seal door tops and bottoms prior to finishing.

S. Wood Doors - Field-Glazed Frames and Sash: Prime or seal glazing channels prior to glazing.

3.4 APPLICATION - GENERAL

A. Application of primers, paints, stains or coatings, by the Contractor, will serve as acceptance that surfaces were properly prepared in accordance with the manufacturer's recommendation.

B. Apply each coat to uniform coating thickness in accordance with manufacturer's instructions, not exceeding manufacturer's specified maximum spread rate for indicated surface; thins, brush marks, roller marks, orange-peel, or other application imperfections are not permitted.

C. Allow manufacturer's specified drying time, and ensure correct coating adhesion, for each coat before applying next coat.

D. Inspect each coat before applying next coat; touch-up surface imperfections with coating material, feathering, and sanding if required; touch-up areas to achieve flat, uniform surface without surface defects visible from 5 feet (1.5 m).

E. Remove dust and other foreign materials from substrate immediately prior to applying each coat.

F. Where paint application abuts other materials or other coating color, terminate coating with a clean sharp termination line without coating overlap.

G. Where color changes occur between adjoining spaces, through framed openings that are of same color as adjoining surfaces, change color at outside stop corner nearest to face of closed door.

H. Re-prepare and re-coat unsatisfactory finishes; refinish entire area to corners or other natural terminations.

3.5 CLEANING

A. Clean excess coating materials, and coating materials deposited on surfaces not indicated to receive coatings, as construction activities of this section progress; do not allow to dry.

B. Re-install hardware, electrical equipment plates, mechanical grilles and louvers, lighting fixture trim, and other items that have been removed to protect from contact with coatings.

C. Reconnect equipment adjacent to surfaces indicated to receive coatings.

D. Relocate to original position equipment and fixtures that have been moved to allow application of coatings.

E. Remove protective materials.

3.6 PROTECTION AND REPAIR

A. Protect completed coating applications from damage by subsequent construction activities until completion of painting project.

B. Touch-up coatings damaged by subsequent construction activities.

END OF SECTION

SECTION 101419
SIGNAGE AND GRAPHICS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Dimensional characters.
   a. Cutout dimensional characters.
   b. ADA and Wayfinding Plaques
   c. Exterior Building Wall Wrap

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For signs.

1. Include fabrication and installation details and attachments to other work.
2. Show sign mounting heights, locations of supplementary supports to be provided by other installers, and accessories.
3. Show message list, typestyles, graphic elements, and layout for each sign at least half size

C. Samples: For each exposed product and for each color and texture specified.

1.3 CLOSEOUT SUBMITTALS

A. Maintenance data.

1.4 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of signs that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 DIMENSIONAL CHARACTERS

A. Cutout Characters : Characters with uniform faces; square-cut, smooth , eased edges; precisely formed lines and profiles; and as follows:

1. Character Material: Sheet or plate aluminum.
2. Character Height: As indicated on Drawings.
3. Thickness: 1/2”
4. Finishes:
   a. Integral Aluminum Finish: Brushed Satin.
5. Mounting: Back Stud & Spacer to CMU – Coordinate with Wall Assembly Thickness

2.2 ADA Wayfinding Plaques:

1. Material: Acrylic Sheet: ASTM D4802, category as standard with manufacturer for each sign
2. Color: Manufacturer's standard integral color process, Color and Pattern to be determined.
3. Size: As indicated on Drawings.
4. Mounting: Adhesive

2.3 EXTERIOR BUILDING WRAP

1. Material: 3M Exterior Graphic Building Wrap Film or approved substitution
2. Color: Custom School Branded Graphic to be determined.
3. Imaging Method: Digital Print or as recommended by MFR.
4. Application Surface: Existing Flat Sectioned Metal Panel
5. Opacity: Opaque
6. Maximize UV Resistance

2.4 ACCESSORIES

A. Fasteners and Anchors: Manufacturer's standard as required for secure anchorage of signs, noncorrosive and compatible with each material joined, and complying with the following:

1. Use concealed fasteners and anchors unless indicated to be exposed.

2.5 FABRICATION

A. General: Provide manufacturer's standard sign assemblies according to requirements indicated.

1. Mill joints to a tight, hairline fit. Form assemblies and joints exposed to weather to resist water penetration and retention.
2. Provide welds and brazes behind finished surfaces without distorting or discoloring exposed side. Clean exposed welded and brazed connections of flux, and dress exposed and contact surfaces.
3. Conceal connections if possible; otherwise, locate connections where they are inconspicuous.
4. Internally brace dimensional characters for stability, to meet structural performance loading without oil-canning or other surface deformation, and for securing fasteners.
5. Provide rabbets, lugs, and tabs necessary to assemble components and to attach to existing work. Drill and tap for required fasteners. Use concealed fasteners where possible; use exposed fasteners that match sign finish.
6. Castings: Fabricate castings free of warp, cracks, blowholes, pits, scale, sand holes, and other defects that impair appearance or strength. Grind, wire brush, sandblast, and buff

castings to remove seams, gate marks, casting flash, and other casting marks before finishing.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Install signs using mounting methods indicated and according to manufacturer's written instructions.

1. Install signs level, plumb, true to line, and at locations and heights indicated, with sign surfaces free of distortion and other defects in appearance.
2. Before installation, verify that sign surfaces are clean and free of materials or debris that would impair installation.
3. Corrosion Protection: Coat concealed surfaces of exterior aluminum in contact with grout, concrete, masonry, wood, or dissimilar metals, with a heavy coat of bituminous paint.

B. Mounting Methods:

1. Concealed Studs: Using a template, drill holes in substrate aligning with studs on back of sign. Remove loose debris from hole and substrate surface.
   a. Masonry Substrates: Fill holes with adhesive. Leave recess space in hole for displaced adhesive. Place sign in position and push until flush to surface, embedding studs in holes. Temporarily support sign in position until adhesive fully sets.
   b. Thin or Hollow Surfaces: Place sign in position and flush to surface, install washers and nuts on studs projecting through opposite side of surface, and tighten.
2. Projecting Studs: Using a template, drill holes in substrate aligning with studs on back of sign. Remove loose debris from hole and substrate surface.
   a. Masonry Substrates: Fill holes with adhesive. Leave recess space in hole for displaced adhesive. Place spacers on studs, place sign in position, and push until spacers are pinched between sign and substrate, embedding the stud ends in holes. Temporarily support sign in position until adhesive fully sets.
   b. Thin or Hollow Surfaces: Place spacers on studs, place sign in position with spacers pinched between sign and substrate, and install washers and nuts on stud ends projecting through opposite side of surface, and tighten.
3. Through Fasteners: Drill holes in substrate using predrilled holes in sign as template. Countersink holes in sign if required. Place sign in position and flush to surface. Install through fasteners and tighten.
4. Back Bar and Brackets: Remove loose debris from substrate surface and install backbar or bracket supports in position, so that signage is correctly located and aligned.
5. Adhesive: Clean bond-breaking materials from substrate surface and remove loose debris. Apply linear beads or spots of adhesive symmetrically to back of sign and of suitable quantity to support weight of sign after cure without slippage. Keep adhesive away from edges to prevent adhesive extrusion as sign is applied and to prevent visibility of cured adhesive at sign edges. Place sign in position, and push to engage adhesive. Temporarily support sign in position until adhesive fully sets.

C. Remove temporary protective coverings and strippable films as signs are installed.

END OF SECTION 101419

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SECTION 102113.19
PLASTIC TOILET COMPARTMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Solid-plastic toilet compartments configured as toilet enclosures and urinal screens.

1.2 COORDINATION

A. Coordinate requirements for blocking, reinforcing, and other supports concealed within wall.

1.3 ACTION SUBMITTALS

A. Product Data:

1. Solid-plastic toilet compartments:

a. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for toilet compartments.

B. Shop Drawings: For solid-plastic toilet compartments.

1. Include plans, elevations, sections, details, and attachment details.
2. Show locations of cutouts for compartment-mounted toilet accessories.
3. Show locations of centerlines of toilet fixtures.
4. Show locations of floor drains.
5. Show overhead support or bracing locations.

C. Samples for Initial Selection: Manufacturer's standard color sheets, showing full range of available colors for each type of toilet compartment material indicated.

1. Include Samples of hardware and accessories involving material and color selection.

D. Product Schedule: For toilet compartments, prepared by or under the supervision of supplier, detailing location and selected colors for toilet compartment material.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance Data: For toilet compartments.

1.5 MAINTENANCE MATERIAL SUBMITTALS

A. Extra Stock Material: Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Door Hinges: Two hinge(s) with associated fasteners.

2. Latch and Keeper: Two latch(es) and keeper(s) with associated fasteners.
3. Door Bumper: Two bumper(s) with associated fasteners.
4. Door Pull: Two door pull(s) with associated fasteners.
5. Fasteners: Ten fasteners of each size and type.

1.6 FIELD CONDITIONS

A. Field Measurements: Verify actual locations of toilet fixtures, walls, columns, ceilings, and other construction contiguous with toilet compartments by field measurements, and coordinate before fabrication.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Regulatory Requirements: Comply with applicable provisions in the U.S. Department of Justice current ADA Standards for Accessible Design and ICC A117.1 for toilet compartments designated as accessible.

2.2 SOLID-PLASTIC TOILET & SHOWER COMPARTMENTS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Global Partitions Corp., an ASI Group Company.
2. Bradley Partitions
3. General Partitions Mfg. Corp.
4. Scranton Products.
5. Weis-Robart Partitions, Inc.

B. Toilet-Enclosure Style: Overhead Braced, Floor anchored.

C. Urinal-Screen Style: Wall hung.

D. Door, Panel, Screen, and Pilaster Construction: Solid, high-density polyethylene (HDPE) panel material, not less than 1 inch thick, seamless, with eased edges, and with homogenous color and pattern throughout thickness of material.

1. Integral Hinges: Configure doors and pilasters to receive integral hinges.
2. Heat-Sink Strip: Manufacturer's standard continuous, stainless steel strip fastened to exposed bottom edges of solid-plastic components to hinder malicious combustion.
3. Color and Pattern: in each room as selected by Architect from manufacturer's full range (confirm below selection with Architect prior to fabrication).

E. Pilaster Shoes and Sleeves (Caps): Manufacturer's standard design; stainless steel.

1. Polymer Color and Pattern: Matching pilaster.

F. Urinal-Screen Post: Manufacturer's standard post design of material matching the thickness and construction of pilasters; with shoe matching that on the pilaster.

G. Brackets (Fittings):

1. Full-Height (Continuous) Type: Manufacturer's standard design; stainless steel.
   a. Polymer Color and Pattern: Matching pilaster.

H. Overhead Cross Bracing for Ceiling-Hung Units: As recommended by manufacturer and fabricated from solid polymer.

2.3 HARDWARE AND ACCESSORIES

A. Hardware and Accessories, Heavy Duty: Manufacturer's heavy-duty operating hardware and accessories.

1. Hinges: Manufacturer's minimum 0.062-inch- thick stainless steel continuous, cam type that swings to a closed or partially open position, allowing emergency access by lifting door. Mount with through bolts.
2. Latch and Keeper: Manufacturer's heavy-duty, surface-mounted, cast-stainless steel latch unit, designed to resist damage due to slamming, with combination rubber-faced door strike and keeper, and with provision for emergency access. Provide units that comply with regulatory requirements for accessibility at compartments designated as accessible. Mount with through bolts.
3. Coat Hook: Manufacturer's heavy-duty combination cast-stainless steel hook and rubber-tipped bumper, sized to prevent inswinging door from hitting compartment-mounted accessories. Mount with through bolts.
4. Door Bumper: Manufacturer's heavy-duty, rubber-tipped, cast-stainless steel bumper at outswinging doors. Mount with through bolts.
5. Door Pull: Manufacturer's heavy-duty, cast-stainless steel pull at outswinging doors that complies with regulatory requirements for accessibility. Provide units on both sides of doors at compartments designated as accessible. Mount with through bolts.

B. Overhead Bracing: Manufacturer's standard continuous, extruded-aluminum head rail with antigrip profile and in manufacturer's standard finish.

C. Anchorages and Fasteners: Manufacturer's standard exposed fasteners of stainless steel, finished to match the items they are securing, with theft-resistant-type heads. Provide sex-type bolts for through-bolt applications. For concealed anchors, use stainless steel, hot-dip galvanized steel, or other rust-resistant, protective-coated steel compatible with related materials.

2.4 MATERIALS

A. Stainless Steel Sheet: ASTM A240/A240M or ASTM A666, Type 304, stretcher-leveled standard of flatness.

B. Stainless Steel Castings: ASTM A743/A743M.

C. Zamac: ASTM B86, commercial zinc-alloy die castings.

2.5 FABRICATION

A. Fabrication, General: Fabricate toilet compartment components to sizes indicated. Coordinate requirements and provide cutouts for through-partition toilet accessories where required for attachment of toilet accessories.

B. Overhead-Braced Units: Provide manufacturer's standard corrosion-resistant supports, leveling mechanism, and anchors at pilasters to suit floor conditions. Provide shoes at pilasters to conceal supports and leveling mechanism.

C. Floor-Anchored Units: Provide manufacturer's standard corrosion-resistant anchoring assemblies with leveling adjustment nuts at pilasters for structural connection to floor. Provide shoes at pilasters to conceal anchorage.

D. Door Size and Swings: Unless otherwise indicated, provide 24-inch- wide, inswinging doors for standard toilet compartments and 36-inch- wide, outswinging doors with a minimum 32-inch-wide, clear opening for compartments designated as accessible.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions, with Installer present, for compliance with requirements for fastening, support, alignment, operating clearances, and other conditions affecting performance of the Work.

1. Confirm location and adequacy of blocking and supports required for installation.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION OF PLASTIC TOILET COMPARTMENTS

A. General: Comply with manufacturer's written installation instructions. Install units rigid, straight, level, and plumb. Secure units in position with manufacturer's recommended anchoring devices.

1. Maximum Clearances:

a. Pilasters and Panels: 1/2 inch.
b. Panels and Walls: 1 inch.

2. Full-Height (Continuous) Brackets: Secure panels to walls and to pilasters with full-height brackets.

a. Locate bracket fasteners, so holes for wall anchors occur in masonry or tile joints.
b. Align brackets at pilasters with brackets at walls.

B. Overhead-Braced Units: Secure pilasters to floor and level, plumb, and tighten. Set pilasters with anchors penetrating not less than 1-3/4 inches into structural floor unless otherwise indicated in manufacturer's written instructions. Secure continuous head rail to each pilaster with no fewer than two fasteners. Hang doors to align tops of doors with tops of panels and adjust, so tops of doors are parallel with overhead brace when doors are in closed position.

C. Floor-Anchored Units: Set pilasters with anchors penetrating not less than 2 inches into structural floor unless otherwise indicated in manufacturer's written instructions. Level, plumb, and tighten pilasters. Hang doors and adjust, so tops of doors are level with tops of pilasters when doors are in closed position.

D. Urinal Screens: Attach with anchoring devices to suit supporting structure. Set units level and plumb, rigid, and secured to resist lateral impact.

3.3 ADJUSTING

A. Hardware Adjustment: Adjust and lubricate hardware according to hardware manufacturer's written instructions for proper operation. Set hinges on inswinging doors to hold doors open approximately 30 degrees from closed position when unlatched. Set hinges on outswinging doors to return doors to fully closed position.

END OF SECTION 102113.19

SECTION 102800
TOILET ACCESSORIES

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Toilet accessories.
B. Mirrors
C. Attachment hardware.
D. Coordinate the work of this Section with the placement of internal wall reinforcement to receive anchor attachments.

1.2 REFERENCES

A. ANSI A117.1 - Specifications for Making Buildings and Facilities Accessible To and Usable by Physically Handicapped People.
B. ANSI/ASTM A123 - Zinc (Hot-Dip Galvanized) Coatings on Products Fabricated from Rolled, Pressed, and Forged Steel Shapes, Plates, Bars and Strips.
C. ANSI/ASTM A366 - Steel, Carbon, Cold-Rolled Sheet, Commercial Quality.
D. ANSI/ASTM A386 - Zinc Coating (Hot-Dip) on Assembled Steel Products.
E. ANSI/ASTM B456 - Electrodeposited Coatings of Copper Plus Nickel Plus Chromium and Nickel Plus Chromium.
F. ASTM A167 - Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet and Strip.
G. ASTM A269 - Seamless and Welded Austenitic Stainless Steel Tubing for General Service.
H. NEMA LD-3 - High Pressure Decorative Laminates.
I. ADA - Americans with Disabilities Act
J. ANSI A117.1 - Specifications for Making Buildings and Facilities Accessible to and Usable by Physical Handicapped People.

1.3 SUBMITTALS

A. Provide Product Data on accessories describing size, finish, details of function, attachment methods.
B. Submit two samples chips of each specified color and finish.
C. Submit manufacturer's installation instructions for each product.

1.4 REGULATORY REQUIREMENTS

A. Conform to applicable code for installing work in conformance with ANSI A117.1 and ADA.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS – TOILET ROOM ACCESSORIES

A. Bobrick
B. American Specialties Inc.
C. Bradley
D. McKinney
E. Manufacturers of equivalent products submitted and approved in accordance with Section 016000 - Product Requirements.

2.2 MATERIALS

A. Sheet Steel: ANSI/ASTM A366.
B. Stainless Steel Sheet: ASTM A167, Type 304.
C. Tubing: ASTM A269, stainless steel.
D. Adhesive: Contact type, waterproof.
E. Fasteners, Screws, and Bolts: Hot dip galvanized, tamperproof.
F. Expansion Shields: Fiber, lead, or rubber as recommended by accessory manufacturer for component and substrate.

2.3 FABRICATION

A. Weld and grind smooth joints of fabricated components.
B. Form exposed surfaces from single sheet of stock, free of joints.
C. Form surfaces flat without distortion. Maintain flat surfaces without scratches or dents.
D. Back paint components where contact is made with building finishes to prevent electrolysis.
E. Shop assemble components and package complete with anchors and fittings.
F. Provide steel anchor plates, adapters, and anchor components for installation.
G. Hot dip galvanize exposed and painted ferrous metal and fastening devices.

2.4 FACTORY FINISHING

A. Galvanizing: ANSI/ASTM A123 and A386 to 1.25 oz/sq. yd.
B. Shop Primed Ferrous Metals: Pre-treat and clean, spray apply one coat primer and bake.
C. Enamel: Pre-treat to clean conditions, apply one coat primer and a minimum of two coats electrostatic baked enamel.
D. Chrome/Nickel Plating: ANSI/ASTM B456, Type SC 2 satin finish.
E. Stainless Steel: No. 4 satin luster finish.

PART 3 - EXECUTION

3.1 PREPARATION

A. Verify that site conditions are ready to receive work.
B. Beginning of installation means acceptance of existing conditions.
C. Deliver inserts and rough-in frames to site at appropriate time for building-in.
D. Provide templates and rough-in measurements as required.
E. Verify exact location of accessories for installation.

3.2 INSTALLATION

A. Install fixtures, accessories and items in accordance with manufacturers' instructions.
B. Install plumb and level, securely and rigidly anchored to substrate.
C. Protect products from damage caused by subsequent construction activities.
D. Field repair of damaged product finishes is prohibited; replace products having damaged finishes caused by subsequent construction activities.
E. Locate toilet accessories at heights and locations required for compliance with local accessibility regulations and the Americans with Disabilities Act.

3.3 SCHEDULE

Bobrick and American Specialties Inc. is used as a quality standard set to be expected on all items of this Section. Provide accessories where indicated on floor plan. The following accessories are:

A. Mirrors: 1/4" float/plate glass with stainless channel trim, 18” x 36”. Provide minimum 1 at each sink location.

1. Bobrick Series B-165.

B. Sanitary Napkin Disposal. Provide 1 at each toilet location.

1. Bobrick Series B-270.

C. Grab Bars: 1 1/2” O.D. (minimum) stainless steel, with peened surface, with concealed fasteners. Length as indicated on accessible mounting diagram.

1. Bobrick Series.
2. Provide anchors for solid walls or plastic toilet partitions where shown on plans.

D. Tissue Dispenser:

1. Provided by Owner and installed by Contractor. Provide 1 minimum at each toilet location.

E. Paper Towel Dispenser:

1. Provided by Owner and installed by Contractor. Provide (1) minimum per every (2) sinks in restroom. No less than (1) per toilet room.

F. Soap Dispenser:

1. Provided by Owner and installed by Contractor. Provide 1 minimum at each sink location

G. Sanitary Product Dispenser

1. Provided by Owner and installed by Contractor. Provide 1 at each gang restroom.

H. Coat Hooks: Heavy duty clothes hook. Provide (1) on the back of each toilet compartment door. Provide (1) in single user toilet rooms.

1. Single Prong: Bobrick Series B-211.
2. At Plastic Toilet Compartments – provide manufacturer's standard hook with rubber tipped bumper (refer to Toilet Compartment specification 102113.19)

END OF SECTION 102800

SECTION 104413
FIRE PROTECTION CABINETS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Fire-protection cabinets for portable fire extinguishers.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.3 CLOSEOUT SUBMITTALS

A. Maintenance data.

1.4 COORDINATION

A. Coordinate sizes and locations of fire-protection cabinets with wall depths and fire extinguisher sizes.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Rated Fire-Protection Cabinets: Listed and labeled to comply with requirements in ASTM E814 for fire-resistance rating of walls where they are installed.

2.2 FIRE-PROTECTION CABINET

A. Cabinet Type: Suitable for fire extinguisher.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. Babcock-Davis.
   b. Guardian Fire Equipment, Inc.
   c. Larsens Manufacturing Company.
   d. Nystrom.

B. Cabinet Construction: One-hour fire rated .

1. Fire-Rated Cabinets: Construct fire-rated cabinets with double walls fabricated from 0.043-inch- thick cold-rolled steel sheet lined with minimum 5/8-inch- thick fire-barrier material. Provide factory-drilled mounting holes.

C. Cabinet Material: Cold-rolled steel sheet .

D. Semirecessed Cabinet: One-piece combination trim and perimeter door frame overlapping surrounding wall surface, with exposed trim face and wall return at outer edge (backbend).

1. Rolled-Edge Trim: 2-1/2-inch backbend depth.

E. Cabinet Trim Material: Same material and finish as door.

F. Door Material: Steel sheet .

G. Door Style: Fully glazed panel with frame .

H. Door Glazing: Acrylic sheet .

1. Clear transparent acrylic sheet.
2. Clear transparent acrylic sheet painted white on unexposed side.

I. Door Hardware: Manufacturer's standard door-operating hardware of proper type for cabinet type, trim style, and door material and style indicated.

1. Piano Hinge

J. Accessories:

1. Mounting Bracket: Manufacturer's standard steel, designed to secure fire extinguisher to fire-protection cabinet, of sizes required for types and capacities of fire extinguishers indicated, with plated or baked-enamel finish.
2. Lettered Door Handle: One-piece, cast-iron door handle with the word "FIRE" embossed into face.
3. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location. Locate as indicated .
    a. Identify fire extinguisher in fire-protection cabinet with the words " FIRE EXTINGUISHER ."
        1) Location: Applied to cabinet door .
        2) Application Process: Pressure-sensitive vinyl letters.
        3) Lettering Color: Red .
        4) Orientation: Horizontal .
4. Alarm: Manufacturer's standard alarm that actuates when fire-protection cabinet door is opened and that is powered by batteries .

K. Materials:

1. Cold-Rolled Steel: ASTM A1008/A1008M, Commercial Steel (CS), Type B.

a. Finish: Baked enamel, TGIC polyester powder coat, HAA polyester powder coat, epoxy powder coat, or polyester/epoxy hybrid powder coat, complying with AAMA 2603.
b. Color: As selected by Architect from manufacturer's full range .

2. Tempered Float Glass: ASTM C1048, Kind FT, Condition A, Type I, Quality q3, 3 mm thick, .

2.3 FABRICATION

A. Fire-Protection Cabinets: Provide manufacturer's standard box (tub) with trim, frame, door, and hardware to suit cabinet type, trim style, and door style indicated.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Prepare recesses for semirecessed fire-protection cabinets as required by type and size of cabinet and trim style.

B. Install fire-protection cabinets in locations and at mounting heights indicated or, if not indicated, at heights acceptable to authorities having jurisdiction.

C. Fire-Protection Cabinets: Fasten cabinets to structure, square and plumb.

D. Identification: Apply decals at locations indicated.

E. Adjust fire-protection cabinet doors to operate easily without binding. Verify that integral locking devices operate properly.

END OF SECTION 104413

SECTION 104416
FIRE EXTINGUISHERS

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 portable, hand-carried fire extinguishers and mounting bracket.

1.3 SUBMITTALS

A. Product Data: For each type of product. Include rating and classification, material descriptions, dimensions of individual components and profiles, and finishes for fire extinguisher and mounting brackets.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For fire extinguishers to include in maintenance manuals.

1.5 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace fire extinguishers that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:
    a. Failure of hydrostatic test according to NFPA 10 when testing interval required by NFPA 10 is within the warranty period.
    b. Faulty operation of valves or release levers.
2. Warranty Period: Six years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. NFPA Compliance: Fabricate and label fire extinguishers to comply with NFPA 10, "Portable Fire Extinguishers."

B. Fire Extinguishers: Listed and labeled for type, rating, and classification by an independent testing agency acceptable to authorities having jurisdiction.

1. Provide fire extinguishers approved, listed, and labeled by FM Global.

2.2 PORTABLE, HAND-CARRIED FIRE EXTINGUISHERS

A. Fire Extinguishers:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Guardian Fire Equipment, Inc.
b. JL Industries, Inc.; a division of the Activar Construction Products Group.
c. Kidde Residential and Commercial Division.
d. Larsens Manufacturing Company.

2. Source Limitations: Obtain fire extinguishers, and accessories, from single source from single manufacturer.
3. Valves: Manufacturer's standard.
4. Handles and Levers: Manufacturer's standard.
5. Instruction Labels: Include pictorial marking system complying with NFPA 10, Appendix B.

B. Multipurpose Dry-Chemical Type in Aluminum Container: UL-rated 4-A:60-B:C, 10-lb nominal capacity, with monoammonium phosphate-based dry chemical in enameled-aluminum container.

C. Mounting wall bracket per manufacturers standards.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine fire extinguishers for proper charging and tagging. Remove and replace damaged, defective, or undercharged fire extinguishers.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Install fire extinguishers in locations indicated and in compliance with requirements of authorities having jurisdiction.

END OF SECTION 104416

SECTION 122413
ROLLER WINDOW SHADES

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. Manually operated roller shades with single rollers.

B. Related Requirements:

1. Section 061000 "Rough Carpentry" for wood blocking and grounds for mounting roller shades and accessories.
2. Section 079200 "Joint Sealants" for sealing the perimeters of installation accessories for light-blocking shades with a sealant.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, features, finishes, and operating instructions for roller shades.

B. Shop Drawings: Show fabrication and installation details for roller shades, including shadeband materials, their orientation to rollers, and their seam and batten locations.

C. Samples for Initial Selection: For each type and color of shadeband material.

1. Include Samples of accessories involving color selection.

1.4 INFORMATIONAL SUBMITTALS

A. Product Test Reports: For each type of shadeband material, for tests performed by a qualified testing agency.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For roller shades to include in maintenance manuals.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: Fabricator of products.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver roller shades in factory packages, marked with manufacturer, product name, and location of installation using same designations indicated on Drawings.

1.8 FIELD CONDITIONS

A. Environmental Limitations: Do not install roller shades until construction and finish work in spaces, including painting, is complete and dry and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

B. Field Measurements: Where roller shades are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on Shop Drawings. Allow clearances for operating hardware of operable glazed units through entire operating range. Notify Architect of installation conditions that vary from Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain roller shades from single source from single manufacturer.

2.2 MANUALLY OPERATED SHADES WITH SINGLE ROLLERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Draper Inc.
2. Hunter Douglas Contract.
3. Lutron Electronics Co., Inc.
4. MechoShade Systems, Inc.

B. Chain-and-Clutch Operating Mechanisms: With continuous-loop bead chain and clutch that stops shade movement when bead chain is released; permanently adjusted and lubricated.

1. Bead Chains: Manufacturer's standard.

a. Loop Length: Full length of roller shade.
b. Limit Stops: Provide upper and lower ball stops.
c. Chain-Retainer Type: Clip, jamb mount.

C. Rollers: Corrosion-resistant extruded-aluminum tubes of diameters and wall thicknesses required to accommodate operating mechanisms and weights and widths of shadebands indicated without deflection. Provide with permanently lubricated drive-end assemblies and idle-end assemblies designed to facilitate removal of shadebands for service.

1. Roller Drive-End Location: Right side of interior face of shade.
2. Direction of Shadeband Roll: Regular, from back (exterior face) of roller.

3. Shadeband-to-Roller Attachment: Manufacturer's standard method.

D. Mounting Hardware: Brackets or endcaps, corrosion resistant and compatible with roller assembly, operating mechanism, installation accessories, and mounting location and conditions indicated.

E. Shadebands:

1. Shadeband Material: Light-filtering fabric.
2. Shadeband Bottom (Hem) Bar: Extruded Aluminum.

a. Type: Enclosed in sealed pocket of shadeband material.

F. Shadecloth: Basis of Design: Draper, Inc., (Phifer Sheer Weave Series): Non-raveling vinyl/fiberglass mesh, PVC free. Fabric thickness 0.025 inches, weight 16.4 oz./sq.yd.
1. Phifer Sheer Weave, Interior Sun Control Fabric, Basic 3% Openness.
a. Color: As selected from standard options.

G. Installation Accessories:

1. Front Fascia: Aluminum extrusion that conceals front and underside of roller and operating mechanism and attaches to roller endcaps without exposed fasteners.

a. Shape: L-shaped.
b. Height: Manufacturer's standard height required to conceal roller and shadeband assembly when shade is fully open, but not less than 3 inches.

2. Installation Accessories Color and Finish: As selected from manufacturer's full range.

b. ROLLER SHADE FABRICATION

i. Product Safety Standard: Fabricate roller shades to comply with WCMA A 100.1, including requirements for flexible, chain-loop devices; lead content of components; and warning labels.

ii. Unit Sizes: Fabricate units in sizes to fill window and other openings as follows, measured at 74 deg F:

1. Between (Inside) Jamb Installation: Width equal to jamb-to-jamb dimension of opening in which shade is installed less 1/4 inch per side or 1/2-inch total, plus or minus 1/8 inch. Length equal to head-to-sill or -floor dimension of opening in which shade is installed less 1/4 inch, plus or minus 1/8 inch.

iii. Shadeband Fabrication: Fabricate shadebands without battens or seams to extent possible, except as follows:

1. Vertical Shades: Where width-to-length ratio of shadeband is equal to or greater than 1:4 , provide battens and seams at uniform spacings along shadeband length to ensure shadeband tracking and alignment through its full range of movement without distortion of the material.

2. Skylight Shades: Provide battens and seams at uniform spacings along shadeband as required to ensure shadeband tracking and alignment through its full range of movement without distortion or sag of material.
3. Railroaded Materials: Railroad material where material roll width is less than the required width of shadeband and where indicated. Provide battens and seams as required by railroaded material to produce shadebands with full roll-width panel(s) plus, if required, one partial roll-width panel located at top of shadeband.

PART 3: EXECUTION

3.1. EXAMINATION

i. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, operational clearances, and other conditions affecting performance of the Work.
ii. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2. ROLLER SHADE INSTALLATION

iii. Install roller shades level, plumb, and aligned with adjacent units according to manufacturer's written instructions.

4. Opaque Shadebands: Located so shadeband is not closer than 2 inches to interior face of glass. Allow clearances for window operation hardware.

iv. Roller Shade Locations: At exterior windows.

3.3. ADJUSTING

v. Adjust and balance roller shades to operate smoothly, easily, safely, and free from binding or malfunction throughout entire operational range.

3.4. CLEANING AND PROTECTION

vi. Clean roller shade surfaces, after installation, according to manufacturer's written instructions.
vii. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure that roller shades are without damage or deterioration at time of Substantial Completion.
viii. Replace damaged roller shades that cannot be repaired, in a manner approved by Architect, before time of Substantial Completion.

END OF SECTION

SECTION 26 05 00 – BASIC ELECTRICAL REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and General Provisions of the Contract, including General and Supplementary Conditions and Division 1 specification sections, apply to work of this section.
B. Provide all items, articles, materials, operations or methods listed, mentioned or scheduled on drawings and/or herein, including all labor, materials, equipment and incidentals necessary and required for their completion.
C. The items in this section are supplementary to the requirements set forth in other portions of the specifications as indicated under Item "A" above.

1.2 DRAWINGS

A. The drawings show the location and general arrangement of equipment, electrical systems and related items. They shall be followed as closely as elements of the construction will permit.
B. Examine the drawings of other trades and verify the conditions governing the work on the job site. Arrange work accordingly, providing such fittings, conduit, junction boxes and accessories as may be required to meet such conditions.
C. Deviations from the drawings, with the exception of minor changes in routing and other such incidental changes that do not affect the functioning or serviceability of the systems, shall not be made without the written approval of the Architect.
D. The architectural and structural drawings take precedence in all matters pertaining to the building structure, mechanical drawings in all matters pertaining to mechanical trades and electrical drawings in all matters pertaining to electrical trades. Where there are conflicts or differences between the drawings for the various trades, report such conflicts or differences to the Architect for resolution.

1.3 SECTION INCLUDES

A. Basic Electrical Requirements specifically applicable to Division 16 Sections, in addition to Division 1 - General Requirements.

1.4 COORDINATION

A. Coordinate the work specified in this division with all other divisions of these specifications.
B. Prepare drawings showing proposed rearrangement of work to meet job conditions, including changes to work specified under other sections. Obtain permission of Architect/Engineer before proceeding.

1.5 REFERENCES

A. ANSI/NFPA 70 - National Electrical Code.
B. ANSI/IEEE C2 - National Electrical Safety Code.
C. NECA - Standard of Installation.
D. EIA/TIA Standards 568A, 569, 606, 607, T568B.

1.6 SUBMITTALS

A. Submit inspection and permit certificates under provisions of Division 1 – General requirements.
B. Include certificate of final inspection and acceptance from authority having jurisdiction.
C. Submit shop drawings and product data grouped to include complete submittals of related systems, products, and accessories in a single submittal.
D. Mark dimensions and values in unit to match those specified.

1.7 REGULATORY REQUIREMENTS

A. Conform to ANSI/NFPA 70.
B. Conform to ANSI/IEEE C2.
C. Obtain permits, and request inspections from authority having jurisdiction.

PART 2 - PRODUCTS

2.1 MATERIALS AND EQUIPMENT

A. Materials and Equipment: Acceptable to the authority having jurisdiction as suitable for the use intended.

PART 3 - EXECUTION

3.0 WORKMANSHIP

A. Install work using procedures defined in NECA Standard of Installation.
B. Install all Data/Communication systems raceways/pathways per TIA/EIA Standard 569A.

END OF SECTION 26 05 00

SECTION 26 05 05
SELECTIVE DEMOLITION FOR ELECTRICAL

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 work of this section.
B. Provide all items, articles, materials, operations or methods listed, mentioned or scheduled on drawings and/or herein, including all labor, materials, equipment and incidentals necessary and required for their completion.
C. The items in this section are supplementary to the requirements set forth in other portions of the specifications as indicated under Item "A" above.

1.2 DRAWINGS

A. The drawings show the location and general arrangement of equipment, electrical systems and related items. They shall be followed as closely as elements of the construction will permit.
B. Examine the drawings of other trades and verify the conditions governing the work on the job site. Arrange work accordingly, providing such fittings, conduit, junction boxes and accessories as may be required to meet such conditions.
C. Deviations from the drawings, with the exception of minor changes in routing and other such incidental changes that do not affect the functioning or serviceability of the systems, shall not be made without the written approval of the Architect.
D. The architectural and structural drawings take precedence in all matters pertaining to the building structure, mechanical drawings in all matters pertaining to mechanical trades and electrical drawings in all matters pertaining to electrical trades. Where there are conflicts or differences between the drawings for the various trades, report such conflicts or differences to the Architect for resolution.

1.3 SECTION INCLUDES

A. Electrical demolition.

PART 2 PRODUCTS

2.1 MATERIALS AND EQUIPMENT

A. Materials and equipment for patching and extending work: As specified in individual Sections.
B. Owner has right of first refusal on all equipment and materials removed from premises.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify field measurements and circuiting arrangements are as shown on Drawings.
B. Verify that abandoned wiring and equipment serve only abandoned facilities.
C. Demolition Drawings are based on casual field observation and existing record documents. Report discrepancies to Architect/Engineer before disturbing existing installation.
D. Beginning of demolition means installer accepts existing conditions.

3.2 PREPARATION

A. Provide temporary wiring and connections to maintain existing systems in service during construction. When work must be performed on energized equipment or circuits, use personnel experienced in such operations.

3.3 DEMOLITION AND EXTENSION OF EXISTING ELECTRICAL WORK

A. Demolish and extend existing electrical work under provisions of this Section.
B. Remove, relocate and extend existing installations to accommodate new construction.
C. Remove abandoned wiring to source of supply.
D. Remove exposed abandoned conduit, including abandoned conduit above accessible ceiling finishes. Cut conduit flush with walls and floors, and patch surfaces.
E. Disconnect and remove electrical devices and equipment serving utilization equipment that has been removed.
F. Repair adjacent construction and finishes damaged during demolition and extension work.
G. Maintain access to existing electrical installations which remain active. Modify installation or provide access panel as appropriate.
H. Extend existing installations using materials and methods compatible with existing electrical installations, or as specified.
I. Provide necessary materials to maintain circuit continuity to existing electrical devices affected by demolition.

3.4 CLEANING AND REPAIR

A. Clean and repair existing materials and equipment which remain or are to be reused.
B. Panelboards: Clean exposed surfaces and check tightness of electrical connections. Replace damaged circuit breakers and provide closure plates for vacant positions. Provide typed circuit directory showing revised circuiting arrangement.

3.5 INSTALLATION

A. Install relocated materials and equipment where indicated in contract documents.
B. Provide new blank cover plates; smooth stainless steel, for all unused outlet boxes and openings that remain upon completion of demolition.

END OF SECTION

SECTION 26 05 19 – LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Building wire.
B. Wiring connections and terminations.

1.2 REFERENCES

A. NEMA WC 5 - Thermoplastic-Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy.

PART 2 - PRODUCTS

2.1 BUILDING WIRE

A. Thermoplastic-insulated Building Wire: NEMA WC 5.
B. Feeders and Branch Circuits: Copper, stranded conductor, 600 volt insulation, THHN/THWN.
C. Control Circuits: Copper, 14 AWG stranded conductor 600 volt insulation, THWN/THHN.

2.2 METAL-CLAD CABLE

A. Metal-Clad Cable size 14 through 4 AWG: Copper conductor, 600 volt insulation rated for the use intended, type MC. Type MC cable may be used in concealed interior spaces only and where acceptable to the Authority having Jurisdiction. See architectural plans for fire-wall ratings and locations.

PART 3 - EXECUTION

3.1 GENERAL WIRING METHODS

A. Type MC cable as specified may be used where acceptable to the Authority Having Jurisdiction and where permitted by the national Electrical Code. Building wire in conduit/raceway shall be used where indicated on the drawings.
B. Use no wire smaller than 12 AWG for power and lighting circuits, and no smaller than 14 AWG for control wiring.
C. Use 10 AWG conductor for 20 ampere, 120 volt branch circuits longer than 100 feet and for 20 ampere, 277 volt branch circuits longer than 200 feet.
D. Place an equal number of conductors for each phase of a circuit in same raceway or cable.
E. Splice only in junction or outlet boxes.
F. Neatly train and lace wiring inside boxes, equipment, and panelboards.
G. Make conductor lengths for parallel circuits equal.

3.2 WIRING INSTALLATION IN RACEWAYS

A. Pull all conductors into a raceway at the same time. Use UL listed wire pulling lubricant for pulling 4 AWG and larger wires.
B. Install wire in raceway after interior of building has been physically protected from the weather and all mechanical work likely to injure conductors has been completed.
C. Completely and thoroughly swab raceway system before installing conductors.

3.3 WIRING CONNECTIONS AND TERMINATIONS

A. Splice only in accessible junction boxes.
B. Use solderless pressure connectors with insulating covers for copper wire splices and taps, 8 AWG and smaller. For 10 AWG and smaller, use insulated spring wire connectors with plastic caps.

C. Use split bolt connectors for copper wire splices and taps, 6 AWG and larger. Tape uninsulated conductors and connectors with electrical tape to 150% of the insulation value of conductor.
D. Thoroughly clean wires before installing lugs and connectors.
E. Make splices, taps, and terminations to carry full ampacity of conductors without perceptible temperature rise.
F. Terminate spare conductors with electrical tape.

3.4 FIELD QUALITY CONTROL

A. Inspect wire and cable for physical damage and proper connection.
B. Torque test conductor connections and terminations to manufacturer's recommended values.
C. Perform continuity test on all power and equipment branch circuit conductors. Verify proper phasing connections.

3.5 WIRE AND CABLE INSTALLATION SCHEDULE

A. Concealed Interior Locations: Building wire in raceways.
B. Exposed Interior Locations: Building wire in raceways.
C. Wet or Damp Interior Locations: Building wire in raceways.
D. Exterior Locations: Building wire in raceways.
E. Underground Locations: Building wire in raceways.

END OF SECTION 26 05 19

SECTION 26 05 26 - GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and General Provisions of the Contract, including General and Supplementary Conditions and Division 1 specification sections, apply to work of this section.
B. Provide all items, articles, materials, operations or methods listed, mentioned or scheduled on drawings and/or herein, including all labor, materials, equipment and incidentals necessary and required for their completion.
C. The items in this section are supplementary to the requirements set forth in other portions of the specifications as indicated under Item "A" above..

1.2 DRAWINGS

A. The drawings show the location and general arrangement of equipment, electrical systems and related items. They shall be followed as closely as elements of the construction will permit.
B. Examine the drawings of other trades and verify the conditions governing the work on the job site. Arrange work accordingly, providing such fittings, conduit, junction boxes and accessories as may be required to meet such conditions.
C. Deviations from the drawings, with the exception of minor changes in routing and other such incidental changes that do not affect the functioning or serviceability of the systems, shall not be made without the written approval of the Architect.
D. The architectural and structural drawings take precedence in all matters pertaining to the building structure, mechanical drawings in all matters pertaining to mechanical trades and electrical drawings in all matters pertaining to electrical trades. Where there are conflicts or differences between the drawings for the various trades, report such conflicts or differences to the Architect for resolution.

1.3 SUMMARY

A. This Section includes grounding of electrical systems and equipment. Grounding requirements specified in this Section may be supplemented by special requirements of systems described in other Sections.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated.

    1. Ground rods.

B. Qualification Data: For firms and persons specified in “Quality Assurance” Article.
C. Field Test Reports: Submit written test reports to include the following:

    1. Test procedures used.
    2. Test results that comply with requirements.
    3. Results of failed tests and corrective action taken to achieve test results that comply with requirements.

1.5 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

1. Comply with UL 467.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Grounding Conductors, Cables, Connectors, and Rods:

a) Apache Grounding/Erico Inc.
b) Boggs, Inc.
c) Chance/Hubbell.
d) Copperweld Corp.
e) Dossert Corp.
f) Erico Inc.; Electrical Products Group.
g) Galvan Industries, Inc.
h) Heary Brothers Lightning Protection Co.
i) Ideal Industries, Inc.
j) ILSCO.
k) Kearney/Cooper Power Systems
l) Korns: C.C. Korns Co.; Division of Robroy Industries.
m) O-Z/Gedney Co.; a business of the EGS Electrical Group.
n) Raco, Inc.; Division of Hubbell
o) Thomas & Betts, Electrical.

2.2 GROUNDING CONDUCTORS

A. For insulated conductors, comply with Division 16 Section “Conductors and Cables.”
B. Material: Copper.
C. Equipment Grounding Conductors: Insulated with green-colored insulation.
D. Isolated Ground Conductors: Insulated with green-colored insulation with yellow stripe. On feeders with isolated ground, use colored tape, alternating bands of green and yellow tape to provide a minimum of three bands of green and two bands of yellow.
E. Grounding Electrode Conductors: Stranded cable.
F. Bare Copper Conductors: Comply with the following:

1. Solid Conductors: ASTM B 3.
2. Assembly of Stranded Conductors: ASTM B 8.
3. Tinned Conductors: ASTM B 33.

G. Copper Bonding Conductors: As follows:

1. Bonding Cable: 28 kcmil, 14 strands of No. 17 AWG copper conductor, ¼ inch in diameter.
2. Bonding Conductor: No. 4 or No. 6 AWG, stranded copper conductor.
3. Bonding Jumper: Bare copper tape, braided bare copper conductors, terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.

H. Grounding Bus: Bare, annealed copper bars of rectangular cross section, with insulators.

2.3 CONNECTOR PRODUCTS

A. Comply with IEEE 837 and UL 467; listed for use for specific types, sizes, and combinations of conductors and connected items.
B. Bolted Connectors: Bolted-pressure-type connectors, or compression type.
C. Welded Connectors: Exothermic-weld type, in kit form, and selected per manufacturer's written instructions.

2.4 GROUNDING ELECTRODES

A. Ground Rods: Copper-clad steel.

1. Size: Minimum of 5/8 diameter by 120 inches.

PART 3 – EXECUTION

3.1 APPLICATION

A. Use only copper conductors for both insulated and bare grounding conductors in direct contact with earth, concrete, masonry, crushed stone and similar materials.
B. In raceways, use insulated equipment grounding conductors.
C. Exothermic-Welded Connections: use for connections to structural steel and for underground connections.
D. Equipment Grounding Conductor Terminations: Use bolted pressure clamps.
E. Grounding Bus: Install in electrical and telephone data equipment rooms, in rooms housing service equipment, and elsewhere as indicated.

1. Use insulated spacer; space 1 inch from wall and support from wall 6 inches above finished floor, unless otherwise indicated.

3.2 EQUIPMENT GROUNDING CONDUCTORS

A. Comply with NFPA 70, Article 250, for types, sizes, and quantities of equipment grounding conductors, unless specific types, larger sizes, or more conductors than required by NFPA 70 are indicated.
B. Install equipment grounding conductors in all feeders circuits.
C. Install insulated equipment grounding conductor with circuit conductors for the following items, in addition to those required by NEC.

1. Feeders and branch circuits.
2. Lighting circuits.
3. Receptacle circuits.
4. Single-phase motor and appliance branch circuits.
5. Three-phase motor and appliance branch circuits.
6. Flexible raceway runs.
7. Armored and metal-clad cable runs.

D. Isolated Equipment Enclosure Circuits: For designated equipment supplied by a branch circuit or feeder, isolate equipment enclosure from supply raceway with a nonmetallic raceway fitting listed for the purpose. Install fitting where raceway enters enclosure, and install a separate equipment grounding conductor. Isolate equipment grounding conductor from raceway and from panelboard grounding terminals. Terminate at equipment grounding conductor terminal of the applicable derived system or service, unless otherwise indicated.

E. Nonmetallic Raceways: Install an equipment grounding conductor in nonmetallic raceways unless they are designated for telephone or data cables.
F. Signal and Communication Systems: For telephone, alarm, voice and data, and other communication systems, provide No. 4 AWG minimum insulated grounding conductor in raceway from grounding electrode system to each service location, terminal cabinet, wiring closet, and central equipment location.

    1. Service and Central Equipment Locations and Wiring Closets: Terminate grounding conductor on a ¼-by-3-by-12-inch grounding bus.
    2. Terminal Cabinets: Terminate grounding conductor on cabinet grounding terminal.

3.3 INSTALLATION

A. Grounding Conductors: Route along shortest and straightest paths possible, unless otherwise indicated. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.
B. Bonding Straps and Jumpers: Install so vibration by equipment mounted on vibration isolation hangers and supports is not transmitted to rigidly mounted equipment. Bond straps directly to the basic structure taking care not to penetrate any adjacent parts. Install straps only in locations accessible for maintenance.
C. Ground Rods: Install at least three rods spaced at least one-rod length from each other and located at least the same distance from other grounding electrodes.
D. Metal Water Service Pipe: Provide insulated copper grounding conductors, in conduit, from building's main service equipment, or grounding bus, to main metal water service entrances to building. Connect grounding conductors to main metal water service pipes by grounding clamp connectors. Where a dielectric main water fitting is installed, connect grounding conductor to street side of fitting. Bond metal grounding conductor conduit or sleeve to conductor at each end.
E. Water Meter Piping: Use braided-type bonding jumpers to electrically bypass water meters. Connect to pipe with grounding clamp connectors.
F. Bond interior metal piping systems and metal air ducts to equipment grounding conductors of associated pumps, fans, blowers, electric heaters, and air cleaners. Use braided-type bonding straps.
G. Bond each aboveground portion of gas piping system upstream from equipment shutoff valve.

3.4 CONNECTIONS

A. General: Make connections so galvanic action or electrolysis possibility is minimized. Select connectors, connection hardware, conductors, and connection methods so metals in direct contact will be galvanically compatible.

    1. Use electroplated or hot-tin-coated materials to ensure high conductivity and to make contact points closer to order of galvanic series.
    2. Make connections with clean, bare metal at points of contact.
    3. Make aluminum-to-steel connections with stainless-steel separators and mechanical clamps.
    4. Make aluminum-to-galvanized steel connections with tin-plated copper jumpers and mechanical clamps.
    5. Coat and seal connections having dissimilar metals with inert material to prevent future penetration of moisture to contact surfaces.

B. Exothermic-Weld Connections: Comply with the manufacturer's written instructions. Weld that are puffed up or that show convex surfaces indicating improper cleaning are not acceptable.

C. Equipment Grounding Conductor Terminations: For No. 8 AWG and larger, use pressure-type grounding lugs. No. 10 AWG and smaller grounding conductors may be terminated with winged pressure-type connectors.
D. Non-contact Metal Raceway Terminations: If metallic raceways terminate at metal housings without mechanical and electrical connection to housing, terminate each conduit with a grounding bushing. Connect grounding bushings with a bare grounding conductor to grounding bus or terminal in housing. Bond electrically non-continuous conduits at entrances and exits with grounding bushings and bare grounding conductors unless otherwise indicated.
E. Tighten screws and bolts for grounding and bonding connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A.
F. Compression-Type Connections: Use hydraulic compression tools to provide correct circumferential pressure for compression connectors. Use tools and dies recommended by connector manufacturer. Provide embossing die code or other standard method to make a visible indication that a connector has been adequately compressed on grounding conductor.
G. Moisture Protection: If insulated grounding conductors are connected to grounding buses, insulate entire area of connection and seal against moisture penetration of insulation and cable.

3.5 UNDERGROUND DISTRIBUTION SYSTEM GROUNDING

A. Pad-Mounted Transformers and Switches: Install two ground rods and counterpoise circling pad. Ground pad-mounted equipment and noncurrent-carrying metal items associated with substations by connecting them to underground cable and grounding electrodes. Use tinned-copper conductor not less than No. 2 AWG for counterpoise and for taps to equipment ground pad. Bury counterpoise not less than 18 inches below grade and 6 inches from the foundation.

3.6 FIELD QUALITY CONTROL

A. Testing: Perform the following field quality-control testing:

1. After installing grounding system but before permanent electrical circuitry has been energized, test for compliance with requirements.
2. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Architect promptly and include recommendations to reduce round resistance.
3. Test completed grounding system at each location where a maximum ground-resistance level is specified, at service disconnect enclosure grounding terminal, and at ground test wells. Measure ground resistance not less than two full days after the last trace of precipitation, and without the soil being moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground-resistance. Perform tests, by the fall-of-potential method according to IEEE 81.
4. Provide drawings locating each ground rod and ground rod assembly and other grounding electrodes, identify each by letter in alphabetical order, and key to the record of tests and observations. Include the number of rods driven and their depth at each location and include observations of weather and other phenomena that may affect test results. Describe measures taken to improve test results.

a) Equipment Rated 500 kVA and Less: 10 ohms.
b) Pad-Mounted Switching Equipment: 5 ohms.

END OF SECTION 26 05 26

SECTION 26 05 29 – HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and General Provisions of the Contract, including General and Supplementary Conditions and Division 1 specification sections, apply to work of this section.
B. Provide all items, articles, materials, operations or methods listed, mentioned or scheduled on drawings and/or herein, including all labor, materials, equipment and incidentals necessary and required for their completion.
C. The items in this section are supplementary to the requirements set forth in other portions of the specifications as indicated under Item "A" above..

1.2 DRAWINGS

A. The drawings show the location and general arrangement of equipment, electrical systems and related items. They shall be followed as closely as elements of the construction will permit.
B. Examine the drawings of other trades and verify the conditions governing the work on the job site. Arrange work accordingly, providing such fittings, conduit, junction boxes and accessories as may be required to meet such conditions.
C. Deviations from the drawings, with the exception of minor changes in routing and other such incidental changes that do not affect the functioning or serviceability of the systems, shall not be made without the written approval of the Architect.
D. The architectural and structural drawings take precedence in all matters pertaining to the building structure, mechanical drawings in all matters pertaining to mechanical trades and electrical drawings in all matters pertaining to electrical trades. Where there are conflicts or differences between the drawings for the various trades, report such conflicts or differences to the Architect for resolution.

1.3 WORK INCLUDED

A. Conduit and equipment supports.
B. Fastening hardware.

1.4 COORDINATION

A. Coordinate size, shape and location of concrete pads with Division 3.

1.5 QUALITY ASSURANCE

A. Support systems shall be adequate for weight of equipment and conduit, including wiring, which they carry.

PART 2 - PRODUCTS

2.1 MATERIAL

A. Support Channel: Galvanized or painted steel.
B. Hardware: Corrosion resistant.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Fasten hanger rods, conduit clamps, and outlet and junction boxes to building structure using expansion anchors, preset inserts or beam clamps. Do not use spring steel clips and clamps.
B. Use toggle bolts or hollow wall fasteners in hollow masonry, plaster, or gypsum board partitions and

walls; expansion anchors or preset inserts in solid masonry walls; self-drilling anchors or expansion anchor on concrete surfaces; sheet metal screws in sheet metal studs; and wood screws in wood construction.

C. Do not fasten supports to piping, ductwork, mechanical equipment, or conduit.
D. Do not use powder-actuated anchors.
E. Do not drill structural steel members.
F. Fabricate supports from structural steel or steel channel, rigidly welded or bolted to present a neat appearance. Use hexagon head bolts with spring lock washers under all nuts.
G. Install free-standing electrical equipment on 4" concrete housekeeping pads. Pads to extend 4" beyond equipment on front and sides.
H. Install surface mounted cabinets and panelboards with minimum of four anchors.
I. Bridge studs top and bottom with channels to support flush mounted cabinets and panelboards in stud walls.

END OF SECTION 26 05 29

SECTION 26 05 33 – RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and General Provisions of the Contract, including General and Supplementary Conditions and Division 1 specification sections, apply to work of this section.
B. Provide all items, articles, materials, operations or methods listed, mentioned or scheduled on drawings and/or herein, including all labor, materials, equipment and incidentals necessary and required for their completion.
C. The items in this section are supplementary to the requirements set forth in other portions of the specifications as indicated under Item "A" above.

1.2 DRAWINGS

A. The drawings show the location and general arrangement of equipment, electrical systems and related items. They shall be followed as closely as elements of the construction will permit.
B. Examine the drawings of other trades and verify the conditions governing the work on the job site. Arrange work accordingly, providing such fittings, conduit, junction boxes and accessories as may be required to meet such conditions.
C. Deviations from the drawings, with the exception of minor changes in routing and other such incidental changes that do not affect the functioning or serviceability of the systems, shall not be made without the written approval of the Architect.
D The architectural and structural drawings take precedence in all matters pertaining to the building structure, mechanical drawings in all matters pertaining to mechanical trades and electrical drawings in all matters pertaining to electrical trades. Where there are conflicts or differences between the drawings for the various trades, report such conflicts or differences to the Architect for resolution.
E. The electrical “Division 26” contractor shall be responsible for all raceway and cable tray indicated on the electrical plans to be used for the installation of “Division 27” Network, Telephone, Coaxial and Fiber Optic Cable installations.

1.3 WORK INCLUDED

A. Rigid metal conduit and fittings.
B. Electrical metallic tubing and fittings.
C. Flexible metal conduit and fittings.
D. Liquidtight flexible metal conduit and fittings.
E. Non-metallic conduit and fittings.
F. Wall and ceiling outlet boxes.
G. Pull and junction boxes.

1.4 REFERENCES

A. ANSI C80.1 - Rigid Steel Conduit, Zinc-Coated.
B. ANSI C80.3 - Electrical Metallic Tubing, Zinc-Coated.
C. ANSI/NEMA FB 1 - Fittings and Supports for Conduit and Cable Assemblies.
D. NEMA TC 2 - Electrical Plastic Conduit (EPC-40 and EPC-80).
E. NEMA TC 3 - PVC Fittings for use with PVC Conduit.
F. ANSI/NEMA OS 1 - Sheet-Steel Outlet Boxes, Device Boxes, Covers and Box Supports.
G. NEMA 250 - Enclosures for Electrical Equipment (1000 volts maximum).

PART 2 - PRODUCTS

2.1 RIGID METAL CONDUIT AND FITTINGS

A. Rigid Steel Conduit: ANSI C80.1.
B. Fittings and Conduit Bodies: ANSI/NEMA FB 1; threaded type, material to match conduit.

2.2 ELECTRICAL METALLIC TUBING (EMT) AND FITTINGS

A. EMT: ANSI C80.3 galvanized tubing.
B. Fittings and Conduit Bodies: ANSI/NEMA FB 1; set screw type.

2.3 FLEXIBLE METAL CONDUIT AND FITTINGS

A. Conduit: steel.
B. Fittings and Conduit Bodies: ANSI/NEMA FB 1.

2.4 LIQUIDTIGHT FLEXIBLE CONDUIT AND FITTINGS

A. Conduit: Flexible metal conduit with PVC jacket.
B. Fittings and Conduit Bodies: ANSI/NEMA FB 1.

2.5 PLASTIC CONDUIT AND FITTINGS

A. Conduit: NEMA TC 2; Schedule 40 PVC.
B. Fittings and Conduit Bodies: NEMA TC 3.

2.6 CONDUIT SUPPORTS

A. Conduit Clamps, Straps, and Supports: Steel or malleable iron.

2.7 OUTLET BOXES

A. Sheet Metal Outlet Boxes: ANSI/NEMA Os 1; galvanized steel, with 1/2" male fixture studs where required.
B. Cast Boxes: Aluminum, deep type, gasketed cover, threaded hubs.
C. Plastic Boxes: Where acceptable for use with types NM and NMC cable.

2.8 PULL AND JUNCTION BOXES

A. Sheet Metal Boxes: ANSI/NEMA OS 1; galvanized steel.
B. Sheet Metal Boxes Larger Than 12 Inches in Any Dimension: Hinged enclosure in accordance with Section 16160.
C. Cast Metal Boxes for Outdoor and Wet Location Installations: NEMA 250; Type 4 and Type 6, flat-flanged, surface mounted junction box, UL listed as raintight. Galvanized cast iron Cast aluminum box and cover with ground flange, neoprene gasket, and stainless steel cover screws.

PART 3 - EXECUTION

3.1 CONDUIT SIZING, ARRANGEMENT AND SUPPORT

A. Size conduit for conductor type installed or for Type THW conductors, whichever is larger; 3/4" minimum size. Unless noted otherwise, conduit for Data/Communication Cabling shall be 1” minimum.
B. Arrange conduit to maintain headroom and present a neat appearance.
C. Route exposed conduit and conduit above accessible ceilings parallel and perpendicular to walls

and adjacent piping.

D. Maintain minimum 6" (150 mm) clearance between conduit and piping. Maintain 12" (300 mm) clearance between conduit and heat sources such as flues, steam pipes, and heating appliances.
E. Arrange conduit supports to prevent distortion of alignment by wire pulling operations. Fasten conduit using galvanized straps, lay-in adjustable hangers, clevis hangers, or bolted split stamped galvanized hangers.
F. Group conduit in parallel runs where practical and use conduit rack constructed of steel channel with conduit straps or clamps. Provide space for 25% additional conduit.
G. Do not fasten conduit with wire or perforated pipe straps. Remove all wire used for temporary conduit support during construction, before conductors are pulled.
H. Support conduit at a maximum of 10' on center.

3.2 CONDUIT INSTALLATION

A. Cut conduit square using a saw or pipecutter; de-burr cut ends.
B. Bring conduit to the shoulder of fittings and couplings and fasten securely.
C. Use conduit hubs or sealing locknuts for fastening conduit to cast boxes, and for fastening conduit to sheet metal boxes in damp or wet locations.
D. Install no more than the equivalent of four 90E bends between boxes.
E. Use conduit bodies to make sharp changes in direction, as around beams.
F. Avoid moisture traps where possible; where unavoidable, provide junction box with drain fitting at conduit low point.
G. Use suitable conduit caps to protect installed conduit against entrance of dirt and moisture.
H. Provide No. 12 AWG insulted conductor or suitable pull string in empty conduit, except sleeves and nipples.
I. Install expansion-deflection joints where conduit crosses building expansion joints.
J. Where conduit penetrates fire-rated walls and floors, provide firestopping per section 07270.
K. Route conduit through roof openings for piping and ductwork where possible; otherwise, route through roof jack with pitch pocket.
L. Use rigid steel, long sweep, factory elbows for all 90 degree bends in plastic conduit runs installed below grade.
M. Wipe plastic conduit clean and dry before joining. Apply full even coat of cement to entire area that will be inserted into fitting. Let joint cure for 20 minutes.
N. Unless noted otherwise, conduit may not be run within concrete floor slabs.
O. All conduit noted to run to cable tray systems must connect to cable tray system in accessible ceiling areas, access to connections must be available without moving equipment or lighting fixtures, coordinate all locations with other trades prior to installation.

3.3 CONDUIT INSTALLATION SCHEDULE

A. Exposed Outdoor Locations: Rigid Steel Conduit.
B. Wet Interior Locations: Electrical metallic tubing.
C. Concealed Dry Interior Locations: Electrical metallic tubing.
D. Exposed Dry Interior Locations: Electrical metallic tubing.
E. Equipment Connections: Flexible metal conduit, liquid tight in wet or damp locations.
F. Underground Installations More Than Five Feet From Foundation Wall: Schedule 40 plastic conduit.
G. Installations Under Concrete Slab, or Underground within Five Feet of Foundation Wall: Rigid steel conduit.
H. Installations Within Concrete Slab, Schedule 40 plastic conduit, maximum ¾" trade size, single runs, conduit shall not cross within floor slab.
I. All conduit in finished areas shall be run concealed in walls or above ceilings. Exposed conduit acceptable in unfinished areas only.

3.4 COORDINATION OF BOX LOCATIONS

A. Provide electrical boxes as shown on Drawings, and as required for splices, taps, wire pulling, equipment connections, and code compliance.
B. Electrical box locations shown on Contract Drawings are approximate unless dimensioned.
C. Locate and install boxes to allow access.
D. Locate and install to maintain headroom and to present a neat appearance.

3.5 OUTLET BOX INSTALLATION

A. Do not install boxes back-to-back in walls. Provide minimum 6" separation, except provide minimum 24" separation in acoustic-rated walls.
B. Locate boxes in masonry walls to require cutting of masonry unit corner only. Coordinate masonry cutting to achieve neat openings for boxes.
C. Provide knockout closures for unused openings.
D. Support boxes independently of conduit.
E. Use multiple-gang boxes where more than one device are mounted together; do not use sectional boxes. Provide barriers to separate wiring of different voltage systems.
F. Install boxes in walls without damaging wall insulation.
G. Coordinate mounting heights and locations of outlets mounted above counters, benches, and backsplashes.
H. Position outlets to locate luminaries as shown on reflected ceiling plans.
I. In inaccessible ceiling areas, position outlets and junction boxes within 6 inches (150 mm) of recessed luminary, to be accessible through luminary ceiling opening.
J. Provide recessed outlet boxes in finished areas; secure boxes to interior wall and partition studs, accurately positioning to allow for surface finish thickness. Use stamped steel stud bridges for flush outlets in hollow stud wall, and adjustable steel channel fasteners for flush ceiling outlet boxes.
K. Align wall-mounted outlet boxes for switches, thermostats and similar devices.
L. Provide cast outlet boxes in exterior locations exposed to weather and wet locations.

3.6 PULL AND JUNCTION BOX INSTALLATION

A. Locate pull boxes and junction boxes above accessible ceilings or in unfinished areas.
B. Support pull and junction boxes independent of conduit.

END OF SECTION 26 05 33

SECTION 26 05 53 – IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and General Provisions of the Contract, including General and Supplementary Conditions and Division 1 specification sections, apply to work of this section.
B. Provide all items, articles, materials, operations or methods listed, mentioned or scheduled on drawings and/or herein, including all labor, materials, equipment and incidentals necessary and required for their completion.
C. The items in this section are supplementary to the requirements set forth in other portions of the specifications as indicated under Item "A" above.

1.2 DRAWINGS

A. The drawings show the location and general arrangement of equipment, electrical systems and related items. They shall be followed as closely as elements of the construction will permit.
B. Examine the drawings of other trades and verify the conditions governing the work on the job site. Arrange work accordingly, providing such fittings, conduit, junction boxes and accessories as may be required to meet such conditions.
C. Deviations from the drawings, with the exception of minor changes in routing and other such incidental changes that do not affect the functioning or serviceability of the systems, shall not be made without the written approval of the Architect.
D. The architectural and structural drawings take precedence in all matters pertaining to the building structure, mechanical drawings in all matters pertaining to mechanical trades and electrical drawings in all matters pertaining to electrical trades. Where there are conflicts or differences between the drawings for the various trades, report such conflicts or differences to the Architect for resolution.

1.3 WORK INCLUDED

A. Nameplates.
B. Wire and cable markers.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Nameplates: Engraved three-layer laminated plastic, white letters on a black background.
B. Wire and Cable Markers: Cloth markers, split sleeve or tubing type.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Degrease and clean surfaces to receive nameplates.
B. Install nameplates parallel to equipment lines.
C. Secure nameplates to equipment fronts using screws, rivets, or adhesive. Secure nameplates to inside face of recessed panelboard doors in finished locations.
D. Embossed tape will not be permitted for any application.

3.2 WIRE IDENTIFICATION

A. Provide wire markers on each conductor in panelboard gutters, pull boxes, outlet and junction

boxes, and at load connection. Identify with branch circuit or feeder number for power and lighting circuits, and with control wire number as indicated on schematic and interconnection diagrams or equipment manufacturer's shop drawings for control wiring.

3.3 NAMEPLATE ENGRAVING SCHEDULE

A. Provide nameplates to identify all electrical distribution and control equipment, and loads served. Letter Height: 1/8" (3 mm) for individual switches and loads served, 1/4" (6 mm) for distribution and control equipment identification.

END OF SECTION 26 05 53

SECTION 26 24 16- PANELBOARDS

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 work of this section.
B. Provide all items, articles, materials, operations or methods listed, mentioned or scheduled on drawings and/or herein, including all labor, materials, equipment and incidentals necessary and required for their completion.
C. The items in this section are supplementary to the requirements set forth in other portions of the specifications as indicated under Item "A" above.

1.2 DRAWINGS

A. The drawings show the location and general arrangement of equipment, electrical systems and related items. They shall be followed as closely as elements of the construction will permit.
B. Examine the drawings of other trades and verify the conditions governing the work on the job site. Arrange work accordingly, providing such fittings, conduit, junction boxes and accessories as may be required to meet such conditions.
C. Deviations from the drawings, with the exception of minor changes in routing and other such incidental changes that do not affect the functioning or serviceability of the systems, shall not be made without the written approval of the Architect.
D. The architectural and structural drawings take precedence in all matters pertaining to the building structure, mechanical drawings in all matters pertaining to mechanical trades and electrical drawings in all matters pertaining to electrical trades. Where there are conflicts or differences between the drawings for the various trades, report such conflicts or differences to the Architect for resolution.

1.3 WORK INCLUDED

A. Lighting and appliance branch circuit panelboards.

1.4 RELATED WORK

A. Section 26 05 53 – Identification for Electrical Systems.

1.5 REFERENCES

A. NEMA AB 1 - Molded Case Circuit Breakers.
B. NEMA PB 1 - Panelboards.
C. NEMA PB 1.1 - Instructions for Safe Installation, Operation and Maintenance of Panelboards Rated 600 Volts or Less.

1.6 SUBMITTALS

A. Submit shop drawings for equipment and component devices under provisions of Division 1 – General Requirements.
B. Include outline and support point dimensions, voltage, main bus ampacity, integrated short circuit ampere rating, circuit breaker and fusible switch arrangement and sizes.

1.7 SPARE PARTS

A. Keys: Furnish 2 to each Owner.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS - PANELBOARDS

A. Square D.
B. Siemens.
C. Cutler Hammer
D. Substitutions: Under provisions of Division 1 – General Requirements.

2.2 BRANCH CIRCUIT PANELBOARDS

A. Lighting and Appliance Branch Circuit Panelboards: NEMA PB1; circuit breaker type.
B. Enclosure: NEMA PB 1; Type 1.
C. Cabinet Size: 5:" (153 mm) deep; 20" wide for 240 volt and less panelboards, 20" wide for 480 volt panelboards.
D. Provide surface or flush cabinet front as scheduled with concealed trim clamps, concealed hinge and flush lock all keyed alike. Finish in manufacturer's standard gray enamel.
E. Provide panelboards with copper bus, ratings as scheduled on Drawings. Provide copper ground bus in all panelboards.
F. Minimum Integrated Short Circuit Rating: 22,000 amperes rms symmetrical (minimum) for 240 volt and 480 volt panelboards.
G. Molded Case Circuit Breakers: NEMA AB 1: Plug-on type thermal magnetic trip circuit breakers, with common trip handle for all poles. Provide circuit breakers UL listed as Type SWD for lighting circuits. Provide UL Class A ground fault interrupter circuit breakers where scheduled.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install panelboards plumb finishes, in conformance with NEMA PB 1.1.
B. Height: 6 feet.
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.

3.2 FIELD QUALITY CONTROL

A. Measure steady state load currents at each panelboard feeder. Should the difference at any panelboard between phases exceed 20%, rearrange circuits in the panelboard to balance the phase loads within 20%. Take care to maintain proper phasing for multi-wire branch circuits.
B. Visual and Mechanical Inspection: Inspect for physical damage, proper alignment, anchorage, and grounding. Check proper installation and tightness of connections for circuit breakers.

END OF SECTION 26 24 16

SECTION 26 27 02
EQUIPMENT WIRING 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 work of this section.
B. Provide all items, articles, materials, operations or methods listed, mentioned or scheduled
on drawings and/or herein, including all labor, materials, equipment and incidentals necessary and required for their completion.
C. The items in this section are supplementary to the requirements set forth in other portions of the specifications as indicated under Item "A" above.

1.2 DRAWINGS

A. The drawings show the location and general arrangement of equipment, electrical systems and related items. They shall be followed as closely as elements of the construction will permit.
B. Examine the drawings of other trades and verify the conditions governing the work on the job site. Arrange work accordingly, providing such fittings, conduit, junction boxes and accessories as may be required to meet such conditions.
C. Deviations from the drawings, with the exception of minor changes in routing and other such incidental changes that do not affect the functioning or serviceability of the systems, shall not be made without the written approval of the Engineer.

1.3 WORK INCLUDED

A. Electrical connections to equipment specified under other Sections.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

3.1 INSPECTION

A. Verify that equipment is ready for electrical connection, wiring and energization.

3.2 PREPARATION

A. Review equipment submittals prior to installation and electrical rough-in. Verify location, size, and type of connections. Coordinate details of equipment connections with suppliers and installer.

3.3 INSTALLATION

A. Use wire and cable with insulation suitable for temperatures encountered in heat-producing equipment.
B. Make conduit connections to equipment using flexible conduit. Use liquidtight flexible conduit in damp or wet locations.

C. Install pre-finished cord set where connection with attachment plug is indicated or specified, or use attachment plug with suitable strain-relief clamps.

D. Provide suitable strain-relief clamps for cord connections to outlet boxes and equipment connection boxes.

E. Make wiring connections in control panel or in wiring compartment of pre-wired equipment in accordance with manufacturer's instructions. Provide interconnecting wiring where indicated.

F. Install disconnect switches, controllers, control stations, and control devices such as limit switches and temperature switches as indicated. Connect with conduit and wiring as indicated.

END OF SECTION 26 27 02

SECTION 26 27 26- WIRING DEVICES

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 work of this section.
B. Provide all items, articles, materials, operations or methods listed, mentioned or scheduled on drawings and/or herein, including all labor, materials, equipment and incidentals necessary and required for their completion.
C. The items in this section are supplementary to the requirements set forth in other portions of the specifications as indicated under Item "A" above.

1. 2 DRAWINGS

A. The drawings show the location and general arrangement of equipment, electrical systems and related items. They shall be followed as closely as elements of the construction will permit.
B. Examine the drawings of other trades and verify the conditions governing the work on the job site. Arrange work accordingly, providing such fittings, conduit, junction boxes and accessories as may be required to meet such conditions.
C. Deviations from the drawings, with the exception of minor changes in routing and other such incidental changes that do not affect the functioning or serviceability of the systems, shall not be made without the written approval of the Architect.
D. The architectural and structural drawings take precedence in all matters pertaining to the building structure, mechanical drawings in all matters pertaining to mechanical trades and electrical drawings in all matters pertaining to electrical trades. Where there are conflicts or differences between the drawings for the various trades, report such conflicts or differences to the Architect for resolution.

1.3 WORK INCLUDED

A. Wall switches.
B. Receptacles.
C. Device plates and box covers.

1.4 REFERENCES

A. NEMA WD 1 - General-Purpose Wiring Devices.
B. NEMA WD 5 - Specific-Purpose Wiring Devices.

1.5 SUBMITTALS

A. Submit product data under provisions of Division 1 – General Requirements.
B. Provide product data showing configurations, finishes, dimensions, and manufacturer's instructions.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS - WALL SWITCHES

A. Bryant
B. Hubbell
C. Leviton
D. Arrow Hart
E. Eagle
F. P&S Legrand

2.2 WALL SWITCHES

A. Wall Switches for Lighting Circuits and Motor Loads Under 3/4 HP: NEMA WD; 1 AC general use snap switch with toggle handle, rated 20 amperes and 120-277 volts AC. Handle: Ivory plastic.

2.3 ACCEPTABLE MANUFACTURERS - RECEPTACLES

A. Bryant
B. Hubbell
C. Eagle
D. Arrow Hart
E. Leviton
F. P&S Legrand

2.4 RECEPTACLES

A. Convenience and Straight-Blade Receptacles: NEMA WD 1, tamper resistant (TR) type,.
B. Locking-Blade Receptacles: NEMA WD 5.
C. Convenience Receptacle Configuration: NEMA WD 1; Type 5-15 R, tamper resistant (TR) type, white plastic face.
D. Specific-Use Receptacle Configuration: NEMA WD 1 or WD 5; Type as indicated on Drawings, Black Plastic Face.
E. GFCI Receptacles: Duplex convenience receptacle with integral ground fault current interrupter, tamper resistant (TR) type, white plastic face.

2.5 ACCEPTABLE MANUFACTURERS - WALL PLATES

A. Bryant
B. Hubbell
C. Eagle
D. Arrow Hart
E. Leviton
F. P&S Legrand

2.6 WALL PLATES

A. Decorative Cover Plate: Smooth Stainless Steel.
B. Weatherproof Cover Plate: Raintight While-In-Use Device Covers.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install wall switches 48" above floor to top, OFF position down.
B. Install convenience receptacles, unless noted otherwise, 16" above floor to bottom, 6" to bottom above counters, backsplash, grounding pole on bottom. When noted on plans, dimensions indicated are to bottom of device.
C. Install specific-use receptacles at heights shown on contract drawings, or at 16" above floor to bottom.
D. Install decorative plates on switch, receptacle, and blank outlets in finished areas, using jumbo size plates for outlets installed in masonry walls.
E. Install galvanized steel plates on outlet boxes and junction boxes in unfinished areas, above accessible ceilings, and on surface-mounted outlets.
F. Install devices and wall plates flush and level.

END OF SECTION 26 27 26

SECTION 26 28 16 - ENCLOSED SWITCHES AND CIRCUIT BREAKERS

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 work of this section.
B. Provide all items, articles, materials, operations or methods listed, mentioned or scheduled on drawings and/or herein, including all labor, materials, equipment and incidentals necessary and required for their completion.
C. The items in this section are supplementary to the requirements set forth in other portions of the specifications as indicated under Item "A" above.

1.2 DRAWINGS

A. The drawings show the location and general arrangement of equipment, electrical systems and related items. They shall be followed as closely as elements of the construction will permit.
B. Examine the drawings of other trades and verify the conditions governing the work on the job site. Arrange work accordingly, providing such fittings, conduit, junction boxes and accessories as may be required to meet such conditions.
C. Deviations from the drawings, with the exception of minor changes in routing and other such incidental changes that do not affect the functioning or serviceability of the systems, shall not be made without the written approval of the Architect.
D. The architectural and structural drawings take precedence in all matters pertaining to the building structure, mechanical drawings in all matters pertaining to mechanical trades and electrical drawings in all matters pertaining to electrical trades. Where there are conflicts or differences between the drawings for the various trades, report such conflicts or differences to the Architect for resolution.

1.3 WORK INCLUDED

A. Disconnect switches.
B. Fuses.
C. Enclosures.

1.4 RELATED WORK

A. Section 26 05 53 - Identification for Electrical Systems.

1.5 REFERENCES

A. ANSI/UL 198C - High Intensity Capacity Fuses, Current Limiting Types.
B. ANSI/UL 198E - Class R Fuses.
C. NEMA KS 1 - Enclosed Switches.

1.6 SUBMITTALS

A. Submit product data under provisions of Division 1 – General Requirements.
B. Include outline drawings with dimensions, and equipment ratings for voltage, capacity, horsepower, and short circuit.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS - DISCONNECT SWITCHES

A. Square "D"
B. Westinghouse

C. General Electric

2.2 DISCONNECT SWITCHES

A. Fusible Switch Assemblies: NEMA KS 1; Type HD; quick-make, quick-break, 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 HD; quick-make, quick-break, 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; Type as indicated on Drawings.

2.3 ACCEPTABLE MANUFACTURERS - FUSES

A. Bussman
B. Gould/Shawmut
C. Substitutions: Under provisions of Division 1 – General requirements.

2.4 FUSES

A. Fuses 600 Amperes and Less: ANSI/UL 198E, Class RK1; dual element, current limiting, time delay, 600 volt.
B. Interrupting Rating: 200,000 rms amperes.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install disconnect switches where indicated on Drawings.
B. Install fuses in fusible disconnect switches

END OF SECTION 26 28 16

SECTION 264313

SURGE PROTECTIVE DEVICE (SPD)
FORMERLY KNOWN AS
TRANSIENT VOLTAGE SURGE SUPPRESSION (TVSS))

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes: Surge Protective Devices (SPD) formerly known as Transient Voltage Surge Suppression (TVSS) for Service Entrance (not required to be installed on existing MDP on this project) and Branch Panel applications (install only on new Dist Panel '25DP).

1.02 REFERENCES

A. ANSI/IEEE C.62.41 and C62.45
B. UL 1449 – Most Recent Edition
C. UL 1283
D. NEC – NFPA 70
E. NFPA
F. OSHA
G. IEEE Std. 1100

1.03 SUBMITTALS

A. Shop Drawings: Provide Shop Drawings with wiring diagrams, installation information, testing and maintenance procedures, and operational information for the transient protection system. Shop Drawings shall be submitted to Engineer for approval before starting actual fabrication.

B. Submittals for Approval: Provide the following test data submittals:

1. Manufacturer will provide UL-1449, Most Recent Edition ULiQ data showing the Voltage Protection Rating (VPR) and "Engineering Considerations" for the specific catalog number submitted.

2. Per the requirements of NEC Article 285.6 (See Article 242 for 2020 NEC), the devices shall be marked with the short circuit current rating. This rating shall meet or exceed the available fault current. Test data shall be provided to demonstrate the short circuit current rating has been tested on a complete device.

3. Submit test report data clearly demonstrating the maximum surge current rating has been tested on a COMPLETE SPD unit including all necessary fusing/overcurrent protection, thermal disconnects, integral disconnects and monitoring systems. Manufacturers who cannot provide this data will not be approved.

4. Submit data demonstrating that the SPD unit is capable of surviving the specified minimum repetitive surge current rating. The rating is based on surviving a specified number of ANSI/IEEE C62.41, Category C-High (10kA) impulses without failure or degradation in performance characteristics of more than 10%.

5. Written detailed response to each paragraph of the specification indicating that the proposed product meets or exceeds this specification. If specific paragraphs are not met, provide written explanation as to why not.

PART 2 - SERVICE ENTRANCE SPD (Not required to be installed on the existing MDP as part of this project)

2.01 ENVIRONMENTAL

A. General Requirements:

1. No audible noise shall be generated.
2. No appreciable magnetic fields shall be generated. System shall be capable of use directly in computer rooms in any location without danger to disc units, disk packs, or tapes.
3. Operating Conditions:

   a. 30 – 130 Degrees F
   b. 15 – 85 Percent Humidity Non-Condensing

4. Enclosure: The unit shall at minimum have a heavy duty NEMA 12 dust-tight, drip-tight enclosure unless specified otherwise.

2.02 GENERAL REQUIREMENTS

A. The manufacturer shall provide a surge protective device that is classified by UL-1449 as a Type 2 device intended for installation on the load side of the main disconnect. The unit shall also be tested and listed to be installed as a 1-port (parallel) or 2-port device (In-line/Kelvin).

B. SPD shall be rated for a 208Y/120 volt, 60 Hertz, 3-phase, 4-wire system and shall be connected in parallel with the Main Distribution Panel of the building.

C. Nominal Current Discharge Level (I_n): The peak value of surge current through the SPD, selected by the manufacturer, having a current wave-shape of 8x20µs where the SPD remains functional after 15 surges shall be 20kA per mode.

D. Impulse Current (I_{imp}): The service entrance device shall be capable of surviving direct strike transient (10x350µs) without failure or degradation of performance. Provide 3rd party test data confirming this, using minimum 12.5kA I_{imp}.

E. Temporary Overvoltage (TOV) Survivability: The units shall be able to at a minimum survive 60 cycles (1s) of varying TOV levels.

F. Quality: The manufacturer shall be ISO 9001 certified, demonstrating world-class quality systems for the design and manufacture of the SPD units.

G. Unit shall be UL 1449, Most Recent Edition Listed. An SPD that is a UL “Recognized” component will not be accepted.

H. The system shall be constructed using multiple surge current diversion modules utilizing a single metal oxide varistor (MOV) and high capacity thermal electrode ensuring max surge current capacity can pass through the SPD without degradation or failure. Use of gas tubes, silicon avalanche diodes (SADs), or selenium cells are unacceptable.

I. Unit shall include solid-state, long-life externally mounted LED visual status indicators that indicate the on-line status and operational integrity of each phase of the unit.

J. Unit shall have a Form C summary alarm output contact rated for at least 1 amp at 120VAC for remote annunciation of SPD status.

K. Unit shall have optional advanced monitoring, displayed through an integrated color LCD display, that includes real time measurements for voltage, current, frequency, power factor, kW, kVAR, kVA. The monitor should also include an event counter with time & date stamp, user settable alarm thresholds and an embedded web page for remote monitoring.

2.03 MANUFACTURERS AND SPECIFIC PRODUCT REQUIREMENTS

A. Acceptable Manufacturers: Subject to compliance with requirements of the Contract Documents, acceptable manufacturers are as follows:

1. Raycap: Rayvoss Series

Service Entrance SPD Device Selection							
System Voltage	Switchboard Amps	**SPD Model**	Surge Rating	Protection Modes	Max Wire Size	Max Breaker Amps	Time Stamp Event Monitoring
208/120 V Wye	Up to 2000A	120-3Y-N3-7-04-A-P	140kA/Mode	L-N, L-G, N-G	4/0	200	Yes
208/120 V Wye	2000A-4000A	120-3Y-A1-7-04-A-P	200kA/Mode	L-N, L-G, N-G	4/0	200	Yes
480/277 V Wye	Up to 2000A	277-3Y-N3-7-04-C-P	140kA/Mode	L-N, L-G, N-G	4/0	200	Yes
480/277 V Wye	2000A-4000A	277-3Y-A1-7-04-C-P	200kA/Mode	L-N, L-G, N-G	4/0	200	Yes
480 Delta	Up to 2000A	480-3D-M3-3-04-D-P	140kA/Mode	L-G	#2 AWG	100	Yes
480 Delta	2000A-4000A	480-3D-N1-3-04-D-P	200kA/Mode	L-G	#2 AWG	100	Yes

B. Unit shall provide maximum UL 1449, Voltage Protection Rating (VPR) as follows:

S', 'M', 'N' and 'A' are enclosure sizes; '1' = 80mm MOV; '3' = 40mm MOV	**ANSI/UL 1449 4th Edition**	
	Rayvoss Enclosure VPR	
	In-Line (Kelvin)	**T-Connection (Parallel)**

Service Type	Enclosure	L-L	L-N	L-G	N-G	L-L	L-N	L-G	N-G
120 Single Phase	S3	X	1000	500	500	X	1200	800	700
	M1	X	900	500	500	X	1200	800	800
120/240 Split Phase	N3	900	900	600	700	1200	1200	700	700
	M1	900	900	500	500	1200	1200	800	800
120/208 Wye	N3	900	900	600	700	1200	1200	700	700
	A1	900	900	600	600	1200	1200	800	800
240 Delta	N3	1800	X	1000	X	2000	X	1200	X
	M1	1800	X	900	X	2000	X	1200	X
277/480 Wye	M3	2500	2500	1200	1200	2500	2500	1500	1200
	M1	1500	1500	1000	1000	2500	2500	1500	1500
480 Delta	M3	3000	X	1500	X	3000	X	1800	X
	M1	2500	X	1500	X	3000	X	1500	X

C. The SPD will be modular in design. Separate and replaceable suppression modules will protect each mode (L-N, L-G, and N-G).

D. The service entrance SPD will be capable of surviving 600 IEC, 10x350µs waveforms of 5kA impulses without failure or degradation of original performance characteristics of more than 5%.

E. Unit shall have a maximum surge current rating of 200,000 [140,000] amperes L-N, 200,000 [140,000] amperes L-G, and 200,000 [140,000] amperes N-G, based on ANSI/IEEE C62.41 standard 8 by 20 microsecond current waveform.

F. Warranty: Manufacturer shall provide a product warranty for a period of not less than 10 years from date of installation. Warranty shall cover unlimited replacement of system protection modules during warranty period.

PART 3 - BRANCH PANEL SPD (only to be installed on new Dist Panel '25DP')

3.01 ENVIRONMENTAL

A. General Requirements:

1. No audible noise shall be generated.
2. No appreciable magnetic fields shall be generated. System shall be capable of use directly in computer rooms in any location without danger to disc units, disk packs, or tapes.
3. Operating Conditions:

   a. 30 – 130 Degrees F
   b. 15 – 85 Percent Humidity Non-Condensing

B. Enclosure: The unit shall have a heavy duty NEMA 12 dust-tight, drip-tight enclosure.

3.02 GENERAL REQUIREMENTS

A. The manufacturer shall provide a surge protective device that is classified by UL-1449, as a Type 1 or 2 device.
B. SPD shall be rated for a 208Y/120 volt, 60 Hertz, 3-phase, 4-wire system and shall be connected in parallel with the branch panels as indicated on electrical schedules sheet.
C. Nominal Current Discharge Level (I_n): The peak value of surge current through the SPD, selected by the manufacturer, having a current wave-shape of 8x20ms where the SPD remains functional after 15 surges shall be 20kA per mode.
D. Quality: The manufacturer shall be ISO 9001 certified, demonstrating world-class quality systems for the design and manufacture of the SPD units.
E. Unit shall be UL 1449, Most Recent Edition Listed. An SPD that is a UL "Recognized" component will not be accepted.
F. Each surge suppression element (MOV) shall utilized a stacked MOV design.
G. Unit shall include solid-state, long-life externally mounted LED visual status indicators that indicate the on-line status and operational integrity of each phase of the unit.
H. Unit shall have a Form C summary alarm output contact rated for at least 1 amp at 120VAC for remote annunciation of SPD status.
I. Unit shall have a surge/TOV counter with time & date stamp.

3.03 MANUFACTURERS AND PRODUCT REQUIREMENTS

A. Acceptable Manufacturers: Subject to compliance with requirements of the Contract Documents, acceptable manufacturers are as follows:

1. Raycap: RSE Series

Branch Panel SPD Device Selection						
System Voltage	Switchboard Amps	**SPD Model**	Surge Rating	Protection Modes	Max Breaker Amps	Time Stamp Event Monitoring
208/120 V Wye	Up to 400A	RSE-2-120-3Y-A-05-E-F-S	50kA/Mode	L-N, L-G, N-G	30-100	Yes
208/120 V Wye	400A-2000A	RSE-2-120-3Y-A-10-E-F-S	100kA/Mode	L-N, L-G, N-G	60-125	Yes
480/277 V Wye	Up to 400A	RSE-2-277-3Y-A-05-E-F-S	50kA/Mode	L-N, L-G, N-G	30-100	Yes
480/277 V Wye	400A-2000A	RSE-2-277-3Y-A-10-E-F-S	100kA/Mode	L-N, L-G, N-G	60-125	Yes

B. Unit shall provide maximum UL 1449, Voltage Protection Rating (VPR) for 208Y/120 Volt systems as follows:

1. L-N = 600V
2. L-G = 600V
3. N-G = 600V
4. L-L = 1000V

C. Unit shall provide maximum UL 1449, Voltage Protection Rating (VPR) for 480Y/277 Volt systems as follows:

1. L-N = 1000V
2. L-G = 1200V
3. N-G = 1200V
4. L-L = 1800V

D. Unit shall have a maximum surge current rating of 100,000 amperes L-N, 100,000 amperes L-G, and 100,000 amperes N-G, based on ANSI/IEEE C62.41 standard 8 by 20 microsecond current waveform.

E. Unit shall include dry contacts, LEDs, audible alarm, and a surge/TOV counter w/ time & date stamp.

F. The SPD will be connected to the panelboard bus bar through a dedicated 30 amp breaker provided by the equipment manufacturer.

G. Warranty: Manufacturer shall provide a product warranty for a period of not less than 10 years from date of installation.

PART 4 - EXECUTION

4.01 INSTALLATION

A. General Requirements:

1. Contractor shall install suppression system immediately next to or on top of service equipment where so approved by the Engineer:
2. Conductors between suppressor and point of attachment to service equipment shall be sized in accordance with manufacturer's Shop Drawings and conductor lengths shall be as short as possible, preferably not exceeding 24".

B. Grounding: Suppressor ground shall be bonded to the equipment grounding conductor and service entrance ground.

END OF SECTION

SECTION 26 51 00 – INTERIOR LIGHTING

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 work of this section.
B. Provide all items, articles, materials, operations or methods listed, mentioned or scheduled on drawings and/or herein, including all labor, materials, equipment and incidentals necessary and required for their completion.
C. The items in this section are supplementary to the requirements set forth in other portions of the specifications as indicated under Item "A" above.

1.2 DRAWINGS

A. The drawings show the location and general arrangement of equipment, electrical systems and related items. They shall be followed as closely as elements of the construction will permit.
B. Examine the drawings of other trades and verify the conditions governing the work on the job site. Arrange work accordingly, providing such fittings, conduit, junction boxes and accessories as may be required to meet such conditions.
C. Deviations from the drawings, with the exception of minor changes in routing and other such incidental changes that do not affect the functioning or serviceability of the systems, shall not be made without the written approval of the Architect.
D. The architectural and structural drawings take precedence in all matters pertaining to the building structure, mechanical drawings in all matters pertaining to mechanical trades and electrical drawings in all matters pertaining to electrical trades. Where there are conflicts or differences between the drawings for the various trades, report such conflicts or differences to the Architect for resolution.

1.3 WORK INCLUDED

A. Interior luminaries and accessories.
B. Lamps.
C. Ballasts.

1.4 REFERENCES

A. ANSI C82.1 - Specification for Fluorescent Lamp Ballasts.

1.5 SUBMITTALS

A. Submit product data under provisions of Division 1 – General Requirements.
B. Include outline drawings, lamp and ballast data, support points, weights, and accessory information for each luminary type.
C. Submit manufacturer's installation instructions under provisions of Division 1 – General Requirements.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site under provisions of Division 1 – General Requirements.
B. Store and protect products under provisions of Division 1 – General Requirements.

PART 2 - PRODUCTS

2.1 INTERIOR LUMINARIES AND ACCESSORIES

A. Fluorescent Luminaries: Provide all necessary mounting devices, hardware, etc as required per

manufacturer's requirements.

B. Exit Signs: Stencil face, 6 inch high red letters on white background, directional arrows as indicated, universal mounting type as indicated.

2.2 LAMPS

A. The contractor shall furnish and install lamps of size and type as scheduled unless noted otherwise on plans. Laps shall be as manufactured by G.E., Phillips, or Sylvania and shall be specific type required for proper and normal lamp operation in conjunction with auxiliary equipment, i.e. ballasts, lampholders, etc.
B. All fluorescent lamps shall be energy saving type.

2.3 ELECTRONIC BALLAST

A. Electric ballasts shall be meet the following minimum requirements.

1. Ballast manufacturer shall have been producing electronic ballasts for at least 10 years with a low failure rate.
2. Ballasts shall operate at an input frequency of 60 Hz and an input voltage of 108 to 132 (120V circuit) or 249 to 305 (277V circuit).
3. Ballasts shall operate lamps to a frequency of 20 to 35 KHz with no detectable flicker.
4. Ballasts that operate as a parallel circuit shall permit other lamps to maintain full output after failure of companion lamp(s).
5. Ballasts shall be of U.S. manufacture and carry a 3-year warranty with up to $25 replacement labor allowance.
6. Ballasts shall comply with FCC and NEMA limits governing EMI and RFI and shall not interfere with operation of other normal electrical equipment.
7. Ballasts shall meet any applicable ANSI standards (i.e.: harmonic distortion, surge protection, etc.)
8. Ballasts shall not be affected by lamp failure and shall deliver normal lamp life.
9. Ballasts shall be high power factor (90% or higher). UL listed for Class P, Sound rated A.
10. Operating temperature shall not exceed 60 degrees C at any point on the case during normal operation.
11. Ballasts shall be potted and in a steel case and shall contain no PCBs.
12. Ballast shall be marked with manufacturer's name, part number, supply voltage, 1 power factor, open circuit voltage, current draw for each lamp type, and UL listing.

2.5 HID BALLASTS

A. All HID ballasts shall be of the constant wattage type.
B. Shall be capable of starting and operating lamps with line voltage variations of plus or minus three (3) percent.
C. All outdoor ballasts shall be designed for operation down to minus 20 degrees F.
D. Approved manufacturers are Advance, Universal, Valmont Electric.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install lamps in luminaries and lampholders.
B. Support surface-mounted luminaries from building structure.
C. Install recessed luminaries to permit removal from below. Use plaster frames and install grid clips as applicable.

3.2 RELAMPING

A. Relamp luminaries which have failed lamps at completion of Work.

3.3 ADJUSTING AND CLEANING

A. Align luminaries and clean lenses and diffusers at completion of Work. Clean paint splatters, dirt, and debris from installed luminaries.
B. Touch up luminary finish at completion of Work.

END OF SECTION 26 51 00

SECTION 26 56 00
EXTERIOR LIGHTING

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 work of this section.
B. Provide all items, articles, materials, operations or methods listed, mentioned or scheduled on drawings and/or herein, including all labor, materials, equipment and incidentals necessary and required for their completion.
C. The items in this section are supplementary to the requirements set forth in other portions of the specifications as indicated under Item "A" above.

1.2 DRAWINGS

A. The drawings show the location and general arrangement of equipment, electrical systems and related items. They shall be followed as closely as elements of the construction will permit.
B. Examine the drawings of other trades and verify the conditions governing the work on the job site. Arrange work accordingly, providing such fittings, conduit, junction boxes and accessories as may be required to meet such conditions.
C. Deviations from the drawings, with the exception of minor changes in routing and other such incidental changes that do not affect the functioning or serviceability of the systems, shall not be made without the written approval of the Architect.
D. The architectural and structural drawings take precedence in all matters pertaining to the building structure, mechanical drawings in all matters pertaining to mechanical trades and electrical drawings in all matters pertaining to electrical trades. Where there are conflicts or differences between the drawings for the various trades, report such conflicts or differences to the Architect for resolution.

1.3 WORK INCLUDED

A. Exterior Luminaries and accessories.
B. Lamps.
C. Ballasts.

1.4 REFERENCES

A. ANSI C82.1 - Specification for Fluorescent Lamp Ballasts.

1.5 SUBMITTALS

A. Submit product data under provisions of Division 1 – General Requirements.
B. Include outline drawings, lamp and ballast data, support points, weights, and accessory information for each luminary type.
C. Submit manufacturer's installation instructions under provisions of Division 1 – General Requirements.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site under provisions of Division 1 – General Requirements.
B. Store and protect products under provisions of Division 1 – General Requirements.

PART 2 - PRODUCTS

2.1 EXTERIOR LUMINARIES AND ACCESSORIES

A. Enclosures: Complete with gaskets to form weatherproof assembly.
B. Provide low temperature ballasts, with reliable starting to -20 degrees.

2.2 LED LUMINAIRES

A. General: Except as otherwise indicated, provide LED luminaires, of types and sizes indicated on fixture schedules.
B. Material and specifications for each luminaire are as follows:

1. Each luminaire shall consist of an assembly that utilizes LEDs as the light source. In addition, a complete luminaire shall consist of a housing, LED array, and electronic driver (power supply).
2. Each luminaire shall be rated for a minimum operational life of 50,000 hours. This life rating must be conducted at 40C ambient temperature.
3. The rated operating temperature range shall be -30°C to +40°C.
4. Each luminaire is capable of operating above 100°F [37°C], but not expected to comply with photometric requirements at elevated temperatures.
5. Photometry must be compliant with IESNA LM-79 and shall be conducted at 25°C ambient temperature.
6. The individual LEDs shall be constructed such that a catastrophic loss or the failure of one LED will not result in the loss of the entire luminaire.
7. Luminare shall be constructed such that LED modules may be replaced or repaired without replacement of whole luminaire.
8. Each luminaire shall be listed with Underwriters Laboratory, Inc. under UL1598 for luminaires, or an equivalent standard from a nationally recognized testing laboratory.

B. Technical Requirements

1. Electrical

a. Power Consumption: Maximum power consumption allowed for the luminaire shall be determined by application. The luminaire shall not consume power in the off state.
b. Operation Voltage: The luminaire shall operate from a 60 HZ ±3 HZ AC line over a voltage ranging from 108 VAC to 305 VAC. The fluctuations of line voltage shall have no visible effect on the luminous output.
c. Power Factor: The luminaire shall have a power factor of 0.90 or greater.
d. THD: Total harmonic distortion (current and voltage) induced into an AC power line by a luminaire shall not exceed 20 percent.
e. Surge Suppression: The luminaire onboard circuitry shall include fused surge protection devices (SPD) to withstand high repetition noise transients as a result of utility line switching, nearby lightning strikes, and other interference. The SPD shall protect the luminaire from damage and failure for common mode transient peak voltages up to 10 kV (minimum) and transient peak currents up to 5 kA (minimum). SPD shall conform to UL 1449 depending of the components used in the design. SPD performance shall be tested per the procedures in ANSI/IEEE C62.41-1992 (or current edition) for category C (standard). The SPD shall fail in such a way as the Luminaire will no longer operate. The SPD shall be field replaceable.
f. Each Luminaire shall have integral UL Listed Class II power supplies. Class I power supplies will not be acceptable.
g. Operational Performance: The LED circuitry shall prevent visible flicker to the unaided eye over the voltage range specified above.
h. RF Interference: LED Drivers must meet Class A emission limits referred in Federal Communications Commission (FCC) Title 47, Subpart B, Section 15 regulations concerning the emission of electronic noise.
i. Drivers shall have a Class A sound rating.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install lamps in luminaries and lampholders.
B. Support surface-mounted luminaries from building structure.
C. Install recessed luminaries to permit removal from below. Use plaster frames and install grid clips as applicable.

3.2 RELAMPING

A. Relamp luminaries which have failed lamps at completion of Work.

3.3 ADJUSTING AND CLEANING

A. Align luminaries and clean lenses and diffusers at completion of Work. Clean paint splatters, dirt, and debris from installed luminaries.
B. Touch up luminary finish at completion of Work.

END OF SECTION 26 56 00

SECTION 27 15 01
BASIC CABLING REQUIREMENTS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Provide all items, articles, materials, operations or methods listed, mentioned or scheduled and/or herein, including all labor, materials, equipment and incidentals necessary and required for their completion.

1.2 SECTION INCLUDES

A. Basic Cabling Requirements specifically applicable to Division 27 Sections.

1.3 COORDINATION

A. Coordinate the work specified in this division with all other divisions of these specifications.
B. Prepare drawings showing proposed rearrangement of work to meet job conditions, including changes to work specified under other sections. Obtain permission of Architect/Engineer before proceeding. Coordinate patch panel location in existing rack and labeling with district technology staff prior to installation.

1.4 REFERENCES

A. ANSI/NFPA 70 - National Electrical Code
B. ANSI/IEEE C2 - National Electrical Safety Code
C. NECA - Standard of Installation
D. EIA/TIA Standards 568A, 569, 606, 607, T568B.

1.5 SUBMITTALS

A. Submit shop drawings and product data grouped to include complete submittals of related systems, products, and accessories in a single submittal.
B. Include certificate of completion for training of installers verifying recognition of personnel certified to perform such work.

1.6 REGULATORY REQUIREMENTS

A. Conform to ANSI/NFPA 70.
B. Conform to ANSI/IEEE C2.
C. Conform to EIA/TIA Standards.
D. Obtain permits, and request inspections from authority having jurisdiction.

PART 2 PRODUCTS

2.1 MATERIALS AND EQUIPMENT

A. Materials and Equipment: Acceptable to the authority having jurisdiction and industry standards as suitable for the use intended.

PART 3 EXECUTION

3.1 WORKMANSHIP

A. Install work using procedures defined in NECA and EIA/TIA Standards of Installation.

END OF SECTION 27 15 01

SECTION 28 31 00
FIRE DETECTION, ALARM AND MASS NOTIFICATION SYSTEM REQUIREMENTS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SYSTEM DESCRIPTION

A. A fire alarm control panel with Intelligent Addressable initiating devices and one-way voice communications system with audio paging speakers will be installed. The main control panel shall be located in a secure location with remote annunciators with microphone located at primary and secondary entrances.
B. Provide connection from the main control panel to the nearest MDF or building Phone Demarcation Point. Coordinate with Owner for location and final connections.
C. The mass notification system will consist of one-way audio paging speakers located throughout the facility and tapped at lower wattage, with numerous speakers. Visual notification shall be CLEAR Lens strobe imprinted with the word FIRE for Fire Evacuation and AMBER Lens strobe imprinted with the word ALERT for Mass Notification Events. Visual notification devices shall be WHITE.
D. The System supplied under this specification shall utilize node to node, direct wired, multi priority peer-to-peer network operations. The system shall utilize independently addressed, input/output modules, audio amplifiers, and voice communications as described in this specification. The peer-to-peer network shall contain multiple nodes consisting of the command center, main controller, remote control panels, and LCD panels. Each panel shall be an equal, active functional member of the network, which is capable of making all local decisions and generating network tasks to other panels in the event of panel failure or communications failure between panels. Master/slave system configurations shall not be considered as equals.

1.3 BUILDING CODES and STANDARDS

A. National Fire Protection Association (NFPA):

1. NFPA-70 National Electrical Code (NEC)
2. NFPA-72 National Fire Alarm Code

a. Chapter 12 - Emergency Communications

3. NFPA 101 Life Safety Code
4. IBC International Building Code
5. IFC International Fire Code
6. IMC International Mechanical Code
7. State of Michigan Building Codes and Amendments

B. National Electrical Manufacture’s Association (NEMA)
C. Underwriters Laboratories, Inc. (UL)

1. UL-864 Control Units for Fire Protective Signaling Systems (9th Edition)
2. UL-2572 Control Units for Mass Notification System
3. UL-268 Smoke Detector for Fire Protective Signaling Systems
4. UL-217 Smoke Detectors for Single and Multiple Station
5. UL-521 Heat Detectors for Fire Protective Signaling Systems

6. UL-464 Audible Signaling Appliances
7. UL-1971 Visual Signaling Appliances
8. UL-38 Manually Actuated Signaling Boxes
9. UL-1481 Power Supplies for Fire Protective Signaling Systems

1.4 SUBMITTALS

A. The Contractor shall purchase no equipment for the system specified herein until the Owner has approved the project submittals in their entirety and has returned them to the contractor. It is the responsibility of the contractor to meet the entire intent and functional performance detailed in these specifications. Approved submittals shall only allow the contractor to proceed with the installation and shall not be construed to mean that the contractor has satisfied the requirements of these specifications. The Contractor shall submit documentation electronically within 30 calendar days after award of contract.

B. Each submittal shall include a cover letter providing a list of each variation that the submittal may have from the requirements of the Contract Documents. In addition, the Contractor shall provide specific notation on each Shop Drawing, sample, catalog cut, data sheet, installation manual, etc. submitted for review and approval, of each such variation.

1. Submittals shall be approved by authorities having jurisdiction prior to submitting them to the Architect.
2. Shop Drawings shall be prepared by persons with the following qualifications:

a. Trained and certified by manufacturer in fire-alarm system design.
b. NICET-certified fire-alarm technician, Level II minimum or Michigan registered Professional Engineer.

C. Product Data: Product Data sheets with the printed logo or trademark of the manufacturer of all equipment. Indicated in the documentation shall be the type, size, rating, style, and catalog number for all items proposed to meet the system performance detailed in this specification. The proposed equipment shall be subject to the approval of the Owner.

D. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

1. Comply with recommendations in the "Documentation" Section of the "Fundamentals of Fire Alarm Systems" Chapter in NFPA72.
2. Include voltage drop calculations for notification appliance circuits.
3. Include battery-size calculations.
4. Include performance parameters and installation details for each detector, verifying that each detector is listed for complete range of air velocity, temperature, and humidity possible when air-handling system is operating.
5. Include plans, sections, and elevations of heating, ventilating, and air-conditioning ducts, drawn to scale and coordinating installation of duct smoke detectors and access to them. Show critical dimensions that relate to placement and support of sampling tubes, detector housing, and remote status and alarm indicators. Locate detectors according to manufacturer's written recommendations.
6. Include voice/alarm signaling-service equipment rack or console layout, grounding schematic, amplifier power calculation, and single-line connection diagram.
7. Include floor plans to indicate final outlet locations showing address of each addressable device. Show size and route of cable and conduits.

E. Operation and Maintenance Data: For fire-alarm systems and components to be included in emergency, operation, and maintenance manuals. In addition to items specified in Division 1 Section "Operation and Maintenance Data, include the following:

1. Comply with the "Records" Section of the "Inspection, Testing and Maintenance" Chapter in NFPA72.
2. Provide "Record of Completion Documents" according to NFPA72 article "Permanent Records" in the "Records" Section of the "Inspection, Testing and Maintenance" Chapter.
3. Record copy of site-specific software database file, hardcopy print-out and CD, with password for delivery to the owner. Proprietary system/service companies will not be acceptable.
4. Provide "Maintenance, Inspection and Testing Records" according to NFPA72 article of the same name and include the following:

    a. Frequency of testing of installed components.
    b. Frequency of inspection of installed components.
    c. Requirements and recommendations related to results of maintenance.
    d. Manufacturer's user training manuals (hardcopy) and electronic on CD.

5. Manufacturer's required maintenance related to system warranty requirements.
6. Abbreviated operating instructions for mounting at fire-alarm control unit.
7. Copy of NFPA72.

F. Software and Firmware Operational Documentation:

1. CD of site-specific software database file with password, all product data sheets and AutoCAD files. Provide hard copy print-out of the software program. Proprietary system/service companies will not be acceptable.
2. Provide a list of global system settings
3. Provide a list of the contents of each system cabinet and their settings
4. Provide a list of all addressable devices with their addresses and settings

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Personnel shall be trained and certified by manufacturer for installation of units required for this Project.
B. Installer Qualifications: Installation shall be by personnel certified by NICET as fire-alarm Level IV technician.
C. Source Limitations for Fire-Alarm System and Components: Obtain fire-alarm system from single source from single manufacturer. Components shall be compatible with, and operate as, an extension of existing system.
D. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA70, by a qualified testing agency, and marked for intended location and application.
E. NFPA Certification: Obtain certification according to NFPA72 in the form of a placard by an approved alarm company.

1.6 WARRANTY and SOFTWARE SERVICE AGREEMENT

A. The contractor shall warranty all materials, installation and workmanship for five (5) years from date of acceptance, unless otherwise specified. A copy of the manufacturers' warranty shall be provided with closeout documentation and included with the operation and installation manuals.
B. The System Supplier shall maintain a service organization with adequate spare parts stocked within 75 miles of the installation. Any defects that render the system inoperative shall be repaired within 24 hours of the Owner notifying the contractor.

C. Technical Support: Beginning with Substantial Completion, provide software support for five (5) years, shall be included in this project.

D. Detector Sensitivity Testing: During the warranty period, each year the contractor is to perform detector sensitivity testing and provide report to the Owner unless the system is UL Listed to perform automatic sensitivity testing without any manual intervention and should detector fall outside of sensitivity window, the system will automatically indicate a device's trouble. A copy of UL letter is to be provided as proof of system operation.

E. Upgrade Service: Update software to latest version at Project completion. Install and program software upgrades that become available within five (5) years from date of Substantial Completion. Upgrading software shall include operating system. Upgrade shall include new or revised licenses for use of software.

1. Provide 30 days notice to Owner to allow scheduling and access to system and to allow Owner to upgrade computer equipment if necessary.

1.7 EXTRA MATERIALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Provide quantity equal to 2% percent of amount of each type installed, but no fewer than 2 unit of each type.

a. Smoke Detectors, heat detectors, manual pull stations, duct smoke detector, monitor modules and control modules:
b. Notification appliances; speakers, speaker-strobes and strobes.

2. Keys: Ten extra sets for access to locked and tamper-proof components.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: The materials, appliances, equipment and devices shall be tested and listed by a nationally recognized approvals agency for use as part of a protected premises protective signaling fire alarm system. The authorized representative of the manufacturer of the major equipment, such as control panels, shall be responsible for the satisfactory installation of the complete system.

B. The Contractor shall provide, from the acceptable manufacturer's current product lines, equipment and components, which comply with the requirements of these Specifications. Equipment or components, which do not provide the performance and features, required by these specifications are not acceptable, regardless of manufacturer.

C. Strict conformance to this specification is required to ensure that the installed and programmed system will function as designed, and will accommodate the future requirements and operations of the building Owner. All specified operational features must be met without exception.

D. All control panel assemblies and connected (new) field appliances shall be provided by the same System Supplier**,** and shall be designed and tested to ensure that the system operates as specified. All equipment and components shall be installed in strict compliance with the manufacturer's recommendations.

E. That equipment proposed to be supplied will be considered only if it meets all sections of the performance specification. Any deviations of system performance outlined in this specification will only be considered when the following requirements have been met:

1. A complete description of proposed alternate system performance methods with three (3) copies of working drawings thereof for approval by the Owner, not less than ten (10) calendar days prior to the scheduled date for submission of bids.
2. The supplier of alternate equipment shall furnish evidence that the proposed alternate system performance is equal to or superior than the system operation stated in the specification. Such evidence shall be submitted to the Owner, not less than ten (10) calendar days prior to the scheduled date for submission of bids.
3. The supplier shall submit a point-by-point statement of compliance for all sections in this specification. The statement of compliance shall consist of a list of all paragraphs within these sections. Where the proposed system complies fully with the paragraph as written, placing the word "comply" opposite the paragraph number shall indicate such. Where the proposed system does not comply with the paragraph, as written, and the supplier feels the proposed system will accomplish the intent of the paragraph, a full description of the function as well as a full narrative description of how its proposal will meet its intent shall be provided. Any submission that does not include a point-by-point statement of compliance as described herein shall be disqualified. Where a full description is not provided, it shall be assumed that the proposed system does not comply.
4. The supplier of alternate equipment shall submit a list from the alternate manufacturer on the manufacturer's letterhead indicating the names and addresses of all authorized suppliers in the area. Proprietary products will not be considered.
5. The acceptability of any alternate proposed system shall be the sole decision of the Owner or his authorized representative.

F. Approved Products: All panels and peripheral devices shall be of the standard product of single manufacturer and shall display the manufacturer's name of each component. The following manufacturers are approved:

1. Simplex (existing system in building).

2.2 SYSTEMS OPERATIONAL DESCRIPTION

A. Fire-alarm signal initiation shall be by one or more of the following devices:

1. Manual stations.
2. Heat detectors.
3. Flame detectors.
4. Smoke detectors.
5. Duct smoke detectors.

B. Fire-alarm signal shall initiate the following actions:

1. Activate multiple channel pre-recorded voice messages followed by temporal tone.
2. Continuously operate the visual notification appliances.
3. Identify alarm at fire-alarm control unit and remote annunciators.
4. Transmit an alarm signal to the remote alarm receiving station.
5. Unlock electric door locks in designated egress paths.
6. Release fire and smoke doors held open by magnetic door holders.

7. Switch heating, ventilating, and air-conditioning equipment controls to fire-alarm mode.
8. Record events in the system memory.
9. Record events by the system printer.

C. Supervisory signal initiation shall be by one or more of the following devices and actions:

D. System trouble signal initiation shall be by one or more of the following devices and actions:

1. Open circuits, shorts, and grounds in designated circuits.
2. Opening, tampering with, or removing alarm-initiating and supervisory signal-initiating devices.
3. Loss of primary power at fire-alarm control unit.
4. Ground or a single break in fire-alarm control unit internal circuits.
5. Abnormal ac voltage at fire-alarm control unit.
6. Break in standby battery circuitry.
7. Failure of battery charging.
8. Abnormal position of any switch at fire-alarm control unit or annunciator.
9. Fire-pump power failure, including a dead-phase or phase-reversal condition.
10. Low-air-pressure switch operation on a dry-pipe or pre-action sprinkler system.

E. System Trouble and Supervisory Signal Actions: Initiate notification appliance and annunciate at fire-alarm control unit and remote annunciators. Record the event on system printer.

2.3 FIRE-ALARM CONTROL UNIT

A. The main control panel or remote control panel(s) shall be a multi-processor based networked system designed specifically for detection, and one-way emergency audio communications applications. The control panel(s) shall be listed and approved for the application under the standard(s) as listed.

B. The control panel(s) shall include all required hardware, software and site-specific system programming to provide a complete and operational system. The control panel(s) shall be designed such that interactions between any application can be configured, and modified using software provided by a single supplier. The control panel operational priority shall assure that life safety takes precedence among the activities coordinated by the control panel.

C. The network of control panels shall include the following features.

1. Ability to download all network applications and firmware from the configuration computer on the network or at any control panel (network node) location.
2. Each control panel (network node) shall have an LCD display with common controls. The display shall be configurable to display the status of any and all combinations of alarm, supervisory, trouble, monitor, or group event messages.
3. From each LCD display on the system shall be capable of being programmed for control functions of any node or the entire network. The LCD display shall reside on the network as a node and continue to operate with fault on the network. An LCD can be programmed to be only operation when a node is operational in stand-alone mode, with a network fault.
4. The system program shall have a minimum of 100 system definable Service Groups to facilitate the testing of installed system based on the physical layout of the system. Service groups that disable entire circuits serving multiple floors or fire zones shall not be considered as equal.
5. Advanced Windows based programming with Program Version Reporting to document any and all changes made during system start-up or system commissioning. Time and date stamps of all modifications made to the program

must be Included to allow full retention of all previous program version data. The operator display shall clearly identify unacknowledged and acknowledged alarm, supervisory, trouble, and monitor status messages. The system shall provide the ability to download data from the analog/addressable detectors to a PC while the system is on-line and operational in the protected premises. The downloaded data may then be analyzed in a diagnostic program supplied by the system manufacturer.

6. Provide system reports that list a detailed description of the status of system parameters for corrective action or for preventive maintenance. Reports shall be displayed on the operator interface or be capable of being sent to a printer.
7. Provide an authorized operator with the ability to operate or modify system functions such as system time, date, passwords, holiday dates, restart the system and clear the control panel event history file.
8. Provide an authorized operator the ability to perform test functions within the installed system.
9. Supervision of system components, wiring, initiating devices and software shall be provided by the control panel. Failure or fault of system component or wiring shall be indicated by type and location on the LCD display. Software and processor operation shall be independently monitored for failure. The system shall provide fail-safe operation, with multiple-levels of system operation

D. Each network control panel shall be capable of:

1. Supporting up to 2500 intelligent analog/addressable points.
2. Supporting up to ten (10) intelligent addressable loops, each loop supporting 125 detectors and 125 modules, total of 250 points.
3. Supporting network connections up to 63 other control panels and annunciators.
4. Supporting up to 124 (security/access control) Keypad/Displays.
5. Supporting up to ten network digital dialers with Contact ID or SIA format and TAP Pager protocol.
6. Supporting multiple RS-232 communication ports and protocol.
7. Supporting up to 1740 chronological history events.
8. Total network response shall not exceed 3 seconds.

E. Alphanumeric Display and System Controls: Arranged for interface between human operator at fire-alarm control unit and addressable system components including annunciation and supervision. Display alarm, supervisory, monitor, trouble and component status messages and control menu.

1. The common control switches and with corresponding LEDs provided as minimum will be; Reset Alarm Silence, Panel Silence, and Drill. It shall be able to add additional switches/LEDs as required.
2. The main control panel shall have display that is 24 lines by 40 character graphic LCD and backlit when active.
3. Each point shall have custom event message of up to 40 charters, for total of 80 charters. In addition to instructional text message support a maximum of 2,000 characters each.
4. Provide 8 simultaneous events to be displayed. The first seven (7) highest priority events in addition to the most recent event. The events shall be automatically placed in event types (Alarm, Supervisory, Monitor & Trouble) for easy access and shall be possible to view the specific event type separately. Having to scroll through a mixed list of event types is not acceptable.
5. Provide an internal audible signal with different programmable patterns to distinguish between alarm, supervisory, trouble and monitor conditions.

F. Audio One-Way Voice Communications

1. The voice communication system shall be eight (8) channel audio evacuation systems, to allow the ability to have eights simultaneous announcements/paging. The audio channels shall be designed as such:

    a. Mass Notification Message (HIGHEST PRIORITY)
    b. Fire Message
    c. Alert Message
    d. Stand-by Message
    e. Elevator Message
    f. Stairwell Message
    g. Security/Weather Threat
    h. Manual Paging

2. The system custom digital voice message shall provide a minimum of 100 minutes and be created as a .wav file format. All messages shall be able to be created on-site without any special tools or burning of chips. Provide as minimum one twenty (20) watt supervised audio amplifier per paging zone. The system software shall be capable of selecting the required audio source signal for amplification. To enhance system survivability, each audio amplifier shall automatically provide an internally generated local 3-3-3, 1000 Hz temporal pattern output upon loss of the audio signal from the one-way emergency audio control unit, during an alarm condition.
3. Audio amplifiers shall be power limited and protected from short circuits conditions on the audio circuit wiring. Each amplifier output shall be a supervised, dedicated, selectable 25/70 Vrms output.
4. Provide a standby audio amplifier, per node that will automatically sense the failure of any primary amplifier installed in the same panel and replace the function of the failed amplifier.

G. Provide an Emergency Voice Communication System with the following design features:

1. An audio control unit with Microphone for Paging.
2. Provide 3-position switch for each evacuation signaling zone and “All-Call”, with "Page FIRE", "Auto" and “Page ALERT” positions identified and two LED status indicators for each audio visual evacuation signaling "zone", one red and one yellow.
3. These LED's shall illuminate to indicate respectively:

    a. Evacuation signals activated (red),
    b. Trouble in audio (speaker) or visual (strobe) circuit(s) (yellow).

H. Provide 2-position switch for manually activate pre-recorded voice messages, with “Message Name" positions identified and one LED status indicators, one red. Provide minimum of 12 selector switches.

1. These LED's shall illuminate to indicate respectively:

    a. Message activated (red)

I. Instructions: Computer printout or typewritten instruction card mounted behind a plastic or glass cover in a stainless steel or aluminum frame. Include interpretation and describe appropriate response for displays and signals. Briefly describe the functional operation of the system under normal, alarm, and trouble conditions

J. Circuits Requirements:

1. Signaling Line Circuits for Network Communications:

    a. Class A, Style 7.

2. Signaling Line Circuits for Intelligent Analog Addressable Loop:

    a. Class B, Style 4.
    b. No more than 100 detectors or 100 modules installed on a loop.

3. Initiating Device Circuit:

    a. Class B, Style B

4. Notification Appliance Circuits:

    a. Class B, Style Y.
    b. Maximum circuit loading to 2 amps for visuals.

5. Activation of alarm notification appliances, smoke control, elevator recall and other functions shall occur within 3 seconds after the activation of an initiating device.

K. Smoke-Alarm Verification:

1. Initiate an audible and visible indication of an "alarm-verification" signal at fire-alarm control unit.
2. Activate an NRTL-listed and -approved "alarm-verification" sequence at fire-alarm control unit and detector.
3. Record events by the system printer.
4. Sound general alarm if the alarm is verified.
5. Cancel fire-alarm control unit indication and system reset if the alarm is not verified.

L. Elevator Recall:

1. Smoke detectors at the following locations shall initiate automatic elevator recall. Alarm initiating devices, except those listed, shall not start elevator recall.

    a. Elevator lobby detectors except the lobby detector on the designated floor.
    b. Smoke detector in elevator machine room.
    c. Smoke detectors in elevator hoist way.

2. Elevator lobby detectors located on the designated recall floors shall be programmed to move the cars to the alternate recall floor.
3. Water-flow alarm connected to sprinkler in an elevator shaft and elevator machine room shall shut down elevators associated with the location without time delay.

    a. Water-flow switch associated with the sprinkler in the elevator pit may have a delay to allow elevators to move to the designated floor.

M. Door Controls: Door hold-open devices that are controlled by smoke detectors at doors in smoke barrier walls shall be connected to fire-alarm system.

N. Remote Smoke-Detector Sensitivity Adjustment: Controls shall select specific addressable smoke detectors for adjustment, display their current status and sensitivity

settings, and change to alternate settings. Allow controls to be used to program repetitive, time-scheduled, and automated changes in sensitivity of specific detector groups. Record sensitivity adjustments and sensitivity-adjustment schedule changes in system memory, and print out the final adjusted values on system printer.

O. Primary Power: 24-V dc obtained from 120-V ac service and a power-supply module. Initiating devices, notification appliances, signaling lines, trouble signals, shall be powered by nominal 24-V dc source.

P. Secondary Power: Shall provide 24 hours supervisory and 15 minutes of alarm with batteries, automatic battery charger, and automatic transfer switch.

2.6 REMOTE ANNUNCIATOR

A. Annunciator shall match those of fire-alarm control unit LCD display functions for alarm, supervisory, monitor and trouble indications and common system controls including; acknowledging, silencing, resetting, and testing. See section 2.3 E for specific requirements.

2.7 NAC POWER SUPPLY:

A. The NAC power supply shall be independent unit that will provide power to visual strobe notification appliances. It shall be possible to configure the NAC's to follow the main panel's NAC or activate from intelligent synchronized modules. The booster NAC's must be configurable to operate independently at any one of the following rates: continuous synchronized, or 3-3-3 temporal. Fault conditions on the power supply shall not impede alarm activation of host NAC circuits or other power supplies. The NAC power supply must be able to provide concurrent power for notification devices, security devices, access control equipment and auxiliary devices such as door holders. . All the NAC Power Supplies shall be synchronized. The power supply shall support up to 24 amp hour batteries.

1. Power supply shall be minimum of 10 amps and UL 864 Listed.
2. Four independent 3amp NAC circuits. Each being configurable as auxiliary power.
3. All circuits shall be synchronized.

2.8 INTELLIGENT ANALOG SYSTEM SMOKE DETECTORS

A. General Requirements for Intelligent Analog Detectors

1. Integral Microprocessor: All decision are made at the detector determining if the device is in the alarm or trouble condition.
2. Non-Volatile Memory: Permanently stores serial number and type of device. Automatically updates historic information including hours of operation, last maintenance date, number of alarms and troubles, time of last alarm, and analog signal patterns for each sensing element just before last alarm.
3. Electronic Addressing: Permanently stores programmable system address. It shall be possible to address each intelligent module without the use of DIP or rotary switches. Devices using switches for addressing shall not be acceptable.
4. Automatic Device Mapping: Each detector transmits wiring information regarding its location with respect to other devices on the circuit, creating an As-Built wiring diagram. This will also provide enhanced supervision of the device physical location and the device message shall reside with the location and not the device address. Devices installed in the wrong location will always report the correct message of the physical location.
5. Sensitivity Range: Each analog addressable smoke detector's sensitivity shall be capable of being programmed individually as: most sensitive, more sensitive,

normal, less sensitive or least sensitive. It shall be possible to automatically change the sensitivity of individual analog/addressable detectors for the day and night periods. It shall be possible to program control panel activity to each level.

6. Pre-Alarm: Detector stores 20 pre-alarm sensitivity values to alert local personnel prior to the sensor reaching full evacuation sensitivity. Sensitivity values can be set in 5% increments.
7. Environmental Compensation: The detector's sensing element reference point shall automatically adjust, compensating for background environmental conditions such as dust, temperature, and pressure. Periodically, the sensing element real-time analog value shall be compared against its reference value. The detector shall provide a maintenance alert signal when the detector reaches 75% (Dirty) to 99% (More Dirty) compensation has been used. The detector shall provide a dirty fault signal when 100% or greater compensation has been used.
8. Twin Status LEDs: Flashing Green LED shows normal; flashing RED shows alarm state; steady RED and steady GREEN show alarm state in stand-alone mode, visible from any direction.
9. UL Sensitivity Testing: The detector shall utilize a supervised microprocessor that is capable of monitoring the sensitivity of the detector. If the detector sensitivity shifts outside of the UL limits, a trouble signal is sent to the panel.
10. Device Replacement: The system shall allow for changing of detector types for service replacement purposes without the need to reprogram the system. The replacement detector type shall automatically continue to operate with the same programmed sensitivity levels and functions as the detector it replaced. System shall display an off-normal condition until the proper detector type has been installed or change in the application program profile has been made.

B. Intelligent 4D Multi-sensor Detector (Photo/Ion/Thermal and Time)

1. Provide intelligent analog addressable 4D multi-sensor smoke detectors at the locations shown on the drawings. The 4D Intelligent detector gathers analog information from each of its three fire sensing elements and converts it into digital signals. The detector’s onboard microprocessor measures and analyzes these signals separately with respect to a fourth element – Time. It compares the information to historical readings, time patterns and known fire characteristics to make an alarm decision. Digital filters remove signal patterns that are not typical of fires.
2. Separately mounted combinations of photoelectric detectors, ionization detectors and heat detectors in the same location, clustered at the manufacturer's listed spacing is an acceptable alternative.

C. Intelligent 3D Multi-sensor Detector (Photo/Thermal and Time)

1. Provide intelligent analog addressable 3D multi-sensor smoke detectors at the locations shown on the drawings. The 3D Intelligent detector gathers analog information from each of its two fire sensing elements and converts it into digital signals. The detector’s on-board microprocessor measures and analyzes these signals separately with respect to a third element – Time. It compares the information to historical readings, time patterns and known fire characteristics to make an alarm decision. Digital filters remove signal patterns that are not typical of fires.

D. Intelligent Photoelectric Detector

1. Provide intelligent analog addressable photoelectric smoke detectors at the locations shown on the drawings.

E. Intelligent 135 Degree Fixed Temperature / Rate of Rise Heat Detector

1. Provide intelligent combination fixed temperature/rate-of-rise heat detectors at the locations shown on the drawings. The heat detector shall have a low mass thermistor heat sensor and operate at a fixed temperature and at a temperature rate-of-rise. It shall continually monitor the temperature of the air in its surroundings to minimize thermal lag to the time required to process an alarm. The integral microprocessor shall determine if an alarm condition exists and initiate an alarm based on the analysis of the data. Systems using central intelligence for alarm decisions shall not be acceptable. The intelligent heat detector shall have a nominal fixed temperature alarm point rating of 135°F (57°C) and a rate-of-rise alarm point of 15°F (9°C) per minute. The heat detector shall be rated for ceiling installation at a minimum of 70 ft (21.3m) centers and be suitable for wall mount applications.

F. Fixed Temperature Heat Detector

1. Provide intelligent fixed temperature heat detectors at the locations shown on the drawings. The heat detector shall have a low mass thermistor heat sensor and operate at a fixed temperature. It shall continually monitor the temperature of the air in its surroundings to minimize thermal lag to the time required to process an alarm. The integral microprocessor shall determine if an alarm condition exists and initiate an alarm based on the analysis of the data. Systems using central intelligence for alarm decisions shall not be acceptable. The heat detector shall have a nominal alarm point rating of 135°F (57°C). The heat detector shall be rated for ceiling installation at a minimum of 70 ft (21.3m) centers and be suitable for wall mount applications.

G. Detector Base Types

1. Provide standard detector mounting bases suitable for mounting on 1-gang, or 4inch octagon box and 4 inch square box. The base shall, contain no electronics and support all series detector types. Bases with electronics or dip-switches are not acceptable.
2. Provide relay detector mounting bases suitable for mounting on 1-gang, or 4” octagon box and 4” square box. The relay base shall support all Signature Series detector types and have the following minimum requirements:

    a. The relay shall be a bi-stable type and selectable for normally open or normally closed operation.
    b. The position of the contact shall be supervised.
    c. The relay shall automatically de-energize when a detector is removed.
    d. The operation of the relay base shall be controlled by its respective detector processor or under program control as required by the application. Detector relays not capable of operational programming independent of the detector shall not be considered equal. Form “C” Relay contacts shall have a minimum rating of 1 amp @ 30 Vdc and be listed for “pilot duty”.
    e. Removal of the respective detector shall not affect communications with other detectors.

3. Provide audible detector mounting bases suitable for mounting on 4” x 4” octagonal concrete ring (mud box) and 4” square x 2-1/8” (54 mm) deep box.

a. The base shall support all Signature Series detector types and be capable of single or group operation. The audible base shall emit a temporal alarm tone and be selectable for low or high output.
b. The operation of the audible base shall be controlled by its respective detector processor or under program control as required by the application. Detector audible base not capable of operational programming independent of the detector shall not be considered equal.
c. The audible bases shall be UL268 and UL464 Listed, and provide a reverberant room sound output per UL464 of 81 dBA at 10ft (3m). and an average anechoic sound output of 90 dBA at 10 ft.(3m).

H. Intelligent Duct Smoke Detector – Photoelectric

1. Provide intelligent photoelectric duct smoke detector at the locations shown on the drawings.

a. One form C auxiliary alarm relay rated at 2amps @ 30Vdc.
b. The operating range shall be 100ft/min to 4,000ft/min air velocity and temperature range of –20 to 158F.
c. Sample tube can be installed with or without the cover place and be rotated in 45-degree increments to ensure proper alignment with duct airflow.
d. Local magnet-activated test switch.
e. Provide EST, model SIGA-SD

2. Provide remote test station with Alarm LED and Key Switch.

a. Provide EST, model SD-TRK.

3. Relay Fan Shutdown: Rated to interrupt fan motor control circuit. Furnish and install separate device for each motor start. Connect to motor start as required for fan shutdown during alarm condition.

I. Beam Smoke Detectors

1. Provide reflective beam type smoke detectors at the locations shown on the drawings. This detector shall consist of a integrated transmitter and receiver capable of being powered separately or together.
2. The detector shall operate in either a short range of 15 to 160 ft. or a long range of 160 to 330 ft. The detector shall feature a bank of alignment LEDs on both the receiver and transmitter to ensure proper alignment without the use of special tools.
3. The detector shall utilize an automatic gain control to compensate for gradual signal deterioration from dirt accumulation on lenses. The beam smoke detectors shall be powered from the system control panel. Testing shall be carried out using calibrated test filters.
4. Provide a remote key activated remote test station.

2.9 INTELLIGENT MODULES

A. It shall be possible to address each intelligent module without the use of DIP or rotary switches. Devices using switches for addressing shall not be acceptable. The personality of multifunction modules shall be programmable at site to suit conditions and may be changed at any time using a personality code downloaded from the Analog Loop Controller.

1. Integral Microprocessor: All decisions are made at the module determining if the device is alarm or trouble condition.
2. Non-Volatile Memory: Permanently stores serial number, and type of device. Automatically updates historic information including hours of operation, number of alarms and troubles, time of last alarm.
3. Automatic Device Mapping: Each detector transmits wiring information regarding its location with respect to other devices on the circuit, creating an As-Built wiring diagram. This will also provide enhanced supervision of the device physical location. The device message shall reside with the location and not the device address. Devices installed in the wrong location will always report the correct message of the physical location.
4. Twin Status LEDs: The modules shall have a minimum of 2 diagnostic LEDs mounted behind a finished cover plate. A green LED shall flash to confirm communication with the loop controller. A red LED shall flash to display alarm status.
5. Input and output circuit wiring shall be supervised for open and ground faults.
6. Two styles of modules shall be available, those designed for gang box mounting, and where multiple modules are required in a single location, plug in modules shall be provided with a Universal Input/Output motherboard.

B. Intelligent Input Module. The Input Module shall provide one or two supervised Class B input circuit capable of a minimum of 4 personalities, each with a distinct operation. The module shall be suitable for mounting on North American 2 ½" (64mm) deep 1-gang boxes and 1 ½" (38mm) deep 4" square boxes with 1-gang covers. The single input module shall support the following circuit types:

1. Normally-Open Alarm Latching (Manual Stations, Heat Detectors, etc.)
2. Normally-Open Alarm Delayed Latching (Waterflow Switches)
3. Normally-Open Active Non-Latching (Monitor, Fans, Dampers, Doors, etc.)
4. Normally-Open Active Latching (Supervisory, Tamper Switches)

C. Intelligent Relay Module. Provide addressable control relay circuit modules shall provide one (1) form C dry relay contacts rated at 24Vdc @ 2 amps (pilot duty) to control external appliances or equipment. The position of the relay contact shall be confirmed by the system firmware. The module shall be suitable for mounting on North American 2 ½" (64mm) deep 1-gang boxes and 1 ½" (38mm) deep 4" square boxes with 1-gang covers.

D. NAC Control Module: Provide intelligent NAC control module shall provide one (1) supervised Class B output circuit capable of a minimum of 2 personalities, each with a distinct operation. The gang box -mounted version shall be suitable for mounting in North American 2 ½" (64mm) deep 2-gang boxes and 1 ½" (38mm) deep 4" square boxes with 2-gang covers, or European 100mm square boxes. The plug-In version shall plug into a universal multi-module motherboard. The NAC control module shall support the following operations:

1. 24volt NAC circuit
2. Audio notification circuit 25v or 70v
3. Telephone Power Selector with Ring Tone (Firefighter's Telephone)
4. Visual Synchronized Output to Genesis appliances or to NAC Power Supply.

E. FA Elevator Interface Cabinet

1. Provide red metal cabinet enclosure with word FIRE in white letters on the cover. Inside will be four intelligent relays (Primary Recall, Alternate Recall, Fire Hat and Shunt Trip), one monitor input (Shunt Trip AC Power Supervision) and 120vac relay (Shunt Trip AC Power Supv).

2. Label all the relays and input modules for the function.

2.10 MANUAL FIRE-ALARM BOXES

A. General Requirements for Manual Fire-Alarm Boxes: Comply with UL38. Boxes shall be finished in red with molded, raised-letter operating instructions in contrasting color; shall show visible indication of operation; and shall be mounted on recessed outlet box. If indicated as surface mounted, provide manufacturer's surface back box.

1. Double-action mechanism requiring two actions to initiate an alarm, pull-lever type; with integral addressable module arranged to communicate manual-station status (normal, alarm, or trouble) to fire-alarm control unit.
2. The manual pull station will have an intelligent module integral of the unit.
3. Station Reset: key operated switch shall match the control panel key.
4. Manual pull stations that initiated an alarm condition by opening the unit are not acceptable.

B. Indoor Protective Shield: Factory-fabricated clear plastic enclosure. Hinged at the top to permit lifting for access to initiate alarm. Lifting the cover actuates an integral battery powered audible horn (when noted on the drawings) intended to discourage false-alarm operation.

C. Weatherproof manual pull station shall be provided of red metal construction with special weatherproof gasket metal red box.

1. Single-action operation.
2. Station Reset: key operated switch shall match the control panel key.
3. The intelligent monitor module will be located within the building and not with the station

2.11 NOTIFICATION APPLIANCES

A. All appliances shall be of the same manufacturer as the Fire Alarm Control Panel specified to insure absolute compatibility between the appliances and the control panels, and to insure that the application of the appliances are done in accordance with the single manufacturers' instructions.

B. Any appliances, which do not meet the above requirements, and are submitted, for use must show written proof of their compatibility for the purpose intended. Such proof shall be in the form of documentation from all manufacturers which clearly states that their equipment (as submitted) are 100% compatible with each other for the purposes intended. All appliances shall be UL listed Fire Protective Service. and shall be UL 1971.

C. Notification Appliances – Visual (Fire – Evacuation)

1. Provide wall or ceiling mounted clear lens strobes with white body and "FIRE" markings. Strobes shall provide a smooth light distribution pattern field selectable candela 15 cd, 30 cd, 75 cd, and 110 cd flash output rating, UL1971 listed with in-out screw terminals shall be provided for wiring. The strobe (15, 30, 75, 110) candela rating shall be view from the side window to verify the setting. All strobes shall be synchronized to within 10 milliseconds for an indefinite period shall not require the use of separately installed remote synch modules. The strobes shall mount to one-gang electrical box.
2. The device shall have plastic protective cover for during installation.
3. The actual candela setting on the visual shall be marked on the appliance.

D. Notification Appliances – Visual (ALERT – Mass Notification)

1. Provide wall or ceiling mounted amber colored lens strobe with white body and “ALERT” markings. Amber strobe shall provide a smooth light distribution pattern field selectable candela 15 cd, 30 cd, 75 cd, and 110 cd flash output rating UL1638 listed, with in-out screw terminals shall be provided for wiring. The strobe (A, B, C, D) candela rating shall be view from the side window to verify the setting. All strobes shall be synchronized to within 10 milliseconds for an indefinite period shall not require the use of separately installed remote synch modules. The strobes shall mount to electrical box.
2. Provide Amber Strobe adapter plate that will allow G4 Speaker-Strobe. The amber strobe shall be located directly below the Fire clear lens strobe.
3. The device shall have plastic protective cover for during installation.

E. Notification Appliance - 4" Cone Speaker

1. Speakers shall have a 4" mylar cone, paper cones shall not accept as equal. The rear of the speakers shall be completely sealed protecting the cone during and after installation. In and out screw terminals shall be provided for wiring. Speakers shall provide 1/4w, 1/2w, 1w, and 2w power taps for use with 70V systems. The actual speaker wattage & strobe candela setting shall be viewable from the device window to verify the wattage setting without removing the device. To make any changes to the speaker wattage will only require the removal of the cover plate.
2. At the 2-watt setting, the speaker shall provide a 90 dBA sound output over a frequency range of 400-4000 Hz. as measured in reverberation room per UL-1480.
3. Combination speaker strobes shall meet both sections of above.
4. The device shall have plastic protective cover for during installation.
5. The actual wattage setting on the speaker shall be marked on the face of the appliance.

F. Notification Appliance - Re-entrant Speakers

1. Provide 4”white flush re-entrant speakers at loud ambient locations or for outdoor weatherproof installation. Weatherproof boxes shall be provided for outdoor mounting. Speakers shall provide 2w, 4w, 8w, and 15w power taps. The re-entrant speakers shall utilize a high-efficiency compression driver. Cone type drivers are not acceptable. At the 15 watt setting, the speaker shall provide a 102 dBA sound output over a frequency range of 400-4000 Hz. when measured in reverberation room per UL-1480.
2. Combination speaker strobes shall meet both sections of above.

G. Notification Appliance - 8" Cone Speaker

1. Speakers shall have a 8" cone with 5.32oz ceramic magnet. In and out screw terminals shall be provided for wiring. Speakers shall provide 1/2w, 1w, 2w and 4w power taps for use with 70V systems. With response from 100Hz - 8KHz +/- 5dB.
2. At the 2-watt setting, the speaker shall provide an 85 dBA sound output over a frequency range of 100-8KHz. as measured in reverberation room per UL-1480.
3. The baffle shall be steel, baked epoxy powder coat finish - White.
4. Combination speaker strobes shall meet both sections of above.

2.12 GUARDS FOR PHYSICAL PROTECTION

A. Provide welded mesh of size and shape for the manual pull stations, smoke detectors, notification appliances at location noted on the drawings.

2.13 MAGNETIC DOOR HOLDERS

A. Description: Units are equipped for wall or floor mounting as indicated and are complete with matching doorplate.

1. Electromagnet: Requires no more than 3 W to develop 25-lbf holding force.
2. Wall-Mounted Units: Flush mounted unless otherwise indicated.
3. Rating: 120-V ac, 24-V ac or dc.

2.14 WIRE AND CABLE

A. Signaling Line Circuits – Network Data: Twisted pair, not less than No. 18Awg or as recommended by the manufacturer.
B. Signaling Line Circuits – Intelligent Loop: Non-Twisted pair, not less than No. 16Awg or as recommended by the manufacturer.

1. Circuit Integrity Cable: Provide as required to meet NFPA or Local Code requirements.
2. CI Cable shall meet article 760, power limited fire alarm service.

C. Notification Appliance Circuits –

1. Audio: Twisted pair, not less than No. 16Awg or as recommended by the manufacturer.
2. Visual. Twisted pair, not less than No. 14Awg or as recommended by the manufacturer.

PART 3 – EXECUTION

3.1 EQUIPMENT INSTALLATION

A. Comply with NFPA72 for installation of fire-alarm equipment.
B. Equipment Mounting: Install fire-alarm control unit on finished floor with tops of cabinets not more than 72 inches above the finished floor.
C. Connecting to Existing Equipment: NOT APPLICABLE
D. Smoke- or Heat-Detector Spacing:

1. Comply with NFPA72, "Smoke-Sensing Fire Detectors" Section in the "Initiating Devices" Chapter, for smoke-detector spacing.
2. Comply with NFPA72, "Heat-Sensing Fire Detectors" Section in the "Initiating Devices" Chapter, for heat-detector spacing.
3. Smooth ceiling spacing shall not exceed 30 feet.
4. Spacing of detectors for irregular areas, for irregular ceiling construction, and for high ceiling areas shall be determined according to Appendix A **or Appendix B** in NFPA 72.
5. HVAC: Locate detectors not closer than **5 feet** from air-supply diffuser or return-air opening.
6. Lighting Fixtures: Locate detectors not closer than 12 inches from any part of a lighting fixture.

E. Duct Smoke Detectors: Comply with NFPA72 and NFPA90A. Install sampling tubes so they extend the full width of duct.
F. Heat Detectors in Elevator Shafts: Coordinate temperature rating and location with sprinkler rating and location.

G. Single-Station Smoke Detectors: Where more than one smoke alarm is installed within a dwelling or suite, they shall be connected so that the operation of any smoke alarm causes the alarm in all smoke alarms to sound.
H. Notification Appliance Devices: Install between 80 and 96 inches on the wall.
I. Fire-Alarm Control Unit: Surface mounted, with tops of cabinets not more than 72 inches above the finished floor.
J. Annunciator: Install with top of panel not more than 56 inches above the finished floor.

3.2 CONNECTIONS

A. For fire-protection systems related to doors in fire-rated walls and partitions and to doors in smoke partitions, comply with requirements in Division 8 Section "Door Hardware." Connect hardware and devices to fire-alarm system.

1. Verify that hardware and devices are NRTL listed for use with fire-alarm system in this Section before making connections.

B. Make addressable connections with a supervised interface device to the following devices and systems. Install the interface device less than 3 feet from the device controlled. Make an addressable confirmation connection when such feedback is available at the device or system being controlled.

1. Alarm-initiating connection to smoke-control system (smoke management) at firefighter smoke-control system panel.
2. Alarm-initiating connection to stairwell and elevator-shaft pressurization systems.
3. Smoke dampers in air ducts of designated air-conditioning duct systems.
4. Alarm-initiating connection to elevator recall system and components.
5. Alarm-initiating connection to activate emergency lighting control.
6. Alarm-initiating connection to activate emergency shutoffs for gas and fuel supplies.
7. Supervisory connections at valve supervisory switches.
8. Supervisory connections at low-air-pressure switch of each dry-pipe sprinkler system.
9. Supervisory connections at elevator shunt trip breaker.
10. Supervisory connections at fire-pump power failure including a dead-phase or phasereversal condition.
11. Supervisory connections at fire-pump engine control panel.

3.3 IDENTIFICATION

A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Division 16 Section "Electrical Identification."
B. Install framed instructions in a location visible from fire-alarm control unit.
C. All initiating devices shall have bar code label installed visibly on the device. This bar code shall be used for digital inspection of the fire alarm system using Building-Reports.Com.

3.4 GROUNDING

A. Ground fire-alarm control unit and associated circuits; comply with IEEE 1100. Install a ground wire from main service ground to fire-alarm control unit.

3.5 FIELD QUALITY CONTROL

A. Field tests shall be witnessed by Architect, Engineer and authorities having jurisdiction.

B. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.

C. Perform tests and inspections.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

D. Tests and Inspections:

1. Visual Inspection: Conduct visual inspection prior to testing.

a. Inspection shall be based on completed Record Drawings and system documentation that is required by NFPA72 in its "Completion Documents, Preparation" Table in the "Documentation" Section of the "Fundamentals of Fire Alarm Systems" Chapter.
b. Comply with "Visual Inspection Frequencies" Table in the "Inspection" Section of the "Inspection, Testing and Maintenance" Chapter in NFPA72; retain the "Initial/Reacceptance" column and list only the installed components.

2. System Testing: Comply with "Test Methods" Table in the "Testing" Section of the "Inspection, Testing and Maintenance" Chapter in NFPA72.
3. Test audible appliances for the public operating mode according to manufacturer's written instructions. Perform the test using a portable sound-level meter complying with Type 2 requirements in ANSI S1.4.
4. Test audible appliances for the private operating mode according to manufacturer's written instructions.
5. Test visible appliances for the public operating mode according to manufacturer's written instructions.
6. Factory-authorized service representative shall prepare the "Fire Alarm System Record of Completion" in the "Documentation" Section of the "Fundamentals of Fire Alarm Systems" Chapter in NFPA72 and the "Inspection and Testing Form" in the "Records" Section of the "Inspection, Testing and Maintenance" Chapter in NFPA72.

E. Reacceptance Testing: Perform reacceptance testing to verify the proper operation of added or replaced devices and appliances.

F. Fire-alarm system will be considered defective if it does not pass tests and inspections.

G. Prepare test and inspection reports.

H. Maintenance Test and Inspection: Perform tests and inspections listed for weekly, monthly, quarterly, and semiannual periods. Use forms developed for initial tests and inspections.

I. Annual Test and Inspection: During the warranty period, each year test fire-alarm system complying with visual and testing inspection requirements in NFPA72. Use forms developed for initial tests and inspections.

J. Detector Sensitivity Testing: During the warranty period, each year the contractor is to perform detector sensitivity testing and provide report to the Owner. Unless, the system is UL Listed to perform automatic sensitivity testing without any manual intervention and should detector fall outside of sensitivity window, the system will automatically indicated a devices trouble. A copy of UL letter is to be provided as proof of system operation

3.6 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain fire-alarm system.

END OF SECTION

PART 1 – GENERAL

1.1 DESCRIPTION

A. This section covers basic materials and methods which may be common to two or more subsequent sections.

1.2 QUALITY ASSURANCE

A. Chemical and physical properties of all materials, design, performance characteristics and methods of construction of all items of equipment shall be in accordance with the following applicable regulations, references, and standards of current editions in effect 30 days prior to receipt of bids:

1. Factory Mutual Laboratories (FM).
2. National Electrical Manufacturer's Association (NEMA).
3. National Fire Protection Association (NFPA).
4. Plumbing and Drainage Institute (PDI).
5. Underwriters' Laboratories, Inc. (UL).
6. American National Standards Institute (ANSI).

B. All work, materials and equipment shall comply with the rules and regulations of all codes and ordinances of the local, state and federal authorities. Such codes, where applicable, shall take precedence over these drawings and specifications.

C. 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.

D. All castings used for coupling housings, fittings, and valve bodies shall be date stamped for quality assurance and traceability.

1.3 MATERIALS AND MANUFACTURERS

A. Unless otherwise noted all materials and equipment shall be new, free of defects, installed in accordance with manufacturer's current published recommendations in a neat manner and in accordance with standard practice of the Industry.

B. Certain materials and/or equipment in this specification are specified by manufacturer and catalog numbers. The design was based on the specified equipment and establishes a degree of quality, performance, physical configuration, etc. If the Contractor should elect to use equipment other than the equipment used as a basis for design but listed as "acceptable" in the Specifications, Contractor shall be responsible for space requirements, configuration, performance and changes in other appurtenances that may be affected by itsuse.

C. Contractor further agrees that if deviations, discrepancies, or conflicts between reviewed submittals and shop drawings, and the Contract Documents in the form of design drawings and specifications are discovered after submittals and/or shop drawings are processed by the Architect/Engineer, the design drawings and specifications shall control and shall be followed at no additional cost to Owner or Engineer.

1.4 SUBSTITUTION APPROVALS

A. Equipment and/or materials manufactured by any one of the manufacturers listed in this specification or on the drawings shall be acceptable.

B. Where no specific manufacturer is listed, a first-class item of cataloged manufacturer shall be furnished.

C. Where specifications list a manufacturer and then state, 'or approved equal', it shall be the contractors' responsibility to obtain in writing the Engineers approval of the proposed 'equal' product prior to bids. Contractor shall not simply assume a product will be approved 'as equal' based on supplier representatives' verbal statements.

D. Coordinate with Division 1 for substitutions and forms tofollow.

1.5 QUIET OPERATION AND VIBRATION

A. All pumps, water heaters, and other equipment provided under this contract shall operate under all conditions of load without any sound or vibration which is objectionable in the opinion of the Architect/Engineer. Sound or vibration noticeable outside of its own room in which it is installed, or annoyingly noticeable inside its own room, will be considered objectionable. Sound or vibration conditions considered objectionable by the Architect/Engineer shall be corrected in an approved manner by the Contractor at his expense. Vibration control shall be by means of approved vibration eliminators in a manner as recommended by the manufacturer of the eliminators.

1.6 PERMITS AND INSPECTIONS\

A. Plumbing contractor shall file for, pay all fees, and obtain all applicable plumbing and other permits required to receive approvals for occupancy and use of the premises.

B. Contractor shall call for, and ascertain all inspections are completed and approvals obtained for the work prior to submitting an application for finalpayment.

PART 2 - PRODUCTS

2.1 VALVES

A. All valves, except as otherwise specified in detail specifications, shall be of one manufacturer: Victaulic, Jomar, Apollo, Milwaukee Valve, Crane, Kennedy, Jenkins, Hammond, Powell, Nibco (gate valves - block pattern) and are to be manufactured in accordance with the Manufacturer's Standardization Society of the Valves and Fittings Industry Standards wherever applicable.

B. Ball valves shall be used in lieu of gate valves wherever the pressure and temperature ratings of same are satisfactory for the intended service and valve can be operated easily from floor or platform.

C. Listed manufacturer's numbers in detailed specifications are for cross reference purposes

D. ASME Compliance:

1. ASME B1.20.1 for threads for threaded-end valves.
2. ASME B16.1 for flanges on iron valves.
3. ASME B16.5 for flanges on steel valves.
4. ASME B16.10 and ASME B16.34 for ferrous valve dimensions and design criteria.
5. ASME B16.18 for solder-joint connections.
6. ASME B31.1 for power piping valves.
7. ASME B31.9 for building services piping valves.

E. Ball Valves:

1. NPS 2 and Smaller:

a. Brass, Two-Piece (Dezincification Resistant Brass Alloy, Lead-Free):

1. Standard: MSS SP-110 or MSS SP-145.
2. CWP Rating: 600 psig, non-shock.
3. Body Design: Two piece.
4. Body material: Forged brass.
5. Ends: Threaded or solder.
6. Seats: PTFE.
7. Stem: Brass, blow-out proof.
8. Ball: T.E.A. (ternary eco alloy) coated brass.
9. Port: Full.

2. NPS 2-1/2 and Larger:

a. Steel, Class 150:

1. Standard: MSS SP-72.
2. CWP Rating: 285 psig, non-shock.
3. Body Design: Split body.
4. Body material: Carbon steel, ASTM A216, Type WCB.
5. Ends: Flanged or threaded.
6. Seats: PTFE.
7. Stem: Stainless steel, blow-out proof.
8. Ball: Stainless steel, vented.
9. Port: Full.

b. Iron, Class 125:

1. Standard: MSS SP-72.
2. CWP Rating: 200 psig, non-shock.
3. Body Design: Split body.
4. Body material: ASTM A126, gray iron.
5. Ends: Flanged or threaded.
6. Seats: PTFE.
7. Stem: Stainless steel, blow-out proof.
8. Ball: Stainless steel.
9. Port: Full.

F. Recirculation System Balancing Valves:

1. One-piece non-ferrous brass/bronze flow measuring and balancing/shut-off valve combination rated to 150 psig. Flow element shall be a low loss/high signal Venturi or orifice meter equipped with pressure and temperature test ports and caps. Valve shall be ball type with teflon seats and blow-out proof stem with teflon packing. Valves shall provide positive shut-off, memory stop, and union, equal to Circuit Setter by B & G.

G. Swing Check Valves:

1. NPS 2 and Smaller:

a. Bronze with Bronze Disc, Class 125:

1. Standard: MSS SP-80, Type 3.
2. CWP Rating: 200 psig.
3. Body Design: Horizontal flow.
4. Body Material: ASTM B62, bronze.
5. Ends: Threaded or solder.

2. NPS 2-1/2 and Larger:

a. Iron with Metal Seat, Class 125:

1. Standard: MSS SP-71, Type 1.
2. CWP Rating: 200 psig, non-shock.
3. Body Design: Clear or full waterway.
4. Body Material: ASTM A126, gray iron with bolted bonnet.
5. Ends: Flanged.
6. Trim: Bronze.
7. Gasket: Asbestos free.

b. Iron with Metal Seat, Grooved-End:

1. CWP Rating: 300 psig, non-shock.
2. Body material: ASTM A536, ductile iron.
3. Seal: EPDM.
4. Disc: Spring-operated, ductile iron or stainless steel.
5. Can be installed vertically (flow upwards only) or horizontally.
6. Victaulic series 716.

c. Iron, Dual-Plate with Metal Seat, Class 125, Grooved-End:

1. Standard: API 594.
2. CWP Rating: 200 psig, non-shock.
3. Body Design: Wafer, spring-loaded plates.
4. Body Material: ASTM A126, gray iron.
5. Seat: Bronze
6. Victaulic series W715.

d. Iron, with Lever- and Spring-Closure Control, Class 125:

1. Standard: MSS SP-71, Type 1.
2. CWP Rating: 200 psig, non-shock.
3. Body Design: Clear or full waterway.
4. Body Material: ASTM A126, gray iron with bolted bonnet.
5. Ends: Flanged.
6. Trim: Bronze:
7. Gasket: Asbestos free.
8. Closure control: Factory-installed, exterior lever and spring.

e. Iron, Compact-Wafer, Center-Guided with Metal Seat, Class 125:

1. Standard: MSS SP-125.
2. CWP Rating: 200 psig, non-shock.

3. Body Material: ASTM A126, gray iron.
4. Ends: Flanged.
5. Style: Compact wafer.
6. Seat: Bronze:

3. Class 150 valves meeting the above specifications may be used where system pressure requires.
4. Alternative check valves (2½" and larger) shall be class 125/250 iron body, bronze mounted, wafer check valve, with ends designed for flanged type connection, aluminum bronze disc, EPDM seats, 316 stainless steel torsion spring, and hinge pin.
5. A spring-actuated check valve is to be used on pump discharge. Swing check with outside lever and spring (not center guided) is to be used on sewage ejectors or storm-water sump pumps.

H. Valves in insulated piping shall include a 2-inch stem extension, extended operating handle of nonthermal-conductive material and protective sleeves that allow operation of valves without breaking the vapor seals or disturbing insulation, and memory stops that are fully adjustable after insulation is applied.

2.2 HANGERS AND SUPPORTS

A. Pipe hangers shall be manufactured of the same material as the pipe or be non-corrosive to the piping system to which it serves.

B. Multiple pipe runs may be supported on trapeze hangers. Trapeze shall be Unistrut P-100. Hanger rods shall be one size larger than size specified herein for largest pipe on trapeze. Where trapeze lengths exceeds 42", additional hanger rod shall be installed at midspan.

C. Except where governed by local codes, maximum hanger spacing and minimum hanger rod sizes shall conform to the following table:

	Pipe Size	Spacing	Hanger Rod
Steel Pipe	1/2"	6'-0"	3/8"
	3/4" thru 1-1/4 1-	8'-0"	3/8"
	1/2", 2"	10'-0"	3/8"
	2-1/2"	10'-0"	1/2"
	3"	12'-0"	1/2"
	4"	14'-0"	5/8"
	6"-8"	16'-0"	5/8"
Copper Pipe	1/2"	6'-0"	3/8"
	3/4" thru 1"	8'-0"	3/8"
	1-1/4" thru 2" 2-	10'-0"	3/8"
	1/2"	10'-0"	1/2"
	3"-4"	12'-0"	1/2"
Plastic Pipe	1-1/4", 1-1/2"	4'-0"	3/8"
(PVC)	2"	5'-0"	3/8"
	2-1/2", 3"	6'-0"	3/8"
	4", 6"	7'-0"	1/2"
	8"	8'-0"	5/8"
	10", 12"	8'-0"	3/4"
	14", 16"	8'-0"	1"

D. Vertical risers shall be supported at each floor line with steel riser clamps equal to Figure 230 as

manufactured by "Auto-Grip" Division, Automatic Sprinkler Corporation of America or equal of Michigan Hanger Company.

E. Insulated pipe where specified to be continuous through hanger shall be protected at points of support with thermal hanger shields as manufactured by Pipe Shields, Inc. or equal of Insulshield or Uni-Grip. Thermal hanger shields shall consist of a 360 insert of high density, 100 psi, water- proofed calcium silicate, encased in a 360 sheet metal shield. Insert to be same thickness as adjoining pipe insulation. Shield length and minimum sheet metal gauges shown in chart below:

Pipe Size	Shield Length	Minimum Gauge
1/2" - 1-1/2"	4"	26
2"-8"	6"	20

F. Floor type pipe supports for flanged piping, backflow devices, water meters, etc. shall be equal to Material Resources, "Standon" adjustable steel pipe support Model 89 for up to 12", Class 125 flanges.

G. Victaulic pipe hangers and supports shall be spaced in accordance with the following pipe spacing table to allow for the proper installation of the insulating materials on the pipe and fittings.

VICTAULIC PIPE SPACING

Pipe Size	Spacing on Pipe Centers 2 ½
	11 inches
3	11 inches
4	12 inches
5	14 inches
6	14 inches
7	15 inches
8	15 inches
10	15 inches

2.3 THERMOMETERS

A. Approved manufacturers are Duro Instrument Corp., Miljoco, H.O. Trerice Co.

B. Thermometers shall have die cast aluminum case with baked enamel finish; red reading tube with suitable 9" scale; adjustable multi-angle housing, brass separable socket.

2.4 PRESSURE GAUGES

A. Approved manufacturers are Duro Instrument Corp., Miljoco, H.O. Trerice Co., Ametek U.S. Gauge Division.

B. Pressure gauges shall have phenolic turret case; 4-1/2" dial with suitable range; phosphorous bronze Bourdon tube; corrosion-resistant movement; adjustable stainless steel pointer; 1% of full scale accuracy; 1/4" NPT brass connection.

C. Furnish the following with each pressure gauge: 1/4" brass needle valve Hammond IB415; pressure snubber (Ray Model 1).

2.5 ACCESS DOORS

A. Mechanical Contractor shall provide and locate all required access doors where they may be required to service equipment, valves, dampers, etc. in inaccessible ceiling and walls. General Contractor shall install.

PART 3 - EXECUTION

3.1 DELIVERY AND STORAGE OF MATERIALS

A. Make provisions for the delivery and safe storage of materials and make the required arrangements with other contractors for the introduction into the building of equipment too large to pass through finished openings.

3.2 PIPE AND FITTINGS

A. Piping is to be installed as shown on the drawings insofar as practical. When a pipe size is not indicated the subcontractor shall request the pipe size from the Architect/Engineer through the general contractor.

B. Provide sufficient swing joints, anchors, expansion loops, and/or devices necessary and install so as to permit free expansion and contraction without causing undue stresses. Make all changes in direction with fittings. Support piping independently at all equipment so that its weight shall not be supported by the equipment.

C. 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, use flexible-type couplings on the loops.

D. Install piping without springing or forcing and clear all windows, doors, and other openings. Excessive cutting or other weakening of the building structure to facilitate piping installation will not be permitted.

E. All pipe shall be reamed to full pipe diameter before joining.

F. Install vertical risers plumb and straight, horizontal lines parallel with walls and partitions.

G. Provide shut-off valves and unions suitably located to isolate each item of equipment, branch circuit or section of piping.

H. Unions and flanges for servicing and disconnect are not required in installations using grooved joint couplings. (The couplings shall serve as disconnectpoints.)

I. Provide 1/2" drain valves at all low points of each system to enable complete drainage.

J. Provide dielectric unions or waterway fittings at all junctions of dissimilar metals in fresh water systems.

K. Grooved joint shall be installed in accordance with the manufacturer's written recommendations. Grooved ends shall be clean and free from indentations, projections, or roll marks. The gasket shall be molded and produced by the coupling manufacturer of an elastomer suitable for the intended service. The coupling manufacturer's factory trained representative shall provide on-site

training for the contractor's field personnel in the use of grooving tools and installation of product. The representative shall periodically visit the job site to ensure best practices in grooved product installation are being followed. (A distributor's representative is not considered qualified to conduct the training.)

L. All piping shall be adequately supported from the buildings structural framing system with adjustable hangers to maintain grading where required and to prevent sagging and pocketing.

M. Provide supports between piping and building structure where necessary to prevent swaying.

N. The use of wire or perforated metal to support pipe will not be permitted.

O. Do not install back-to-back change of direction or offset fittings such as ells and tees without a minimum of 3" nipple for the purposes of insulating the pipe properly.

3.3 CLEARANCE TO ELECTRICAL PANELS

A. In no case shall an exposed metallic pipe conveying any water or gas be located closer than 36" from the front or sides of an Motor Control Center (MCC), electrical breaker/fuse panel or transformer per NEC codes. When a pipe appears to be shown on the plans in close proximity to an electrical breaker panel or transformer, adjust the routing and position of that pipe or piping accordingly.

B. If the contractor deems that an extra is required to make the necessary offsets in a pipe for whatever reason, contact the engineer before installing the piping within 36". Any cost to relocate a pipe once installed to close to an electrical panel will be the responsibility of the contractor.

C. For MCC panels in excess of 800 amps, additional clearance requirements of 72" should be maintained.

3.4 OPERATION INSTRUCTIONS

A. Upon completion of all work and all tests, Contractor shall furnish the necessary skilled labor for operating all systems and equipment installed under this Division. The purpose is to demonstrate the workability of all systems and to instruct the Owner or his representative fully in the operations, adjustment, and maintenance of all equipment furnished utilizing the appropriate sections of the maintenance manual as a reference guide. Give at least 48 hours notice to the Owner and Architect/Engineer in advance of this period.

3.5 MAINTENANCE

A. The Contractor shall provide the necessary skills and labor to assure the proper operation and to provide all required maintenance for all equipment and controls provided under Division 22 for a period of one year after substantial completion of the contract as defined in paragraphs B through D below.

B. The Contractor shall receive calls for any and all problems experienced in the operation of the equipment provided under Division 22 and shall take steps to immediately correct any deficiencies that may exist.

C. All equipment that requires repairing shall be immediately serviced and repaired. Since the period of maintenance runs for one year concurrently with the warranty and guarantee, all parts and labor

shall be furnished at no extra cost to Owner (including all controls).

D. When emergency service is required beyond working hours to maintain the system in operation, the Contractor shall furnish such service.

3.6 SCAFFOLDING, RIGGING, HOISTING

A. Provide all scaffolding, rigging, hoisting, and services necessary for delivery, erection, and placement within the premises of any equipment and apparatus furnished. Remove same from premises when no longer required.

3.7 THERMAL CONTINUITY

A. Where openings are created for piping, vents, or any type of plumbing equipment penetration thru an insulated wall, roof, or partition, Plumbing Contractor shall be responsible for providing an air tight seal against air infiltration.

B. Where openings surrounding the item penetration the thermal barrier are larger than ¼", Plumbing Contractor shall fill opening with an insulation matching the existing R-value of the thermal barrier, but no less than R-18 for walls and R-30 for roofs, and then seal air tight.

3.8 WATERPROOFING

A. Where any work pierces waterproofing, the method of installation shall be as approved by the Architect/Engineer before work is done. Contractor shall furnish all necessary sleeves, caulking, and flashing required to make openings watertight.

3.9 ESCUTCHEON PLATES

A. Escutcheon plates shall be provided for all exposed uninsulated pipes passing through walls, floors, ceilings, into cabinets, or other areas where visually seen by occupants of the facility. Plates shall be nickel plated metal, of the split ring type, of size to match the pipe or conduit. Where plates are provided for pipes passing through sleeves which extend above the floor surface, provide deep recessed plates to conceal the pipe sleeves.

B. Plates for water supply penetrations serving sinks or water closets shall be one-piece non-split ring.

3.10 REMOVAL AND RELOCATION OF EXISTING PIPING AND/OR EQUIPMENT

A. The layout of the existing plumbing system as shown on the drawings has been prepared from inspection of the site. All data shown is the most accurate that is available at this time. Contractor shall visit the site to determine the exact quantities and the extent of equipment and piping to be removed and/or relocated prior to bid.

B. All materials to be removed shall become the property of the Contractor and shall be removed from the site unless specifically otherwise indicated on the drawings and/or tagged by Owner.

3.11 INSTALLATION

A. Unless otherwise specifically indicated on the plans or specifications, all equipment and materials shall be installed in accordance with the recommendations of the manufacturer. Maintain maximum headroom and space conditions at all points.

3.12 ACCESSIBILITY

A. Locate all equipment which must be serviced, operated, or maintained in fully accessible positions. If required for better accessibility, locate access doors for this purpose. Minor deviations from drawings may be made to allow for better accessibility.

3.13 CLEAN-UP

A. At the completion of work, all equipment on the project shall be checked and thoroughly cleaned. Clean all exposed surfaces of all piping, hangers, and other exposed metal of all grease, plaster, or other foreign material. Remove all stick-on labels and clean surfaces.

B. At the completion of each work day, remove from the building, the premises, and surrounding streets, alleys, etc., all rubbish and debris resulting from the operations and leave all equipment spaces absolutely clean and ready for use.

3.14 OLD PIPE LINES

A. Old sewer, water, or other pipes that exist shall be removed.

3.15 COORDINATION AND COOPERATION WITH OTHER TRADES

A. The Contractor for this work shall examine the drawings and specifications for other parts of the work, and if head room or space conditions appear inadequate, or if any discrepancies occur between the plans and his work and the plans for the work of others, he shall report such discrepancies to the Architect/Engineer and shall obtain written instructions for any changes necessary to accommodate his work with the work of others. Any changes in the work covered by

this specification made necessary by the failure or neglect of the Contractor to report such discrepancies shall be made by and at the expense of this Contractor.

3.16 RECORD OF CHANGES

A. Show prints in red ink all changes from original plans made during installation of work and file with Architect/Engineer when work is complete.

B. Coordinate with Division 1 and portions of this section for "As-Built" drawings and specification requirements.

3.17 SURVEY AND MEASUREMENTS

A. Base all measurements, both horizontal and vertical, on established benchmarks. All work shall agree with these established lines and levels. Verify all measurements at site and check the correctness of same as related to the work.

B. If any discrepancy between actual measurements and those indicated is discovered, which prevents following good practice or the intent of the drawings and specifications, the Architect shall be notified through the general Contractor, and work shall not proceed until instructions are received from the Architect.

3.18 PROTECTION

A. The Contractor shall protect all work and material from damage by his work or workmen, and shall be liable for all damage thus caused.

B. The Contractor shall be responsible for work and equipment until finally inspected, tested, and accepted; protecting work against theft, injury, or damage; and shall carefully store material and equipment received on site which is not immediately installed. Close open ends of work with temporary covers or plugs during storage and construction to prevent entry of foreign objects.

3.19 RESPONSIBILITY OF CONTRACTOR

A. The Contractor is responsible for the complete and satisfactory installation of the work in accordance with the intent of the drawings and specifications. He shall provide, without extra charge, all incidental items required, as part of his work, even though not particularly specified or indicated. The installation shall be so made that its several component parts will function together as a workable system and shall be left with all parts adjusted and in working order.

3.20 PENETRATION OF FIRE AND SMOKE BARRIERS

A. Penetrations of floor, wall and/or ceiling assemblies required to have a fire or smoke resistance rating shall be protected in accordance with all applicable codes and as further described in Division 22 specification sections.

B. Fire stop insulation for all copper, iron and steel pipe/duct where passing through fire walls shall

be ceramic fiber blanket equal to Manville "Cerablanket" 6 lb. density.

C. Fire stop insulation on plastic pipe penetrations through fire walls shall be an intumescent type wrap. Provide sleeves of adequate diameter to apply the required number of insulation wraps on pipe per manufacturer's requirement.

3.21 OPERATION AND MAINTENANCE MANUALS

A. The Contractor shall prepare one hard bound copy and complete electronically scanned copy of an operation and maintenance manual which shall cover all plumbing fixtures and devices, pumps, water heaters and other systems installed under Division 22.

B. The manual shall be submitted to the Engineer in draft form for approval prior to preparation of three copies for final submission to the Architect for delivery to the Owner.

C. The manual shall be 8-1/2" x 11" size and assembled in loose-leaf three ring or post binders. The manual shall be adequately indexed and contain the following information.

1. Contractors' names, addresses, and telephone numbers
2. Alphabetical list of all system components with the names and addresses, and 24-hour phone number of the companies responsible for servicing each item during the warranty period.
3. Guarantees and warranties of all equipment whenever applicable.
4. All manufacturer's data that are applicable to the installed equipment such as the following:

    a. Shop drawings.
    b. Installation instructions.
    c. Lubrication instructions.
    d. Wiring diagrams.

5. All equipment shall be clearly identified as to the model, size, flow data, electrical characteristics, and other design and sizing parameters as may be applicable to the actual installed piece of equipment or systems described.
6. A simplified description of the operation of all systems including the function of each system, and piece of equipment within a system.
7. An outline of a preventative maintenance program for each system or item of equipment, and shall include a schedule of inspection and maintenance. It shall suggest the maintenance and inspection that should be performed by the owner and that which should be completed with outside service.

3.22 PATCHING AND REPAIR OF EXISTING OPENINGS

A. The plumbing contractor shall include within their bid unless specifically noted in the plans or specifications for another trade to complete the work, the material and labor for all infilling, patching and repair of existing openings through walls, floors or roofs that remain when plumbing systems such as pipe or other equipment are removed.

B. Unless specifically noted on the plans, the repair shall be of same material and color as the original surface being repaired. In the event the material being patched is not available or cannot be matched, consult the architect for a suitable material that can be used.

C. Employee or sub-contractor the work of infilling, patching, and repairing to a professional trade person skilled in the use of materials being used for the repair.

D. Include all painting or finishing of the surface to match existing color and texture.

E. Include the installation and repair of all trim, base molding, flooring, and other surface treatments when the mechanical work requires to provide a finished look to match all surrounding materials and surfaces.

3.23 PAINTING EXTERIOR FERROUS PIPING

A. All exterior ferrous piping shall be primed and painted.

B. Contractor shall grind the pipe smooth.

C. Clean piping and make ready for paint.

D. Prime all exterior piping with metal primer.

E. Paint with two coats of industrial enamel.

END OF SECTION

SECTION 220553 - IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

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. Equipment labels.
2. Warning signs and labels.
3. Pipe labels.
4. Valve tags.
5. Warning tags.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

PART 2 - PRODUCTS

2.1 EQUIPMENT LABELS

A. Metal Labels for Equipment:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Brady Corporation.
b. Brimar Industries, Inc.
c. Carlton Industries, LP.
d. Champion America.
e. Craftmark Pipe Markers.
f. Emedco.
g. Kolbi Pipe Marker Co.
h. LEM Products Inc.
i. Marking Services, Inc.
j. Seton Identification Products; a Brady Corporation company.

1. Material and Thickness: Brass, 0.032-inch; stainless steel, 0.025-inch; aluminum, 0.032-inch; or anodized aluminum, 0.032-inch minimum thickness, and having predrilled or stamped holes for attachment hardware.
2. Letter Color: White.
3. Background Color: Black.
4. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.

5. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-quarters the size of principal lettering.
6. Fasteners: Stainless-steel rivets or self-tapping screws.
7. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

B. Plastic Labels for Equipment:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Brady Corporation.
    b. Brimar Industries, Inc.
    c. Carlton Industries, LP.
    d. Champion America.
    e. Craftmark Pipe Markers.
    f. Emedco.
    g. Kolbi Pipe Marker Co.
    h. LEM Products Inc.
    i. Marking Services, Inc.
    j. Seton Identification Products; a Brady Corporation company.

2. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/16 inch thick, and having predrilled holes for attachment hardware.
3. Letter Color: White.
4. Background Color: Black.
5. Maximum Temperature: Able to withstand temperatures up to 160 deg F.
6. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
7. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-quarters the size of principal lettering.
8. Fasteners: Stainless-steel rivets or self-tapping screws.
9. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

C. Label Content: Include equipment's Drawing designation or unique equipment number, Drawing numbers where equipment is indicated (plans, details, and schedules), and the Specification Section number and title where equipment is specified.

D. Equipment Label Schedule: For each item of equipment to be labeled, on 8-1/2-by-11-inch bond paper. Tabulate equipment identification number, and identify Drawing numbers where equipment is indicated (plans, details, and schedules) and the Specification Section number and title where equipment is specified. Equipment schedule shall be included in operation and maintenance data.

2.2 WARNING SIGNS AND LABELS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Brady Corporation.
2. Brimar Industries, Inc.

3. Carlton Industries, LP.
4. Champion America.
5. Craftmark Pipe Markers.
6. Emedco.
7. LEM Products Inc.
8. Marking Services, Inc.
9. Natinal Marker Company.
10. Seton Identification Products; a Brady Corporation company.
11. Stranco, Inc.

B. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/16 inch thick, and having predrilled holes for attachment hardware.

C. Letter Color: Black.

D. Background Color: Yellow.

E. Maximum Temperature: Able to withstand temperatures up to 160 deg F.

F. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.

G. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-quarters the size of principal lettering.

H. Fasteners: Stainless-steel rivets or self-tapping screws.

I. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

J. Label Content: Include caution and warning information plus emergency notification instructions.

2.3 PIPE LABELS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Actioncraft Products, Inc; a division of Industrial Test Equipment Co., Inc.
2. Brady Corporation.
3. Brimar Industries, Inc.
4. Carlton Industries, LP.
5. Champion America.
6. Craftmark Pipe Markers.
7. Emedco.
8. Kolbi Pipe Marker Co.
9. LEM Products Inc.
10. Marking Services, Inc.
11. Seton Identification Products; a Brady Corporation company.

B. General Requirements for Manufactured Pipe Labels: Preprinted, color-coded, with lettering indicating service, and showing flow direction.

C. Pretensioned Pipe Labels: Precoiled, semirigid plastic formed to cover full circumference of pipe and to attach to pipe without fasteners or adhesive.

D. Self-Adhesive Pipe Labels: Printed plastic with contact-type, permanent-adhesive backing.

E. Pipe Label Contents: Include identification of piping service using same designations or abbreviations as used on Drawings; also include pipe size and an arrow indicating flow direction.

1. Flow-Direction Arrows: Integral with piping-system service lettering to accommodate both directions or as separate unit on each pipe label to indicate flow direction.
2. Lettering Size: Size letters according to ASME A13.1 for piping.

2.4 VALVE TAGS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Actioncraft Products, Inc; a division of Industrial Test Equipment Co., Inc.
2. Brady Corporation.
3. Brimar Industries, Inc.
4. Carlton Industries, LP.
5. Champion America.
6. Craftmark Pipe Markers.
7. Emedco.
8. Kolbi Pipe Marker Co.
9. LEM Products Inc.
10. Marking Services, Inc.
11. Seton Identification Products; a Brady Corporation company.

B. Description: Stamped or engraved with 1/4-inch letters for piping system abbreviation and 1/2-inch numbers.

1. Tag Material: Brass, 0.032-inch; stainless steel, 0.025-inch; aluminum, 0.032-inch; or anodized aluminum, 0.032-inch minimum thickness, and having predrilled or stamped holes for attachment hardware.
2. Fasteners: Brass wire-link chain, beaded chain, or S-hook.

C. Valve Schedules: For each piping system, on 8-1/2-by-11-inch bond paper. Tabulate valve number, piping system, system abbreviation (as shown on valve tag), location of valve (room or space), normal-operating position (open, closed, or modulating), and variations for identification. Mark valves for emergency shutoff and similar special uses.

1. Valve-tag schedule shall be included in operation and maintenance data.

2.5 WARNING TAGS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Brady Corporation.
2. Brimar Industries, Inc.
3. Champion America.

4. Craftmark Pipe Markers.
5. Emedco.
6. Kolbi Pipe Marker Co.
7. LEM Products Inc.
8. Marking Services, Inc.
9. Seton Identification Products; a Brady Corporation company.

B. Description: Preprinted or partially preprinted accident-prevention tags of plasticized card stock with matte finish suitable for writing.

1. Size: 3 by 5-1/4 inches minimum.
2. Fasteners: Brass grommet and wire.
3. Nomenclature: Large-size primary caption such as "DANGER," "CAUTION," or "DO NOT OPERATE."
4. Color: Safety yellow background with black lettering.

PART 3 - EXECUTION

3.1 PREPARATION

A. Clean piping and equipment surfaces of substances that could impair bond of identification devices, including dirt, oil, grease, release agents, and incompatible primers, paints, and encapsulants.

3.2 GENERAL INSTALLATION REQUIREMENTS

A. Coordinate installation of identifying devices with completion of covering of surfaces where devices are to be applied.

B. Coordinate installation of identifying devices with locations of access panels and doors.

C. Install identifying devices before installing acoustical ceilings and similar concealment.

3.3 EQUIPMENT LABEL INSTALLATION

A. Install or permanently fasten labels on each major item of mechanical equipment.

B. Locate equipment labels where accessible and visible.

3.4 PIPE LABEL INSTALLATION

A. Pipe Label Locations: Locate pipe labels where piping is exposed or above accessible ceilings in finished spaces; machine rooms; accessible maintenance spaces such as shafts and plenums; and exterior exposed locations as follows:

1. Near each valve and control device.
2. Near each branch connection, excluding short takeoffs for fixtures and terminal units. Where flow pattern is not obvious, mark each pipe at branch.
3. Near penetrations through walls, floors, ceilings, and inaccessible enclosures.
4. At access doors and similar access points that permit view of concealed piping.

5. Near major equipment items and other points of origination and termination.
6. Spaced at maximum intervals of 50 feet along each run. Reduce intervals to 25 feet in areas of congested piping and equipment.
7. On piping above removable acoustical ceilings. Omit intermediately spaced labels.

B. Directional Flow Arrows: Arrows shall be used to indicate direction of flow in pipes, including pipes where flow is allowed in both directions.

C. Pipe Label Color Schedule:

1. Domestic Water Piping

a. Background: Safety green.
b. Letter Colors: White.

2. Sanitary Waste and Storm Drainage Piping:

a. Background Color: Safety green.
b. Letter Color: White.

3.5 VALVE-TAG INSTALLATION

A. Install tags on valves and control devices in piping systems, except check valves, valves within factory-fabricated equipment units, shutoff valves, faucets, convenience and lawn-watering hose connections, and similar roughing-in connections of end-use fixtures and units. List tagged valves in a valve schedule.

B. Valve-Tag Application Schedule: Tag valves according to size, shape, and color scheme and with captions similar to those indicated in the following subparagraphs:

1. Valve-Tag Size and Shape:

a. Cold Water: 1-1/2 inches, round.
b. Hot Water: 1-1/2 inches, round.

2. Valve-Tag Colors:

a. Cold Water: Natural.
b. Hot Water: Natural.

3. Letter Colors:

a. Cold Water: White.
b. Hot Water: White.

3.6 WARNING-TAG INSTALLATION

A. Write required message on, and attach warning tags to, equipment and other items where required.

END OF SECTION 220553

SECTION 220719 - PLUMBING PIPING INSULATION

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 insulating the following plumbing piping services:

1. Domestic cold-water piping.
2. Domestic hot-water piping.
3. Domestic recirculating hot-water piping.
4. Roof drains and rainwater leaders.
5. Supplies and drains for handicap-accessible lavatories and sinks.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product. Include thermal conductivity, water-vapor permeance thickness, and jackets (both factory and field applied if any).

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Skilled mechanics who have successfully completed an apprenticeship program or another craft training program certified by the Department of Labor, Bureau of Apprenticeship and Training.

B. Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical products in accordance with ASTM E84 by a testing agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing agency.

1. Insulation Installed Indoors: Flame-spread index of 25 or less and smoke-developed index of 50 or less.

C. Comply with the following applicable standards and other requirements specified for miscellaneous components:

1. Supply and Drain Protective Shielding Guards: ICC A117.1.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Packaging: Insulation material containers shall be marked by manufacturer with appropriate ASTM standard designation, type and grade, and maximum use temperature.

1.6 COORDINATION

A. Coordinate sizes and locations of supports, hangers, and insulation shields specified in Section 220500 "Common Work Results for Plumbing."

B. Coordinate clearance requirements with piping Installer for piping insulation application. Before preparing piping Shop Drawings, establish and maintain clearance requirements for installation of insulation and field-applied jackets and finishes and for space required for maintenance.

C. Coordinate installation and testing of heat tracing.

1.7 SCHEDULING

A. Schedule insulation application after pressure testing systems and, where required, after installing and testing heat tracing. Insulation application may begin on segments that have satisfactory test results.

B. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

PART 2 - PRODUCTS

2.1 INSULATION MATERIALS

A. Comply with requirements in "Piping Insulation Schedule, General" and "Indoor Piping Insulation Schedule" articles for where insulating materials shall be applied.

B. Products shall not contain asbestos, lead, mercury, or mercury compounds.

C. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.

D. Flexible Elastomeric: Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C534/C534M, Type I for tubular materials.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Aeroflex USA.
b. Armacell LLC.
c. K-Flex USA.

E. Mineral-Fiber, Preformed Pipe: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C547.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Johns Manville; a Berkshire Hathaway company.
b. Knauf Insulation.
c. Manson Insulation Inc.
d. Owens Corning.

2.
3. Preformed Pipe Insulation: Type I, Grade A **with factory-applied** ASJ(-SSL).
4. 850 deg F.
5. Factory fabricate shapes in accordance with ASTM C450 and ASTM C585.
6. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

2.2 INSULATING CEMENTS

A. Mineral-Fiber Insulating Cement: Comply with ASTM C195.

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

a. Ramco Insulation, Inc.

2.3 ADHESIVES

A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated unless otherwise indicated.

2.4 MASTICS AND COATINGS

A. Materials shall be compatible with insulation materials, jackets, and substrates.

2.5 SEALANTS

A. Materials shall be as recommended by the insulation manufacturer and shall be compatible with insulation materials, jackets, and substrates.

2.6 FACTORY-APPLIED JACKETS

A. Insulation system schedules indicate factory-applied jackets on various applications. When factory-applied jackets are indicated, comply with the following:

1. ASJ: White, kraft-paper, fiberglass-reinforced scrim with aluminum-foil backing; complying with ASTM C1136, Type I.
2. ASJ-SSL: ASJ with self-sealing, pressure-sensitive, acrylic-based adhesive covered by a removable protective strip; complying with ASTM C1136, Type I.
3. FSK Jacket: Aluminum-foil, fiberglass-reinforced scrim with kraft-paper backing; complying with ASTM C1136, Type II.

2.7 FIELD-APPLIED JACKETS

A. Field-applied jackets shall comply with ASTM C1136, Type I, unless otherwise indicated.

B. PVC Jacket: High-impact-resistant, UV-resistant PVC complying with ASTM D1784, Class 16354-C; thickness as scheduled; roll stock ready for shop or field cutting and forming. Thickness is indicated in field-applied jacket schedules.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Airex Manufacturing.
    b. Johns Manville; a Berkshire Hathaway company.
    c. P.I.C. Plastics, Inc.
    d. Proto Corporation.
    e. Speedline Corporation.

2. Adhesive: As recommended by jacket material manufacturer.
3. Color: White.
4. Factory-fabricated fitting covers to match jacket if available; otherwise, field fabricate.

    a. Shapes: 45- and 90-degree, short- and long-radius elbows, tees, valves, flanges, unions, reducers, end caps, soil-pipe hubs, traps, mechanical joints, and P-trap and supply covers for lavatories.

2.8 TAPES

A. ASJ Tape: White vapor-retarder tape matching factory-applied jacket with acrylic adhesive, complying with ASTM C1136.

B. FSK Tape: Foil-face, vapor-retarder tape matching factory-applied jacket with acrylic adhesive; complying with ASTM C1136.

C. PVC Tape: White vapor-retarder tape matching field-applied PVC jacket with acrylic adhesive; suitable for indoor and outdoor applications.

D. Aluminum-Foil Tape: Vapor-retarder tape with acrylic adhesive.

2.9 SECUREMENTS

A. Bands:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Johns Manville; a Berkshire Hathaway company.
    b. RPR Products, Inc.

2. Stainless Steel: ASTM A240/A240M, Type 304 or Type 316; 0.015 inch thick, 1/2 inch wide with wing seal or closed seal.
3. Aluminum: ASTM B209, Alloy 3003, 3005, 3105, or 5005; Temper H-14, 0.020 inch thick, 1/2 inch wide with wing seal or closed seal.

B. Staples: Outward-clinching insulation staples, nominal 3/4-inch-wide, stainless steel or Monel.

C. Wire: 0.080-inch nickel-copper alloy; 0.062-inch soft-annealed, stainless steel; or 0.062-inch soft-annealed, galvanized steel.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. C&F Wire.
b. Johns Manville; a Berkshire Hathaway company.
c. RPR Products, Inc.

2.10 PROTECTIVE SHIELDING GUARDS

A. Protective Shielding Pipe Covers:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Buckaroos, Inc.
b. Just Manufacturing.
c. McGuire Manufacturing.
d. MVG Molded Products.
e. Plumberex Specialty Products, Inc.
f. Truebro.
g. Zurn Industries, LLC.

2. Description: Manufactured plastic wraps for covering plumbing fixture hot- and cold-water supplies and trap and drain piping. Comply with Americans with Disabilities Act (ADA) requirements.

B. Protective Shielding Piping Enclosures:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Truebro.
b. Zurn Industries, LLC.

2. Description: Manufactured plastic enclosure for covering plumbing fixture hot- and cold-water supplies and trap and drain piping. Comply with ADA requirements.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of insulation application.

1. Verify that systems to be insulated have been tested and are free of defects.
2. Verify that surfaces to be insulated are clean and dry.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

B. Mix insulating cements with clean potable water; if insulating cements are to be in contact with stainless steel surfaces, use demineralized water.

3.3 GENERAL INSTALLATION REQUIREMENTS

A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of piping, including fittings, valves, and specialties.

B. Install insulation materials, forms, vapor barriers or retarders, jackets, and of thicknesses required for each item of pipe system, as specified in insulation system schedules.

C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.

D. Install insulation with longitudinal seams at top and bottom of horizontal runs.

E. Install multiple layers of insulation with longitudinal and end seams staggered.

F. Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.

G. Keep insulation materials dry during storage, application, and finishing. Replace insulation materials that get wet.

H. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.

I. Install insulation with least number of joints practical.

J. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.

1. Install insulation continuously through hangers and around anchor attachments.
2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends attached to structure with vapor-barrier mastic.
3. Install insert materials and insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.
4. Cover inserts with jacket material matching adjacent pipe insulation. Install shields over jacket, arranged to protect jacket from tear or puncture by hanger, support, and shield.

K. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.

L. Install insulation with factory-applied jackets as follows:

1. Draw jacket tight and smooth.
2. Cover circumferential joints with 3-inch-wide strips, of same material as insulation jacket. Secure strips with adhesive and outward-clinching staples along both edges of strip, spaced 4 inches o.c.
3. Overlap jacket longitudinal seams at least 1-1/2 inches. Install insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap. Staple laps with outward-clinching staples along edge at 4 inches o.c.

a. For below-ambient services, apply vapor-barrier mastic over staples.

4. Cover joints and seams with tape, in accordance with insulation material manufacturer's written instructions, to maintain vapor seal.
5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to pipe flanges and fittings.

M. Cut insulation in a manner to avoid compressing insulation more than 25 percent of its nominal thickness.

N. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.

O. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches in similar fashion to butt joints.

P. For above-ambient services, do not install insulation to the following:

1. Vibration-control devices.
2. Testing agency labels and stamps.
3. Nameplates and data plates.
4. Cleanouts.

3.4 PENETRATIONS

A. Insulation Installation at Roof Penetrations: Install insulation continuously through roof penetrations.

1. Seal penetrations with flashing sealant.
2. For applications requiring only indoor insulation, terminate insulation above roof surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
3. Extend jacket of outdoor insulation outside roof flashing at least 2 inches below top of roof flashing.
4. Seal jacket to roof flashing with flashing sealant.

B. Insulation Installation at Underground Exterior Wall Penetrations: Terminate insulation flush with sleeve seal. Seal terminations with flashing sealant.

C. Insulation Installation at Aboveground Exterior Wall Penetrations: Install insulation continuously through wall penetrations.

1. Seal penetrations with flashing sealant.
2. For applications requiring only indoor insulation, terminate insulation inside wall surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
3. Extend jacket of outdoor insulation outside wall flashing and overlap wall flashing at least 2 inches.
4. Seal jacket to wall flashing with flashing sealant.

D. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.

E. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Install insulation continuously through penetrations of fire-rated walls and partitions.

1. Comply with requirements in Section 078413 "Penetration Firestopping" for firestopping and fire-resistive joint sealers.

F. Insulation Installation at Floor Penetrations:

1. Pipe: Install insulation continuously through floor penetrations.
2. Seal penetrations through fire-rated assemblies. Comply with requirements in Section 078413 "Penetration Firestopping."

3.5 GENERAL PIPE INSULATION INSTALLATION

A. Requirements in this article generally apply to all insulation materials, except where more specific requirements are specified in various pipe insulation material installation articles.

B. Insulation Installation on Fittings, Valves, Strainers, Flanges, Mechanical Couplings, and Unions:

1. Install insulation over fittings, valves, strainers, flanges, mechanical couplings, unions, and other specialties with continuous thermal and vapor-retarder integrity unless otherwise indicated.
2. Insulate pipe elbows using preformed fitting insulation or mitered fittings made from same material and density as that of adjacent pipe insulation. Each piece shall be butted tightly against adjoining piece and bonded with adhesive. Fill joints, seams, voids, and irregular surfaces with insulating cement finished to a smooth, hard, and uniform contour that is uniform with adjoining pipe insulation.
3. Insulate tee fittings with preformed fitting insulation or sectional pipe insulation of same material and thickness as that used for adjacent pipe. Cut sectional pipe insulation to fit. Butt each section closely to the next and hold in place with tie wire. Bond pieces with adhesive.
4. Insulate valves using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as that used for adjacent pipe. Overlap adjoining pipe insulation by not less than 2 times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. For valves, insulate up to and including the bonnets, valve stuffing-box studs, bolts, and nuts. Fill joints, seams, and irregular surfaces with insulating cement.
5. Insulate strainers using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than 2 times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. Fill joints, seams, and irregular surfaces with insulating cement. Insulate strainers, so strainer basket flange or plug can be easily removed and replaced without damaging the insulation and jacket. Provide a removable reusable insulation cover. For below-ambient services, provide a design that maintains vapor barrier.
6. Insulate flanges, mechanical couplings, and unions, using a section of oversized preformed pipe insulation. Overlap adjoining pipe insulation by not less than 2 times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. Stencil or label the outside insulation jacket of each union with the word "union" matching size and color of pipe labels.

7. Cover segmented insulated surfaces with a layer of finishing cement and coat with a mastic. Install vapor-barrier mastic for below-ambient services and a breather mastic for above-ambient services. Reinforce the mastic with fabric-reinforcing mesh. Trowel the mastic to a smooth and well-shaped contour.
8. For services not specified to receive a field-applied jacket, except for flexible elastomeric and polyolefin, install fitted PVC cover over elbows, tees, strainers, valves, flanges, and unions. Terminate ends with PVC end caps. Tape PVC covers to adjoining insulation facing, using PVC tape.

C. Insulate instrument connections for thermometers, pressure gages, pressure temperature taps, test connections, flow meters, sensors, switches, and transmitters on insulated pipes. Shape insulation at these connections by tapering it to and around the connection with insulating cement and finish with finishing cement, mastic, and flashing sealant.

D. Install removable insulation covers at locations indicated. Installation shall conform to the following:

1. Make removable flange and union insulation from sectional pipe insulation of same thickness as that on adjoining pipe. Install same insulation jacket as that of adjoining pipe insulation.
2. When flange and union covers are made from sectional pipe insulation, extend insulation from flanges or union at least 2 times the insulation thickness over adjacent pipe insulation on each side of flange or union. Secure flange cover in place with stainless steel or aluminum bands. Select band material compatible with insulation and jacket.
3. Construct removable valve insulation covers in same manner as for flanges, except divide the two-part section on the vertical center line of valve body.
4. When covers are made from block insulation, make two halves, each consisting of mitered blocks wired to stainless steel fabric. Secure this wire frame, with its attached insulation, to flanges with tie wire. Extend insulation at least 2 inches over adjacent pipe insulation on each side of valve. Fill space between flange or union cover and pipe insulation with insulating cement. Finish cover assembly with insulating cement applied in two coats. After first coat is dry, apply and trowel second coat to a smooth finish.
5. Unless a PVC jacket is indicated in field-applied jacket schedules, finish exposed surfaces with a metal jacket.

3.6 INSTALLATION OF FLEXIBLE ELASTOMERIC INSULATION

A. Seal longitudinal seams and end joints with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

B. Insulation Installation on Pipe Flanges:

1. Install pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of sheet insulation of same thickness as that of pipe insulation.
4. Secure insulation to flanges and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install mitered sections of pipe insulation.

2. Secure insulation materials and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed valve covers manufactured of same material as that of pipe insulation when available.
2. When preformed valve covers are not available, install cut sections of pipe and sheet insulation to valve body. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
3. Install insulation to flanges as specified for flange insulation application.
4. Secure insulation to valves and specialties, and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

3.7 INSTALLATION OF MINERAL-FIBER INSULATION

A. Insulation Installation on Straight Pipes and Tubes:

1. Secure each layer of preformed pipe insulation to pipe with wire or bands, and tighten bands without deforming insulation materials.
2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
3. For insulation with factory-applied jackets on above-ambient surfaces, secure laps with outward-clinched staples at 6 inches o.c.
4. For insulation with factory-applied jackets on below-ambient surfaces, do not staple longitudinal tabs. Instead, secure tabs with additional adhesive, as recommended by insulation material manufacturer, and seal with vapor-barrier mastic and flashing sealant.

B. Insulation Installation on Pipe Flanges:

1. Install preformed pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with mineral-fiber blanket insulation.
4. Install jacket material with manufacturer's recommended adhesive, overlap seams at least 1 inch, and seal joints with flashing sealant.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install preformed sections of same material as that of straight segments of pipe insulation when available.
2. When preformed insulation elbows and fittings are not available, install mitered sections of pipe insulation, to a thickness equal to adjoining pipe insulation. Secure insulation materials with wire or bands.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed sections of same material as that of straight segments of pipe insulation when available.
2. When preformed sections are not available, install mitered sections of pipe insulation to valve body.

3. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
4. Install insulation to flanges as specified for flange insulation application.

3.8 FIELD-APPLIED JACKET INSTALLATION

A. Where PVC jackets are indicated, install with 1-inch overlap at longitudinal seams and end joints. Seal with manufacturer's recommended adhesive.

1. Apply two continuous beads of adhesive to seams and joints, one bead under lap and the finish bead along seam and joint edge.

3.9 FIELD QUALITY CONTROL

A. Engage a qualified testing agency to perform tests and inspections.

B. Tests and Inspections: Inspect pipe, fittings, strainers, and valves by removing field-applied jacket and insulation in layers in reverse order of their installation.

C. All insulation applications will be considered defective if they do not pass tests and inspections.

D. Prepare test and inspection reports.

3.10 PIPING INSULATION SCHEDULE, GENERAL

A. Acceptable preformed pipe and tubular insulation materials and thicknesses are identified for each piping system and pipe size range. If more than one material is listed for a piping system, selection from materials listed is Contractor's option.

B. Items Not Insulated: Unless otherwise indicated, do not install insulation on the following:

1. Drainage piping located in crawl spaces.
2. Underground piping.
3. Chrome-plated pipes and fittings unless there is a potential for personnel injury.

3.11 INDOOR PIPING INSULATION SCHEDULE

A. Domestic Cold Water:

1. NPS 1 and Smaller: Insulation shall be the following:

a. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1/2 inch thick.

B. Domestic Hot and Recirculated Hot Water:

1. NPS 1-1/4 and Smaller: Insulation shall be the following:

a. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1 inch thick.

C. Stormwater and Overflow:

1. All Pipe Sizes: Insulation shall be one of the following:

    a. Flexible Elastomeric: 1 inch thick.
    b. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1 inch thick.

D. Roof Drain and Overflow Drain Bodies:

1. All Pipe Sizes: Insulation shall be one of the following:

    a. Flexible Elastomeric: 1 inch thick.
    b. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1 inch thick.

END OF SECTION

SECTION 221116 - DOMESTIC WATER PIPING

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. Copper tube and fittings.
2. Piping joining materials.
3. Transition fittings.
4. Dielectric fittings.

1.3 ACTION SUBMITTALS

A. Product Data:

1. Pipe and tube.
2. Fittings.
3. Joining materials.
4. Transition fittings.

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

A. Potable-water piping and components shall comply with NSF 14, NSF 61, and NSF 372. Include marking "NSF-pw" on piping.

2.2 COPPER TUBE AND FITTINGS

A. Drawn-Temper Copper Tube: ASTM B88, Type L.

B. Annealed-Temper Copper Tube: ASTM B88, Type L.

C. Cast-Copper, Solder-Joint Fittings: ASME B16.18, pressure fittings.

D. Wrought-Copper, Solder-Joint Fittings: ASME B16.22, pressure fittings.

E. Bronze Flanges: ASME B16.24, Class 150, with solder-joint ends.

F. Cast Copper Unions: MSS SP-123, cast-copper-alloy, hexagonal-stock body, with ball-and-socket, metal-to-metal seating surfaces and solder-joint or threaded ends.

G. Wrought Copper Unions: ASME B16.22.

H. Copper Tube, Pressure-Seal-Joint Fittings:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Apollo Valves; a part of Aalberts Integrated Piping Systems.
b. Conex Banninger – USA.
c. Elkhart Products Corporation.
d. Mueller Industries, Inc.
e. NIBCO INC.
f. Viega LLC.

2. Fittings: Cast-brass, cast-bronze, or wrought-copper with EPDM O-ring seal in each end.
3. Minimum 200-psig working-pressure rating at 250 deg F.

2.3 PIPING JOINING MATERIALS

A. Metal, Pipe-Flange Bolts and Nuts: ASME B18.2.1, carbon steel unless otherwise indicated.

B. Solder Filler Metals: ASTM B32, lead-free alloys.

C. Flux: ASTM B813, water flushable.

D. Brazing Filler Metals: AWS A5.8M/A5.8, BCuP Series, copper-phosphorus alloys for general-duty brazing unless otherwise indicated.

2.4 TRANSITION FITTINGS

A. General Requirements:

1. Same size as pipes to be joined.
2. Pressure rating at least equal to pipes to be joined.
3. End connections compatible with pipes to be joined.

2.5 DIELECTRIC FITTINGS

A. General Requirements: Assembly of copper alloy and ferrous materials with separating nonconductive insulating material. Include end connections compatible with pipes to be joined.

B. Dielectric Unions:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. A.Y. McDonald Mfg. Co.
b. Capitol Manufacturing Company.
c. Central Plastics Company.
d. HART Industrial Unions, LLC.
e. Jomar Valve.
f. Matco-Norca.

g. WATTS.
h. Wilkins.
i. Zurn Industries, LLC.

2. Standard: ASSE 1079.
3. Pressure Rating: 125 psig minimum at 180 deg F.
4. End Connections: Solder-joint copper alloy and threaded ferrous.
5.

C. Dielectric Nipples:

1. Standard: IAPMO PS 66.
2. Electroplated steel nipple complying with ASTM F1545.
3. Pressure Rating and Temperature: 300 psig at 225 deg F.
4. End Connections: Male threaded or grooved.
5. Lining: Inert and noncorrosive, propylene.

PART 3 - EXECUTION

3.1 PIPING APPLICATIONS

A. Transition and special fittings with pressure ratings at least equal to piping rating may be used in applications below unless otherwise indicated.

B. Flanges and unions may be used for aboveground piping joints unless otherwise indicated.

C. Fitting Option: Extruded-tee connections and brazed joints may be used on aboveground copper tubing.

D. Under-building-slab, domestic water piping, NPS 2 and smaller, shall be the following:

1. Drawn-temper or annealed-temper copper tube, ASTM B88, Type L; wrought-copper, solder-joint fittings; and brazed or copper pressure-seal-joint fittings; and pressure-sealed joints.

E. Aboveground domestic water piping, NPS 2 and smaller, shall be one of the following:

1. Drawn-temper copper tube, ASTM B88, Type L; cast- or wrought-copper, solder-joint fittings; and soldered joints.
2. Drawn-temper copper tube, ASTM B88, Type L; copper pressure-seal-joint fittings; and pressure-sealed joints.

3.2 INSTALLATION OF PIPING

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of domestic water piping. Indicated locations and arrangements are used to size pipe and calculate friction loss, expansion, and other design considerations. Install piping as indicated unless deviations to layout are approved on coordination drawings.

B. Install copper tubing under building slab according to CDA's "Copper Tube Handbook."

C. Install valves according to Section 220500 "Common Work Results for Plumbing."

D. Install domestic water piping level with 0.25 percent slope downward toward drain and plumb.

E. Install piping concealed from view and protected from physical contact by building occupants unless otherwise indicated and except in equipment rooms and service areas.

F. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

G. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal, and coordinate with other services occupying that space.

H. Install piping to permit valve servicing.

I. Install nipples, unions, special fittings, and valves with pressure ratings the same as or higher than the system pressure rating used in applications below unless otherwise indicated.

J. Install piping free of sags and bends.

K. Install fittings for changes in direction and branch connections.

L. Install unions in copper tubing at final connection to each piece of equipment, machine, and specialty.

M. Install thermostats in hot-water circulation piping. Comply with requirements for thermostats in Section 221123 "Domestic Water Pumps."

N. Install thermometers on outlet piping from each water heater.

O. Install sleeves for piping penetrations of walls, ceilings, and floors.

P. Install sleeve seals for piping penetrations of concrete walls and slabs.

Q. Install escutcheons for piping penetrations of walls, ceilings, and floors.

3.3 JOINT CONSTRUCTION

A. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

B. Remove scale, slag, dirt, and debris from inside and outside of pipes, tubes, and fittings before assembly.

C. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

1. Apply appropriate tape or thread compound to external pipe threads.
2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged.

D. Brazed Joints for Copper Tubing: Comply with CDA's "Copper Tube Handbook," "Brazed Joints" chapter.

E. Soldered Joints for Copper Tubing: Apply ASTM B813, water-flushable flux to end of tube. Join copper tube and fittings according to ASTM B828 or CDA's "Copper Tube Handbook."

F. Pressure-Sealed Joints for Copper Tubing: Join copper tube and pressure-seal fittings with tools and procedure recommended by pressure-seal-fitting manufacturer. Leave insertion marks on pipe after assembly.

G. Joints for Dissimilar-Material Piping: Make joints using adapters compatible with materials of both piping systems.

3.4 INSTALLATION OF TRANSITION FITTINGS

A. Install transition couplings at joints of dissimilar piping.

B. Transition Fittings in Aboveground Domestic Water Piping NPS 2 and Smaller: Plastic-to-metal transition fittings or unions.

3.5 INSTALLATION OF DIELECTRIC FITTINGS

A. Install dielectric fittings in piping at connections of dissimilar metal piping and tubing.

B. Dielectric Fittings for NPS 2 and Smaller: Use dielectric couplings, nipples, or unions.

3.6 INSTALLATION OF HANGERS AND SUPPORTS

A. Comply with requirements for hangers, supports, and anchor devices in Section 220500 "Common Work Results for Plumbing."

B. Install hangers for copper tubing and piping, with maximum horizontal spacing and minimum rod diameters, to comply with MSS-58, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.

C. Support horizontal piping within 12 inches of each fitting.

3.7 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. When installing piping adjacent to equipment and machines, allow space for service and maintenance.

3.8 IDENTIFICATION

A. Identify system components. Comply with requirements for identification materials and installation in Section 220553 "Identification for Plumbing Piping and Equipment."

3.9 ADJUSTING

A. Perform the following adjustments before operation:

1. Close drain valves, hydrants, and hose bibbs.
2. Open shutoff valves to fully open position.
3. Open throttling valves to proper setting.
4. Adjust balancing valves in hot-water-circulation return piping to provide adequate flow.

    a. Manually adjust ball-type balancing valves in hot-water-circulation return piping to provide hot-water flow in each branch.
    b. Adjust calibrated balancing valves to flows indicated.

5. Remove plugs used during testing of piping and for temporary sealing of piping during installation.
6. Remove and clean strainer screens. Close drain valves and replace drain plugs.
7. Remove filter cartridges from housings and verify that cartridges are as specified for application where used and are clean and ready for use.
8. Check plumbing specialties and verify proper settings, adjustments, and operation.

3.10 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. Piping Inspections:

    a. Do not enclose, cover, or put piping into operation until it has been inspected and approved by authorities having jurisdiction.
    b. During installation, notify authorities having jurisdiction at least one day before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction:

        1) Roughing-in Inspection: Arrange for inspection of piping before concealing or closing in after roughing in and before setting fixtures.
        2) Final Inspection: Arrange for authorities having jurisdiction to observe tests specified in "Piping Tests" Subparagraph below and to ensure compliance with requirements.

    c. Reinspection: If authorities having jurisdiction find that piping will not pass tests or inspections, make required corrections and arrange for reinspection.
    d. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.

2. Piping Tests:

    a. Fill domestic water piping. Check components to determine that they are not air bound and that piping is full of water.
    b. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit a separate report for each test, complete with diagram of portion of piping tested.
    c. Leave new, altered, extended, or replaced domestic water piping uncovered and unconcealed until it has been tested and approved. Expose work that was covered or concealed before it was tested.
    d. Cap and subject piping to static water pressure of 50 psig above operating pressure, without exceeding pressure rating of piping system materials. Isolate test source and allow it to stand for four hours. Leaks and loss in test pressure constitute defects that must be repaired.

e. Repair leaks and defects with new materials, and retest piping or portion thereof until satisfactory results are obtained.
f. Prepare reports for tests and for corrective action required.

B. Domestic water piping will be considered defective if it does not pass tests and inspections.

C. Prepare test and inspection reports.

3.11 CLEANING

A. Clean and disinfect potable domestic water piping as follows:

1. Purge new piping and parts of existing piping that have been altered, extended, or repaired before using.
2. Use purging and disinfecting procedures prescribed by authorities having jurisdiction; if methods are not prescribed, use procedures described in either AWWA C651 or AWWA C652 or follow procedures described below:

a. Flush piping system with clean, potable water until dirty water does not appear at outlets.
b. Fill and isolate system according to either of the following:

1) Fill system or part thereof with water/chlorine solution with at least 50 ppm of chlorine. Isolate with valves and allow to stand for 24 hours.
2) Fill system or part thereof with water/chlorine solution with at least 200 ppm of chlorine. Isolate and allow to stand for three hours.

c. Flush system with clean, potable water until no chlorine is in water coming from system after the standing time.
d. Repeat procedures if biological examination shows contamination.
e. Submit water samples in sterile bottles to authorities having jurisdiction.

B. Clean non-potable domestic water piping as follows:

1. Purge new piping and parts of existing piping that have been altered, extended, or repaired before using.
2. Use purging procedures prescribed by authorities having jurisdiction or; if methods are not prescribed, follow procedures described below:

a. Flush piping system with clean, potable water until dirty water does not appear at outlets.
b. Submit water samples in sterile bottles to authorities having jurisdiction. Repeat procedures if biological examination shows contamination.

C. Prepare and submit reports of purging and disinfecting activities. Include copies of water-sample approvals from authorities having jurisdiction.

D. Clean interior of domestic water piping system. Remove dirt and debris as work progresses.

END OF SECTION

SECTION 221119 - DOMESTIC WATER PIPING SPECIALTIES

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. Balancing valves.
2. Temperature-actuated, water mixing valves.
3. Flexible connectors.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For domestic water piping specialties to include in emergency, operation, and maintenance manuals.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR PIPING SPECIALTIES

A. Domestic water piping specialties intended to convey or dispense water for human consumption are to comply with the SDWA, requirements of authorities having jurisdiction, and NSF 61 and NSF 372, or to be certified in compliance with NSF 61 and NSF 372 by an American National Standards Institute (ANSI)-accredited third-party certification body that the weighted average lead content at wetted surfaces is less than or equal to 0.25 percent.

2.2 PERFORMANCE REQUIREMENTS

A. Minimum Working Pressure for Domestic Water Piping Specialties: 125 psig unless otherwise indicated.

2.3 BALANCING VALVES

A. Copper-Alloy Calibrated Balancing Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Bell & Gossett; a Xylem brand.

b. Hydronic Components Inc.
c. IMI Hydronic Engineering Inc.
d. Jomar Valve.
e. Nexus Valve, Inc.
f. NIBCO INC.
g. WATTS.

2. Type: Ball or Y-pattern globe valve with two readout ports and memory-setting indicator.
3. Body: Brass.
4. Size: Same as connected piping, but not larger than NPS 2.
5. Accessories: Meter hoses, fittings, valves, differential pressure meter, and carrying case.

B. Memory-Stop Balancing Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Apollo Valves; a part of Aalberts Integrated Piping Systems.
b. Crane; a Crane Co. brand.
c. Hammond Valve.
d. Jenkins Valves; a Crane Co. brand.
e. Jomar Valve.
f. Milwaukee Valve Company.
g. NIBCO INC.
h. Red-White Valve Corp.
i. Stockham; a Crane Co. brand.

2. Standard: MSS SP-110 for two-piece, copper-alloy ball valves.
3. Pressure Rating: 400-psig minimum CWP.
4. Size: NPS 2 or smaller.
5. Body: Copper alloy.
6. Port: Standard or full port.
7. Ball: Chrome-plated brass or stainless steel.
8. Seats and Seals: Replaceable.
9. End Connections: Solder joint or threaded.
10. Handle: Vinyl-covered steel with memory-setting device.

2.4 TEMPERATURE-ACTUATED, WATER MIXING VALVES

A. Water-Temperature Limiting Devices:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Acorn Engineering Company; A Division of Morris Group International.
b. Apollo Valves; a part of Aalberts Integrated Piping Systems.
c. Cash Acme, A Division of Reliance Worldwide Corporation.
d. Leonard Valve Company.
e. POWERS; A WATTS Brand.
f. Symmons Industries, Inc.
g. Taco Comfort Solutions, Inc.
h. WATTS.

i. Zurn Industries, LLC.

2. Standard: ASSE 1070.
3. Pressure Rating: 125 psig.
4. Type: Thermostatically controlled, water mixing valve.
5. Material: Bronze body with corrosion-resistant interior components.
6. Connections: Threaded union inlets and outlet.
7. Accessories: Check stops on hot- and cold-water supplies, and adjustable, temperature-control handle.
8. Valve Finish: Rough bronze.

2.5 FLEXIBLE CONNECTORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Flex-Hose Co., Inc.
2. Innerlynx.
3. Mason Industries, Inc.
4. Metraflex Company (The).

B. Stainless Steel-Hose Flexible Connectors: Corrugated-stainless steel tubing with stainless steel wire-braid covering and ends welded to inner tubing.

1. Working-Pressure Rating: Minimum 200 psig.
2. End Connections NPS 2 and Smaller: Threaded steel-pipe nipple.

PART 3 - EXECUTION

3.1 INSTALLATION OF PIPING SPECIALTIES

A. Balancing Valves: Install in locations where they can easily be adjusted. Set at indicated design flow rates.

B. Temperature-Actuated, Water Mixing Valves: Install with check stops or shutoff valves on inlets and with shutoff valve on outlet.

1. Install cabinet-type units recessed in or surface mounted on wall as specified.

3.2 PIPING CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. When installing piping specialties adjacent to equipment and machines, allow space for service and maintenance.

3.3 ADJUSTING

A. Set field-adjustable flow set points of balancing valves.

B. Set field-adjustable temperature set points of temperature-actuated, water mixing valves.

3.4 FIELD QUALITY CONTROL

A. Perform the following tests and inspections.

1. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

B. Domestic water piping specialties will be considered defective if they do not pass tests and inspections.

C. Prepare test and inspection reports.

END OF SECTION

SECTION 221316 - SANITARY WASTE AND VENT PIPING

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. Hub-and-spigot, cast-iron soil pipe and fittings.
2. Hubless, cast-iron soil pipe and fittings.
3. Ductile-iron pipe and fittings.
4. Copper tube and fittings.
5. PVC pipe and fittings.
6. Specialty pipe fittings.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.4 FIELD CONDITIONS

A. Interruption of Existing Sanitary Waste Service: Do not interrupt service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary service according to requirements indicated:

1. Notify Construction Manager and Owner no fewer than **two** days in advance of proposed interruption of sanitary waste service.

1.5 WARRANTY

A. Listed manufacturers to provide labeling and warranty of their respective products.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Components and installation shall be capable of withstanding the following minimum working pressure unless otherwise indicated:

1. Soil, Waste, and Vent Piping: 10-foot head of water.

2.2 PIPING MATERIALS

A. Piping materials shall bear label, stamp, or other markings of specified testing agency.

B. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, fitting materials, and joining methods for specific services, service locations, and pipe sizes.

2.3 HUB-AND-SPIGOT, CAST-IRON SOIL PIPE AND FITTINGS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. AB & I Foundry; a part of the McWane family of companies.
2. Charlotte Pipe and Foundry Company.
3. NewAge Casting.
4. Tyler Pipe; a part of the McWane family of companies.

B. Pipe and Fittings: ASTM A 74, Service class.

C. Gaskets: ASTM C 564, rubber.

D. Caulking Materials: ASTM B 29, pure lead and oakum or hemp fiber.

2.4 HUBLESS, CAST-IRON SOIL PIPE AND FITTINGS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. AB & I Foundry; a part of the McWane family of companies.
2. Charlotte Pipe and Foundry Company.
3. NewAge Casting.
4. Tyler Pipe; a part of the McWane family of companies.

B. Pipe and Fittings: ASTM A 888 or CISPI 301.

C. CISPI, Hubless-Piping Couplings:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. ANACO-Husky.
b. Charlotte Pipe and Foundry Company.
c. Dallas Specialty & Mfg. Co.
d. Fernco Inc.
e. Ideal Clamp Products, Inc.
f. Josam Company.
g. Matco-Norca.
h. MIFAB, Inc.
i. Mission Rubber Company, LLC; a division of MCP Industries.
j. NewAge Casting.
k. Tyler Pipe; a subsidiary of McWane, Inc.

2. Standards: ASTM C 1277 and CISPI 310.

3. Description: Stainless-steel corrugated shield with stainless-steel bands and tightening devices; and ASTM C 564, rubber sleeve with integral, center pipe stop.

D. Heavy-Duty, Hubless-Piping Couplings:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. ANACO-Husky.
   b. Charlotte Pipe and Foundry Company.
   c. Clamp-All Corp.
   d. Dallas Specialty & Mfg. Co.
   e. Ideal Clamp Products, Inc.
   f. MIFAB, Inc.
   g. Mission Rubber Company, LLC; a division of MCP Industries.
   h. NewAge Casting.
   i. Tyler Pipe; a subsidiary of McWane, Inc.

2. Standards: ASTM C 1277 and ASTM C 1540.
3. Description: Stainless-steel shield with stainless-steel bands and tightening devices; and ASTM C 564, rubber sleeve with integral, center pipe stop.

E. Cast-Iron, Hubless-Piping Couplings:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Charlotte Pipe and Foundry Company.
   b. MG Piping Products Company.

2. Standard: ASTM C 1277.
3. Description: Two-piece ASTM A 48/A 48M, cast-iron housing; stainless-steel bolts and nuts; and ASTM C 564, rubber sleeve with integral, center pipe stop.

2.5 COPPER TUBE AND FITTINGS

A. Copper Type DWV Tube: ASTM B 306, drainage tube, drawn temper.

B. Copper Drainage Fittings: ASME B16.23, cast copper or ASME B16.29, wrought copper, solder-joint fittings.

C. Hard Copper Tube: ASTM B 88, Type M, water tube, drawn temper.

D. Solder: ASTM B 32, lead free with ASTM B 813, water-flushable flux.

2.6 PVC PIPE AND FITTINGS

A. Comply with NSF 14, "Plastics Piping Systems Components and Related Materials," for plastic piping components. Include marking with "NSF-dwv" for plastic drain, waste, and vent piping and "NSF-sewer" for plastic sewer piping.

B. Solid-Wall PVC Pipe: ASTM D 2665, drain, waste, and vent.

C. PVC Socket Fittings: ASTM D 2665, made to ASTM D 3311, drain, waste, and vent patterns and to fit Schedule 40 pipe.

D. Adhesive Primer: ASTM F 656.

E. Solvent Cement: ASTM D 2564.

2.7 SPECIALTY PIPE FITTINGS

A. Transition Couplings:

1. Fitting-Type Transition Couplings: Manufactured piping coupling or specified piping system fitting.

2. Shielded, Nonpressure Transition Couplings:

a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1) Cascade Waterworks Mfg. Co.
2) Mission Rubber Co; a division of MCP Industries.

b. Standard: ASTM C 1460.
c. Description: Elastomeric or rubber sleeve with full-length, corrosion-resistant outer shield and corrosion-resistant-metal tension band and tightening mechanism on each end.
d. End Connections: Same size as and compatible with pipes to be joined.

B. Dielectric Fittings:

1. Dielectric Unions:

a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1) A.Y. McDonald Mfg. Co.
2) Capitol Manufacturing Company.
3) Central Plastics Company.
4) HART Industrial Unions, LLC.
5) Jomar Valve.
6) Matco-Norca.
7) WATTS.
8) Wilkins.
9) Zurn Industries, LLC.

b. Description:

1) Standard: ASSE 1079.
2) Pressure Rating: 125 psig minimum at 180 deg F.
3) End Connections: Solder-joint copper alloy and threaded ferrous.

2. Dielectric Flanges:

a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1) Capitol Manufacturing Company.
2) Central Plastics Company.
3) Matco-Norca.
4) WATTS.
5) Wilkins.
6) Zurn Industries, LLC.

b. Description:

1) Standard: ASSE 1079.
2) Factory-fabricated, bolted, companion-flange assembly.
3) Pressure Rating: 125 psig minimum at 180 deg F.
4) End Connections: Solder-joint copper alloy and threaded ferrous; threaded solder-joint copper alloy and threaded ferrous.

3. Dielectric-Flange Insulating Kits:

a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1) Advance Products & Systems, Inc.
2) Calpico, Inc.
3) Central Plastics Company.
4) Pipeline Seal and Insulator, Inc.

b. Description:

1) Nonconducting materials for field assembly of companion flanges.
2) Pressure Rating: 150 psig.
3) Gasket: Neoprene or phenolic.
4) Bolt Sleeves: Phenolic or polyethylene.
5) Washers: Phenolic with steel backing washers.

PART 3 - EXECUTION

3.1 EARTH MOVING

A. Comply with requirements for excavating, trenching, and backfilling specified in Section 312000 "Earth Moving."

3.2 PIPING INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems.

1. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations.
2. Install piping as indicated unless deviations to layout are approved on coordination drawings.

B. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.

C. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

D. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

E. Install piping to permit valve servicing.

F. Install piping at indicated slopes.

G. Install piping free of sags and bends.

H. Install fittings for changes in direction and branch connections.

I. Install piping to allow application of insulation.

J. Make changes in direction for soil and waste drainage and vent piping using appropriate branches, bends, and long-sweep bends.

1. Sanitary tees and short-sweep 1/4 bends may be used on vertical stacks if change in direction of flow is from horizontal to vertical.
2. Use long-turn, double Y-branch and 1/8-bend fittings if two fixtures are installed back to back or side by side with common drain pipe.

    a. Straight tees, elbows, and crosses may be used on vent lines.

3. Do not change direction of flow more than 90 degrees.
4. Use proper size of standard increasers and reducers if pipes of different sizes are connected.

    a. Reducing size of waste piping in direction of flow is prohibited.

K. Lay buried building waste piping beginning at low point of each system.

1. Install true to grades and alignment indicated, with unbroken continuity of invert. Place hub ends of piping upstream.
2. Install required gaskets according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements.
3. Maintain swab in piping and pull past each joint as completed.

L. Install soil and waste and vent piping at the following minimum slopes unless otherwise indicated:

1. Building Sanitary Waste: 2 percent downward in direction of flow for piping NPS 3 and smaller; 1 percent downward in direction of flow for piping NPS 4 and larger.
2. Horizontal Sanitary Waste Piping: 2 percent downward in direction of flow for piping NPS 3 and smaller; 1 percent downward in direction of flow for piping NPS 4 and larger.
3. Vent Piping: 1 percent down toward vertical fixture vent or toward vent stack.

M. Install cast-iron soil piping according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings."

1. Install encasement on underground piping according to ASTM A 674 or AWWA C105/A 21.5.

N. Install aboveground copper tubing according to CDA's "Copper Tube Handbook."

O. Install aboveground PVC piping according to ASTM D 2665.

P. Install underground PVC piping according to ASTM D 2321.

Q. Install engineered soil and waste and vent piping systems as follows:

1. Combination Waste and Vent: Comply with standards of authorities having jurisdiction.
2. Hubless, Single-Stack Drainage System: Comply with ASME B16.45 and hubless, single-stack aerator fitting manufacturer's written installation instructions.
3. Reduced-Size Venting: Comply with standards of authorities having jurisdiction.

R. Plumbing Specialties:

1. Install cleanouts at grade and extend to where building sanitary drains connect to building sanitary sewers in sanitary waste gravity-flow piping.

    a. Install cleanout fitting with closure plug inside the building in sanitary drainage force-main piping.
    b. Comply with requirements for cleanouts specified in Section 221319 "Sanitary Waste Piping Specialties."

2. Install drains in sanitary waste gravity-flow piping.

    a. Comply with requirements for drains specified in Section 221319 "Sanitary Waste Piping Specialties."

S. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.

T. Install sleeves for piping penetrations of walls, ceilings, and floors.

1. Comply with requirements for sleeves specified in Section 220517 "Sleeves and Sleeve Seals for Plumbing Piping."

U. Install sleeve seals for piping penetrations of concrete walls and slabs.

1. Comply with requirements for sleeve seals specified in Section 220517 "Sleeves and Sleeve Seals for Plumbing Piping."

V. Install escutcheons for piping penetrations of walls, ceilings, and floors.

1. Comply with requirements for escutcheons specified in Section 220500 "Common Work Results for Plumbing."

3.3 JOINT CONSTRUCTION

A. Join hub-and-spigot, cast-iron soil piping with gasket joints according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for compression joints.

B. Join hub-and-spigot, cast-iron soil piping with calked joints according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for lead-and-oakum calked joints.

C. Join hubless, cast-iron soil piping according to CISPI 310 and CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for hubless-piping coupling joints.

D. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1.

1. Cut threads full and clean using sharp dies.
2. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

    a. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
    b. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged.
    c. Do not use pipe sections that have cracked or open welds.

E. Join copper tube and fittings with soldered joints according to ASTM B 828. Use ASTM B 813, water-flushable, lead-free flux and ASTM B 32, lead-free-alloy solder.

F. Grooved Joints: Cut groove ends of pipe according to AWWA C606. Lubricate and install gasket over ends of pipes or pipe and fitting. Install coupling housing sections, over gasket, with keys seated in piping grooves. Install and tighten housing bolts.

G. Flanged Joints: Align bolt holes. Select appropriate gasket material, size, type, and thickness. Install gasket concentrically positioned. Use suitable lubricants on bolt threads. Torque bolts in cross pattern.

H. Plastic, Nonpressure-Piping, Solvent-Cement Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:

1. Comply with ASTM F 402 for safe-handling practice of cleaners, primers, and solvent cements.
2. ABS Piping: Join according to ASTM D 2235 and ASTM D 2661 appendixes.
3. PVC Piping: Join according to ASTM D 2855 and ASTM D 2665 appendixes.

3.4 SPECIALTY PIPE FITTING INSTALLATION

A. Transition Couplings:

1. Install transition couplings at joints of piping with small differences in ODs.
2. In Waste Drainage Piping: Shielded, nonpressure transition couplings.

B. Dielectric Fittings:

1. Install dielectric fittings in piping at connections of dissimilar metal piping and tubing.
2. Dielectric Fittings for NPS 2 and Smaller: Use dielectric unions.
3. Dielectric Fittings for NPS 2-1/2 to NPS 4: Use dielectric flanges.
4. Dielectric Fittings for NPS 5 and Larger: Use dielectric flange kits.

3.5 VALVE INSTALLATION

A. Comply with requirements in Section 220500 "common Work Results for Plumbing" for general-duty valve installation requirements.

B. Shutoff Valves:

1. Install gate or full-port ball valve for piping NPS 2 and smaller.
2. Install gate valve for piping NPS 2-1/2 and larger.

C. Check Valves: Install swing check valve, between pump and shutoff valve, on each sewage pump discharge.

3.6 INSTALLATION OF HANGERS AND SUPPORTS

A. Comply with requirements for pipe hanger and support devices and installation specified in Section 220500 "Common Work Results for Plumbing."

1. Install carbon-steel pipe hangers for horizontal piping in noncorrosive environments.
2. Install carbon-steel pipe support clamps for vertical piping in noncorrosive environments.
3. Vertical Piping: MSS Type 8 or Type 42, clamps.
4. Install individual, straight, horizontal piping runs:

    a. 100 Feet and Less: MSS Type 1, adjustable, steel clevis hangers.
    b. Longer Than 100 Feet: MSS Type 43, adjustable roller hangers.
    c. Longer Than 100 Feet if Indicated: MSS Type 49, spring cushion rolls.

5. Multiple, Straight, Horizontal Piping Runs 100 Feet or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
6. Base of Vertical Piping: MSS Type 52, spring hangers.

B. Install hangers for cast-iron soil piping, with maximum horizontal spacing and minimum rod diameters, to comply with MSS-58, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.

C. Install hangers for PVC piping, with maximum horizontal spacing and minimum rod diameters, to comply with manufacturer's written instructions, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.

D. Support horizontal piping and tubing within 12 inches of each fitting and coupling.

E. Support vertical runs of cast iron soil piping to comply with MSS-58, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.

F. Support vertical runs of PVC piping to comply with manufacturer's written instructions, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.

3.7 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Connect soil and waste piping to exterior sanitary sewerage piping. Use transition fitting to join dissimilar piping materials.

C. Connect waste and vent piping to the following:

1. Plumbing Fixtures: Connect waste piping in sizes indicated, but not smaller than required by plumbing code.
2. Plumbing Fixtures and Equipment: Connect atmospheric vent piping in sizes indicated, but not smaller than required by authorities having jurisdiction.
3. Plumbing Specialties: Connect waste and vent piping in sizes indicated, but not smaller than required by plumbing code.
4. Install test tees (wall cleanouts) in conductors near floor and floor cleanouts with cover flush with floor.
5. Comply with requirements for cleanouts and drains specified in Section 221319 "Sanitary Waste Piping Specialties."
6. Equipment: Connect waste piping as indicated.

    a. Provide shutoff valve if indicated and union for each connection.
    b. Use flanges instead of unions for connections NPS 2-1/2 and larger.

D. Where installing piping adjacent to equipment, allow space for service and maintenance of equipment.

E. Make connections according to the following unless otherwise indicated:

1. Install unions, in piping NPS 2 and smaller, adjacent to each valve and at final connection to each piece of equipment.
2. Install flanges, in piping NPS 2-1/2 and larger, adjacent to flanged valves and at final connection to each piece of equipment.

3.8 IDENTIFICATION

A. Identify exposed sanitary waste and vent piping.

B. Comply with requirements for identification specified in Section 220553 "Identification for Plumbing Piping and Equipment."

3.9 FIELD QUALITY CONTROL

A. During installation, notify authorities having jurisdiction at least 24 hours before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction.

1. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.
2. Final Inspection: Arrange for final inspection by authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.

B. Reinspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for reinspection.

C. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.

D. Test sanitary waste and vent piping according to procedures of authorities having jurisdiction or, in absence of published procedures, as follows:

1. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired.

    a. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.

2. Leave uncovered and unconcealed new, altered, extended, or replaced waste and vent piping until it has been tested and approved.

    a. Expose work that was covered or concealed before it was tested.

3. Roughing-in Plumbing Test Procedure: Test waste and vent piping except outside leaders on completion of roughing-in.

    a. Close openings in piping system and fill with water to point of overflow, but not less than 10-foot head of water.
    b. From 15 minutes before inspection starts to completion of inspection, water level must not drop.
    c. Inspect joints for leaks.

4. Finished Plumbing Test Procedure: After plumbing fixtures have been set and traps filled with water, test connections and prove they are gastight and watertight.

    a. Plug vent-stack openings on roof and building drains where they leave building. Introduce air into piping system equal to pressure of 1-inch wg.
    b. Use U-tube or manometer inserted in trap of water closet to measure this pressure.
    c. Air pressure must remain constant without introducing additional air throughout period of inspection.
    d. Inspect plumbing fixture connections for gas and water leaks.

5. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.
6. Prepare reports for tests and required corrective action.

3.10 CLEANING AND PROTECTION

A. Clean interior of piping. Remove dirt and debris as work progresses.

B. Protect sanitary waste and vent piping during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.

C. Place plugs in ends of uncompleted piping at end of day and when work stops.

D. Exposed PVC Piping: Protect plumbing vents exposed to sunlight with two coats of water-based latex paint.

E. Repair damage to adjacent materials caused by waste and vent piping installation.

3.11 PIPING SCHEDULE

A. Aboveground, soil and waste piping NPS 4 and smaller shall be any of the following:

1. Service class, cast-iron soil pipe and fittings; gaskets; and gasketed joints.
2. Hubless, cast-iron soil pipe and fittings and hubless, single-stack aerator fittings; CISPI hubless-piping couplings; and coupled joints.
3. Dissimilar Pipe-Material Couplings: Shielded, nonpressure transition couplings.

B. Aboveground, vent piping NPS 4 and smaller shall be any of the following:

1. Service class, cast-iron soil pipe and fittings; gaskets; and gasketed joints.
2. Hubless, cast-iron soil pipe and fittings; CISPI hubless-piping couplings; and coupled joints.
3. Solid-wall PVC pipe, PVC socket fittings, and solvent-cemented joints.
4. Dissimilar Pipe-Material Couplings: Shielded, nonpressure transition couplings.

C. Underground, soil, waste, and vent piping NPS 4 and smaller shall be any of the following:

1. Service class, cast-iron soil piping; gaskets and gasketed joints or calking materials and calked joints.
2. Hubless, cast-iron soil pipe and fittings; CISPI or cast-iron hubless-piping couplings; and coupled joints.
3. Solid wall PVC pipe, PVC socket fittings, and solvent-cemented joints. PVC shall not be used where sanitary waste discharge could exceed 140 degrees F such as kitchens or boiler room drains.
4. Dissimilar Pipe-Material Couplings: Shielded, nonpressure transition couplings.

D. Underground, soil and waste piping NPS 5 and larger shall be any of the following:

1. Service class, cast-iron soil piping; gaskets and gasketed joints or calking materials and calked joints.
2. Hubless, cast-iron soil pipe and fittings; CISPI or cast-iron hubless-piping couplings; coupled joints.
3. Solid-wall PVC pipe; PVC socket fittings; and solvent-cemented joints.
4. Dissimilar Pipe-Material Couplings: Shielded, nonpressure transition couplings.

END OF SECTION

SECTION 221319 - SANITARY WASTE PIPING SPECIALTIES

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. Cleanouts.
2. Air-admittance valves.
3. Miscellaneous sanitary drainage piping specialties.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.4 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For sanitary waste piping specialties to include in emergency, operation, and maintenance manuals.

PART 2 - PRODUCTS

2.1 ASSEMBLY DESCRIPTIONS

A. Sanitary waste piping specialties shall bear label, stamp, or other markings of specified testing agency.

B. Comply with NSF 14 for plastic sanitary waste piping specialty components.

2.2 CLEANOUTS

A. Cast-Iron Exposed Cleanouts:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Jay R. Smith Mfg Co; a division of Morris Group International.

b. Josam Company.
c. MIFAB, Inc.
d. Tyler Pipe; a subsidiary of McWane Inc.
e. WATTS.
f. Zurn Industries, LLC.

2. Standard: ASME A112.36.2M.
3. Size: Same as connected drainage piping
4. Body Material: Hub-and-spigot, cast-iron soil pipe T-branch; or Hubless, cast-iron soil pipe test tee as required to match connected piping.
5. Closure: Countersunk or raised-head; brass, cast-iron or plastic plug.
6. Closure Plug Size: Same as or not more than one size smaller than cleanout size.

B. Cast-Iron Exposed Floor Cleanouts:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Jay R. Smith Mfg Co; a division of Morris Group International.
b. Josam Company.
c. MIFAB, Inc.
d. Sioux Chief Manufacturing Company, Inc.
e. WATTS.
f. Zurn Industries, LLC.

2. Standard: ASME A112.36.2M for adjustable housing cleanout.
3. Size: Same as connected branch.
4. Type: Adjustable housing.
5. Body or Ferrule: Cast iron.
6. Clamping Device: Required where finished flooring requires waterproof membrane.
7. Outlet Connection: Inside calk, spigot, or threaded.
8. Closure: Brass plug with straight threads and gasket.
9. Adjustable Housing Material: Cast iron with threads, setscrews or other device.
10. Frame and Cover Material and Finish: Nickel-bronze, copper alloy; polished bronze; or stainless steel.
11. Frame and Cover Shape: Round.
12. Top-Loading Classification: Light Duty.
13. Riser: ASTM A74, Service Class, cast-iron drainage pipe fitting and riser to cleanout.

C. Cast-Iron Wall Cleanouts:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Jay R. Smith Mfg Co; a division of Morris Group International.
b. Josam Company.
c. MIFAB, Inc.
d. WATTS.
e. Zurn Industries, LLC.

2. Standard: ASME A112.36.2M. Include wall access.
3. Size: Same as connected drainage piping.
4. Body: Hub-and-spigot, cast-iron soil pipe T-branch; or Hubless, cast-iron soil pipe test tee as required to match connected piping.
5. Closure Plug:

a. Brass.
b. Countersunk or raised head.
c. Drilled and threaded for cover attachment screw.
d. Size: Same as or not more than one size smaller than cleanout size.

6. Wall Access, Cover Plate: Round, flat, chrome-plated brass or stainless steel cover plate with screw.
7. Wall Access, Frame and Cover: Round, nickel-bronze, copper-alloy, or stainless steel wall-installation frame and cover.

D. Plastic Floor Cleanouts:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Endura; a division of IPEX.
b. IPS Corporation.
c. NDS Inc.
d. Plastics Oddities.
e. Sioux Chief Manufacturing Company, Inc.
f. Zurn Industries, LLC.

2. Size: Same as connected branch.
3. Body: PVC.
4. Closure Plug: PVC.
5. Riser: Drainage pipe fitting and riser to cleanout of same material as drainage piping.

2.3 AIR-ADMITTANCE VALVES

A. Fixture Air-Admittance Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Ayrlett, LLC.
b. Oatey.
c. ProVent Systems.
d. Studor, Inc.

2. Standard: ASSE 1051, Type A for single fixture or Type B for branch piping.
3. Housing: Plastic.
4. Operation: Mechanical sealing diaphragm.
5. Size: Same as connected fixture or branch vent piping.

2.4 MISCELLANEOUS SANITARY DRAINAGE PIPING SPECIALTIES

A. Open Drains:

1. Description: Shop or field fabricate from ASTM A74, Service Class, hub-and-spigot, cast-iron soil-pipe fittings. Include P-trap, hub-and-spigot riser section; and where required, increaser fitting joined with ASTM C564 rubber gaskets.
2. Size: Same as connected waste piping with increaser fitting of size indicated.

B. Air-Gap Fittings:

1. Standard: ASME A112.1.2, for fitting designed to ensure fixed, positive air gap between installed inlet and outlet piping.
2. Body: Bronze or cast iron.
3. Inlet: Opening in top of body.
4. Outlet: Larger than inlet.
5. Size: Same as connected waste piping and with inlet large enough for associated indirect waste piping.

C. Sleeve Flashing Device:

1. Description: Manufactured, cast-iron fitting, with clamping device that forms sleeve for pipe floor penetrations of floor membrane. Include galvanized-steel pipe extension in top of fitting that will extend 1 inch above finished floor and galvanized-steel pipe extension in bottom of fitting that will extend through floor slab.
2. Size: As required for close fit to riser or stack piping.

D. Vent Caps:

1. Description: Cast-iron body with threaded or hub inlet and vandal-proof design. Include vented hood and setscrews to secure to vent pipe.
2. Size: Same as connected stack vent or vent stack.

E. Frost-Resistant Vent Terminals:

1. Description: Manufactured or shop-fabricated assembly constructed of copper, lead-coated copper, or galvanized steel.
2. Design: To provide 1-inch enclosed air space between outside of pipe and inside of flashing collar extension, with counterflashing.

F. Expansion Joints:

1. Standard: ASME A112.6.4.
2. Body: Cast iron with bronze sleeve, packing, and gland.
3. End Connections: Matching connected piping.
4. Size: Same as connected soil, waste, or vent piping.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install cleanouts in aboveground piping and building drain piping according to the following, unless otherwise indicated:

1. Size same as drainage piping up to NPS 4. Use NPS 4 for larger drainage piping unless larger cleanout is indicated.
2. Locate at each change in direction of piping greater than 45 degrees.
3. Locate at minimum intervals of 50 feet for piping NPS 4 and smaller and 100 feet for larger piping.
4. Locate at base of each vertical soil and waste stack.

B. For floor cleanouts for piping below floors, install cleanout deck plates with top flush with finished floor.

C. For cleanouts located in concealed piping, install cleanout wall access covers, of types indicated, with frame and cover flush with finished wall.

D. Install fixture air-admittance valves on fixture drain piping.

E. Install air-gap fittings on draining-type backflow preventers and on indirect-waste piping discharge into sanitary drainage system.

F. Install sleeve and sleeve seals with each riser and stack passing through floors with waterproof membrane.

G. Install vent caps on each vent pipe passing through roof.

H. Install frost-resistant vent terminals on each vent pipe passing through roof. Maintain 1-inch clearance between vent pipe and roof substrate.

I. Install expansion joints on vertical stacks and conductors. Position expansion joints for easy access and maintenance.

J. Install frost-proof vent caps on each vent pipe passing through roof. Maintain 1-inch clearance between vent pipe and roof substrate.

K. Install wood-blocking reinforcement for wall-mounting-type specialties.

L. Install traps on plumbing specialty drain outlets. Omit traps on indirect wastes unless trap is indicated.

3.2 PIPING CONNECTIONS

A. Comply with requirements in Section 221316 "Sanitary Waste and Vent Piping" for piping installation requirements. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to equipment, to allow service and maintenance.

3.3 LABELING AND IDENTIFYING

A. Distinguish among multiple units, inform operator of operational requirements, indicate safety and emergency precautions, and warn of hazards and improper operations, in addition to identifying unit.

1. Nameplates and signs are specified in Section 220553 "Identification for Plumbing Piping and Equipment."

3.4 PROTECTION

A. Protect drains during remainder of construction period to avoid clogging with dirt or debris and to prevent damage from traffic or construction work.

B. Place plugs in ends of uncompleted piping at end of each day or when work stops.

END OF SECTION

SECTION 221319.13 - SANITARY DRAINS

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. Floor drains.
2. Floor sinks.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

PART 2 - PRODUCTS

2.1 DRAIN ASSEMBLIES

A. Sanitary drains shall bear label, stamp, or other markings of specified testing agency.

B. Comply with NSF 14 for plastic sanitary piping specialty components.

2.2 FLOOR DRAINS

A. Cast-Iron Floor Drains:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Jay R. Smith Mfg Co; a division of Morris Group International.
    b. Josam Company.
    c. MIFAB, Inc.
    d. Wade; a subsidiary of McWane Inc.
    e. WATTS.
    f. Zurn Industries, LLC.

2. Standard: ASME A112.6.3.
3. Pattern: Floor drain.
4. Body Material: Gray iron.
5. Seepage Flange: Required.
6. Anchor Flange: Required.
7. Clamping Device: Required.
8. Outlet: Bottom.

9. Backwater Valve: Not required.
10. Coating on Interior and Exposed Exterior Surfaces: Not required.
11. Top or Strainer Material: Stainless steel.
12. Top of Body and Strainer Finish: Stainless steel.
13. Top Shape: Round.
14. Dimensions of Top or Strainer: 6” diameter.
15. Top Loading Classification: Light Duty.
16. Funnel: Not required.
17. Inlet Fitting: Not required.

2.3 FLOOR SINKS

A. Cast-Iron Floor Sinks:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Jay R. Smith Mfg Co; a division of Morris Group International.
    b. Josam Company.
    c. Wade; a subsidiary of McWane Inc.
    d. WATTS.
    e. Zurn Industries, LLC.

2. Standard: ASME A112.6.7.
3. Pattern: Floor drain.
4. Body Material: Cast iron.
5. Anchor Flange: Required, with seepage holes.
6. Clamping Device: Required.
7. Outlet: Bottom, no-hub connection.
8. Coating on Interior Surfaces: Not required.
9. Sediment Bucket: Not required.
10. Internal Strainer: Dome.
11. Internal Strainer Material: Aluminum.
12. Top Grate Material: Cast iron, loose.
13. Top of Body and Grate Finish: Nickel bronze.
14. Top Shape: Square.
15. Dimensions of Top Grate: 8 inch by 8 inch, with 3/4 grate.
16. Top Loading Classification: No traffic.
17. Funnel: Not required.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install floor drains at low points of surface areas to be drained. Set grates of drains flush with finished floor, unless otherwise indicated.

B. Refer to structural and architectural plans for floor slope requirements.

1. Position floor drains for easy access and maintenance.
2. Set floor drains below elevation of surrounding finished floor to allow floor drainage.
3. Set with grates depressed according to the following drainage area radii:

a. Radius, 30 Inches or Less: Equivalent to 1 percent slope, but not less than 1/4-inch total depression.
b. Radius, 30 to 60 Inches: Equivalent to 1 percent slope.
c. Radius, 60 Inches or Larger: Equivalent to 1 percent slope, but not greater than 1-inch total depression.

4. Install floor-drain flashing collar or flange, so no leakage occurs between drain and adjoining flooring.

   a. Maintain integrity of waterproof membranes where penetrated.

5. Install individual traps for floor drains connected to sanitary building drain, unless otherwise indicated.

3.2 CONNECTIONS

A. Comply with requirements in Section 221316 "Sanitary Waste and Vent Piping" for piping installation requirements. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Comply with requirements in Section 221319 "Sanitary Waste Piping Specialties" for backwater valves, air admittance devices and miscellaneous sanitary drainage piping specialties.

C. Install piping adjacent to equipment to allow service and maintenance.

3.3 PROTECTION

A. Protect drains during remainder of construction period to avoid clogging with dirt or debris and to prevent damage from traffic or construction work.

B. Place plugs in ends of uncompleted piping at end of each day or when work stops.

END OF SECTION

SECTION 221413 - FACILITY STORM DRAINAGE PIPING

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. Hub-and-spigot, cast-iron soil pipe and fittings.
2. Hubless, cast-iron soil pipe and fittings.
3. PVC pipe and fittings.
4. Specialty pipe and fittings.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.4 QUALITY ASSURANCE

A. Piping materials shall bear label, stamp, or other markings of specified testing agency.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Components and installation shall be capable of withstanding the following minimum working pressure unless otherwise indicated:

1. Storm Drainage Piping: 10-foot head of water.

2.2 HUB-AND-SPIGOT, CAST-IRON SOIL PIPE AND FITTINGS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. AB & I Foundry; a part of the McWane family of companies.
2. Charlotte Pip and Foundry Company.
3. NewAge Casting.
4. Tyler Pipe; a part of the McWane family of companies.

B. Pipe and Fittings:

1. Marked with CISPI collective trademark and NSF certification mark.

2. Class: ASTM A 74, Service class.

C. Gaskets: ASTM C 564, rubber.

D. Caulking Materials: ASTM B 29, pure lead and oakum or hemp fiber.

2.3 HUBLESS, CAST-IRON SOIL PIPE AND FITTINGS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. AB & I Foundry; a part of the McWane family of companies.
2. Charlotte Pip and Foundry Company.
3. NewAge Casting.
4. Tyler Pipe; a part of the McWane family of companies.

B. Pipe and Fittings:

1. Marked with CISPI collective trademark and NSF certification mark.
2. Standard: ASTM A 888 or CISPI 301.

C. CISPI, Hubless-Piping Couplings:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. ANACO-Husky.
b. Charlotte Pip and Foundry Company.
c. Dallas Specialty & Mfg. Co.
d. Fernco Inc.
e. Ideal Clamp Products, Inc.
f. Matco-Norca.
g. MIFAB, Inc.
h. Mission Rubber Company, LLC; a division of MCP Industries.
i. NewAge Casting.
j. Tyler Pipe; a part of the McWane family of companies.

2. Couplings shall bear CISPI collective trademark and NSF certification mark.
3. Standards: ASTM C 1277 and CISPI 310.
4. Description: Stainless-steel corrugated shield with stainless-steel bands and tightening devices; and ASTM C 564, rubber sleeve with integral, center pipe stop.

D. Cast-Iron, Hubless-Piping Couplings:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Charlotte Pip and Foundry Company.
b. MG Piping Products Company.

2. Standard: ASTM C 1277.
3. Description: Two-piece ASTM A 48/A 48M, cast-iron housing; stainless-steel bolts and nuts; and ASTM C 564, rubber sleeve with integral, center pipe stop.

2.4 PVC PIPE AND FITTINGS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Charlotte Pip and Foundry Company.
2. GF Piping Systems.
3. JM Eagle; J-M Manufacturing Co., Inc.
4. Mueller Industries, Inc.
5. National Pipe and Plastic, Inc.
6. North America Pipe Corporation.
7. Rocky Mountain Colby Pipe Company.
8. Silver-line Plastics.

B. NSF Marking: Comply with NSF 14, "Plastics Piping Systems Components and Related Materials," for plastic piping components. Include marking with "NSF-drain" for plastic storm drain and "NSF-sewer" for plastic storm sewer piping.

C. Solid-Wall PVC Pipe: ASTM D 2665; drain, waste, and vent.

D. PVC Socket Fittings: ASTM D 2665, made to ASTM D 3311, drain, waste, and vent patterns and to fit Schedule 40 pipe.

E. Adhesive Primer: ASTM F 656.

F. Solvent Cement: ASTM D 2564.

2.5 SPECIALTY PIPE FITTINGS

A. Transition Couplings:

1. General Requirements: Fitting or device for joining piping with small differences in ODs or of different materials. Include end connections same size as and compatible with pipes to be joined.
2. Fitting-Type Transition Couplings: Manufactured piping coupling or specified-piping-system fitting.

3. Shielded, Nonpressure Transition Couplings:

a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1) Cascade Waterworks Mfg. Co.
2) Mission Rubber Company, LLC; a division of MCP Industries.

b. Standard: ASTM C 1460.
c. Description: Elastomeric or rubber sleeve with full-length, corrosion-resistant outer shield and corrosion-resistant-metal tension band and tightening mechanism on each end.
d. End Connections: Same size as and compatible with pipes to be joined.

B. Dielectric Fittings:

1. General Requirements: Assembly of copper alloy and ferrous materials with separating nonconductive insulating material. Include end connections compatible with pipes to be joined.
2. Dielectric Unions:

    a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

        1) A.Y. McDonald Mfg. Co.
        2) Capitol Manufacturing Company.
        3) Central Plastics Company.
        4) HART Industrial Unions, LLC.
        5) Jomar Valve.
        6) Matco-Norca.
        7) WATTS.
        8) Zurn Industries, LLC.

    b. Description:

        1) Standard: ASSE 1079.
        2) Pressure Rating: 150 psig minimum at 180 deg F.
        3) End Connections: Solder-joint copper alloy and threaded ferrous.

3. Dielectric Flanges:

    a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

        1) Central Plastics Company.
        2) Matco-Norca.
        3) WATTS.
        4) Zurn Industries, LLC.

    b. Description:

        1) Standard: ASSE 1079.
        2) Factory-fabricated, bolted, companion-flange assembly.
        3) Pressure Rating: 150 psig minimum at 180 deg F.
        4) End Connections: Solder-joint copper alloy and threaded ferrous; threaded solder-joint copper alloy and threaded ferrous.

4. Dielectric-Flange Insulating Kits:

    a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

        1) Advance Products & Systems, Inc.
        2) Calpico, Inc.
        3) Central Plastics Company.
        4) GPT; an EnPro Industries company.

    b. Description:

        1) Nonconducting materials for field assembly of companion flanges.
        2) Pressure Rating: 150 psig.

3) Gasket: Neoprene or phenolic.
4) Bolt Sleeves: Phenolic or polyethylene.
5) Washers: Phenolic with steel-backing washers.

PART 3 - EXECUTION

3.1 EARTH MOVING

A. Comply with requirements for excavating, trenching, and backfilling specified in Section 312000 "Earth Moving."

3.2 PIPING INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems.

1. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations.
2. Install piping as indicated unless deviations from layout are approved on coordination drawings.

B. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.

C. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

D. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

E. Install piping to permit valve servicing.

F. Install piping at indicated slopes.

G. Install piping free of sags and bends.

H. Install fittings for changes in direction and branch connections.

I. Install piping to allow application of insulation.

J. Make changes in direction for piping using appropriate branches, bends, and long-sweep bends.

1. Do not change direction of flow more than 90 degrees.
2. Use proper size of standard increasers and reducers if pipes of different sizes are connected.

a. Reducing size of drainage piping in direction of flow is prohibited.

K. Lay buried building piping beginning at low point of each system.

1. Install true to grades and alignment indicated, with unbroken continuity of invert. Place hub ends of piping upstream.
2. Install required gaskets according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements.
3. Maintain swab in piping and pull past each joint as completed.

L. Install piping at the following minimum slopes unless otherwise indicated:

1. Building Storm Drain: 2 percent downward in direction of flow for piping NPS 3 and smaller; 1 percent downward in direction of flow for piping NPS 4 and larger.
2. Horizontal Storm Drainage Piping: 2 percent downward in direction of flow.

M. Install cast-iron soil piping according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings."

1. Install encasement on underground piping according to ASTM A 674 or AWWA C105/A 21.5.

N. Install steel piping according to applicable plumbing code.

O. Install underground PVC piping according to ASTM D 2321.

P. Plumbing Specialties:

1. Install cleanouts at grade and extend to where building storm drains connect to building storm sewers in storm drainage gravity-flow piping.

    a. Comply with requirements for cleanouts specified in Section 221423 "Storm Drainage Piping Specialties."

2. Install drains in storm drainage gravity-flow piping.

    a. Comply with requirements for drains specified in Section 221423 "Storm Drainage Piping Specialties."

Q. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.

R. Install sleeves for piping penetrations of walls, ceilings, and floors.

1. Comply with requirements for sleeves specified in Section 220517 "Sleeves and Sleeve Seals for Plumbing Piping."

S. Install sleeve seals for piping penetrations of concrete walls and slabs.

1. Comply with requirements for sleeve seals specified in Section 220517 "Sleeves and Sleeve Seals for Plumbing Piping."

T. Install escutcheons for piping penetrations of walls, ceilings, and floors.

1. Comply with requirements for escutcheons specified in Section 220500 "Common Work Results for Plumbing."

3.3 JOINT CONSTRUCTION

A. Hub-and-Spigot, Cast-Iron Soil Piping Gasketed Joints: Join according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for compression joints.

B. Hub-and-Spigot, Cast-Iron Soil Piping Caulked Joints: Join according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for lead-and-oakum caulked joints.

C. Hubless, Cast-Iron Soil Piping Coupled Joints:

1. Join according to CISPI 310 and CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for hubless-piping coupling joints.

D. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1.

1. Cut threads full and clean using sharp dies.
2. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

a. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
b. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged.
c. Do not use pipe sections that have cracked or open welds.

E. Join copper tube and fittings with soldered joints according to ASTM B 828 procedure. Use ASTM B 813, water-flushable, lead-free flux and ASTM B 32, lead-free-alloy solder.

F. Grooved Joints: Cut groove ends of pipe according to AWWA C606. Lubricate and install gasket over ends of pipes or pipe and fittings. Install coupling housing sections, over gasket, with keys seated in piping grooves. Install and tighten housing bolts.

G. Flanged Joints: Align bolt holes. Select appropriate gasket material, size, type, and thickness. Install gasket concentrically positioned. Use suitable lubricants on bolt threads. Torque bolts in cross pattern.

H. Plastic, Nonpressure-Piping, Solvent-Cemented Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:

1. Comply with ASTM F 402 for safe-handling practice of cleaners, primers, and solvent cements.
2. PVC Piping: Join according to ASTM D 2855 and ASTM D 2665 appendices.

I. Joint Restraints and Sway Bracing:

1. Provide joint restraints and sway bracing for storm drainage piping joints to comply with the following conditions:

a. Provide axial restraint for pipe and fittings 5 inches and larger, upstream and downstream of all changes in direction, branches, and changes in diameter greater than two pipe sizes.
b. Provide rigid sway bracing for pipe and fittings 4 inches and larger, upstream and downstream of all changes in direction 45 degrees and greater.
c. Provide rigid sway bracing for pipe and fittings 5 inches and larger, upstream and downstream of all changes in direction and branch openings.

3.4 SPECIALTY PIPE FITTING INSTALLATION

A. Transition Couplings:

1. Install transition couplings at joints of piping with small differences in ODs.
2. In Drainage Piping: Shielded, nonpressure transition couplings.

B. Dielectric Fittings:

1. Install dielectric fittings in piping at connections of dissimilar metal piping and tubing.
2. Dielectric Fittings for NPS 2 and Smaller: Use dielectric unions.
3. Dielectric Fittings for NPS 2-1/2 to NPS 4: Use dielectric flanges.
4. Dielectric Fittings for NPS 5 and Larger: Use dielectric flange kits.

3.5 INSTALLATION OF HANGERS AND SUPPORTS

A. Comply with requirements for seismic-restraint devices specified in Section 220500 "Common Work Results for Plumbing."

B. Comply with requirements for hangers, supports, and anchor devices specified in Section 220529 "Hangers and Supports for Plumbing Piping and Equipment."

1. Install carbon-steel pipe hangers for horizontal piping in noncorrosive environments.
2. Install carbon-steel pipe support clamps for vertical piping in noncorrosive environments.
3. Install stainless-steel pipe support clamps for vertical piping in corrosive environments.
4. Vertical Piping: MSS Type 8 or Type 42, clamps.
5. Install individual, straight, horizontal piping runs:

    a. 100 Feet and Less: MSS Type 1, adjustable, steel clevis hangers.
    b. Longer Than 100 Feet: MSS Type 43, adjustable roller hangers.
    c. Longer Than 100 Feet if Indicated: MSS Type 49, spring cushion rolls.

6. Multiple, Straight, Horizontal Piping Runs 100 Feet or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
7. Base of Vertical Piping: MSS Type 52, spring hangers.

C. Install hangers for cast-iron soil tubing and piping, with maximum horizontal spacing and minimum rod diameters, to comply with MSS-58, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.

D. Support horizontal piping and tubing within 12 inches of each fitting and coupling.

E. Support vertical cast-iron tubing and piping to comply with MSS-58, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent, but as a minimum at base and at each floor.

3.6 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Connect interior storm drainage piping to exterior storm drainage piping. Use transition fitting to join dissimilar piping materials.

C. Connect storm drainage piping to roof drains and storm drainage specialties.

1. Install test tees (wall cleanouts) in conductors near floor, and floor cleanouts with cover flush with floor.
2. Comply with requirements for cleanouts and drains specified in Section 221423 "Storm Drainage Piping Specialties."

D. Where installing piping adjacent to equipment, allow space for service and maintenance.

E. Make connections according to the following unless otherwise indicated:

1. Install unions, in piping NPS 2 and smaller, adjacent to each valve and at final connection to each piece of equipment.
2. Install flanges, in piping NPS 2-1/2 and larger, adjacent to flanged valves and at final connection to each piece of equipment.

3.7 IDENTIFICATION

A. Identify exposed storm drainage piping.

B. Comply with requirements for identification specified in Section 220553 "Identification for Plumbing Piping and Equipment."

3.8 FIELD QUALITY CONTROL

A. During installation, notify authorities having jurisdiction at least 24 hours before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction.

1. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in.
2. Final Inspection: Arrange for final inspection by authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.

B. Test storm drainage piping according to procedures of authorities having jurisdiction or, in absence of published procedures, as follows:

1. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired.

    a. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.

2. Leave uncovered and unconcealed new, altered, extended, or replaced storm drainage piping until it has been tested and approved.

    a. Expose work that was covered or concealed before it was tested.

3. Test Procedure:

    a. Test storm drainage piping, except outside leaders, on completion of roughing-in.
    b. Close openings in piping system and fill with water to point of overflow, but not less than 10-foot head of water. From 15 minutes before inspection starts until completion of inspection, water level must not drop. Inspect joints for leaks.

4. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.
5. Prepare reports for tests and required corrective action.

C. Piping will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

3.9 CLEANING AND PROTECTION

A. Clean interior of piping. Remove dirt and debris as work progresses.

B. Protect drains during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.

C. Place plugs in ends of uncompleted piping at end of day and when work stops.

3.10 PIPING SCHEDULE

A. Flanges and unions may be used on aboveground pressure piping unless otherwise indicated.

B. Aboveground storm drainage piping NPS 6 and smaller shall be any of the following:

1. Service class, cast-iron soil pipe and fittings; gaskets; and gasketed joints.
2. Hubless, cast-iron soil pipe and fittings; CISPI, hubless-piping couplings; and coupled joints.
3. Dissimilar Pipe-Material Couplings: Shielded, nonpressure transition couplings.

C. Aboveground, storm drainage piping NPS 8 and larger shall be any of the following:

1. Service class, cast-iron soil pipe and fittings; gaskets; and gasketed joints.
2. Hubless, cast-iron soil pipe and fittings; CISPI, hubless-piping couplings; and coupled joints.
3. Galvanized-steel pipe, drainage fittings, and threaded joints.
4. Dissimilar Pipe-Material Couplings: Shielded, nonpressure transition couplings.

D. Underground storm drainage piping NPS 6 and smaller shall be any of the following:

1. Service class, cast-iron soil pipe and fittings; gaskets, and gasketed; and caulked joints.
2. Hubless, cast-iron soil pipe and fittings; CISPI, cast-iron, hubless-piping couplings; and coupled joints.
3. Solid-wall PVC pipe, PVC socket fittings, and solvent-cemented joints.
4. Dissimilar Pipe-Material Couplings: Shielded, nonpressure transition couplings.

E. Underground, storm drainage piping NPS 8 and larger shall be any of the following:

1. Service class, cast-iron soil pipe and fittings; gaskets, and gasketed; and caulked joints.
2. Hubless, cast-iron soil pipe and fittings; CISPI, cast-iron, hubless-piping couplings; and coupled joints.
3. Solid-wall PVC pipe, PVC socket fittings, and solvent-cemented joints.
4. Dissimilar Pipe-Material Couplings: Shielded, nonpressure transition couplings.

END OF SECTION

SECTION 221423 - STORM DRAINAGE PIPING SPECIALTIES

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. Metal roof drains.
2. Miscellaneous storm drainage piping specialties.
3. Cleanouts.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.4 QUALITY ASSURANCE

A. Drainage piping specialties shall bear label, stamp, or other markings of specified testing agency.

PART 2 - PRODUCTS

2.1 METAL ROOF DRAINS

A. Cast-Iron, Medium-Sump, General-Purpose Roof Drains:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Jay R. Smith Mfg Co; a division of Morris Group International.
b. Josam Company.
c. Marathon Roofing Products.
d. MIFAB, Inc.
e. Portals Plus; a division of Hart & Cooley, Inc.
f. Wade; a subsidiary of McWane Inc.
g. WATTS.
h. Zurn Industries, LLC.

2. Standard: ASME A112.6.4.
3. Body Material: Cast iron.
4. Dimension of Body: 8- to 12-inch diameter.
5. Combination Flashing Ring and Gravel Stop: Required.
6. Flow-Control Weirs: Not required.

7. Outlet: Bottom.
8. Outlet Type: No hub.
9. Extension Collars: As needed for site conditions.
10. Underdeck Clamp: Not required if using receiver plate.
11. Expansion Joint: As needed for site conditions.
12. Sump Receiver Plate: Not required if using under deck clamp.
13. Dome Material: Cast iron or PE.
14. Wire Mesh: Not required.
15. Perforated Gravel Guard: Not required.
16. Vandal-Proof Dome: Not required.
17. Water Dam: 2 inches high for overflow drains.

B. Cast-Iron, Small-Sump, General-Purpose Roof Drains:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Jay R. Smith Mfg Co; a division of Morris Group International.
    b. Josam Company.
    c. Marathon Roofing Products.
    d. MIFAB, Inc.
    e. Wade; a subsidiary of McWane Inc.
    f. WATTS.
    g. Zurn Industries, LLC.

2. Standard: ASME A112.6.4.
3. Body Material: Cast iron.
4. Dimension of Body: Nominal 8-inch diameter.
5. Combination Flashing Ring and Gravel Stop: Required.
6. Outlet: Bottom.
7. Outlet Type: No hub.
8. Extension Collars: As needed for site conditions.
9. Underdeck Clamp: Not required if using receiver plate.
10. Expansion Joint: As needed for site conditions.
11. Sump Receiver Plate: Not required if using under deck clamp.
12. Dome Material: Cast iron.
13. Wire Mesh: Not required.
14. Vandal-Proof Dome: Not required.

2.2 MISCELLANEOUS STORM DRAINAGE PIPING SPECIALTIES

A. Downspout Adapters:

1. Description: Manufactured, gray-iron casting, for attaching to horizontal-outlet, parapet roof drain and to exterior sheet metal downspout.
2. Size: Inlet size to match parapet drain outlet.

B. Downspout Boots:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. J.R. Hoe & Sons Inc.
    b. Neenah Foundry Company.

c. WATTS.

2. Description: Manufactured, ASTM A48/A48M, gray-iron casting, with strap or ears for attaching to building; NPS 4 outlet; and shop-applied bituminous coating.
3. Size: Inlet size to match downspout and NPS 4 outlet.

C. Metal Downspout Nozzles:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Jay R. Smith Mfg Co; a division of Morris Group International.
b. Josam Company.
c. WATTS.
d. Zurn Industries, LLC.

2. Description: Nozzle with wall flange and mounting holes to cover rough opening and serve as anchor.
3. Size: Same as connected downspout.
4. Material: Cast bronze or nickel bronze nozzle and flange.
5. Piping Connection Type: Threaded, No-hub or Slip on.
6. Finish: Stainless steel.
7. Opening Protection: Birdscreen.

2.3 CLEANOUTS

A. Cast-Iron Exposed Cleanouts:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Jay R. Smith Mfg Co; a division of Morris Group International.
b. Josam Company.
c. MIFAB, Inc.
d. Tyler Pipe; a subsidiary of McWane Inc.
e. Wade; a subsidiary of McWane Inc.
f. WATTS.
g. Zurn Industries, LLC.

2. Standard: ASME A112.36.2M.
3. Size: Same as connected branch.
4. Body Material: Hub-and-spigot, cast-iron soil pipe T-branch; or No-hub, cast-iron soil pipe test tee as required to match connected piping.
5. Closure: Countersunk or raised-head, cast-iron plug.
6. Closure Plug Size: Same as, or not more than, one size smaller than cleanout size.

B. Cast-Iron Exposed Floor Cleanouts:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Jay R. Smith Mfg Co; a division of Morris Group International.
b. Josam Company.
c. Oatey.

d. Sioux Chief Manufacturing Company, Inc.
e. Tyler Pipe; a subsidiary of McWane Inc.
f. Wade; a subsidiary of McWane Inc.
g. WATTS.
h. Zurn Industries, LLC.

2. Standard: ASME A112.36.2M.
3. Size: Same as connected branch.
4. Type: Adjustable housing.
5. Body or Ferrule: Cast iron.
6. Clamping Device: Required.
7. Outlet Connection: No hub.
8. Closure: Brass plug with straight threads and gasket, Brass plug with tapered threads, or Cast-iron plug.
9. Adjustable Housing Material: Cast iron with threads, setscrews or other device.
10. Frame and Cover Material and Finish: Nickel-bronze, copper alloy.
11. Frame and Cover Shape: Round.
12. Top Loading Classification: Light Duty.
13. Riser: ASTM A74, Service class, cast-iron drainage pipe fitting and riser to cleanout.

C. Cast-Iron Wall Cleanouts:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Jay R. Smith Mfg Co; a division of Morris Group International.
b. Josam Company.
c. MIFAB, Inc.
d. Tyler Pipe; a subsidiary of McWane Inc.
e. Wade; a subsidiary of McWane Inc.
f. WATTS.
g. Zurn Industries, LLC.

2. Standard: ASME A112.36.2M. Include wall access.
3. Size: Same as connected drainage piping.
4. Body: Hub-and-spigot, cast-iron soil pipe T-branch; or No-hub, cast-iron soil pipe test tee as required to match connected piping.
5. Closure Plug:

a. Brass or Cast iron.
b. Countersunk or raised head.
c. Drilled and threaded for cover attachment screw.
d. Size: Same as, or not more than, one size smaller than cleanout size.

6. Wall Access, Cover Plate: Round, flat, chrome-plated brass or stainless steel cover plate with screw.
7. Wall Access, Frame and Cover: Round, nickel-bronze, copper-alloy, or stainless steel wall-installation frame and cover.

D. Test Tees:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Jay R. Smith Mfg Co; a division of Morris Group International.

b. Josam Company.
c. MIFAB, Inc.
d. Tyler Pipe; a subsidiary of McWane Inc.
e. WATTS.
f. Zurn Industries, LLC.

2. Standard: ASME A112.36.2M and ASTM A74, ASTM A888, or CISPI 301.
3. Size: Same as connected drainage piping.
4. Body Material: Hub-and-spigot, cast-iron soil-pipe T-branch or no-hub, cast-iron soil-pipe test tee as required to match connected piping.
5. Closure Plug: Countersunk or raised head, brass.
6. Closure Plug Size: Same as, or not more than, one size smaller than cleanout size.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install roof drains at low points of roof areas in accordance with roof membrane manufacturer's written installation instructions.

1. Install flashing collar or flange of roof drain to prevent leakage between drain and adjoining roofing. Maintain integrity of waterproof membranes where penetrated.
2. Install expansion joints, if indicated, in roof drain outlets.
3. Position roof drains for easy access and maintenance.

B. Install downspout nozzles at exposed bottom of conductors where they spill onto grade.

C. Install cleanouts in aboveground piping and building drain piping in accordance with the following instructions unless otherwise indicated:

1. Use cleanouts the same size as drainage piping up to NPS 4. Use NPS 4 for larger drainage piping unless larger cleanout is indicated.
2. Locate cleanouts at each change in direction of piping greater than 45 degrees.
3. Locate cleanouts at minimum intervals of 50 feet for piping NPS 4 and smaller and 100 feet for larger piping.
4. Locate cleanouts at base of each vertical storm piping conductor.

D. For floor cleanouts for piping below floors, install cleanout deck plates with top flush with finished floor.

E. For cleanouts located in concealed piping, install cleanout wall access covers, of types indicated, with frame and cover flush with finished wall.

F. Install test tees in vertical conductors and near floor.

G. Install wall cleanouts in vertical conductors. Install access door in wall if indicated.

H. Install through-penetration firestop assemblies for penetrations of fire- and smoke-rated assemblies.

1. Comply with requirements in Section 078413 "Penetration Firestopping."

3.2 CONNECTIONS

A. Comply with requirements for piping specified in Section 221413 "Facility Storm Drainage Piping." Drawings indicate general arrangement of piping, fittings, and specialties.

3.3 INSTALLATION OF FLASHING

A. Fabricate flashing from single piece of metal unless large pans, sumps, or other drainage shapes are required.

B. Install sheet flashing on pipes, sleeves, and specialties passing through or embedded in floors and roofs with waterproof membrane.

C. Set flashing on floors and roofs in solid coating of bituminous cement.

D. Secure flashing into sleeve and specialty clamping ring or device.

3.4 PROTECTION

A. Protect drains during remainder of construction period to avoid clogging with dirt or debris and to prevent damage from traffic or construction work.

B. Place plugs in ends of uncompleted piping at end of each day or when work stops.

END OF SECTION

SECTION 224213.13 - COMMERCIAL WATER CLOSETS

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. Floor-mounted, bottom-outlet water closets.
2. Wall-mounted water closets.
3. Flushometer valves.
4. Toilet seats.
5. Supports.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for water closets.
2. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

B. Shop Drawings: Include diagrams for power, signal, and control wiring.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For flushometer valves to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 FLOOR-MOUNTED, BOTTOM-OUTLET WATER CLOSETS

A. Water Closets, Floor Mounted, Bottom Outlet, Top Spud:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. American Standard.
b. Kohler Co.
c. Mansfield Plumbing Products LLC.
d. Sloan Valve Company.
e. TOTO USA, Inc.

f. Zurn Industries, LLC.

2. Bowl:

a. Standards: ASME A112.19.2/CSA B45.1 and ASME A112.19.5.
b. Material: Vitreous china.
c. Type: Siphon jet.
d. Style: Flushometer valve.
e. Height: Handicapped/elderly, complying with ICC/ANSI A117.1.
f. Rim Contour: Elongated.
g. Water Consumption: 1.6 gal. per flush.
h. Spud Size and Location: NPS 1-1/2; top.
i. Color: White.

3. Bowl-to-Drain Connecting Fitting: ASTM A1045 or ASME A112.4.3.
4. Flushometer Valve: Semi-red brass construction with synthetic rubber diaphragm.

2.2 WALL-MOUNTED WATER CLOSETS

A. Water Closets, Wall Mounted, Top Spud, Accessible:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. American Standard.
b. Kohler Co.
c. Mansfield Plumbing Products LLC.
d. Sloan Valve Company.
e. TOTO USA, Inc.
f. Zurn Industries, LLC.

2. Bowl:

a. Standards: ASME A112.19.2/CSA B45.1 and ASME A112.19.5.
b. Material: Vitreous china.
c. Type: Siphon jet.
d. Style: Flushometer valve.
e. Height: Standard.
f. Rim Contour: Elongated.
g. Water Consumption: 1.6 gal. per flush.
h. Spud Size and Location: NPS 1-1/2; top.

3. Flushometer Valve: Semi-red brass construction with synthetic rubber diaphragm.
4. Water-Closet Mounting Height: Standard and handicapped/elderly according to ICC/ANSI A117.1. Refer to architectural details for mounting heights of plumbing fixtures.

2.3 FLUSHOMETER VALVES

A. Lever-Handle, Diaphragm Flushometer Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Advanced Modern Technologies Corporation – AMTC.
b. Delaney Products.
c. I-Con Systems, Inc.
d. Sloan Valve Company.
e. Zurn Industries, LLC.

2. Standard: ASSE 1037.
3. Minimum Pressure Rating: 125 psig.
4. Features: Include integral check stop and backflow-prevention device.
5. Material: Semi-red brass body with corrosion-resistant components. Synthetic rubber diaphragm.
6. Exposed Flushometer-Valve Finish: Chrome plated.
7. Panel Finish: Chrome plated or stainless steel.
8. Style: **Exposed**.
9. Consumption: 1.6 gal. per flush.
10. Minimum Inlet: NPS 1.
11. Minimum Outlet: NPS 1-1/4.

2.4 TOILET SEATS

A. Toilet Seats:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. American Standard.
b. Bemis Manufacturing Company.
c. Centoco Manufacturing Corporation.
d. Church Seats; Bemis Manufacturing Company.
e. Jones Stephens Corp.
f. Kohler Co.
g. TOTO USA, INC.
h. Zurn Industries, LLC.

2. Standard: IAPMO/ANSI Z124.5.
3. Material: Plastic.
4. Type: Commercial (Heavy duty).
5. Shape: Elongated rim, open front.
6. Hinge: Self-sustaining, check.
7. Hinge Material: Noncorroding metal.
8. Seat Cover: Not required.
9. Color: White.

2.5 SUPPORTS

A. Water Closet Carrier:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Jay R. Smith Mfg Co; a division of Morris Group International.
b. Josam Company.
c. Wade Drains.

d. WATTS.
e. Zurn Industries, LLC.

2. Standard: ASME A112.6.1M.
3. Description: Waste-fitting assembly, as required to match drainage piping material and arrangement with faceplates, couplings gaskets, and feet; bolts and hardware matching fixture.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine roughing-in of water supply and sanitary drainage and vent piping systems to verify actual locations of piping connections before water-closet installation.

B. Examine walls and floors for suitable conditions where water closets will be installed.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

A. Water-Closet Installation:

1. Install level and plumb according to roughing-in drawings.
2. Install floor-mounted water closets on bowl-to-drain connecting fitting attachments to piping or building substrate.
3. Install accessible, wall-mounted water closets at mounting height for handicapped/elderly, according to ICC/ANSI A117.1.

B. Support Installation:

1. Install supports, affixed to building substrate, for floor-mounted, back-outlet water closets.
2. Use carrier supports with waste-fitting assembly and seal.

C. Flushometer-Valve Installation:

1. Install flushometer-valve, water-supply fitting on each supply to each water closet.
2. Attach supply piping to supports or substrate within pipe spaces behind fixtures.
3. Install lever-handle flushometer valves for accessible water closets with handle mounted on open side of water closet.
4. Install actuators in locations that are easy for people with disabilities to reach.

D. Install toilet seats on water closets.

E. Wall Flange and Escutcheon Installation:

1. Install wall flanges or escutcheons at piping wall penetrations in exposed, finished locations and within cabinets and millwork.
2. Install deep-pattern escutcheons if required to conceal protruding fittings.
3. Comply with escutcheon requirements specified in Section 220500 "Common Work Results for Plumbing."

F. Joint Sealing:

1. Seal joints between water closets and walls and floors using sanitary-type, one-part, mildew-resistant silicone sealant.
2. Match sealant color to water-closet color.
3. Comply with sealant requirements specified in Section 079200 "Joint Sealants."

3.3 CONNECTIONS

A. Connect water closets with water supplies and soil, waste, and vent piping. Use size fittings required to match water closets.

B. Comply with water piping requirements specified in Section 221116 "Domestic Water Piping."

C. Comply with soil and waste piping requirements specified in Section 221316 "Sanitary Waste and Vent Piping."

D. Where installing piping adjacent to water closets, allow space for service and maintenance.

3.4 ADJUSTING

A. Operate and adjust water closets and controls. Replace damaged and malfunctioning water closets, fittings, and controls.

B. Adjust water pressure at flushometer valves to produce proper flow.

3.5 CLEANING AND PROTECTION

A. Clean water closets and fittings with manufacturers' recommended cleaning methods and materials.

B. Install protective covering for installed water closets and fittings.

C. Do not allow use of water closets for temporary facilities unless approved in writing by Owner.

END OF SECTION

SECTION 224213.16 - COMMERCIAL URINALS

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. Wall-hung urinals.
2. Urinal flushometer valves.
3. Supports.

B. Related Requirements:

1. Section 224600 "Security Plumbing Fixtures" for security urinals.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for urinals.
2. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

B. Shop Drawings: Include diagrams for power, signal, and control wiring.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For flushometer valves to include in operation and maintenance manuals.

1.5 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that are packaged with protective covering for storage and identified with labels describing contents.

1. Flushometer-Valve Repair Kits: One of each type.

PART 2 - PRODUCTS

2.1 WALL-HUNG URINALS

A. Urinals, Wall Hung, Back Outlet, Washout:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. American Standard.
    b. Kohler Co.
    c. Mansfield Plumbing Products LLC.
    d. TOTO USA, INC.
    e. Zurn Industries, LLC.

2. Fixture:

    a. Standards: ASME A112.19.2/CSA B45.1 and ASME A112.19.5.
    b. Material: Vitreous china.
    c. Type: Washout with extended shields.
    d. Strainer or Trapway: Manufacturer's standard strainer with integral trap.
    e. Water Consumption: Low.
    f. Spud Size and Location: NPS 3/4, top.
    g. Outlet Size and Location: NPS 2, back.
    h. Color: White.

3. Waste Fitting:

    a. Standard: ASME A112.18.2/CSA B125.2 for coupling.
    b. Size: NPS 2.

4. Support: Type I Urinal Carrier with fixture support plates and coupling with seal and fixture bolts and hardware matching fixture. Include rectangular, steel uprights.
5. Urinal Mounting Height: Refer to architectural elevations for mounting height requirements.

2.2 URINAL FLUSHOMETER VALVES

A. Lever-Handle, Diaphragm Flushometer Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Advanced Modern Technologies Corporation – AMTC.
    b. American Standard.
    c. Delaney Products.
    d. I-Con Systems, Inc.
    e. Sloan Valve Company.
    f. Zurn Industries, LLC.

2. Standard: ASSE 1037.
3. Minimum Pressure Rating: 125 psig.
4. Features: Include integral check stop and backflow-prevention device.

5. Material: Brass body with corrosion-resistant components.
6. Exposed Flushometer-Valve Finish: Chrome plated.
7. Panel Finish: Chrome plated or stainless steel.
8. Style: Exposed.
9. Consumption: 1.0 gal. per flush.
10. Minimum Inlet: NPS 3/4.
11. Minimum Outlet: NPS 1-1/4.

2.3 SUPPORTS

A. Type I Urinal Carrier:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Jay R. Smith Mfg Co; a division of Morris Group International.
   b. Josam Company.
   c. MIFAB, Inc.
   d. Wade Drains.
   e. WATTS.
   f. Zurn Industries, LLC.

2. Standard: ASME A112.6.1M.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine roughing-in of water supply and sanitary drainage and vent piping systems to verify actual locations of piping connections before urinal installation.

B. Examine walls and floors for suitable conditions where urinals will be installed.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Urinal Installation:

1. Install urinals level and plumb according to roughing-in drawings.
2. Install wall-hung, back-outlet urinals onto waste fitting seals and attached to supports.
3. Install accessible, wall-mounted urinals at mounting height for the handicapped/elderly, according to ICC/ANSI A117.1.

B. Support Installation:

1. Install supports, affixed to building substrate, for wall-hung urinals.
2. Use off-floor carriers with waste fitting and seal for back-outlet urinals.
3. Use carriers without waste fitting for urinals with tubular waste piping.
4. Use chair-type carrier supports with rectangular steel uprights for accessible urinals.

C. Flushometer-Valve Installation:

1. Install flushometer-valve water-supply fitting on each supply to each urinal.
2. Attach supply piping to supports or substrate within pipe spaces behind fixtures.
3. Install lever-handle flushometer valves for accessible urinals with handle mounted on open side of compartment.

D. Wall Flange and Escutcheon Installation:

1. Install wall flanges or escutcheons at piping wall penetrations in exposed, finished locations.
2. Install deep-pattern escutcheons if required to conceal protruding fittings.
3. Comply with escutcheon requirements specified in Section 220500 "Common Work Results for Plumbing."

E. Joint Sealing:

1. Seal joints between urinals and walls and floors using sanitary-type, one-part, mildew-resistant silicone sealant.
2. Match sealant color to urinal color.
3. Comply with sealant requirements specified in Section 079200 "Joint Sealants."

3.3 CONNECTIONS

A. Connect urinals with water supplies and soil, waste, and vent piping. Use size fittings required to match urinals.

B. Comply with water piping requirements specified in Section 221116 "Domestic Water Piping."

C. Comply with soil and waste piping requirements specified in Section 221316 "Sanitary Waste and Vent Piping."

D. Where installing piping adjacent to urinals, allow space for service and maintenance.

3.4 ADJUSTING

A. Operate and adjust urinals and controls. Replace damaged and malfunctioning urinals, fittings, and controls.

B. Adjust water pressure at flushometer valves to produce proper flow.

3.5 CLEANING AND PROTECTION

A. Clean urinals and fittings with manufacturers' recommended cleaning methods and materials.

B. Install protective covering for installed urinals and fittings.

C. Do not allow use of urinals for temporary facilities unless approved in writing by Owner.

END OF SECTION

SECTION 224216.13 - COMMERCIAL LAVATORIES

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. Solid surface, wall-mounted, single-basin, multi-station, lavatories.
2. Manually operated lavatory faucets.
3. Supply fittings.
4. Waste fittings.
5. Lavatory supports.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for lavatories.
2. Include rated capacities, operating characteristics, and furnished specialties and accessories.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For lavatories and faucets to include in operation and maintenance manuals.

1. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:

a. Servicing and adjustments of automatic faucets.

PART 2 - PRODUCTS

2.1 SOLID SURFACE, WALL-MOUNTED, SINGLE-BASIN, MULTI-STATION LAVATORIES

A. Lavatory - Rectangular Countertop Deck with Integral Angled Basin:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Acorn.
b. Bradley.

c. Sloan.
d. Trueform Concrete, LLC.

2. Basin(s) and Countertop:

a. Standard: CSA B45, IAPMO.
b. Type: Monolithic, rectangular front and sides.
c. Number of Stations: Refer to plumbing fixture schedule.
d. Faucet-Hole Punching (per Station): Two-holes, 4-inch center.
e. Faucet-Hole Location: Top.
f. Color: Custom, by Architect.
g. Mounting: Concrete wall brackets.

3. Waste Fittings:

a. Standard: ASME A112.18.2/CSA B125.2.
b. Connection: 1-1/4-inch fine thread tailpiece.
c. Finish: Polished chrome.

4. Support: Manufacturer's standard product.
5. Lavatory Mounting Height: Coordinate with architectural elevations.
6. Stainless steel under-counter enclosure, easily removable for access to under-counter piping and components.

2.2 MANUALLY OPERATED LAVATORY FAUCETS

A. NSF Standard: Comply with NSF 61 and NSF 372 for faucet materials that will be in contact with potable water.

B. Lavatory Faucets - Manual Type: Two-handle metering:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. American Standard.
b. Chicago Faucets; Geberit Company.
c. Delta Faucet Company.
d. Elkay.
e. GROHE America, Inc.
f. Just Manufacturing.
g. Kohler Co.
h. Moen Incorporated.
i. Speakman Company.
j. T&S Brass and Bronze Works, Inc.
k. Zurn Industries, LLC.

2. Standard: ASME A112.18.1/CSA B125.1.
3. General: Include hot- and cold-water indicators; coordinate faucet inlets with supplies and fixture hole punchings; coordinate outlet with spout and fixture receptor.
4. Body Type: Centerset.
5. Body Material: Commercial, solid-brass, or die-cast housing with brazed copper and brass waterway.
6. Finish: Polished chrome plate.
7. Maximum Flow Rate: 0.5 gpm.

8. Maximum Flow: 0.25 gal. per metering cycle.
9. Mounting Type: Deck, exposed.
10. Valve Handles: ADA compliant tip action lever handles.
11. Spout: Rigid type.
12. Spout Outlet: Vandal resistant **spray.**
13. Operation: Compression, manual.

2.3 SUPPLY FITTINGS

A. NSF Standard: Comply with NSF 61 and NSF 372 for supply-fitting materials that will be in contact with potable water.

B. Standard: ASME A112.18.1/CSA B125.1.

C. Supply Piping: Chrome-plated-brass pipe or chrome-plated copper tube matching water-supply piping size. Include chrome-plated-brass or stainless steel wall flange.

D. Supply Stops: Chrome-plated-brass, one-quarter-turn, ball-type or compression valve with inlet connection matching supply piping.

E. Operation: Loose key.

F. Risers:

1. NPS 3/8.
2. ASME A112.18.6/CSA B125.6, braided- or corrugated-stainless steel, flexible hose riser.

2.4 WASTE FITTINGS

A. Standard: ASME A112.18.2/CSA B125.2.

B. Drain: Grid type with NPS 1-1/4 offset and straight tailpiece.

C. Trap:

1. Size: NPS 1-1/2 by NPS 1-1/4.
2. Material:

a. Chrome-plated, two-piece, cast-brass trap and swivel elbow with 0.032-inch-thick brass tube to wall; and chrome-plated, brass or steel wall flange.

2.5 LAVATORY SUPPORTS

A. Lavatory Carrier:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Jay R. Smith Mfg Co; a division of Morris Group International.
b. Josam Company.
c. MIFAB, Inc.
d. Wade; a subsidiary of McWane, Inc.

e. WATTS.
f. Zurn Industries, LLC.

2. Standard: ASME A112.6.1M.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine roughing-in of water supply and sanitary drainage and vent piping systems to verify actual locations of piping connections before lavatory installation.

B. Examine counters and walls for suitable conditions where lavatories will be installed.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install lavatories level and plumb in accordance with roughing-in drawings.

B. Install supports, affixed to building substrate, for wall-mounted lavatories.

C. Install accessible wall-mounted lavatories at handicapped/elderly mounting height for people with disabilities or the elderly, in accordance with ICC A117.1.

D. Install wall flanges or escutcheons at piping wall penetrations in exposed, finished locations. Use deep-pattern escutcheons if required to conceal protruding fittings.

E. Seal joints between lavatories, counters, and walls using sanitary-type, one-part, mildew-resistant silicone sealant. Match sealant color to fixture color.

F. Install protective shielding pipe covers and enclosures on exposed supplies and waste piping of accessible lavatories.

3.3 PIPING CONNECTIONS

A. Connect fixtures with water supplies, stops, and risers, and with traps, soil, waste, and vent piping. Use size fittings required to match fixtures.

B. Comply with water piping requirements specified in Section 221116 "Domestic Water Piping."

C. Comply with soil and waste piping requirements specified in Section 221316 "Sanitary Waste and Vent Piping."

3.4 ADJUSTING

A. Operate and adjust lavatories and controls. Replace damaged and malfunctioning lavatories, fittings, and controls.

3.5 CLEANING AND PROTECTION

A. After completing installation of lavatories, inspect and repair damaged finishes.

B. Clean lavatories, faucets, and other fittings with manufacturers' recommended cleaning methods and materials.

C. Provide protective covering for installed lavatories and fittings.

D. Do not allow use of lavatories for temporary facilities unless approved in writing by Owner.

END OF SECTION

SECTION 224216.16 - COMMERCIAL SINKS

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. Stainless steel sinks.
2. Supports.
3. Supply fittings.
4. Waste fittings.

B. Related Requirements:

1. Section 224100 "Residential Plumbing Fixtures" for residential sinks.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for sinks.
2. Include rated capacities, operating characteristics[**, electrical characteristics,**] and furnished specialties and accessories.

1.4 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Counter cutout templates for mounting of counter-mounted lavatories.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For sinks to include in maintenance manuals.

1.6 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Faucet Washers and O-Rings: Equal to [**10**] <**Insert number**> percent of amount of each type and size installed.
2. Faucet Cartridges and O-Rings: Equal to [**5**] <**Insert number**> percent of amount of each type and size installed.

PART 2 - PRODUCTS

2.1 STAINLESS STEEL SINKS

A. Single Bowl Sinks: Undermount.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Elkay.
    b. Just Manufacturing.
    c. Kohler.
    d. Moen Incorporated.

2. Fixture:

    a. Standard: ASME A112.19.1/CSA B45.4 and NSF/ANSI 2.
    b. Metal thickness: 18 gauge.
    c. Dimensions: 20-1/2” x 16-1/2” x 7-7/8”.
    d. Hole configuration: 3 holes.

3. Faucet:

    a. NSF Standard: Comply with NSF 372 for faucet-spout materials that will be in contact with potable water.
    b. Manual type, two lever handle.
    c. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

        1) American Standard.
        2) Bradley Corporation.
        3) Chicago Faucets; Geberit Company.
        4) Delta Faucet Company.
        5) Elkay.
        6) GROHE America, Inc.
        7) Just Manufacturing.
        8) Kohler Co.
        9) Moen Incorporated.
        10) Sloan Valve Company.
        11) Speakman Company.
        12) T&S Brass and Bronze Works, Inc.
        13) Zurn Industries, LLC.

4. Standard: ASME A112.18.1/CSA B125.1.
5. General: Include hot- and cold-water indicators; coordinate faucet inlets with supplies and fixture hole punchings; coordinate outlet with spout and sink receptor.
6. Body Type: Widespread.
7. Body Material: Commercial, solid brass.
8. Finish: Polished chrome plate.
9. Maximum Flow Rate: 1.5 gpm.
10. Handles: Wrist blade, 4 inches.
11. Mounting Type: Deck, exposed.
12. Spout Type: Swivel gooseneck.
13. Vacuum Breaker: Not required for hose outlet.

14. Spout Outlet: Pressure compensating laminar flow non-aerating.

2.2 SUPPLY FITTINGS

A. NSF Standard: Comply with NSF 61 and NSF 372 for supply-fitting materials that will be in contact with potable water.

B. Standard: ASME A112.18.1/CSA B125.1.

C. Supply Piping: Chrome-plated-brass pipe or chrome-plated copper tube matching water-supply piping size. Include chrome-plated-brass or stainless steel wall flange.

D. Supply Stops: Chrome-plated-brass, one-quarter-turn, ball-type or compression valve with inlet connection matching supply piping.

E. Operation: Loose key.

F. Risers:

1. NPS 3/8.
2. ASME A112.18.6/CSA B125.6, braided- or corrugated-stainless steel, flexible hose riser.

2.3 WASTE FITTINGS

A. Standard: ASME A112.18.2/CSA B125.2.

B. Drain: Grid type with NPS 1-1/4 offset and straight tailpiece.

C. Trap:

1. Size: NPS 1-1/2 by NPS 1-1/4.
2. Material:

a. Chrome-plated, two-piece, cast-brass trap and swivel elbow with 0.032-inch-thick brass tube to wall; and chrome-plated, brass or steel wall flange.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine roughing-in of water supply and sanitary drainage and vent piping systems to verify actual locations of piping connections before sink installation.

B. Examine walls, floors, and counters for suitable conditions where sinks will be installed.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install sinks level and plumb according to roughing-in drawings.

B. Install water-supply piping with stop on each supply to each sink faucet.

C. Seal joints between sinks and counters, floors, and walls using sanitary-type, one-part, mildew-resistant silicone sealant. Match sealant color to fixture color. Comply with sealant requirements specified in Section 079200 "Joint Sealants."

3.3 CONNECTIONS

A. Connect sinks with water supplies, stops, and risers, and with traps, soil, waste, and vent piping. Use size fittings required to match fixtures.

B. Comply with water piping requirements specified in Section 221116 "Domestic Water Piping."

C. Comply with soil and waste piping requirements specified in Section 221316 "Sanitary Waste and Vent Piping."

3.4 ADJUSTING

A. Operate and adjust sinks and controls. Replace damaged and malfunctioning sinks, fittings, and controls.

B. Adjust water pressure at faucets to produce proper flow.

3.5 CLEANING AND PROTECTION

A. After completing installation of sinks, inspect and repair damaged finishes.

B. Clean sinks, faucets, and other fittings with manufacturers' recommended cleaning methods and materials.

C. Provide protective covering for installed sinks and fittings.

D. Do not allow use of sinks for temporary facilities unless approved in writing by Owner.

END OF SECTION

SECTION 224716 - PRESSURE WATER COOLERS

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 pressure water coolers and related components.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of pressure water cooler.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
2. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

B. Shop Drawings: Include diagrams for power, signal, and control wiring.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance Data: For pressure water coolers to include in maintenance manuals.

1.5 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Filter Cartridges: Equal to <**Insert number**> percent of quantity installed for each type and size indicated, but no fewer than <**Insert number**> of each.

PART 2 - PRODUCTS

2.1 PRESSURE WATER COOLERS

A. Bottle Filling Station: Surface mounted, wheelchair accessible, vandal resistant.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Elkay.
b. Halsey Taylor.
c. Haws Corporation.

d. Murdock Manufacturing.
e. Oasis International.

2. Standards:

a. Filter First Legislation Requirements:

1) Comply with NSF 42 (Class I particulate reduction) and NSF 53 (lead reduction).

b. Comply with NSF 61 (Drinking Water System Components – Health Effects) and NSF 372 (Low lead content in potable water systems).
c. Comply with ASHRAE 34, "Designation and Safety Classification of Refrigerants," for water coolers. Provide HFC 134a (tetrafluoroethane) refrigerant unless otherwise indicated.
d. Comply with ICC A117.1.

3. Cabinet: All stainless steel.
4. Bottle filler: Sensor activation with 20-second automatic shut-off timer. Fill rate 0.5 to 1.5 gpm.
5. Drain: Grid with NPS 1-1/4 tailpiece.
6. Supply: Lead-free convertible quarter-turn brass ball valve, chrome plated commercial pattern with convertible loose key handle. Inlet shall be compression, sweat, or IPS. Outlet shall be compression.

a. McGuire Manufacturing LFBV series.

7. Waste Fitting: ASME A112.18.2/CSA B125.2, NPS 1-1/4 brass P-trap.
8. Filter: One or more water filters complying with NSF 42 and NSF 53 for cyst and lead reduction to below EPA standards; with capacity sized for unit peak flow rate.
9. Filter status indicator: Must have a light or device to indicate filter cartridge replacement status.
10. Cooling System: Electric, with hermetically sealed compressor, cooling coil, air-cooled condensing unit, corrosion-resistant tubing, refrigerant, corrosion-resistant-metal storage tank, and adjustable thermostat.

a. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

11. Ventilation Grille: Stainless steel.
12. Support: Mounting frame for attaching to substrate.
13. Bottle Filling Station Mounting Height: Handicapped/elderly according to ICC A117.1.

2.2 SUPPORTS

A. Type I Water Cooler Carrier:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Jay R. Smith Mfg Co; a division of Morris Group International.
b. Josam Company.
c. Wade Drains.

d. WATTS.
e. Zurn Industries, LLC.

2. Standard: ASME A112.6.1M.

B. Type II Water Cooler Carrier:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Jay R. Smith Mfg Co; a division of Morris Group International.
b. Josam Company.
c. Wade Drains.
d. WATTS.
e. Zurn Industries, LLC.

2. Standard: ASME A112.6.1M.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine roughing-in for water-supply and sanitary drainage and vent piping systems to verify actual locations of piping connections before fixture installation.

B. Examine walls and floors for suitable conditions where fixtures will be installed.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install fixtures level and plumb according to roughing-in drawings.

B. Install off-the-floor carrier supports, affixed to building substrate, for wall-mounted fixtures.

C. Install mounting frames, affixed to building construction, and attach recessed, pressure water coolers, and in-wall bottle filling stations to mounting frames.

D. Install water-supply piping with shutoff valve on supply to each fixture to be connected to domestic-water distribution piping.

E. Install trap and waste piping on drain outlet of each fixture to be connected to sanitary drainage system.

F. Seal joints between fixtures and walls using sanitary-type, one-part, mildew-resistant, silicone sealant. Match sealant color to fixture color. Comply with sealant requirements specified in Section 079200 "Joint Sealants."

3.3 CONNECTIONS

A. Connect fixtures with water supplies, stops, and risers, and with traps, soil, waste, and vent piping. Use size fittings required to match fixtures.

B. Comply with water piping requirements specified in Section 221116 "Domestic Water Piping."

C. Install ball or gate shutoff valve on water supply to each fixture.

D. Comply with soil and waste piping requirements specified in Section 221316 "Sanitary Waste and Vent Piping."

3.4 ADJUSTING

A. Adjust fixture flow regulators for proper flow and stream height.

B. Adjust pressure water-cooler temperature settings.

3.5 CLEANING

A. After installing fixture, inspect unit. Remove paint splatters and other spots, dirt, and debris. Repair damaged finish to match original finish.

B. Clean fixtures, on completion of installation, according to manufacturer's written instructions.

C. Provide protective covering for installed fixtures.

D. Do not allow use of fixtures for temporary facilities unless approved in writing by Owner.

END OF SECTION

SECTION 230100 - GENERAL MECHANICAL REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and General Provisions of the Contract, including General and Supplementary Conditions as established by the Construction Manager apply to work of this section.

B. Provide all items, articles, materials, operations or methods listed, mentioned or scheduled on drawings and/or herein, including all labor, materials, equipment and incidentals necessary and required for their completion.

C. The items in this section are supplementary to the requirements set forth in other portions of the specifications as indicated under Item "A" above.

1.2 DRAWINGS

A. The drawings show the location and general arrangement of equipment, mechanical systems, and related items affected by this work.

1.3 DESCRIPTION

A. This section includes general provisions that are applicable to Division 23

1.4 SCOPE

A. The work covered by this Division of the Specifications consists of furnishing all labor, supervision, equipment, materials, all incidentals, related items and appurtenance, and performing all operations necessary to complete the installation of Work in strict accordance with the Sections under this Division of the Specifications and work indicated on the Drawings including that which is considered essential to the Contract Documents.

1.5 DRAWINGS AND SPECIFICATIONS

A. The mechanical drawings are diagrammatic in character.

B. All drawings related to this structure, together with these specifications, shall be considered in bidding. The drawings and specifications are complementary, and what is called for in either of these shall be as binding as though called for by both. Should any conflict arise between drawings and specifications, such conflict shall be brought to the attention of the Architect/Engineer for resolution.

1.6 GUARANTEE

A. The Contractor shall guarantee all materials, labor, workmanship, and the successful operation of all equipment and apparatus installed for a period of one year from the date of final acceptance of the entire work, not necessarily the manufacturer's guarantee of when it was installed, and shall guarantee to repair or replace at his own expense any part of the apparatus

which may show defect during that time, provided such defect is, in the opinion of the Architect/Engineer, due to imperfect material or workmanship and not due to carelessness or improper use.

PART 2 - PRODUCTS – NOT USED

PART 3 - EXECUTION

3.1 EXAMINATION OF SITE

A. The Contractor shall visit and examine the premises and/or job site so as to ascertain the existing conditions before bidding. No extras will be allowed due to lack of knowledge of these conditions.

END OF SECTION

SECTION 230553 - IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

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. Equipment labels.
2. Warning signs and labels.
3. Pipe labels.
4. Duct labels.
5. Valve tags.
6. Warning tags.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Equipment Label Schedule: Include a listing of all equipment to be labeled with the proposed content for each label.

C. Valve numbering scheme.

D. Valve Schedules: For each piping system to include in maintenance manuals.

PART 2 - PRODUCTS

2.1 EQUIPMENT LABELS

A. Metal Labels for Equipment:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Brady Corporation.
b. Brimar Industries, Inc.
c. Carlton Industries, LP.
d. Champion America.
e. Craftmark Pipe Markers.
f. Emedco.
g. Kolbi Pipe Marker Co.
h. LEM Products Inc.
i. Marking Services, Inc.
j. Seton Identification Products; a Brady Corporation company.

2. Material and Thickness: Brass, 0.032-inch; stainless steel, 0.025-inch; aluminum, 0.032-inch or anodized aluminum, 0.032-inch minimum thickness, and having predrilled or stamped holes for attachment hardware.
3. Letter Color: White.
4. Background Color: Black.
5. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
6. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-quarters the size of principal lettering.
7. Fasteners: Stainless-steel rivets or self-tapping screws.
8. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

B. Plastic Labels for Equipment:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Brady Corporation.
    b. Brimar Industries, Inc.
    c. Carlton Industries, LP.
    d. Champion America.
    e. Craftmark Pipe Markers.
    f. Emedco.
    g. Kolbi Pipe Marker Co.
    h. LEM Products Inc.
    i. Marking Services, Inc.
    j. Seton Identification Products; a Brady Corporation company.

2. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/16 inch thick, and having predrilled holes for attachment hardware.
3. Letter Color: White.
4. Background Color: Black.
5. Maximum Temperature: Able to withstand temperatures up to 160 deg F.
6. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
7. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-quarters the size of principal lettering.
8. Fasteners: Stainless-steel rivets or self-tapping screws.
9. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

C. Label Content: Include equipment's Drawing designation or unique equipment number, Drawing numbers where equipment is indicated (plans, details, and schedules), and the Specification Section number and title where equipment is specified.

D. Equipment Label Schedule: For each item of equipment to be labeled, on 8-1/2-by-11-inch bond paper. Tabulate equipment identification number, and identify Drawing numbers where equipment is indicated (plans, details, and schedules) and the Specification Section number and title where equipment is specified. Equipment schedule shall be included in operation and maintenance data.

2.2 WARNING SIGNS AND LABELS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Brady Corporation.
2. Brimar Industries, Inc.
3. Carlton Industries, LP.
4. Champion America.
5. Craftmark Pipe Markers.
6. Emedco.
7. LEM Products Inc.
8. Marking Services, Inc.
9. Natinal Marker Company.
10. Seton Identification Products; a Brady Corporation company.
11. Stranco, Inc.

B. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/16 inch thick, and having predrilled holes for attachment hardware.

C. Letter Color: White.

D. Background Color: Red.

E. Maximum Temperature: Able to withstand temperatures up to 160 deg F.

F. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.

G. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-quarters the size of principal lettering.

H. Fasteners: Stainless-steel rivets or self-tapping screws.

I. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

J. Label Content: Include caution and warning information plus emergency notification instructions.

2.3 PIPE LABELS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Actioncraft Products, Inc; a division of Industrial Test Equipment Co., Inc.
2. Brady Corporation.
3. Brimar Industries, Inc.
4. Carlton Industries, LP.
5. Champion America.
6. Craftmark Pipe Markers.
7. Emedco.
8. Kolbi Pipe Marker Co.
9. LEM Products Inc.

10. Marking Services, Inc.
11. Seton Identification Products; a Brady Corporation company.

B. General Requirements for Manufactured Pipe Labels: Preprinted, color-coded, with lettering indicating service, and showing flow direction according to ASME A13.1.

C. Pretensioned Pipe Labels: Precoiled, semirigid plastic formed to cover full circumference of pipe and to attach to pipe without fasteners or adhesive.

D. Self-Adhesive Pipe Labels: Printed plastic with contact-type, permanent-adhesive backing.

E. Pipe Label Contents: Include identification of piping service using same designations or abbreviations as used on Drawings; also include pipe size and an arrow indicating flow direction.

1. Flow-Direction Arrows: Integral with piping system service lettering to accommodate both directions or as separate unit on each pipe label to indicate flow direction.
2. Lettering Size: Size letters according to ASME A13.1 for piping.

2.4 DUCT LABELS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Brady Corporation.
2. Brimar Industries, Inc.
3. Carlton Industries, LP.
4. Champion America.
5. Craftmark Pipe Markers.
6. Emedco.
7. Kolbi Pipe Marker Co.
8. LEM Products Inc.
9. Marking Services, Inc.
10. Seton Identification Products; a Brady Corporation company.

B. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/16 inch thick, and having predrilled holes for attachment hardware.

C. Letter Color: White.

D. Background Color: Black.

E. Maximum Temperature: Able to withstand temperatures up to 160 deg F.

F. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.

G. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-quarters the size of principal lettering.

H. Fasteners: Stainless-steel rivets or self-tapping screws.

I. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

J. Duct Label Contents: Include identification of duct service using same designations or abbreviations as used on Drawings; also include duct size and an arrow indicating flow direction.

1. Flow-Direction Arrows: Integral with duct system service lettering to accommodate both directions or as separate unit on each duct label to indicate flow direction.

2.5 VALVE TAGS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Actioncraft Products, Inc; a division of Industrial Test Equipment Co., Inc.
2. Brady Corporation.
3. Brimar Industries, Inc.
4. Carlton Industries, LP.
5. Champion America.
6. Craftmark Pipe Markers.
7. Emedco.
8. Kolbi Pipe Marker Co.
9. LEM Products Inc.
10. Marking Services, Inc.
11. Seton Identification Products; a Brady Corporation company.

B. Description: Stamped or engraved with 1/4-inch letters for piping system abbreviation and 1/2-inch numbers.

1. Tag Material: Brass, 0.032-inch; stainless steel, 0.025-inch; aluminum, 0.032-inch or anodized aluminum, 0.032-inch minimum thickness, and having predrilled or stamped holes for attachment hardware.
2. Fasteners: Brass wire-link chain, beaded chain, or S-hook.

C. Valve Schedules: For each piping system, on 8-1/2-by-11-inch bond paper. Tabulate valve number, piping system, system abbreviation (as shown on valve tag), location of valve (room or space), normal-operating position (open, closed, or modulating), and variations for identification. Mark valves for emergency shutoff and similar special uses.

1. Valve-tag schedule shall be included in operation and maintenance data.

2.6 WARNING TAGS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Brady Corporation.
2. Brimar Industries, Inc.
3. Champion America.
4. Craftmark Pipe Markers.
5. Emedco.
6. Kolbi Pipe Marker Co.
7. LEM Products Inc.

8. Marking Services, Inc.
9. Seton Identification Products; a Brady Corporation company.

B. Description: Preprinted or partially preprinted accident-prevention tags of plasticized card stock with matte finish suitable for writing.

1. Size: 3 by 5-1/4 inches minimum.
2. Fasteners: Brass grommet and wire.
3. Nomenclature: Large-size primary caption such as "DANGER," "CAUTION," or "DO NOT OPERATE."
4. Color: Safety-yellow background with black lettering.

PART 3 - EXECUTION

3.1 PREPARATION

A. Clean piping and equipment surfaces of substances that could impair bond of identification devices, including dirt, oil, grease, release agents, and incompatible primers, paints, and encapsulants.

3.2 GENERAL INSTALLATION REQUIREMENTS

A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.

B. Coordinate installation of identifying devices with locations of access panels and doors.

C. Install identifying devices before installing acoustical ceilings and similar concealment.

3.3 EQUIPMENT LABEL INSTALLATION

A. Install or permanently fasten labels on each major item of mechanical equipment.

B. Locate equipment labels where accessible and visible.

3.4 PIPE LABEL INSTALLATION

A. Pipe Label Locations: Locate pipe labels where piping is exposed or above accessible ceilings in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior exposed locations as follows:

1. Near each valve and control device.
2. Near each branch connection, excluding short takeoffs for fixtures and terminal units. Where flow pattern is not obvious, mark each pipe at branch.
3. Near penetrations and on both sides of through walls, floors, ceilings, and inaccessible enclosures.
4. At access doors, manholes, and similar access points that permit view of concealed piping.
5. Near major equipment items and other points of origination and termination.

6. Spaced at maximum intervals of 50 feet along each run. Reduce intervals to 25 feet in areas of congested piping and equipment.
7. On piping above removable acoustical ceilings. Omit intermediately spaced labels.

B. Directional Flow Arrows: Arrows shall be used to indicate direction of flow in pipes, including pipes where flow is allowed in both directions.

C. Pipe Label Color Schedule:

1. Chilled-Water Piping: White letters on a safety-green background.
2. Heating Water Piping: White letters on a safety-green background.

3.5 DUCT LABEL INSTALLATION

A. Install plastic-laminated or self-adhesive duct labels with permanent adhesive on air ducts in the following color codes:

1. Blue: For cold-air supply ducts.
2. Yellow: For hot-air supply ducts.
3. Green: For exhaust-, outside-, relief-, return-, and mixed-air ducts.

B. Locate labels near points where ducts enter into and exit from concealed spaces and at maximum intervals of 50 feet in each space where ducts are exposed or concealed by removable ceiling system.

3.6 VALVE-TAG INSTALLATION

A. Install tags on valves and control devices in piping systems, except check valves, valves within factory-fabricated equipment units, shutoff valves, faucets, convenience and lawn-watering hose connections, and HVAC terminal devices and similar roughing-in connections of end-use fixtures and units. List tagged valves in a valve schedule.

B. Valve-Tag Application Schedule: Tag valves according to size, shape, and color scheme and with captions similar to those indicated in the following subparagraphs:

1. Valve-Tag Size and Shape:

a. Chilled Water: 1-1/2 inches, round.
b. Refrigerant: 1-1/2 inches, round.
c. Hot Water: 1-1/2 inches, round.
d. Gas: 1-1/2 inches, round.

2. Valve-Tag Colors:

a. Toxic and Corrosive Fluids: Black letters on a safety-orange background.
b. Flammable Fluids: Black letters on a safety-yellow background.
c. Combustible Fluids: White letters on a safety-brown background.
d. Potable and Other Water: White letters on a safety-green background.
e. Compressed Air: White letters on a safety-blue background.
f. Defined by User: White letters on a safety-purple background, black letters on a safety-white background, white letters on a safety-gray background, and white letters on a safety-black background

3.7 WARNING-TAG INSTALLATION

A. Write required message on, and attach warning tags to, equipment and other items where required.

END OF SECTION

SECTION 230593 - TESTING, ADJUSTING, AND BALANCING FOR HVAC

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. Balancing Air Systems:

    a. Constant-volume air systems.

2. Balancing Hydronic Piping Systems:

    a. Variable-flow hydronic systems.
    b. Primary-secondary hydronic systems.

3. Testing, Adjusting, and Balancing Equipment:

    a. Boilers.
    b. Heat-transfer coils.

4. Testing, adjusting, and balancing existing systems and equipment.
5. Sound tests.
6. Vibration tests.
7. Duct leakage tests.
8. Control system verification.

1.3 DEFINITIONS

A. AABC: Associated Air Balance Council.

B. BAS: Building automation systems.

C. NEBB: National Environmental Balancing Bureau.

D. TAB: Testing, adjusting, and balancing.

E. TABB: Testing, Adjusting, and Balancing Bureau.

F. TAB Specialist: An independent entity meeting qualifications to perform TAB work.

G. TDH: Total dynamic head.

1.4 PREINSTALLATION MEETINGS

A. TAB Conference: If requested by the Owner, conduct a TAB conference at Project site after approval of the TAB strategies and procedures plan to develop a mutual understanding of the details. Provide a minimum of 14 days' advance notice of scheduled meeting time and location.

1. Minimum Agenda Items:

a. The Contract Documents examination report.
b. The TAB plan.
c. Needs for coordination and cooperation of trades and subcontractors.
d. Proposed procedures for documentation and communication flow.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: Within 30 days of Contractor's Notice to Proceed, submit documentation that the TAB specialist and this Project's TAB team members meet the qualifications specified in "Quality Assurance" Article.

B. Contract Documents Examination Report: Within 30 days of Contractor's Notice to Proceed, submit the Contract Documents review report as specified in Part 3.

C. Strategies and Procedures Plan: Within 30 days of Contractor's Notice to Proceed, submit TAB strategies and step-by-step procedures as specified in "Preparation" Article.

D. System Readiness Checklists: Within 30 days of Contractor's Notice to Proceed, submit system readiness checklists as specified in "Preparation" Article.

E. Examination Report: Submit a summary report of the examination review required in "Examination" Article.

F. Certified TAB reports.

G. Instrument calibration reports, to include the following:

1. Instrument type and make.
2. Serial number.
3. Application.
4. Dates of use.
5. Dates of calibration.

1.6 QUALITY ASSURANCE

A. TAB Specialists Qualifications: Certified by AABC.

1. TAB Field Supervisor: Employee of the TAB specialist and certified by AABC.
2. TAB Technician: Employee of the TAB specialist and certified by AABC as a TAB technician.

B. TAB Specialists Qualifications: Certified by NEBB or TABB.

1. TAB Field Supervisor: Employee of the TAB specialist and certified by NEBB or TABB.

2. TAB Technician: Employee of the TAB specialist and certified by NEBB or TABB as a TAB technician.

C. Instrumentation Type, Quantity, Accuracy, and Calibration: Comply with requirements in ASHRAE 111, Section 4, "Instrumentation."

D. ASHRAE/IES 90.1 Compliance: Applicable requirements in ASHRAE/IES 90.1, Section 6.7.2.3 - "System Balancing."

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine the Contract Documents to become familiar with Project requirements and to discover conditions in systems designs that may preclude proper TAB of systems and equipment.

B. Examine installed systems for balancing devices, such as test ports, gage cocks, thermometer wells, flow-control devices, balancing valves and fittings, and manual volume dampers. Verify that locations of these balancing devices are applicable for intended purpose and are accessible.

C. Examine the approved submittals for HVAC systems and equipment.

D. Examine design data including HVAC system descriptions, statements of design assumptions for environmental conditions and systems output, and statements of philosophies and assumptions about HVAC system and equipment controls.

E. Examine ceiling plenums and underfloor air plenums used for supply, return, or relief air to verify that they are properly separated from adjacent areas. Verify that penetrations in plenum walls are sealed and fire-stopped if required.

F. Examine equipment performance data including fan and pump curves.

1. Relate performance data to Project conditions and requirements, including system effects that can create undesired or unpredicted conditions that cause reduced capacities in all or part of a system.
2. Calculate system-effect factors to reduce performance ratings of HVAC equipment when installed under conditions different from the conditions used to rate equipment performance. To calculate system effects for air systems, use tables and charts found in AMCA 201, "Fans and Systems," or in SMACNA's "HVAC Systems - Duct Design." Compare results with the design data and installed conditions.

G. Examine system and equipment installations and verify that field quality-control testing, cleaning, and adjusting specified in individual Sections have been performed.

H. Examine test reports specified in individual system and equipment Sections.

I. Examine HVAC equipment and verify that bearings are greased, belts are aligned and tight, filters are clean, and equipment with functioning controls is ready for operation.

J. Examine strainers. Verify that startup screens have been replaced by permanent screens with indicated perforations.

K. Examine control valves for proper installation for their intended function of throttling, diverting, or mixing fluid flows.

L. Examine heat-transfer coils for correct piping connections and for clean and straight fins.

M. Examine system pumps to ensure absence of entrained air in the suction piping.

N. Examine operating safety interlocks and controls on HVAC equipment.

O. Report deficiencies discovered before and during performance of TAB procedures. Observe and record system reactions to changes in conditions. Record default set points if different from indicated values.

3.2 PREPARATION

A. Prepare a TAB plan that includes the following:

1. Equipment and systems to be tested.
2. Strategies and step-by-step procedures for balancing the systems.
3. Instrumentation to be used.
4. Sample forms with specific identification for all equipment.

B. Perform system-readiness checks of HVAC systems and equipment to verify system readiness for TAB work. Include, at a minimum, the following:

1. Airside:

a. Verify that leakage and pressure tests on air distribution systems have been satisfactorily completed.
b. Duct systems are complete with terminals installed.
c. Volume, smoke, and fire dampers are open and functional.
d. Clean filters are installed.
e. Fans are operating, free of vibration, and rotating in correct direction.
f. Variable-frequency controllers' startup is complete and safeties are verified.
g. Automatic temperature-control systems are operational.
h. Ceilings are installed.
i. Windows and doors are installed.
j. Suitable access to balancing devices and equipment is provided.

2. Hydronics:

a. Verify leakage and pressure tests on water distribution systems have been satisfactorily completed.
b. Piping is complete with terminals installed.
c. Water treatment is complete.
d. Systems are flushed, filled, and air purged.
e. Strainers are pulled and cleaned.
f. Control valves are functioning per the sequence of operation.
g. Shutoff and balance valves have been verified to be 100 percent open.
h. Pumps are started and proper rotation is verified.

i. Pump gage connections are installed directly at pump inlet and outlet flanges or in discharge and suction pipe prior to valves or strainers.
j. Variable-frequency controllers' startup is complete and safeties are verified.
k. Suitable access to balancing devices and equipment is provided.

3.3 GENERAL PROCEDURES FOR TESTING AND BALANCING

A. Perform testing and balancing procedures on each system according to the procedures contained in AABC's "National Standards for Total System Balance," ASHRAE 111, NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems," SMACNA's "HVAC Systems - Testing, Adjusting, and Balancing" and in this Section.

B. Cut insulation, ducts, pipes, and equipment cabinets for installation of test probes to the minimum extent necessary for TAB procedures.

1. After testing and balancing, patch probe holes in ducts with same material and thickness as used to construct ducts.
2. After testing and balancing, install test ports and duct access doors that comply with requirements in Section 233300 "Air Duct Accessories."
3. Install and join new insulation that matches removed materials. Restore insulation, coverings, vapor barrier, and finish according to Section 230713 "Duct Insulation," Section 230716 "HVAC Equipment Insulation," and Section 230719 "HVAC Piping Insulation."

C. Mark equipment and balancing devices, including damper-control positions, valve position indicators, fan-speed-control levers, and similar controls and devices, with paint or other suitable, permanent identification material to show final settings.

D. Take and report testing and balancing measurements in **inch-pound (IP)**] [**and**] [**metric (SI)**] units.

3.4 GENERAL PROCEDURES FOR BALANCING AIR SYSTEMS

A. Prepare test reports for both fans and outlets. Obtain manufacturer's outlet factors and recommended testing procedures. Cross-check the summation of required outlet volumes with required fan volumes.

B. Prepare schematic diagrams of systems' "as-built" duct layouts.

C. Determine the best locations in main and branch ducts for accurate duct-airflow measurements.

D. Check airflow patterns from the outdoor-air louvers and dampers and the return- and exhaust-air dampers through the supply-fan discharge and mixing dampers.

E. Locate start-stop and disconnect switches, electrical interlocks, and motor starters.

F. Verify that motor starters are equipped with properly sized thermal protection.

G. Check dampers for proper position to achieve desired airflow path.

H. Check for airflow blockages.

I. Check condensate drains for proper connections and functioning.

J. Check for proper sealing of air-handling-unit components.

K. Verify that air duct system is sealed as specified in Section 233113 "Metal Ducts."

3.5 PROCEDURES FOR CONSTANT-VOLUME AIR SYSTEMS

A. Adjust fans to deliver total indicated airflows within the maximum allowable fan speed listed by fan manufacturer.

1. Measure total airflow.

    a. Set outside-air, return-air, and relief-air dampers for proper position that simulates minimum outdoor-air conditions.
    b. Where duct conditions allow, measure airflow by main Pitot-tube traverse. If necessary, perform multiple Pitot-tube traverses, close to the fan and prior to any outlets, to obtain total airflow.
    c. Where duct conditions are not suitable for Pitot-tube traverse measurements, a coil traverse may be acceptable.

2. Measure fan static pressures as follows:

    a. Measure static pressure directly at the fan outlet or through the flexible connection.
    b. Measure static pressure directly at the fan inlet or through the flexible connection.
    c. Measure static pressure across each component that makes up the air-handling system.
    d. Report artificial loading of filters at the time static pressures are measured.

3. Review Record Documents to determine variations in design static pressures versus actual static pressures. Calculate actual system-effect factors. Recommend adjustments to accommodate actual conditions.
4. Obtain approval from Engineer for adjustment of fan speed higher or lower than indicated speed. Comply with requirements in HVAC Sections for air-handling units for adjustment of fans, belts, and pulley sizes to achieve indicated air-handling-unit performance.
5. Do not make fan-speed adjustments that result in motor overload. Consult equipment manufacturers about fan-speed safety factors. Modulate dampers and measure fan-motor amperage to ensure that no overload occurs. Measure amperage in full-cooling, full-heating, economizer, and any other operating mode to determine the maximum required brake horsepower.

B. Adjust volume dampers for main duct, submain ducts, and major branch ducts to indicated airflows.

1. Measure airflow of submain and branch ducts.
2. Adjust submain and branch duct volume dampers for specified airflow.
3. Re-measure each submain and branch duct after all have been adjusted.

C. Adjust air inlets and outlets for each space to indicated airflows.

1. Set airflow patterns of adjustable outlets for proper distribution without drafts.
2. Measure inlets and outlets airflow.
3. Adjust each inlet and outlet for specified airflow.
4. Re-measure each inlet and outlet after they have been adjusted.

D. Verify final system conditions.

1. Re-measure and confirm that minimum outdoor, return, and relief airflows are within design. Readjust to design if necessary.
2. Re-measure and confirm that total airflow is within design.
3. Re-measure all final fan operating data, rpms, volts, amps, and static profile.
4. Mark all final settings.
5. Test system in economizer mode. Verify proper operation and adjust if necessary.
6. Measure and record all operating data.
7. Record final fan-performance data.

3.6 GENERAL PROCEDURES FOR HYDRONIC SYSTEMS

A. Prepare test reports for pumps, coils, and heat exchangers. Obtain approved submittals and manufacturer-recommended testing procedures. Crosscheck the summation of required coil and heat exchanger flow rates with pump design flow rate.

B. Prepare schematic diagrams of systems' "as-built" piping layouts.

C. In addition to requirements in "Preparation" Article, prepare hydronic systems for testing and balancing as follows:

1. Check liquid level in expansion tank.
2. Check highest vent for adequate pressure.
3. Check flow-control valves for proper position.
4. Locate start-stop and disconnect switches, electrical interlocks, and motor starters.
5. Verify that motor starters are equipped with properly sized thermal protection.
6. Check that air has been purged from the system.

3.7 PROCEDURES FOR PRIMARY-SECONDARY HYDRONIC SYSTEMS

A. Balance the primary circuit flow first.

B. Balance the secondary circuits after the primary circuits are complete.

C. Adjust pumps to deliver total design gpm.

1. Measure total water flow.

    a. Position valves for full flow through coils.
    b. Measure flow by main flow meter, if installed.
    c. If main flow meter is not installed, determine flow by pump TDH or exchanger pressure drop.

2. Measure pump TDH as follows:

    a. Measure discharge pressure directly at the pump outlet flange or in discharge pipe prior to any valves.
    b. Measure inlet pressure directly at the pump inlet flange or in suction pipe prior to any valves or strainers.
    c. Convert pressure to head and correct for differences in gage heights.
    d. Verify pump impeller size by measuring the TDH with the discharge valve closed. Note the point on manufacturer's pump curve at zero flow and verify that the pump has the intended impeller size.

e. With valves open, read pump TDH. Adjust pump discharge valve until design water flow is achieved.

3. Monitor motor performance during procedures and do not operate motor in an overloaded condition.

D. Adjust flow-measuring devices installed in mains and branches to design water flows.

1. Measure flow in main and branch pipes.
2. Adjust main and branch balance valves for design flow.
3. Re-measure each main and branch after all have been adjusted.

E. Adjust flow-measuring devices installed at terminals for each space to design water flows.

1. Measure flow at terminals.
2. Adjust each terminal to design flow.
3. Re-measure each terminal after it is adjusted.
4. Position control valves to bypass the coil and adjust the bypass valve to maintain design flow.
5. Perform temperature tests after flows have been balanced.

F. For systems with pressure-independent valves at terminals:

1. Measure differential pressure and verify that it is within manufacturer's specified range.
2. Perform temperature tests after flows have been verified.

G. For systems without pressure-independent valves or flow-measuring devices at terminals:

1. Measure and balance coils by either coil pressure drop or temperature method.
2. If balanced by coil pressure drop, perform temperature tests after flows have been verified.

H. Verify final system conditions as follows:

1. Re-measure and confirm that total water flow is within design.
2. Re-measure final pumps' operating data, TDH, volts, amps, and static profile.
3. Mark final settings.

I. Verify that memory stops have been set.

3.8 PROCEDURES FOR BOILERS

A. Hydronic Boilers:

1. Measure and record entering- and leaving-water temperatures.
2. Measure and record water flow.
3. Record relief valve pressure setting.

3.9 PROCEDURES FOR HEAT-TRANSFER COILS

A. Measure, adjust, and record the following data for each electric heating coil:

1. Nameplate data.

2. Airflow.
3. Entering- and leaving-air temperature at full load.
4. Voltage and amperage input of each phase at full load.
5. Calculated kilowatt at full load.
6. Fuse or circuit-breaker rating for overload protection.

3.10 DUCT LEAKAGE TESTS

A. Witness the duct pressure testing performed by Installer.

B. Verify that proper test methods are used and that leakage rates are within specified tolerances.

C. Report deficiencies observed.

3.11 CONTROLS VERIFICATION

A. In conjunction with system balancing, perform the following:

1. Verify temperature control system is operating within the design limitations.
2. Confirm that the sequences of operation are in compliance with Contract Documents.
3. Verify that controllers are calibrated and function as intended.
4. Verify that controller set points are as indicated.
5. Verify the operation of lockout or interlock systems.
6. Verify the operation of valve and damper actuators.
7. Verify that controlled devices are properly installed and connected to correct controller.
8. Verify that controlled devices travel freely and are in position indicated by controller: open, closed, or modulating.
9. Verify location and installation of sensors to ensure that they sense only intended temperature, humidity, or pressure.

B. Reporting: Include a summary of verifications performed, remaining deficiencies, and variations from indicated conditions.

3.12 PROCEDURES FOR TESTING, ADJUSTING, AND BALANCING EXISTING SYSTEMS

A. Perform a preconstruction inspection of existing equipment that is to remain and be reused.

1. Measure and record the operating speed, airflow, and static pressure of each fan.
2. Measure motor voltage and amperage. Compare the values to motor nameplate information.
3. Check the refrigerant charge.
4. Check the condition of filters.
5. Check the condition of coils.
6. Check the operation of the drain pan and condensate-drain trap.
7. Check bearings and other lubricated parts for proper lubrication.
8. Report on the operating condition of the equipment and the results of the measurements taken. Report deficiencies.

B. Before performing testing and balancing of existing systems, inspect existing equipment that is to remain and be reused to verify that existing equipment has been cleaned and refurbished. Verify the following:

1. New filters are installed.
2. Coils are clean and fins combed.
3. Drain pans are clean.
4. Fans are clean.
5. Bearings and other parts are properly lubricated.
6. Deficiencies noted in the preconstruction report are corrected.

C. Perform testing and balancing of existing systems to the extent that existing systems are affected by the renovation work.

1. Compare the indicated airflow of the renovated work to the measured fan airflows, and determine the new fan speed and the face velocity of filters and coils.
2. Verify that the indicated airflows of the renovated work result in filter and coil face velocities and fan speeds that are within the acceptable limits defined by equipment manufacturer.
3. If calculations increase or decrease the airflow rates and water flow rates by more than 5 percent, make equipment adjustments to achieve the calculated rates. If increase or decrease is 5 percent or less, equipment adjustments are not required.
4. Balance each air outlet.

3.13 TOLERANCES

A. Set HVAC system's airflow rates and water flow rates within the following tolerances:

1. Supply, Return, and Exhaust Fans and Equipment with Fans: Plus or minus 10 percent.
2. Air Outlets and Inlets: Plus or minus 10 percent.
3. Heating-Water Flow Rate: Plus or minus 10 percent.
4. Cooling-Water Flow Rate: Plus or minus 10 percent.

B. Maintaining pressure relationships as designed shall have priority over the tolerances specified above.

3.14 PROGRESS REPORTING

A. Initial Construction-Phase Report: Based on examination of the Contract Documents as specified in "Examination" Article, prepare a report on the adequacy of design for systems balancing devices. Recommend changes and additions to systems balancing devices to facilitate proper performance measuring and balancing. Recommend changes and additions to HVAC systems and general construction to allow access for performance measuring and balancing devices.

B. Status Reports: Prepare monthly progress reports to describe completed procedures, procedures in progress, and scheduled procedures. Include a list of deficiencies and problems found in systems being tested and balanced. Prepare a separate report for each system and each building floor for systems serving multiple floors.

3.15 FINAL REPORT

A. General: Prepare a certified written report; tabulate and divide the report into separate sections for tested systems and balanced systems.

1. Include a certification sheet at the front of the report's binder, signed and sealed by the certified testing and balancing engineer.
2. Include a list of instruments used for procedures, along with proof of calibration.
3. Certify validity and accuracy of field data.

B. Final Report Contents: In addition to certified field-report data, include the following:

1. Pump curves.
2. Fan curves.
3. Manufacturers' test data.
4. Field test reports prepared by system and equipment installers.
5. Other information relative to equipment performance; do not include Shop Drawings and Product Data.

C. General Report Data: In addition to form titles and entries, include the following data:

1. Title page.
2. Name and address of the TAB specialist.
3. Project name.
4. Project location.
5. Architect's name and address.
6. Engineer's name and address.
7. Contractor's name and address.
8. Report date.
9. Signature of TAB supervisor who certifies the report.
10. Table of Contents with the total number of pages defined for each section of the report. Number each page in the report.
11. Summary of contents including the following:

    a. Indicated versus final performance.
    b. Notable characteristics of systems.
    c. Description of system operation sequence if it varies from the Contract Documents.

12. Nomenclature sheets for each item of equipment.
13. Data for terminal units, including manufacturer's name, type, size, and fittings.
14. Notes to explain why certain final data in the body of reports vary from indicated values.
15. Test conditions for fans and pump performance forms including the following:

    a. Settings for outdoor-, return-, and exhaust-air dampers.
    b. Conditions of filters.
    c. Cooling coil, wet- and dry-bulb conditions.
    d. Face and bypass damper settings at coils.
    e. Fan drive settings including settings and percentage of maximum pitch diameter.
    f. Inlet vane settings for variable-air-volume systems.
    g. Settings for supply-air, static-pressure controller.
    h. Other system operating conditions that affect performance.

D. System Diagrams: Include schematic layouts of air and hydronic distribution systems. Present each system with single-line diagram and include the following:

1. Quantities of outdoor, supply, return, and exhaust airflows.
2. Water and steam flow rates.
3. Duct, outlet, and inlet sizes.
4. Pipe and valve sizes and locations.

5. Terminal units.
6. Balancing stations.
7. Position of balancing devices.

E. Air-Handling-Unit Test Reports: For air-handling units with coils, include the following:

1. Unit Data:

    a. Unit identification.
    b. Location.
    c. Make and type.
    d. Model number and unit size.
    e. Manufacturer's serial number.
    f. Unit arrangement and class.
    g. Discharge arrangement.
    h. Sheave make, size in inches, and bore.
    i. Center-to-center dimensions of sheave and amount of adjustments in inches.
    j. Number, make, and size of belts.
    k. Number, type, and size of filters.

2. Motor Data:

    a. Motor make, and frame type and size.
    b. Horsepower and rpm.
    c. Volts, phase, and hertz.
    d. Full-load amperage and service factor.
    e. Sheave make, size in inches, and bore.
    f. Center-to-center dimensions of sheave and amount of adjustments in inches.

3. Test Data (Indicated and Actual Values):

    a. Total airflow rate in cfm.
    b. Total system static pressure in inches wg.
    c. Fan rpm.
    d. Discharge static pressure in inches wg.
    e. Filter static-pressure differential in inches wg.
    f. Preheat-coil static-pressure differential in inches wg.
    g. Cooling-coil static-pressure differential in inches wg.
    h. Heating-coil static-pressure differential in inches wg.
    i. Outdoor airflow in cfm.
    j. Return airflow in cfm.
    k. Outdoor-air damper position.
    l. Return-air damper position.
    m. Vortex damper position.

F. Apparatus-Coil Test Reports:

1. Coil Data:

    a. System identification.
    b. Location.
    c. Coil type.
    d. Number of rows.
    e. Fin spacing in fins per inch o.c.
    f. Make and model number.

g. Face area in sq. ft.
h. Tube size in NPS.
i. Tube and fin materials.
j. Circuiting arrangement.

2. Test Data (Indicated and Actual Values):

a. Airflow rate in cfm.
b. Average face velocity in fpm.
c. Air pressure drop in inches wg.
d. Outdoor-air, wet- and dry-bulb temperatures in deg F.
e. Return-air, wet- and dry-bulb temperatures in deg F.
f. Entering-air, wet- and dry-bulb temperatures in deg F.
g. Leaving-air, wet- and dry-bulb temperatures in deg F.
h. Water flow rate in gpm.
i. Water pressure differential in feet of head or psig.
j. Entering-water temperature in deg F.
k. Leaving-water temperature in deg F.
l. Refrigerant expansion valve and refrigerant types.
m. Refrigerant suction pressure in psig.
n. Refrigerant suction temperature in deg F.
o. Inlet steam pressure in psig.

G. Gas- and Oil-Fired Heat Apparatus Test Reports: In addition to manufacturer's factory startup equipment reports, include the following:

1. Unit Data:

a. System identification.
b. Location.
c. Make and type.
d. Model number and unit size.
e. Manufacturer's serial number.
f. Fuel type in input data.
g. Output capacity in Btu/h.
h. Ignition type.
i. Burner-control types.
j. Motor horsepower and rpm.
k. Motor volts, phase, and hertz.
l. Motor full-load amperage and service factor.
m. Sheave make, size in inches, and bore.
n. Center-to-center dimensions of sheave and amount of adjustments in inches.

2. Test Data (Indicated and Actual Values):

a. Total airflow rate in cfm.
b. Entering-air temperature in deg F.
c. Leaving-air temperature in deg F.
d. Air temperature differential in deg F.
e. Entering-air static pressure in inches wg.
f. Leaving-air static pressure in inches wg.
g. Air static-pressure differential in inches wg.
h. Low-fire fuel input in Btu/h.
i. High-fire fuel input in Btu/h.
j. Manifold pressure in psig.
k. High-temperature-limit setting in deg F.

l. Operating set point in Btu/h.
m. Motor voltage at each connection.
n. Motor amperage for each phase.
o. Heating value of fuel in Btu/h.

H. Electric-Coil Test Reports: For electric furnaces, duct coils, and electric coils installed in central-station air-handling units, include the following:

1. Unit Data:

a. System identification.
b. Location.
c. Coil identification.
d. Capacity in Btu/h.
e. Number of stages.
f. Connected volts, phase, and hertz.
g. Rated amperage.
h. Airflow rate in cfm.
i. Face area in sq. ft.
j. Minimum face velocity in fpm.

2. Test Data (Indicated and Actual Values):

a. Heat output in Btu/h.
b. Airflow rate in cfm.
c. Air velocity in fpm.
d. Entering-air temperature in deg F.
e. Leaving-air temperature in deg F.
f. Voltage at each connection.
g. Amperage for each phase.

I. Round and Rectangular Duct Traverse Reports: Include a diagram with a grid representing the duct cross-section and record the following:

1. Report Data:

a. System and air-handling-unit number.
b. Location and zone.
c. Traverse air temperature in deg F.
d. Duct static pressure in inches wg.
e. Duct size in inches.
f. Duct area in sq. ft.
g. Indicated airflow rate in cfm.
h. Indicated velocity in fpm.
i. Actual airflow rate in cfm.
j. Actual average velocity in fpm.
k. Barometric pressure in psig.

J. Pump Test Reports: Calculate impeller size by plotting the shutoff head on pump curves and include the following:

1. Unit Data:

a. Unit identification.
b. Location.

c. Service.
d. Make and size.
e. Model number and serial number.
f. Water flow rate in gpm.
g. Water pressure differential in feet of head or psig.
h. Required net positive suction head in feet of head or psig.
i. Pump rpm.
j. Impeller diameter in inches.
k. Motor make and frame size.
l. Motor horsepower and rpm.
m. Voltage at each connection.
n. Amperage for each phase.
o. Full-load amperage and service factor.
p. Seal type.

2. Test Data (Indicated and Actual Values):

a. Static head in feet of head or psig.
b. Pump shutoff pressure in feet of head or psig.
c. Actual impeller size in inches.
d. Full-open flow rate in gpm.
e. Full-open pressure in feet of head or psig.
f. Final discharge pressure in feet of head or psig.
g. Final suction pressure in feet of head or psig.
h. Final total pressure in feet of head or psig.
i. Final water flow rate in gpm.
j. Voltage at each connection.
k. Amperage for each phase.

K. Instrument Calibration Reports:

1. Report Data:

a. Instrument type and make.
b. Serial number.
c. Application.
d. Dates of use.
e. Dates of calibration.

3.16 VERIFICATION OF TAB REPORT

A. The TAB specialist's test and balance engineer shall conduct the inspection in the presence of Owner and/or Construction Manager.

B. Owner and/or Construction Manager shall randomly select measurements, documented in the final report, to be rechecked. Rechecking shall be limited to either 10 percent of the total measurements recorded or the extent of measurements that can be accomplished in a normal 8-hour business day.

C. If rechecks yield measurements that differ from the measurements documented in the final report by more than the tolerances allowed, the measurements shall be noted as "FAILED."

D. If the number of "FAILED" measurements is greater than 10 percent of the total measurements checked during the final inspection, the testing and balancing shall be considered incomplete and shall be rejected.

E. If TAB work fails, proceed as follows:

1. TAB specialists shall recheck all measurements and make adjustments. Revise the final report and balancing device settings to include all changes; resubmit the final report and request a second final inspection.
2. If the second final inspection also fails, Owner may contract the services of another TAB specialist to complete TAB work according to the Contract Documents and deduct the cost of the services from the original TAB specialist's final payment.
3. If the second verification also fails, Owner may contact AABC Headquarters regarding the AABC National Performance Guaranty.

F. Prepare test and inspection reports.

3.17 ADDITIONAL TESTS

A. Within 90 days of completing TAB, perform additional TAB to verify that balanced conditions are being maintained throughout and to correct unusual conditions.

B. Seasonal Periods: If initial TAB procedures were not performed during near-peak summer and winter conditions, perform additional TAB during near-peak summer and winter conditions.

END OF SECTION

SECTION 230713 - DUCT INSULATION

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 insulating the following duct services:

1. Indoor, concealed supply and outdoor air.
2. Indoor, concealed return located in unconditioned space.

B. Related Sections:

1. Section 233113 "Metal Ducts" for duct liners.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include thermal conductivity, water-vapor permeance thickness, and jackets (both factory- and field-applied if any).

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Skilled mechanics who have successfully completed an apprenticeship program or another craft training program certified by the Department of Labor, Bureau of Apprenticeship and Training.

B. Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical products according to ASTM E84, by a testing agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing agency.

1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Packaging: Insulation material containers shall be marked by manufacturer with appropriate ASTM standard designation, type and grade, and maximum use temperature.

1.6 COORDINATION

A. Coordinate sizes and locations of supports, hangers, and insulation shields specified in Section 230500 "Common Work Results for HVAC."

B. Coordinate clearance requirements with duct Installer for duct insulation application. Before preparing ductwork Shop Drawings, establish and maintain clearance requirements for installation of insulation and field-applied jackets and finishes and for space required for maintenance.

PART 2 - PRODUCTS

2.1 INSULATION MATERIALS

A. Comply with requirements in "Duct Insulation Schedule, General," "Indoor Duct and Plenum Insulation Schedule," and "Aboveground, Outdoor Duct and Plenum Insulation Schedule" articles for where insulating materials shall be applied.

B. Products shall not contain asbestos, lead, mercury, or mercury compounds.

C. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.

D. Mineral-Fiber Blanket Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C553, Type II and ASTM C1290, Type III with factory-applied FSK jacket. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. CertainTeed, LLC.

1) SoftTouch™ Duct Wrap

b. Johns Manville; a Berkshire Hathaway company.

1) Microlite® FSK

c. Knauf Insulation, Inc.

1) Performance +™ Duct Wrap with ECOSE®

d. Manson Insulation Inc.

1) Alley Wrap® B

e. Owens Corning.

1) SoftR® Duct Wrap FRK

E. Mineral-Fiber Board Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C612, Type IA or Type IB. For duct and plenum applications, provide insulation with factory-applied FSK jacket. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. CertainTeed, LLC.

1) CertaPRO®

b. Johns Manville; a Berkshire Hathaway company.

1) Spin-Glas® 800 series

c. Knauf Insulation, Inc.

1) Earthwool®

d. Manson Insulation Inc.

1) AK Board®

e. Owens Corning.

1) Fiberglas™ 703 series board

2.2 ADHESIVES

A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated unless otherwise indicated.

2.3 MASTICS AND COATINGS

A. Materials shall be compatible with insulation materials, jackets, and substrates.

2.4 SEALANTS

A. FSK and Metal Jacket Flashing Sealants:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Childers Brand; H. B. Fuller Construction Products.
b. Eagle Bridges – Marathon Industries.
c. Foster Brand; H. B. Fuller Construction Products.
d. Mon-Eco Industries.

2. Materials shall be compatible with insulation materials, jackets, and substrates.
3. Fire- and water-resistant, flexible, elastomeric sealant.
4. Service Temperature Range: Minus 40 to plus 250 deg F.
5. Color: Aluminum.

2.5 FACTORY-APPLIED JACKETS

A. Insulation system schedules indicate factory-applied jackets on various applications. When factory-applied jackets are indicated, comply with the following:

1. FSK Jacket: Aluminum-foil, fiberglass-reinforced scrim with kraft-paper backing; complying with ASTM C1136, Type II.

2.6 TAPES

A. FSK Tape: Foil-face, vapor-retarder tape matching factory-applied jacket with acrylic adhesive; complying with ASTM C1136.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. 3M.
    b. Avery Dennison Corporation, Specialty Tapes Division.
    c. Ideal Tape Co., an American Biltrite Company.
    d. Knauf Insulation.

2. Width: 3 inches.
3. Thickness: 6.5 mils.
4. Adhesion: 90 ounces force/inch in width.
5. Elongation: 2 percent.
6. Tensile Strength: 40 lbf/inch in width.
7. FSK Tape Disks and Squares: Precut disks or squares of FSK tape.

2.7 SECUREMENTS

A. Bands:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Johns Manville; a Berkshire Hathaway company.
    b. RPR Products, Inc.

2. Stainless Steel: ASTM A167 or ASTM A240/A240M, Type 304 or Type 316; 0.015 inch thick, 1/2 inch wide with wing seal or closed seal.
3. Aluminum: ASTM B209, Alloy 3003, 3005, 3105, or 5005; Temper H-14, 0.020 inch thick, 1/2 inch wide with wing seal or closed seal.
4. Springs: Twin spring set constructed of stainless steel with ends flat and slotted to accept metal bands. Spring size determined by manufacturer for application.

B. Insulation Pins and Hangers:

1. Capacitor-Discharge-Weld Pins: Copper- or zinc-coated steel pin, fully annealed for capacitor-discharge welding, 0.106-inch-diameter shank, length to suit depth of insulation indicated.

    a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

        1) AGM Industries, Inc.
        2) Gemco.
        3) Midwest Fasteners, Inc.
        4) Nelson Stud Welding.

2. Cupped-Head, Capacitor-Discharge-Weld Pins: Copper- or zinc-coated steel pin, fully annealed for capacitor-discharge welding, 0.106-inch-diameter shank, length to suit depth of insulation indicated with integral 1-1/2-inch galvanized carbon-steel washer.

    a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

        1) AGM Industries, Inc.
        2) CL WARD & Family Inc.
        3) Gemco.
        4) Midwest Fasteners, Inc.
        5) Nelson Stud Welding.

3. Metal, Adhesively Attached, Perforated-Base Insulation Hangers: Baseplate welded to projecting spindle that is capable of holding insulation, of thickness indicated, securely in position indicated when self-locking washer is in place. Comply with the following requirements:

    a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

        1) AGM Industries, Inc.
        2) Gemco.
        3) Midwest Fasteners, Inc.

    b. Baseplate: Perforated, galvanized carbon-steel sheet, 0.030-inch-thick by 2 inches square.
    c. Spindle: Copper- or zinc-coated, low-carbon steel; aluminum; or stainless steel, fully annealed, 0.106-inch-diameter shank, length to suit depth of insulation indicated.
    d. Adhesive: Recommended by hanger manufacturer. Product with demonstrated capability to bond insulation hanger securely to substrates indicated without damaging insulation, hangers, and substrates.

4. Nonmetal, Adhesively Attached, Perforated-Base Insulation Hangers: Baseplate fastened to projecting spindle that is capable of holding insulation, of thickness indicated, securely in position indicated when self-locking washer is in place. Comply with the following requirements:

    a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

        1) Gemco.
        2) Midwest Fasteners, Inc.

    b. Baseplate: Perforated, nylon sheet, 0.030-inch-thick by 1-1/2 inches in diameter.
    c. Spindle: Nylon, 0.106-inch-diameter shank, length to suit depth of insulation indicated, up to 2-1/2 inches.
    d. Adhesive: Recommended by hanger manufacturer. Product with demonstrated capability to bond insulation hanger securely to substrates indicated without damaging insulation, hangers, and substrates.

5. Self-Sticking-Base Insulation Hangers: Baseplate welded to projecting spindle that is capable of holding insulation, of thickness indicated, securely in position indicated when self-locking washer is in place. Comply with the following requirements:

a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1) AGM Industries, Inc.
2) Gemco.
3) Midwest Fasteners, Inc.

b. Baseplate: Galvanized carbon-steel sheet, 0.030-inch-thick by 2 inches square.
c. Spindle: Copper- or zinc-coated, low-carbon steel; aluminum; or stainless steel, fully annealed, 0.106-inch-diameter shank, length to suit depth of insulation indicated.
d. Adhesive-backed base with a peel-off protective cover.

6. Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch-thick, galvanized-steel, aluminum, or stainless-steel sheet, with beveled edge sized as required to hold insulation securely in place but not less than 1-1/2 inches in diameter.

a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1) AGM Industries, Inc.
2) Gemco.
3) Midwest Fasteners, Inc.
4) Nelson Stud Welding.

b. Protect ends with capped self-locking washers incorporating a spring steel insert to ensure permanent retention of cap in exposed locations.

7. Nonmetal Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch-thick nylon sheet, with beveled edge sized as required to hold insulation securely in place but not less than 1-1/2 inches in diameter.

a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1) Gemco.
2) Midwest Fasteners, Inc.

C. Staples: Outward-clinching insulation staples, nominal 3/4-inch-wide, stainless steel or Monel.

D. Wire: 0.080-inch nickel-copper alloy; 0.062-inch soft-annealed, stainless steel; or 0.062-inch soft-annealed, galvanized steel.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. C & F Wire.
b. Johsn Manville; a Berkshire Hathaway company.
c. RPR Products, Inc.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of insulation application.

1. Verify that systems to be insulated have been tested and are free of defects.
2. Verify that surfaces to be insulated are clean and dry.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

3.3 GENERAL INSTALLATION REQUIREMENTS

A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of ducts and fittings.

B. Install insulation materials, vapor barriers or retarders, jackets, and thicknesses required for each item of duct system as specified in insulation system schedules.

C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.

D. Install insulation with longitudinal seams at top and bottom of horizontal runs.

E. Install multiple layers of insulation with longitudinal and end seams staggered.

F. Keep insulation materials dry during application and finishing.

G. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.

H. Install insulation with least number of joints practical.

I. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.

1. Install insulation continuously through hangers and around anchor attachments.
2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.

J. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.

K. Install insulation with factory-applied jackets as follows:

1. Draw jacket tight and smooth.
2. Cover circumferential joints with 3-inch-wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches o.c.
3. Overlap jacket longitudinal seams at least 1-1/2 inches. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 2 inches o.c.

    a. For below ambient services, apply vapor-barrier mastic over staples.

4. Cover joints and seams with tape, according to insulation material manufacturer's written instructions, to maintain vapor seal.
5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to duct flanges and fittings.

L. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.

M. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.

N. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.

3.4 PENETRATIONS

A. Insulation Installation at Roof Penetrations: Install insulation continuously through roof penetrations.

1. Seal penetrations with flashing sealant.
2. For applications requiring only indoor insulation, terminate insulation above roof surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
3. Extend jacket of outdoor insulation outside roof flashing at least 2 inches below top of roof flashing.
4. Seal jacket to roof flashing with flashing sealant.

B. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.

C. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Terminate insulation at fire damper sleeves for fire-rated wall and partition penetrations. Externally insulate damper sleeves to match adjacent insulation and overlap duct insulation at least 2 inches.

1. Comply with requirements in Section 078413 "Penetration Firestopping."

3.5 INSTALLATION OF MINERAL-FIBER INSULATION

A. Blanket Insulation Installation on Ducts and Plenums: Secure with adhesive and insulation pins.

1. Apply adhesives according to manufacturer's recommended coverage rates per unit area, for 100 percent coverage of duct and plenum surfaces.
2. Apply adhesive to entire circumference of ducts and to all surfaces of fittings and transitions.
3. Install either capacitor-discharge-weld pins and speed washers or cupped-head, capacitor-discharge-weld pins on sides and bottom of horizontal ducts and sides of vertical ducts as follows:

    a. On duct sides with dimensions 18 inches and smaller, place pins along longitudinal centerline of duct. Space 3 inches maximum from insulation end joints, and 16 inches o.c.
    b. On duct sides with dimensions larger than 18 inches, place pins 16 inches o.c. each way, and 3 inches maximum from insulation joints. Install additional pins to hold insulation tightly against surface at cross bracing.
    c. Pins may be omitted from top surface of horizontal, rectangular ducts and plenums.
    d. Do not overcompress insulation during installation.
    e. Impale insulation over pins and attach speed washers.
    f. Cut excess portion of pins extending beyond speed washers or bend parallel with insulation surface. Cover exposed pins and washers with tape matching insulation facing.

4. For ducts and plenums with surface temperatures below ambient, install a continuous unbroken vapor barrier. Create a facing lap for longitudinal seams and end joints with insulation by removing 2 inches from one edge and one end of insulation segment. Secure laps to adjacent insulation section with 1/2-inch outward-clinching staples, 1 inch o.c. Install vapor barrier consisting of factory- or field-applied jacket, adhesive, vapor-barrier mastic, and sealant at joints, seams, and protrusions.

    a. Repair punctures, tears, and penetrations with tape or mastic to maintain vapor-barrier seal.
    b. Install vapor stops for ductwork and plenums operating below 50 deg F at 18-foot intervals. Vapor stops shall consist of vapor-barrier mastic applied in a Z-shaped pattern over insulation face, along butt end of insulation, and over the surface. Cover insulation face and surface to be insulated a width equal to two times the insulation thickness, but not less than 3 inches.

5. Overlap unfaced blankets a minimum of 2 inches on longitudinal seams and end joints. At end joints, secure with steel bands spaced a maximum of 18 inches o.c.
6. Install insulation on rectangular duct elbows and transitions with a full insulation section for each surface. Install insulation on round and flat-oval duct elbows with individually mitered gores cut to fit the elbow.
7. Insulate duct stiffeners, hangers, and flanges that protrude beyond insulation surface with 6-inch-wide strips of same material used to insulate duct. Secure on alternating sides of stiffener, hanger, and flange with pins spaced 6 inches o.c.

B. Board Insulation Installation on Ducts and Plenums: Secure with adhesive and insulation pins.

1. Apply adhesives according to manufacturer's recommended coverage rates per unit area, for 100 percent coverage of duct and plenum surfaces.
2. Apply adhesive to entire circumference of ducts and to all surfaces of fittings and transitions.

3. Install either capacitor-discharge-weld pins and speed washers or cupped-head, capacitor-discharge-weld pins on sides and bottom of horizontal ducts and sides of vertical ducts as follows:

    a. On duct sides with dimensions 18 inches and smaller, place pins along longitudinal centerline of duct. Space 3 inches maximum from insulation end joints, and 16 inches o.c.
    b. On duct sides with dimensions larger than 18 inches, space pins 16 inches o.c. each way, and 3 inches maximum from insulation joints. Install additional pins to hold insulation tightly against surface at cross bracing.
    c. Pins may be omitted from top surface of horizontal, rectangular ducts and plenums.
    d. Do not overcompress insulation during installation.
    e. Cut excess portion of pins extending beyond speed washers or bend parallel with insulation surface. Cover exposed pins and washers with tape matching insulation facing.

4. For ducts and plenums with surface temperatures below ambient, install a continuous unbroken vapor barrier. Create a facing lap for longitudinal seams and end joints with insulation by removing 2 inches from one edge and one end of insulation segment. Secure laps to adjacent insulation section with 1/2-inch outward-clinching staples, 1 inch o.c. Install vapor barrier consisting of factory- or field-applied jacket, adhesive, vapor-barrier mastic, and sealant at joints, seams, and protrusions.

    a. Repair punctures, tears, and penetrations with tape or mastic to maintain vapor-barrier seal.
    b. Install vapor stops for ductwork and plenums operating below 50 deg F at 18-foot intervals. Vapor stops shall consist of vapor-barrier mastic applied in a Z-shaped pattern over insulation face, along butt end of insulation, and over the surface. Cover insulation face and surface to be insulated a width equal to two times the insulation thickness, but not less than 3 inches.

5. Install insulation on rectangular duct elbows and transitions with a full insulation section for each surface. Groove and score insulation to fit as closely as possible to outside and inside radius of elbows. Install insulation on round and flat-oval duct elbows with individually mitered gores cut to fit the elbow.
6. Insulate duct stiffeners, hangers, and flanges that protrude beyond insulation surface with 6-inch-wide strips of same material used to insulate duct. Secure on alternating sides of stiffener, hanger, and flange with pins spaced 6 inches o.c.

3.6 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Tests and Inspections:

1. Inspect ductwork by removing field-applied jacket and insulation in layers in reverse order of their installation. Extent of inspection shall be limited to one location for each duct system defined in the "Duct Insulation Schedule, General" Article.

C. All insulation applications will be considered defective Work if sample inspection reveals noncompliance with requirements.

3.7 DUCT INSULATION SCHEDULE, GENERAL

A. Plenums and Ducts Requiring Insulation:

1. Indoor, concealed supply and outdoor air.
2. Indoor, concealed return located in unconditioned space.

B. Items Not Insulated:

1. Metal ducts with duct liner of sufficient thickness to comply with energy code and ASHRAE/IESNA 90.1.
2. Factory-insulated flexible ducts.
3. Factory-insulated plenums and casings.
4. Flexible connectors.
5. Vibration-control devices.
6. Factory-insulated access panels and doors.

3.8 INDOOR DUCT AND PLENUM INSULATION SCHEDULE

A. Concealed, round, supply-air duct insulation shall be one of the following:

1. Mineral-Fiber Blanket: 2 inches thick and 1.5 lb/cu.ft. density or of a thickness and density to achieve a minimum, installed, total R-value of 6.

B. Concealed, rectangular, supply-air duct insulation shall be one of the following:

1. Mineral-Fiber Blanket: 2 inches thick and 1.5 lb/cu.ft. density or of a thickness and density to achieve a minimum, installed, total R-value of 6.
2. Mineral-Fiber Board: 1-1/2 inches thick and 3.0 lb/cu.ft. density or of a thickness and density to achieve a minimum, installed, total R-value of 6.

C. Concealed, rectangular, return-air duct insulation shall be one of the following:

1. Mineral-Fiber Blanket: 2 inches thick and 1.5 lb/cu.ft. density or of a thickness and density to achieve a minimum, installed, total R-value of 6.
2. Mineral-Fiber Board: 1-1/2 inches thick and 3.0 lb/cu.ft. density or of a thickness and density to achieve a minimum, installed, total R-value of 6.

D. Concealed, rectangular, outdoor-air duct insulation shall be one of the following:

1. Mineral-Fiber Blanket: 2 inches thick and 1.5 lb/cu.ft. density or of a thickness and density to achieve a minimum, installed, total R-value of 6.
2. Mineral-Fiber Board: 1-1/2 inches thick and 3.0 lb/cu.ft. density or of a thickness and density to achieve a minimum, installed, total R-value of 6.

END OF SECTION

SECTION 230923 – BUILDING AUTOMATION SYSTEMS (BAS) FOR HVAC

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. BAS Building Automation System (BAS) Contractor shall furnish and install all components necessary to install a new fully integrated building automation system, incorporating direct digital control (DDC) for energy management, equipment monitoring and control for all new unit ventilators and associated relief dampers, as well as existing cabinet heaters and convectors indicated.
2. The BAS shall include all required computer software and hardware, controllers, sensors, transmission equipment, system workstations, local panels, conduit, wire, installation, engineering, database and setup, supervision, commissioning, acceptance test, training, warranty service and, at the owner's option, extended warranty service.
3. Assure that every HVAC device specified in Division 23 as well as all existing mechanical systems and components indicated on the plans is properly controlled. It is the responsibility of the Controls Contractor to furnish and install all hardware, software, relays, and programming necessary to assure interoperability between HVAC systems, equipment, or devices.
4. Provide all valves (installed by mechanical contractor), valve actuators, damper actuators, sensors, and other end devices and sensors as may be necessary to provide complete control and supervision of the functions indicated. Deliver to HVAC or appropriate installers for field installation.
5. Controls system shall be complete with Dynamic Graphics package that can be accessed from any networked workstation utilizing a standard web browser for all systems being installed under this work.
6. Integration of all facilities BAS Controls onto a single open-protocol Tridium controls platform is required unless written approval is obtained in advance of the controls work being performed.
7. Log on to access all programming functions, set-point and time scheduling functions, trend logs, and other control functions shall be internet accessible from any computer or web portal device independently of the clients own "secure internet" network. Work closely with the clients IT oversight person when preparing the controls network architecture
8. Provide open-communication protocol, graphics and all system controls components for all BAS system controls being installed throughout the district.

B. Related Requirements:

1. Section 236200 Packaged Compressor and Condenser Units;
2. Section 237313.16 Indoor, Semi-Custom Air-Handling Units;
3. Control Diagrams and Sequence of Operations shown on the Construction Drawings;
4. Division 26 – Electrical for all low voltage and line voltage wiring, raceways, conduit, boxes, and labeling.

1.3 DEFINITIONS

A. Algorithm: A logical procedure for solving a recurrent mathematical problem. A prescribed set of well-defined rules or processes for solving a problem in a finite number of steps.

B. Analog: A continuously varying signal value, such as current, flow, pressure, or temperature.

C. BACnet Specific Definitions:

1. BACnet: Building Automation Control Network Protocol, ASHRAE 135. A communications protocol allowing devices to communicate data over and services over a network.
2. BACnet Interoperability Building Blocks (BIBBs): BIBB defines a small portion of BACnet functionality that is needed to perform a particular task. BIBBs are combined to build the BACnet functional requirements for a device.
3. BACnet/IP: Defines and allows using a reserved UDP socket to transmit BACnet messages over IP networks. A BACnet/IP network is a collection of one or more IP subnetworks that share the same BACnet network number.
4. BACnet Testing Laboratories (BTL): Organization responsible for testing products for compliance with ASHRAE 135, operated under direction of BACnet International.
5. PICS (Protocol Implementation Conformance Statement): Written document that identifies the particular options specified by BACnet that are implemented in a device.

D. BAS: Building Automation System for primarily controlling HVAC systems and components, but may incorporate control of other building functions such as lighting, security cameras and door locks, etc.

E. Binary: Two-state signal where a high signal level represents ON" or "OPEN" condition and a low signal level represents "OFF" or "CLOSED" condition. "Digital" is sometimes used interchangeably with "Binary" to indicate a two-state signal.

F. Controller: Generic term for any standalone, microprocessor-based, digital controller residing on a network, used for local or global control. Three types of controllers are indicated: Network Controller, Programmable Application Controller, and Application-Specific Controller.

G. Control System Integrator: An entity that assists in expansion of existing enterprise system and support of additional operator interfaces to I/O being added to existing enterprise system.

H. COV: Changes of value.

I. DDC System Provider: Authorized representative of, and trained by, DDC system manufacturer and responsible for execution of DDC system Work indicated.

J. Distributed Control: Processing of system data is decentralized and control decisions are made at subsystem level. System operational programs and information are provided to remote subsystems and status is reported back. On loss of communication, subsystems shall be capable of operating in a standalone mode using the last best available data.

K. DOCSIS: Data-Over Cable Service Interface Specifications.

L. E/P: Voltage to pneumatic.

M. Gateway: Bidirectional protocol translator that connects control systems that use different communication protocols.

N. HLC: Heavy load conditions.

O. I/O: System through which information is received and transmitted. I/O refers to analog input (AI), binary input (BI), analog output (AO) and binary output (BO). Analog signals are continuous and represent control influences such as flow, level, moisture, pressure, and temperature. Binary signals convert electronic signals to digital pulses (values) and generally represent two-position operating and alarm status. "Digital," (DI and (DO), is sometimes used interchangeably with "Binary," (BI) and (BO), respectively.

P. I/P: Current to pneumatic.

Q. LAN: Local area network.

R. LNS: LonWorks Network Services.

S. LON Specific Definitions:

1. FTT-10: Echelon Transmitter-Free Topology Transceiver.
2. LonMark: Association comprising suppliers and installers of LonTalk products. Association provides guidelines for implementing LonTalk protocol to ensure interoperability through a standard or consistent implementation.
3. LonTalk: An open standard protocol developed by the Echelon Corporation that uses a "Neuron Chip" for communication. LonTalk is a register trademark of Echelon.
4. LonWorks: Network technology developed by Echelon.
5. Node: Device that communicates using CEA-709.1-C protocol and that is connected to a CEA-709.1-C network.
6. Node Address: The logical address of a node on the network, consisting of a Domain number, Subnet number, and Node number. "Node number" portion of an address is a number assigned to device during installation, is unique within a subnet, and is not a factory-set unique Node ID.
7. Node ID: A unique 48-bit identifier assigned at factory to each CEA-709.1-C device. Sometimes called a "Neuron ID."
8. Program ID: An identifier (number) stored in a device (usually EEPROM) that identifies node manufacturer, functionality of device (application and sequence), transceiver used, and intended device usage.
9. Standard Configuration Property Type (SCPT): Pronounced "skip-it." A standard format type maintained by LonMark International for configuration properties.
10. Standard Network Variable Type (SNVT): Pronounced "snivet." A standard format type maintained by LonMark used to define data information transmitted and received by individual nodes. "SNVT" is used in two ways. It is an acronym for "Standard Network Variable Type" and is often used to indicate a network variable itself (i.e., it can mean "a network variable of a standard network variable type").
11. Subnet: Consists of a logical grouping of up to 127 nodes, where logical grouping is defined by node addressing. Each subnet is assigned a number, which is unique within a Domain. See "Node Address."
12. TP/FT-10: Free Topology Twisted Pair network defined by CEA-709.3 and is most common media type for a CEA-709.1-C control network.
13. TP/XF-1250: High-speed, 1.25-Mbps, twisted-pair, doubly terminated bus network defined by "LonMark Interoperability Guidelines" typically used only to connect multiple TP/FT-10 networks.
14. User-Defined Configuration Property Type (UCPT): Pronounced "U-Keep-It." A Configuration Property format type that is defined by device manufacturer.
15. User-Defined Network Variable Type (UNVT): Network variable format defined by device manufacturer. UNVTs create non-standard communications that other vendors' devices may not correctly interpret and may negatively impact system operation. UNVTs are not allowed.

T. Low Voltage: As defined in NFPA 70 for circuits and equipment operating at less than 50 V or for remote-control, signaling power-limited circuits.

U. Mobile Device: A data-enabled phone or tablet computer capable of connecting to a cellular data network and running a native control application or accessing a web interface.

V. Modbus TCP/IP: An open protocol for exchange of process data.

W. MS/TP: Master-slave/token-passing, IEE 8802-3. Datalink protocol LAN option that uses twisted-pair wire for low-speed communication.

X. MTBF: Mean time between failures.

Y. Network Controller: Digital controller, which supports a family of programmable application controllers and application-specific controllers, that communicates on peer-to-peer network for transmission of global data.

Z. Network Repeater: Device that receives data packet from one network and rebroadcasts it to another network. No routing information is added to protocol.

AA. Peer to Peer: Networking architecture that treats all network stations as equal partners.

BB. POT: Portable operator's terminal.

CC. PUE: Performance usage effectiveness.

DD. RAM: Random access memory.

EE. RF: Radio frequency.

FF. Router: Device connecting two or more networks at network layer.

GG. Server: Computer used to maintain system configuration, historical and programming database.

HH. TCP/IP: Transport control protocol/Internet protocol.

II. UPS: Uninterruptible power supply.

JJ. USB: Universal Serial Bus.

KK. User Datagram Protocol (UDP): This protocol assumes that the IP is used as the underlying protocol.

LL. VAV: Variable air volume.

MM. WLED: White light emitting diode.

1.4 PREINSTALLATION MEETING

A. Preinstallation Conference: Conduct conference at Project site.

1.5 SUBMITTALS

A. Product Data: For each type of product include the following:

1. Construction details, material descriptions, dimensions of individual components and profiles, and finishes.
2. Operating characteristics, electrical characteristics, and furnished accessories indicating process operating range, accuracy over range, control signal over range, default control signal with loss of power, calibration data specific to each unique application, electrical power requirements, and limitations of ambient operating environment, including temperature and humidity.
3. Product description with complete technical data, performance curves, and product specification sheets.
4. Installation, operation and maintenance instructions including factors effecting performance.
5. Bill of materials of indicating quantity, manufacturer, and extended model number for each unique product.

    a. Workstations.
    b. Servers.
    c. Gateways.
    d. Routers.
    e. Protocol analyzers.
    f. DDC controllers.
    g. Enclosures.
    h. Electrical power devices.
    i. Accessories.
    j. Instruments.
    k. Control dampers and actuators.
    l. Control valves and actuators.

6. When manufacturer's product datasheets apply to a product series rather than a specific product model, clearly indicate and highlight only applicable information.
7. Each submitted piece of product literature shall clearly cross reference specification and drawings that submittal is to cover.

B. Software Submittal:

1. Cross-referenced listing of software to be loaded on each operator workstation, server, gateway, and DDC controller.
2. Description and technical data of all software provided, and cross-referenced to products in which software will be installed.
3. Operating system software, operator interface and programming software, color graphic software, DDC controller software, maintenance management software, and third-party software.
4. Include a flow diagram and an outline of each subroutine that indicates each program variable name and units of measure.
5. Listing and description of each engineering equation used with reference source.
6. Listing and description of each constant used in engineering equations and a reference source to prove origin of each constant.
7. Description of operator interface to alphanumeric and graphic programming.
8. Description of each network communication protocol.
9. Description of system database, including all data included in database, database capacity and limitations to expand database.

10. Description of each application program and device drivers to be generated, including specific information on data acquisition and control strategies showing their relationship to system timing, speed, processing burden and system throughout.
11. Controlled Systems: Instrumentation list with element name, type of device, manufacturer, model number, and product data. Include written description of sequence of operation including schematic diagram.

C. Shop Drawings:

1. General Requirements:

    a. Include cover drawing with Project name, location, Owner, Architect, Contractor and issue date with each Shop Drawings submission.
    b. Include a drawing index sheet listing each drawing number and title that matches information in each title block.
2. Include details of product assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
3. Plan Drawings indicating the following:

    a. Screened backgrounds of walls, structural grid lines, HVAC equipment, ductwork and piping.
    b. Room names and numbers with coordinated placement to avoid interference with control products indicated.
    c. Each desktop workstation, server, gateway, router, BAS controller, control panel instrument connecting to BAS controller, and damper and valve connecting to BAS controller, if included in Project.
    d. Exact placement of products in rooms, ducts, and piping to reflect proposed installed condition.
    e. Network communication cable and raceway routing.
    f. Proposed routing of wiring, cabling, conduit, and tubing, coordinated with building services for review before installation.

4. Schematic drawings for each controlled HVAC system indicating the following:

    a. I/O points labeled with point names shown. Indicate instrument range, normal operating set points, and alarm set points. Indicate fail position of each damper and valve, if included in Project.
    b. I/O listed in table format showing point name, type of device, manufacturer, model number, and cross-reference to product data sheet number.
    c. A graphic showing location of control I/O in proper relationship to HVAC system.
    d. Wiring diagram with each I/O point having a unique identification and indicating labels for all wiring terminals.
    e. Unique identification of each I/O that shall be consistently used between different drawings showing same point.
    f. Elementary wiring diagrams of controls for HVAC equipment motor circuits including interlocks, switches, relays and interface to BAS controllers.
    g. Narrative sequence of operation.
    h. Graphic sequence of operation, showing all inputs and output logical blocks.

5. Control panel drawings indicating the following:

    a. Panel dimensions, materials, size, and location of field cable, raceways, and tubing connections.
    b. Interior subpanel layout, drawn to scale and showing all internal components, cabling and wiring raceways, nameplates and allocated spare space.

c. Front, rear, and side elevations and nameplate legend.
d. Unique drawing for each panel.

6. BAS system network riser diagram indicating the following:

a. Each device connected to network with unique identification for each.
b. Interconnection of each different network in DDC system.
c. For each network, indicate communication protocol, speed and physical means of interconnecting network devices, such as copper cable type, or optical fiber cable type. Indicate raceway type and size for each.
d. Each network port for connection of an operator workstation or other type of operator interface with unique identification for each.

7. BAS system electrical power riser diagram indicating the following:

a. Each point of connection to field power with requirements (volts/phase//hertz/amperes/connection type) listed for each.
b. Each control power supply including, as applicable, transformers, power-line conditioners, transient voltage suppression and high filter noise units, DC power supplies, and UPS units with unique identification for each.
c. Each product requiring power with requirements (volts/phase//hertz/amperes/connection type) listed for each.
d. Power wiring type and size, race type, and size for each.

8. Monitoring and control signal diagrams indicating the following:

a. Control signal cable and wiring between controllers and I/O.
b. Point-to-point schematic wiring diagrams for each product.
c. Control signal tubing to sensors, switches and transmitters.
d. Process signal tubing to sensors, switches and transmitters..

D. System Description:

1. Full description of BAS architecture, network configuration, operator interfaces and peripherals, servers, controller types and applications, gateways, routers and other network devices, and power supplies.
2. Complete listing and description of each report, log and trend for format and timing and events which initiate generation.
3. System and product operation under each potential failure condition
4. Complete bibliography of documentation and media to be delivered to Owner.
5. Description of testing plans and procedures.
6. Description of Owner training.

E. Delegated-Design Submittal: For BAS system products and installation indicated as being delegated.

1. Supporting documentation showing BAS system design complies with performance requirements indicated, including calculations and other documentation necessary to prove compliance.
2. Schedule control dampers and actuators.
3. Schedule for control valves and actuators.
4. Schedule for flow instruments.

1.6 INFORMATIONAL SUBMITTALS

A. Coordination Drawings:

1. Plan drawings and corresponding product installation details, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

a. Product installation location shown in relationship to room, duct, pipe and equipment.
b. Structural members to which products will be attached.
c. Wall-mounted instruments located in finished space showing relationship to light switches, fire-alarm devices and other installed devices.
d. Size and location of wall access panels for products installed behind walls and requiring access.

2. Reflected ceiling plans and other details, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

a. Size and location of access panels for products installed above inaccessible ceiling assemblies and requiring access.

PART 2 - PRODUCTS

2.1 BAS SYSTEM MANUFACTURERS

A. Controls installers who can integrate existing and new controls through a single I/P address and meet the requirements of these construction documents may bid.

2.2 BAS SYSTEM DESCRIPTION

A. Microprocessor-based monitoring and control including analog/digital conversion and program logic. A control loop or subsystem in which digital and analog information is received and processed by a microprocessor, and digital control signals are generated based on control algorithms and transmitted to field devices to achieve a set of predefined conditions.

1. BAS system shall consist of a high-speed peer-to-peer network of distributed BAS controllers, other network devices, operator interfaces, and software.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.3 WEB ACCESS

A. BAS system shall be Web based.

1. Web-Based Access to BAS:
a. BAS software shall be designed around open standards of Web technology. BAS server shall be accessed using a Web browser over BAS network, using Owner's LAN, and remotely over Internet through Owner's LAN. Controls contractor shall

be responsible for working with the Owners IT personnel to coordinate the Internet access.

b. Provide operators complete access to BAS system via a Web browser. No special software other than a Web browser shall be required to access graphics, point displays, and trends; to configure trends, points, and controllers; and to edit programming.

c. Web access shall be password protected.

2.4 PERFORMANCE REQUIREMENTS

A. BAS shall satisfy requirements indicated.

1. System Performance Objectives:

a. BAS shall manage HVAC systems.

b. BAS control shall operate HVAC systems to achieve optimum operating costs while using least possible energy and maintaining specified performance.

c. BAS shall respond to power failures, HVAC equipment failures, and adverse and emergency conditions encountered through connected I/O points.

d. BAS shall operate while unattended by an operator and through operator interaction.

e. BAS shall record trends and transaction of events and produce report information such as performance, energy, occupancies, and equipment operation.

B. Surface-Burning Characteristics: Products installed in ducts, equipment, and return-air paths shall comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Flame-Spread Index: 25 or less.
2. Smoke-Developed Index: 50 or less.

C. Network Bandwidth: Design each network of BAS to include at least 30 percent available spare bandwidth with BAS operating under normal and heavy load conditions indicated. Calculate bandwidth usage, and apply a safety factor to ensure that requirement is satisfied when subjected to testing under worst case conditions.

D. BAS Data Storage:

1. Include capability to archive not less than 24 consecutive months of historical data for all I/O points connected to system, including alarms, event histories, transaction logs, trends and other information indicated.
2. Local Storage:

a. Provide server with data storage indicated. Server(s) shall use IT industry standard database platforms and be capable of functions described in "DDC Data Access" Paragraph.

3. Cloud Storage:

a. Provide web browser interfaces to configure, upload, download, and manage data, and service plan with storage adequate to store all data for term indicated. Cloud storage shall use IT industry standard database platforms and be capable of functions described in "BAS Data Access" Paragraph.

E. BAS Data Access:

1. When logged into the system, operator shall be able to also interact with any BAS controller connected to BAS as required for functional operation of the system.
2. System(s) shall be used for application configuration; for archiving, reporting and trending of data; for operator transaction archiving and reporting; for network information management; for alarm annunciation; and for operator interface tasks and controls application management.

F. Environmental Conditions for Controllers, Gateways, and Routers:

1. Products shall operate without performance degradation under ambient environmental temperature, pressure and humidity conditions encountered for installed location.
2. Products shall be protected with enclosures that withstand the environment in which they will be installed. Products not available with integral enclosures that comply shall be housed in protective secondary enclosures. Installed location shall dictate the NEMA 250 enclosure requirements.

G. Environmental Conditions for Instruments and Actuators:

1. Instruments and actuators shall operate without performance degradation under the ambient environmental temperature, pressure, humidity, and vibration conditions specified and encountered for installed location.
   a. If instruments and actuators alone cannot comply with requirement, install instruments and actuators in protective enclosures that are isolated and protected from conditions impacting performance. Enclosure shall be internally insulated, electrically heated and ventilated as required by instrument and application.

H. Electric Power Quality:

1. Power-Line Surges:

   a. Protect susceptible BAS products connected to ac power circuits from power-line surges to comply with requirements of IEEE C62.41.
   b. Do not use fuses for surge protection.

2. Power Conditioning:

   a. Protect susceptible BAS products connected to ac power circuits from irregularities and noise rejection.

3. Ground Fault: Protect products from ground fault by providing suitable grounding. Products shall not fail due to ground fault condition.

I. Backup Power Source:

1. HVAC systems and equipment served by a backup power source shall have associated BAS products that control such systems and equipment also served from a backup power source.

J. Continuity of Operation after Electric Power Interruption:

1. Equipment and associated factory-installed controls, field-installed controls, electrical equipment, and power supply connected to building normal and backup power systems shall automatically return equipment and associated controls to operating state occurring

immediately before loss of normal power, without need for manual intervention by operator when power is restored either through backup power source or through normal power if restored before backup power is brought online.

2.5 SYSTEM ARCHITECTURE

A. BAS shall consist of dedicated LANs that are not shared with other building systems and tenant data and communication networks.

B. System architecture shall perform modifications without having to remove and replace existing network equipment.

C. Number of LANs and associated communication shall be transparent to operator. All I/O points residing on any LAN shall be capable of global sharing between all system LANs.

D. System design shall eliminate dependence on any single device for system alarm reporting and control execution. Each controller shall operate independently by performing its' own control, alarm management and historical data collection.

2.6 BAS SYSTEM OPERATOR INTERFACES

A. Operator Means of System Access: Operator shall be able to access entire BAS through any of multiple means, including, but not limited to, remote connection through web access.

B. Desktop Workstations:

1. Connect to BAS Level one LAN through a communications port directly on LAN or through a communications port on a BAS controller.
2. Able to communicate with any device located on any BAS LAN.

C. Portable Workstations:

1. Connect to BAS Level one LAN through a communications port directly on LAN or through a communications port on a BAS controller.
2. Able to communicate with any device located on any BAS LAN.
3. Connect to system through a wireless router connected to Level one LAN.
4. Connect to system through a cellular data service.
5. Portable workstation shall be able to communicate with any device connected to any system LAN regardless of point of physical connection to system.
6. Monitor, program, schedule, adjust set points, and report capabilities of I/O connected anywhere in system.
7. Have dynamic graphic displays that are identical to desktop workstations.

D. Mobile Device:

1. Connect to system through a wireless router connected to LAN and cellular data service.

E. Critical Alarm Reporting:

1. Operator-selected critical alarms shall be sent by BAS to notify operator of critical alarms that require immediate attention.
2. BAS shall send alarm notification to multiple recipients that are assigned for each alarm.

3. BAS shall notify recipients by any or all means, including e-mail, text message and prerecorded phone message to mobile and landline phone numbers.

F. Simultaneous Operator Use: Capable of accommodating up to a minimum of five simultaneous operators that are accessing BAS through any one of operator interfaces indicated.

2.7 NETWORKS

A. Assure that the BAS being installed will operate and function on the network within the clients facility for connecting workstations, mobile devices, and network controllers.

2.8 DDC SYSTEM WIRELESS NETWORKS

A. Use an open industry standard technology to create a wireless mesh network to provide wireless connectivity for network devices at multiple system levels including communications from programmable application controllers and application-specific controllers to temperature sensors and from network controllers to programmable application controllers and application-specific controllers.

B. Installer shall design wireless networks to comply with DDC system performance requirements indicated. Wireless network devices shall co-exist on same network with hardwired devices.

C. Hardwired controllers shall be capable of retrofit to wireless devices with no special software.

D. A wireless coordinator shall provide a wireless interface between programmable application controllers, application-specific controllers, and network controllers.

E. Wireless System Components shall comply with the following:

1. Use direct sequence spread spectrum RF technology.
2. Operate on the 2.4-GHz ISM Band.
3. Comply with IEEE 802.15.4 for low-power, low duty-cycle RF transmitting systems.
4. FCC compliant to 47 CFR 15, Subpart B, Class A.
5. Operate as a bidirectional transceiver with sensors and routers to confirm and synchronize data transmission.
6. Capable of communication with sensors and routers up to a maximum distance of 250 feet in line of sight.
7. Include visual indicators to provide diagnostic information required for operator verification of operation.

F. Wireless Coordinators:

1. Each wireless mesh network shall use wireless coordinator(s) for initiation and formation of network.

G. Wireless Routers:

1. Each wireless mesh network shall use wireless routers with any controller to provide a wireless interface to a network controller, through a wireless coordinator.
2. Include indication for use in commissioning and troubleshooting.

H. Wireless Temperature Sensors:

1. Wireless temperature sensors shall sense and transmit room temperatures, temperature set point, room occupancy notification and low battery condition to an associated router.
2. Multiple sensors shall be able to report to a router connected to a DDC controller for averaging or high and low selection.

I. One-to-One Wireless Network Receivers:

1. One-to-one wireless receivers shall receive wireless RF signals containing temperature data from multiple wireless room temperature sensors and communicate information to programmable application controllers or application-specific controllers.

J. One-to-One Wireless Network Sensors:

1. One-to-one wireless sensors shall sense and report room temperatures to one-to-one receiver.
   a. Include set point adjustment between 55 to 85 deg F.

2.9 DESKTOP WORKSTATIONS

A. Description: A tower or all-in-one computer designed for normal use at a single, semipermanent location.

B. Performance Requirements:

1. Performance requirements may dictate equipment exceeding minimum requirements indicated.
2. Energy Star compliant.

C. Wireless Ethernet, 802.11 a/b/g/n.

1. Optical Modem: Full duplex link for connection to optical fiber cable provided.
2. I/O Ports:

   a. Two USB 3.0 ports on front panel, six on back panel, and three internal on motherboard.
   b. One serial port.
   c. One parallel port.
   d. Two PS/2 ports.
   e. One RJ-45.
   f. One stereo line-in and headphone/line-out on back panel.
   g. One microphone and headphone connector on front panel.
   h. One IEEE 1394 on front and back panel with PCI-e card.
   i. One ESATA port on back panel.

3. Battery: Life of at least three years to maintain system clock/calendar and ROM, as a minimum.

D. Keyboard:

1. 101 enhanced keyboard.
2. Full upper- and lowercase ASCII keyset, numeric keypad, dedicated cursor control keypad, and 12 programmable function keys.
3. Wireless operation within up to 72 inches in front of workstation.

E. Pointing Device:

1. Either a two- or three-button mouse.
2. Wireless operation within up to 72 inches in front of workstation.

F. Flat Panel Display Monitor:

1. Display:
   a. Color display with minimum 28” diagonal viewable area.
   b. Digital or analog input signal.
   c. Aspect Ratio: 16 to 9.
   d. Antiglare display.
   e. Dynamic Contrast Ratio: 50000 to 1.
   f. Energy Star compliant.
   g. Resolution: 1920 by 1080 pixels at 60 Hz

G. I/O Cabling: Include applicable cabling to connect I/O devices.

2.10 SERVERS

A. Description: x86 based permanently installed computer used for client-server computing.

B. Servers shall include the following:

1. Full-feature backup server (server and backup minimum requirement).
2. Software licenses.
3. Cable installation between server(s) and network.

C. Web Server:

1. If required to be separate, include Web server hardware and software to match, except backup server is not required.
2. Firewalls between server Web and networks.
3. Password protection for access to server from Web server.
4. Cable installation between the server(s) and building Ethernet network.

2.11 PRINTERS

A. Black and White Laser Printer:

1. 1200 by 1200 dots per inch resolution.
2. Complies with Energy Star requirements.
3. Capable of handling letter- and legal-size paper and overhead transparencies.
4. Two paper trays;

2.12 SYSTEM SOFTWARE

A. System Software Minimum Requirements:

1. Real-time multitasking and multiuser 32- or 64-bit operating system that allows concurrent multiple operator workstations operating and concurrent execution of multiple real-time programs and custom program development.

2. Operating system shall be capable of operating DOS and Microsoft Windows applications.
3. Database management software shall manage all data on an integrated and non-redundant basis. Additions and deletions to database shall be without detriment to existing data. Include cross linkages so no data required by a program can be deleted by an operator until that data have been deleted from respective programs.
4. Network communications software shall manage and control multiple network communications to provide exchange of global information and execution of global programs.
5. Operator interface software shall include day-to-day operator transaction processing, alarm and report handling, operator privilege level and data segregation control, custom programming, and online data modification capability.
6. Scheduling software shall schedule centrally based time and event, temporary, and exception day programs.

B. Operator Interface Software:

1. Minimize operator training through use of English language prorating and English language point identification.
2. Minimize use of a typewriter-style keyboard through use of a pointing device similar to a mouse.
3. Operator sign-off shall be a manual operation or, if no keyboard or mouse activity takes place, an automatic sign-off.
4. Automatic sign-off period shall be programmable from one to 60 minutes in one-minute increments on a per operator basis.
5. Operator sign-on and sign-off activity shall be recorded and sent to printer.
6. Security Access:

    a. Operator access to BAS shall be under password control.
    b. An alphanumeric password shall be field assignable to each operator.
    c. Operators shall be able to access BAS by entry of proper password.
    d. Operator password shall be same regardless of which computer or other interface means is used.
    e. Additions or changes made to passwords shall be updated automatically.
    f. Each operator shall be assigned an access level to restrict access to data and functions the operator is cable of performing.
    g. Software shall have at least five access levels.
    h. Each menu item shall be assigned an access level so that a one-for-one correspondence between operator assigned access level(s) and menu item access level(s) is required to gain access to menu item.
    i. Display menu items to operator with those capable of access highlighted. Menu and operator access level assignments shall be online programmable and under password control.

7. Data Segregation:

    a. Include data segregation for control of specific data routed to a workstation, to an operator or to a specific output device, such as a printer.
    b. Segregation groups shall be selectable such as "fire points," "fire points on second floor," "space temperature points," "HVAC points," and so on.
    c. Points shall be assignable to multiple segregation groups. Display and output of data to printer or monitor shall occur where there is a match of operator or peripheral segregation group assignment and point segregations.
    d. Alarms shall be displayed and printed at each peripheral to which segregation allows, but only those operators assigned to peripheral and having proper authorization level will be allowed to acknowledge alarms.

e. Operators and peripherals shall be assignable to multiple segregation groups and all assignments are to be online programmable and under password control.

8. Operators shall be able to perform commands including, but not limited to, the following:

a. Start or stop selected equipment.
b. Adjust set points.
c. Add, modify, and delete time programming.
d. Enable and disable process execution.
e. Lock and unlock alarm reporting for each point.
f. Enable and disable totalization for each point.
g. Enable and disable trending for each point.
h. Override control loop set points.
i. Enter temporary override schedules.
j. Define holiday schedules.
k. Change time and date.
l. Enter and modify analog alarm limits.
m. Enter and modify analog warning limits.
n. View limits.
o. Enable and disable demand limiting.
p. Enable and disable duty cycle.
q. Display logic programming for each control sequence.

9. Reporting:

a. Generated automatically and manually.
b. Sent to displays, printers and disk files.
c. Types of Reporting:

1) General listing of points.
2) List points currently in alarm.
3) List of off-line points.
4) List points currently in override status.
5) List of disabled points.
6) List points currently locked out.
7) List of items defined in a "Follow-Up" file.
8) List weekly schedules.
9) List holiday programming.
10) List of limits and dead-bands.

10. Summaries: For specific points, for a logical point group, for an operator selected group(s), or for entire system without restriction due to hardware configuration.

C. Graphic Interface Software:

1. Include a full interactive graphical selection means of accessing and displaying system data to operator. Include at least five levels with the penetration path operator assignable (for example, site, building, floor, air-handling unit, and supply temperature loop). Native language descriptors assigned to menu items are to be operator defined and modifiable under password control.
2. Include a hierarchical-linked dynamic graphic operator interface for accessing and displaying system data and commanding and modifying equipment operation. Interface shall use a pointing device with pull-down or penetrating menus, color and animation to facilitate operator understanding of system.
3. Include at least 10 levels of graphic penetration with the hierarchy operator assignable.

4. Descriptors for graphics, points, alarms and such shall be modified through operator's workstation under password control.
5. Graphic displays shall be online user definable and modifiable using the hardware and software provided.
6. Data to be displayed within a graphic shall be assignable regardless of physical hardware address, communication or point type.
7. Graphics are to be online programmable and under password control.
8. Points may be assignable to multiple graphics where necessary to facilitate operator understanding of system operation.
9. Graphics shall also contain software points.
10. Penetration within a graphic hierarchy shall display each graphic name as graphics are selected to facilitate operator understanding.
11. Back-trace feature shall permit operator to move upward in the hierarchy using a pointing device. Back trace shall show all previous penetration levels. Include operator with option of showing each graphic full screen size with back trace as horizontal header or by showing a "stack" of graphics, each with a back trace.
12. Display operator accessed data on the monitor.
13. Operator shall select further penetration using pointing device to click on a site, building, floor, area, equipment, and so on. Defined and linked graphic below that selection shall then be displayed.
14. Include operator with means to directly access graphics without going through penetration path.
15. Dynamic data shall be assignable to graphics.
16. Display points (physical and software) with dynamic data provided by BAS with appropriate text descriptors, status or value, and engineering unit.
17. Use color, rotation, or other highly visible means, to denote status and alarm states. Color shall be variable for each class of points, as chosen by operator.
18. Points shall be dynamic with operator adjustable update rates on a per point basis.
19. For operators with appropriate privilege, points shall be commanded directly from display using pointing device.

    a. For an analog command point such as set point, current conditions and limits shall be displayed and operator can position new set point using pointing device.
    b. For a digital command point such as valve position, valve shall show its current state such as open or closed and operator could select alternative position using pointing device.
    c. Keyboard equivalent shall be available for those operators with that preference.

20. Operator shall be able to split or resize viewing screen into quadrants to show one graphic on one quadrant of screen and other graphics or spreadsheet, bar chart, word processing, curve plot and other information on other quadrants on screen. This feature shall allow real-time monitoring of one part of system while displaying other parts of system or data to better facilitate overall system operation.
21. Help Features:

    a. On-line context-sensitive help utility to facilitate operator training and understanding.
    b. Bridge to further explanation of selected keywords. Document shall contain text and graphics to clarify system operation.

        1) If help feature does not have ability to bridge on keywords for more information, a complete set of user manuals shall be provided in an indexed word-processing program, which shall run concurrently with operating system software.

    c. Available for Every Menu Item:

1) Index items for each system menu item.

22. Graphic generation software shall allow operator to add, modify, or delete system graphic displays.

    a. Include libraries of symbols depicting HVAC symbols such as fans, coils, filters, dampers, valves pumps, and electrical symbols.
    b. Graphic development package shall use a pointing device in conjunction with a drawing program to allow operator to perform the following:

        1) Define background screens.
        2) Define connecting lines and curves.
        3) Locate, orient and size descriptive text.
        4) Define and display colors for all elements.
        5) Establish correlation between symbols or text and associated system points or other displays.

D. Project-Specific Graphics: Graphics documentation including, but not limited to, the following:

1. Site plan showing each building, and additional site elements, which are being controlled or monitored by BAS.
2. Plan for each building floor, including interstitial floors, and each roof level of each building, showing the following:

    a. Room layouts with room identification and name.
    b. Locations and identification of all monitored and controlled HVAC equipment and other equipment being monitored and controlled by BAS.
    c. Location and identification of each hardware point being controlled or monitored by BAS.

3. Control schematic for each of following, including a graphic system schematic representation with point identification, set point and dynamic value indication, and sequence of operation.
4. Graphic display for each piece of equipment connected to BAS through a data communications link. Include dynamic indication of all points associated with equipment.
5. BAS network riser diagram that shows schematic layout for entire system including all networks and all controllers.

E. Customizing Software:

1. Software to modify and tailor BAS to specific and unique requirements of equipment installed, to programs implemented and to staffing and operational practices planned.
2. Online modification of BAS configuration, program parameters, and database using menu selection and keyboard entry of data into preformatted display templates.
3. As a minimum, include the following modification capability:

    a. Operator assignment shall include designation of operator passwords, access levels, point segregation and auto sign-off.
    b. Peripheral assignment capability shall include assignment of segregation groups and operators to consoles and printers, designation of backup workstations and printers, designation of workstation header points and enabling and disabling of print-out of operator changes.
    c. System configuration and diagnostic capability shall include communications and peripheral port assignments, BAS controller assignments to network, BAS

controller enable and disable, assignment of command trace to points and application programs and initiation of diagnostics.

d. System text addition and change capability shall include English or native language descriptors for points, segregation groups and access levels and action messages for alarms, run time and trouble condition.

e. Time and schedule change capability shall include time and date set, time and occupancy schedules, exception and holiday schedules and daylight savings time schedules.

f. Point related change capability shall include the following:

1) System and point enable and disable.
2) Run-time enable and disable.
3) Assignment of points to segregation groups, calibration tables, lockout, and run time and to a fixed I/O value.
4) Assignment of alarm and warning limits.

g. Application program change capability shall include the following:

1) Enable and disable of software programs.
2) Programming changes.
3) Assignment of comfort limits, global points, time and event initiators, time and event schedules and enable and disable time and event programs.

4. Software shall allow operator to add points, or groups of points, to BAS and to link them to energy optimization and management programs. Additions and modifications shall be online programmable using operator workstation, downloaded to other network devices and entered into their databases. After verification of point additions and associated program operation, database shall be uploaded and recorded on hard drive and disk for archived record.

F. Alarm Handling Software:

1. Include alarm handling software to report all alarm conditions monitored and transmitted through BAS controllers.
2. Include first in, first out handling of alarms according to alarm priority ranking, with most critical alarms first, and with buffer storage in case of simultaneous and multiple alarms.
3. Alarm handling shall be active at all times to ensure that alarms are processed even if an operator is not currently signed on to BAS.
4. Alarms display shall include the following:

a. Indication of alarm condition such as "Abnormal Off," "Hi Alarm," and "Low Alarm."
b. "Analog Value" or "Status" group and point identification with native language point descriptor such as "Space Temperature, Building 110, 2nd Floor, Room 212."
c. Include extended message capability to allow assignment and printing of extended action messages. Capability shall be operator programmable and assignable on a per point basis.

5. Alarms shall be directed to appropriate operator workstations, printers, and individual operators by privilege level and segregation assignments.
6. Send e-mail alarm messages to designated operators.
7. Send e-mail, page, text and voice messages to designated operators for critical alarms.
8. Include an unacknowledged alarm indicator on display to alert operator that there are unacknowledged alarms in system. Operator shall be able to acknowledge alarms on an individual basis or through a multiple alarm acknowledge key, depending on alarm class.

G. Reports and Logs:

1. Include reporting software package that allows operator to select, modify, or create reports using BAS I/O point data available.
2. Each report shall be definable as to data content, format, interval and date.
3. Report data shall be sampled and stored on BAS controller, within storage limits of BAS controller, and then uploaded to archive on for historical reporting.
4. Operator shall be able to obtain real-time logs of all I/O points by type or status, such as alarm, point lockout, or normal.
5. Reports and logs shall be stored on server hard drives in a format that is readily accessible by other standard software applications, including spreadsheets and word processing.
6. Reports and logs shall be readily printed and set to be printed either on operator command or at a specific time each day.

H. Standard Reports: Standard BAS reports shall be provided and operator shall be able to customize reports later.

1. All I/O: With current status and values.
2. Alarm: All current alarms, except those in alarm lockout.
3. Disabled I/O: All I/O points that are disabled.
4. Alarm Lockout I/O: All I/O points in alarm lockout, whether manual or automatic.
5. Alarm Lockout I/O in Alarm: All I/O in alarm lockout that are currently in alarm.
6. Logs:
    a. Alarm history.
    b. System messages.
    c. System events.
    d. Trends.

I. Custom Reports: Operator shall be able to easily define any system data into a daily, weekly, monthly, or annual report. Reports shall be time and date stamped and shall contain a report title.

J. Programming Software:

1. Include programming software to execute sequences of operation indicated.
2. Include programming routines in simple and easy to follow logic with detailed text comments describing what the logic does and how it corresponds to sequence of operation.
3. Programming software shall be:

    a. Graphic Based: Programming shall use a library of function blocks made from preprogrammed code designed for BAS control systems.

        1) Function blocks shall be assembled with interconnection lines that represent to control sequence in a flowchart.
        2) Programming tools shall be viewable in real time to show present values and logical results of each function block.

    b. Menu Based: Programming shall be done by entering parameters, definitions, conditions, requirements and constraints.
    c. Line by Line and Text Based: Programming shall declare variable types such as local, global, real, integer, and so on, at the beginning of the program. Use descriptive comments frequently to describe programming code.

4. Include means for detecting programming errors and testing software control strategies with a simulation tool before implementing in actual control. Simulation tool may be inherent with programming software or as a separate product.

K. Database Management Software:

1. Where a separate SQL database is used for information storage, BAS shall include database management software that separates database monitoring and managing functions by supporting multiple separate windows.
2. Database secure access shall be accomplished using standard SQL authentication including ability to access data for use outside of BAS applications.
3. Database management function shall include summarized information on trend, alarm, event, and audit for the following database management actions:

    a. Backup.
    b. Purge.
    c. Restore.

4. Database management software shall support the following:

    a. Statistics: Display database server information and trend, alarm, event, and audit information on database.
    b. Maintenance: Include method of purging records from trend, alarm, event and audit databases by supporting separate screens for creating a backup before purging, selecting database, and allowing for retention of a selected number of day's data.
    c. Backup: Include means to create a database backup file and select a storage location.
    d. Restore: Include a restricted means of restoring a database by requiring operator to have proper security level.

5. Database management software shall include information of current database activity, including the following:

    a. Ready.
    b. Purging record from a database.
    c. Action failed.
    d. Refreshing statistics.
    e. Restoring database.
    f. Shrinking a database.
    g. Backing up a database.
    h. Resetting Internet information services.
    i. Starting network device manager.
    j. Shutting down the network device manager.
    k. Action successful.

6. Database management software monitoring functions shall continuously read database information once operator has logged on.
7. Include operator notification through on-screen pop-up display and e-mail message when database value has exceeded a warning or alarm limit.
8. Monitoring settings window shall have the following sections:
    a. Allow operator to set and review scan intervals and start times.
    b. E-mail: Allow operator to create and review e-mail and phone text messages to be delivered when a warning or an alarm is generated.
    c. Warning: Allow operator to define warning limit parameters, set reminder frequency and link e-mail message.

d. Alarm: Allow operator to define alarm limit parameters, set reminder frequency and link e-mail message.
e. Database Login: Protect system from unauthorized database manipulation by creating a read access and a write access for each of trend, alarm, event and audit databases as well as operator proper security access to restore a database.

9. Monitoring settings taskbar shall include the following informational icons:

a. Normal: Indicates by color and size, or other easily identifiable means that all databases are within their limits.
b. Warning: Indicates by color and size, or other easily identifiable means that one or more databases have exceeded their warning limit.
c. Alarm: Indicates by color and size, or other easily identifiable means that one or more databases have exceeded their alarm limit.

2.13 ASHRAE 135 GATEWAYS

A. Include BACnet communication ports, whenever available as an equipment OEM standard option, for integration via a single communication cable. BACnet-controlled plant equipment includes, but is not limited to, boilers, chillers, ERV’s and variable-speed drives.

B. Include gateways to connect BACnet to legacy systems, existing non-BACnet devices, and existing non-BACnet BAS-controlled equipment, only when specifically requested and approved by Owner.

C. Include with each gateway an interoperability schedule showing each point or event on legacy side that BACnet "client" will read, and each parameter that BACnet network will write to. Describe this interoperability of BACnet services, or BIBBs, defined in ASHRAE 135, Annex K.

D. Gateway Minimum Requirements:

1. Read and view all readable object properties on non-BACnet network to BACnet network and vice versa where applicable.
2. Write to all writeable object properties on non-BACnet network from BACnet network and vice versa where applicable.
3. Include single-pass (only one protocol to BACnet without intermediary protocols) translation from non-BACnet protocol to BACnet and vice versa.
4. Comply with requirements of Data Sharing Read Property, Data Sharing Write Property, Device Management Dynamic Device Binding-B, and Device Management Communication Control BIBBs according to ASHRAE 135.
5. Hardware, software, software licenses, and configuration tools for operator-to-gateway communications.
6. Backup programming and parameters on CD media and the ability to modify, download, backup, and restore gateway configuration.

2.14 BAS CONTROLLERS

A. BAS shall consist of a combination of network controllers, programmable application controllers and application-specific controllers to satisfy performance requirements indicated.

B. BAS controllers shall perform monitoring, control, energy optimization and other requirements indicated.

C. BAS controllers shall use a multitasking, multiuser, real-time digital control microprocessor with a distributed network database and intelligence.

D. Each BAS controller shall be capable of full and complete operation as a completely independent unit and as a part of a BAS wide distributed network.

E. Environment Requirements:

1. Controller hardware shall be suitable for the anticipated ambient conditions.
2. Controllers located in conditioned space shall be rated for operation at 32 to 120 deg F.
3. Controllers located outdoors shall be rated for operation at -25 to 120 deg F.

F. Power and Noise Immunity:

1. Controller shall operate at 90 to 110 percent of nominal voltage rating and shall perform an orderly shutdown below 80 percent of nominal voltage.
2. Operation shall be protected against electrical noise of 5 to 120 Hz and from keyed radios with up to 5 W of power located within 36 inches of enclosure.

G. BAS Controller Spare Processing Capacity:

1. Include spare processing memory for each controller. RAM, PROM, or EEPROM will implement requirements indicated with the following spare memory:

    a. Network Controllers: 50 percent.
    b. Programmable Application Controllers: Not less than 60 percent.
    c. Application-Specific Controllers: Not less than 70 percent.

2. Memory shall support BAS controller's operating system and database and shall include the following:

    a. Monitoring and control.
    b. Energy management, operation and optimization applications.
    c. Alarm management.
    d. Historical trend data of all connected I/O points.
    e. Maintenance applications.
    f. Operator interfaces.
    g. Monitoring of manual overrides.

H. BAS Controller Spare I/O Point Capacity: Include spare I/O point capacity for each controller as follows:

1. Network, Programmable Application, and Application Specific Controllers:

    a. 20 percent of each AI, AO, BI, and BO point connected to controller.
    b. Minimum Spare I/O Points per Controller:

        1) AIs: Three
        2) AOs: Three.
        3) BIs: Three.
        4) BOs: Three.

I. Maintenance and Support: Include the following features to facilitate maintenance and support:

1. Mount microprocessor components on circuit cards for ease of removal and replacement.

2. Means to quickly and easily disconnect controller from network.
3. Means to quickly and easily access connect to field test equipment.
4. Visual indication that controller electric power is on, of communication fault or trouble, and that controller is receiving and sending signals to network.

2.15 NETWORK AND PROGRAMMABLE APPLICATION CONTROLLERS

A. General Network Controller Requirements:

1. Include adequate number of controllers to achieve performance indicated.
2. System shall consist of one or more independent, standalone, microprocessor-based network controllers to manage global strategies indicated.
3. Controller shall have enough memory to support its operating system, database, and programming requirements.
4. Data shall be shared between networked controllers and other network devices.
5. Operating system of controller shall manage input and output communication signals to allow distributed controllers to share real and virtual object information and allow for central monitoring and alarms.
6. Controllers that perform scheduling shall have a real-time clock.
7. Controller shall continually check status of its processor and memory circuits. If an abnormal operation is detected, controller shall assume a predetermined failure mode and generate an alarm notification.
8. Controllers shall be fully programmable.

B. Operator Interface:

1. Controller shall be equipped with a service communications port for connection to a portable operator's workstation or mobile device.

C. Serviceability:

1. Controller shall be equipped with diagnostic LEDs or other form of local visual indication of power, communication, and processor.
2. Wiring and cable connections shall be made to field-removable, modular terminal strips or to a termination card connected by a ribbon cable.
3. Controller shall maintain BIOS and programming information in event of a power loss for at least 72 hours.

2.16 APPLICATION-SPECIFIC CONTROLLERS

A. Description: Microprocessor-based controllers, which through hardware or firmware design are dedicated to control a specific piece of equipment. Controllers are not fully user-programmable but are configurable and customizable for operation of equipment they are designed to control.

1. Capable of standalone operation and shall continue to include control functions without being connected to network.
2. Data shall be shared between networked controllers and other network devices.

B. Communication: Application-specific controllers shall communicate with other application-specific controller and devices on network, and to programmable application and network controllers.

C. Operator Interface: Controller shall be equipped with a service communications port for connection to a portable operator's workstation.

D. Serviceability:

1. Controller shall be equipped with diagnostic LEDs or other form of local visual indication of power, communication, and processor.
2. Wiring and cable connections shall be made to field-removable, modular terminal strips or to a termination card connected by a ribbon cable.
3. Controller shall use nonvolatile memory and maintain all BIOS and programming information in event of power loss.

2.17 CONTROLLER SOFTWARE

A. General Controller Software Requirements:

1. Software applications shall reside and operate in controllers. Editing of applications shall occur at operator workstations.
2. Control functions shall be executed within controllers using BAS algorithms.
3. Controllers shall be configured to use stored default values to ensure fail-safe operation. Default values shall be used when there is a failure of a connected input instrument or loss of communication of a global point value.

B. Security:

1. Operator access shall be secured using individual security passwords and user names.
2. Passwords shall restrict operator to points, applications, and system functions as assigned by system manager.
3. Operator log-on and log-off attempts shall be recorded.
4. System shall protect itself from unauthorized use by automatically logging off after last keystroke. The delay time shall be operator-definable.

C. Scheduling: Include capability to schedule each point or group of points in system. Each schedule shall consist of the following:

1. Weekly Schedule:

a. Include separate schedules for each day of week.
b. Each schedule should include the capability for start, stop, optimal start, optimal stop, and night economizer.
c. Each schedule may consist of up to 10 events.
d. When a group of objects are scheduled together, include capability to adjust start and stop times for each member.

2. Exception Schedules:

a. Include ability for operator to designate any day of the year as an exception schedule.
b. Exception schedules may be defined up to a year in advance. Once an exception schedule is executed, it will be discarded and replaced by regular schedule for that day of week.

3. Holiday Schedules:

a. Include capability for operator to define up to 99 special or holiday schedules.
b. Schedules may be placed on scheduling calendar and will be repeated each year.
c. Operator shall be able to define length of each holiday period.

D. System Coordination:

1. Include standard application for proper coordination of equipment.
2. Application shall include operator with a method of grouping together equipment based on function and location.
3. Group may then be used for scheduling and other applications.

E. Binary Alarms:

1. Each binary point shall be set to alarm based on operator-specified state.
2. Include capability to automatically and manually disable alarming.

F. Analog Alarms:

1. Each analog object shall have both high and low alarm limits.
2. Alarming shall be able to be automatically and manually disabled.

G. Alarm Reporting:

1. Operator shall be able to determine action to be taken in event of an alarm.
2. Alarms shall be routed to appropriate operator workstations based on time and other conditions.
3. Alarm shall be able to start programs, print, be logged in event log, generate custom messages, and display graphics.

H. Remote Communication:

1. System shall have ability to dial out in the event of an alarm.

I. Electric Power Demand Limiting (when applicable):

1. Demand-limiting program shall monitor building or other operator-defined electric power consumption from signals connected to electric power meter or from a watt transducer or current transformer.
2. Demand-limiting program shall predict probable power demand such that action can be taken to prevent exceeding demand limit. When demand prediction exceeds demand limit, action will be taken to reduce loads in a predetermined manner. When demand prediction indicates demand limit will not be exceeded, action will be taken to restore loads in a predetermined manner.
3. Demand reduction shall be accomplished by the following means:

a. Reset air-handling unit supply temperature set points.
b. Reset space temperature set points.
c. De-energize equipment based on priority.

4. Demand-limiting parameters, frequency of calculations, time intervals, and other relevant variables shall be based on the means by which electric power service provider computes demand charges.
5. Include demand-limiting prediction and control for any individual meter monitored by system or for total of any combination of meters.
6. Include means operator to make the following changes online:

a. Addition and deletion of loads controlled.
b. Changes in demand intervals.
c. Changes in demand limit for meter(s).
d. Maximum shutoff time for equipment.
e. Minimum shutoff time for equipment.
f. Select rotational or sequential shedding and restoring.
g. Shed and restore priority.

7. Include the following information and reports, to be available on an hourly, daily, weekly, monthly and annual basis:

a. Total electric consumption.
b. Peak demand.
c. Date and time of peak demand.
d. Daily peak demand.

J. Maintenance Management (when applicable): System shall monitor equipment status and generate maintenance messages based on operator-designated run-time, starts, and calendar date limits.

K. Sequencing: Include application software based on sequences of operation indicated to properly sequence chillers, boilers, and other applicable HVAC equipment.

L. Control Loops:

1. Support any of the following control loops, as applicable to control required:

a. Two-position (on/off, open/close, slow/fast) control.
b. Proportional control.
c. Proportional plus integral (PI) control.
d. Proportional plus integral plus derivative (PID) control.

1) Include PID algorithms with direct or reverse action and anti-windup.
2) Algorithm shall calculate a time-varying analog value used to position an output or stage a series of outputs.
3) Controlled variable, set point, and PID gains shall be operator-selectable.

e. Adaptive (automatic tuning).

M. Staggered Start: Application shall prevent all controlled equipment from simultaneously restarting after a power outage. Order which equipment (or groups of equipment) is started, along with the time delay between starts, shall be operator-selectable.

N. Energy Calculations:

1. Include software to allow instantaneous power or flow rates to be accumulated and converted to energy usage data.
2. Include an algorithm that calculates a sliding-window average (rolling average). Algorithm shall be flexible to allow window intervals to be operator specified (such as 15, 30, or 60 minutes).
3. Include an algorithm that calculates a fixed-window average. A digital input signal shall define start of window period (such as signal from utility meter) to synchronize fixed-window average with that used by utility.

O. Anti-Short Cycling:

1. BO points shall be protected from short cycling.
2. Feature shall allow minimum on-time and off-time to be selected.

P. On and Off Control with Differential:

1. Include an algorithm that allows a BO to be cycled based on a controlled variable and set point.
2. Algorithm shall be direct- or reverse-acting and incorporate an adjustable differential.

Q. Run-Time Totalization:

1. Include software to totalize run-times for all BI points.
2. A high run-time alarm shall be assigned, if required, by operator.

2.18 ENCLOSURES

A. General Enclosure Requirements:

1. House each controller and associated control accessories in an enclosure. Enclosure shall serve as central tie-in point for control devices such as switches, transmitters, transducers, power supplies and transformers.
2. Include enclosure door with key locking mechanism. Key locks alike for all enclosures and include one pair of keys per enclosure.
3. Equip doors of enclosures housing controllers and components with analog or digital displays with windows to allow visual observation of displays without opening enclosure door.
4. Include wall-mounted enclosures with brackets suitable for mounting enclosures to wall or freestanding support stand as indicated.
5. Supply each enclosure with a complete set of as-built schematics, tubing, and wiring diagrams and product literature located in a pocket on inside of door.

B. Internal Arrangement:

1. Internal layout of enclosure shall group and protect pneumatic, electric, and electronic components associated with a controller, but not an integral part of controller.
2. Include a barrier between line-voltage and low-voltage electrical and electronic products.
3. Factory or shop install products, tubing, cabling and wiring complying with requirements and standards indicated.
4. Terminate field cable and wire using heavy-duty terminal blocks.
5. Include enclosure field power supply with a toggle-type switch located at entrance inside enclosure to disconnect power.
6. Include products mounted in enclosures with engraved, laminated phenolic nameplates (black letters on a white background.
7. Route tubing cable and wire located inside enclosure within a raceway with a continuous removable cover.
8. Label each end of cable, wire and tubing in enclosure following an approved identification system that extends from field I/O connection and all intermediate connections throughout length to controller connection.

C. Environmental Requirements:

1. Evaluate temperature and humidity requirements of each product to be installed within each enclosure.

2. Where required by application, include temperature-controlled electrical heat to maintain inside of enclosure above minimum operating temperature of product with most stringent requirement.
3. Where required by application, include temperature-controlled ventilation fans with filtered louver(s) to maintain inside of enclosure below maximum operating temperature of product with most stringent requirement.

2.19 RELAYS

A. General-Purpose Relays:

1. Relays shall be heavy duty and rated for at least 10 A at 250-V ac and 60 Hz.
2. Relays shall be either double pole double throw (DPDT) or three-pole double throw, depending on the control application.
3. Use a plug-in-style relay with an eight-pin octal plug for DPDT relays and an 11-pin octal plug for three-pole double-throw relays.
4. Construct the contacts of either silver cadmium oxide or gold.
5. Enclose the relay in a clear transparent polycarbonate dust-tight cover.
6. Relays shall have LED indication and a manual reset and push-to-test button.
7. Performance:

    a. Mechanical Life: At least 10 million cycles.
    b. Electrical Life: At least 100,000 cycles at rated load.
    c. Pickup Time: 15 ms or less.
    d. Dropout Time: 10 ms or less.
    e. Pull-in Voltage: 85 percent of rated voltage.
    f. Dropout Voltage: 50 percent of nominal rated voltage.
    g. Power Consumption: 2 VA.

8. Equip relays with coil transient suppression to limit transients to non-damaging levels.
9. Plug each relay into an industry-standard, 35-mm DIN rail socket. Plug all relays located in control panels into sockets that are mounted on a DIN rail.
10. Relay socket shall have screw terminals. Mold into the socket the coincident screw terminal numbers and associated octal pin numbers.

B. Multifunction Time-Delay Relays:

1. Relays shall be continuous duty and rated for at least 10 A at 240-V ac and 60 Hz.
2. Relays shall be DPDT relay with up to eight programmable functions to provide on/off delay, interval and recycle timing functions.
3. Use a plug-in-style relay with either an 8- or 11-pin octal plug.
4. Construct the contacts of either silver cadmium oxide or gold.
5. Enclose the relay in a dust-tight cover.
6. Include knob and dial scale for setting delay time.
7. Performance:

    a. Mechanical Life: At least 10 million cycles.
    b. Electrical Life: At least 100,000 cycles at rated load.
    c. Timing Ranges: Multiple ranges from 0.1 seconds to 100 minutes.
    d. Repeatability: Within 2 percent.
    e. Recycle Time: 45 ms.
    f. Minimum Pulse Width Control: 50 ms.
    g. Power Consumption: 5 VA or less at 120-V ac.

8. Equip relays with coil transient suppression to limit transients to non-damaging levels.
9. Plug each relay into an industry-standard, 35-mm DIN rail socket. Plug all relays located in control panels into sockets that are mounted on a DIN rail.
10. Relay socket shall have screw terminals. Mold into the socket the coincident screw terminal numbers and associated octal pin numbers.

C. Latching Relays:

1. Relays shall be continuous duty and rated for at least 10 A at 250-V ac and 60 Hz.
2. Relays shall be either DPDT or three-pole double throw, depending on the control application.
3. Use a plug-in-style relay with a multibladed plug.
4. Construct the contacts of either silver cadmium oxide or gold.
5. Enclose the relay in a clear transparent polycarbonate dust-tight cover.
6. Performance:

    a. Mechanical Life: At least 10 million cycles.
    b. Electrical Life: At least 100,000 cycles at rated load.
    c. Pickup Time: 15 ms or less.
    d. Dropout Time: 10 ms or less.
    e. Pull-in Voltage: 85 percent of rated voltage.
    f. Dropout Voltage: 50 percent of nominal rated voltage.
    g. Power Consumption: 2 VA.

7. Equip relays with coil transient suppression to limit transients to non-damaging levels.
8. Plug each relay into an industry-standard, 35-mm DIN rail socket. Plug all relays located in control panels into sockets that are mounted on a DIN rail.
9. Relay socket shall have screw terminals. Mold into the socket the coincident screw terminal numbers and associated octal pin numbers.

D. Current Sensing Relay:

1. Monitors ac current.
2. Independent adjustable controls for pickup and dropout current.
3. Energized when supply voltage is present and current is above pickup setting.
4. De-energizes when monitored current is below dropout current.
5. Dropout current is adjustable from 50 to 95 percent of pickup current.
6. Include a current transformer, if required for application.
7. House current sensing relay and current transformer in its own enclosure. Use NEMA 250, Type 12 enclosure for indoors and NEMA 250, Type 4 for outdoors.

E. Combination On-Off Status Sensor and On-Off Relay:

1. Description:

    a. On-off control and status indication in a single device.
    b. LED status indication of activated relay and current trigger.
    c. Closed-Open-Auto override switch located on the load side of the relay.

2. Performance:

    a. Ambient Temperature: Minus 30 to 140 deg F.
    b. Voltage Rating: Single-phase loads rated for 300-V ac. Three-phase loads rated for 600-V ac.

3. Status Indication:

    a. Current Sensor: Integral sensing for single-phase loads up to 20 A and external solid or split sensing ring for three-phase loads up to 150 A.
    b. Current Sensor Range: As required by application.
    c. Current Set Point: Fixed or adjustable as required by application.
    d. Current Sensor Output:

        1) Solid-state, single-pole double-throw contact rated for 30-V ac and dc and for 0.4 A.
        2) Solid-state, single-pole double-throw contact rated for 120-V ac and 1.0 A.
        3) Analog, zero- to 5- or 10-V dc.
        4) Analog, 4 to 20 mA, loop powered.

4. Relay: Single-pole double-throw, continuous-duty coil; rated for 10-million mechanical cycles.
5. Enclosure: NEMA 250, Type 1 enclosure.

2.20 ELECTRICAL POWER DEVICES

A. Transformers:

1. Transformer shall be sized for the total connected load, plus an additional 25 percent of connected load.
2. Transformer shall be at least 40 VA.
3. Transformer shall have both primary and secondary fuses.

2.21 PIPING AND TUBING

A. Process Tubing:

1. Products in this paragraph are intended for signals to instruments connected to liquid and steam systems.
2. Copper Tubing:

    a. Seamless phosphor deoxidized copper, soft annealed or drawn tempered with chemical and physical properties according to ASTM B 75.
    b. Performance, dimensions, weight and tolerance according to ASTM B 280.
    c. Diameter, as required by application, of not less than nominal 0.25 inch.

3. Copper Tubing Connectors and Fittings:

    a. Brass, compression or solder-joint type.

4. Stainless-Steel Tubing:

    a. Seamless Type 316 stainless steel, Grade TP, cold drawn, annealed and pickled, free from scale.
    b. Chemical and physical properties according to ASTM A 269.
    c. Diameter, as required by application, of not less than nominal 0.25 inch.

5. Stainless-Steel Tubing Connectors and Fittings:

a. Connectors and fittings shall be stainless steel, with stainless-steel collets, flareless type.
b. Connect instruments to tubing with connectors having compression connector on one end and IPS or NPT thread on other end.

2.22 CONTROL WIRE AND CABLE

A. Wire: Single conductor control wiring above 24 V.

1. Wire size shall be at least No. 18 AWG.
2. Conductor shall be 7/24 soft annealed copper strand.
3. Conductor insulation shall be 600 V, Type THWN or Type THHN, and 90 deg C according to UL 83.
4. Conductor colors shall be black (hot), white (neutral), and green (ground).
5. Furnish wire on spools.
6. Cable shall be plenum rated where installed in return air plenums.

B. Single Twisted Shielded Instrumentation Cable above 24 V:

1. Wire size shall be a minimum No. 18 AWG.
2. Conductor insulation shall have a Type THHN/THWN or Type TFN rating.
3. Shielding shall be 100 percent type, 0.35/0.5-mil aluminum/Mylar tape, helically applied with 25 percent overlap, and aluminum side in with tinned copper drain wire.
4. Outer jacket insulation shall have a 600-V, 90-deg C rating and shall be Type TC cable.
5. For twisted pair, conductor colors shall be black and white. For twisted triad, conductor colors shall be black, red and white.
6. Furnish wire on spools.
7. Cable shall be plenum rated when installed in return air plenums.

C. Single Twisted Shielded Instrumentation Cable 24 V and Less:

1. Wire size shall be a minimum No. 22 AWG.
2. Conductor insulation shall have a nominal 15-mil thickness, constructed from flame-retardant PVC.
3. Shielding shall be 100 percent type, 1.35-mil aluminum/polymer tape, helically applied with 25 percent overlap, and aluminum side in with tinned copper drain wire.
4. Outer jacket insulation shall have a 300-V, 105-deg C rating and shall be Type PLTC cable.
5. For twisted pair, conductor colors shall be black and white. For twisted triad, conductor colors shall be black, red and white.
6. Furnish wire on spools.
7. Cable shall be plenum rated when installed in return air plenums.

D. LAN and Communication Cable: Comply with BAS manufacturer requirements for network being installed.

1. Cable shall be balanced twisted pair.
2. Comply with the following requirements and for balanced twisted pair cable described in Division 26 – Electrical.

a. Cable shall be plenum rated.
b. Cable shall have a unique color that is different from other cables used on Project.

2.23 RACEWAYS, FIBER OPTICS AND CONNECTORS

A. Comply with requirements in Division 26 and 27.

2.24 ACCESSORIES

A. Pressure Electric Switches:

1. Diaphragm-operated snap acting switch.
2. Set point adjustable from 3 to 20 psig.
3. Differential adjustable from 2 to 6 psig.
4. Rated for resistance loads at 120-V ac.
5. Body and switch housing shall be metal.

B. Damper Blade Limit Switches:

1. Sense positive open and/or closed position of the damper blades.
2. NEMA 250, Type 13, oil-tight construction.
3. Arrange for the mounting application.
4. Additional waterproof enclosure when required by its environment.
5. Arrange to prevent "over-center" operation.

C. I/P and E/P Transducers:

1. Commercial Grade:

   a. The transducer shall convert an AO signal to a stepped pneumatic signal. Unless otherwise required by the operating sequence, use a 3- to 15-psig pneumatic signal for pneumatic actuation.
   b. Construct the entire assembly so that shock and vibration will neither harm the transducer nor affect its accuracy.
   c. Transducer shall have auto/manual output switch, manual output control and an output pressure gage.
   d. Accuracy: Within 1.0 percent of the output span.
   e. Linearity: Within 0.5 percent of the output span.
   f. Output Capacity: Not less than 550 scim at 15 psig.
   g. Transducer shall have separate zero and span calibration adjustments.
   h. The transducer shall withstand up to 40 psig of supply pressure without damage.
   i. For use on only modulating pneumatic outputs that are associated with terminal units, including fan-coil units, VAV units, and unit heaters.

D. E/P Switch:

1. Construct the body of cast aluminum or brass; three pipe body (common, normally open, and normally closed).
2. Internal construction of steel, copper or brass.
3. Air Connections: Barb.
4. Rating of 30 psig when installed in systems below 25 psig.
5. Include coil transient suppression.

E. Instrument Enclosures:

1. Include instrument enclosure for secondary protection to comply with requirements indicated in "Performance Requirements" Article.

2. NRTL listed and labeled to UL 50.
3. Sized to include at least 25 percent spare area on subpanel.
4. Instrument(s) mounted within enclosure on internal subpanel(s).
5. Enclosure face with engraved, laminated phenolic nameplate for each instrument within enclosure.
6. Enclosures housing pneumatic instruments shall include main pressure gage and a branch pressure gage for each pneumatic device, installed inside.
7. Enclosures housing multiple instruments shall route tubing and wiring within enclosure in a raceway having a continuous removable cover.
8. Equip enclosure with lock and common key.

F. Manual Valves:

1. Needle Type:

a. PTFE packing.
b. Construct of brass for use with copper and polyethylene tubing and of stainless steel for use with stainless-steel tubing.
c. Aluminum T-bar handle.
d. Include tubing connections.

2. Ball Type:

a. Body: Bronze ASTM B 62 or ASTM B 61.
b. Ball: Type 316 stainless steel.
c. Stem: Type 316 stainless steel.
d. Seats: Reinforced PTFE.
e. Packing Ring: Reinforced PTFE.
f. Lever: Stainless steel with a vinyl grip.
g. 600 WOG.
h. Threaded end connections.

2.25 IDENTIFICATION

A. Control Equipment, Instruments, and Control Devices:

1. Self-adhesive label, laminated acrylic or melamine plastic sign bearing unique identification.

a. Include instruments with unique identification identified by equipment being controlled or monitored, followed by point identification.

2. Instruments, control devices and actuators with Project-specific identification tags having unique identification numbers following requirements indicated and provided by original manufacturer do not require additional identification.

B. Equipment Warning Labels:

1. Self-adhesive label with pressure-sensitive adhesive back and peel-off protective jacket.
2. Lettering size shall be at least 14-point type with white lettering on red background.
3. Warning label shall read "CAUTION-Equipment operated under remote automatic control and may start or stop at any time without warning. Switch electric power disconnecting means to OFF position before servicing."

4. Lettering shall be enclosed in a white line border. Edge of label shall extend at least 0.25 inch beyond white border.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

1. Verify compatibility with and suitability of substrates.

B. Examine roughing-in for products to verify actual locations of connections before installation.

1. Examine roughing-in for instruments installed in piping to verify actual locations of connections before installation.
2. Examine roughing-in for instruments installed in duct systems to verify actual locations of connections before installation.

C. Examine walls, floors, roofs, and ceilings for suitable conditions where product will be installed.

D. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.

E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 BAS INTERFACE WITH OTHER SYSTEMS AND EQUIPMENT

A. Communication Interface to Equipment with Integral Controls:

1. BAS shall have communication interface with equipment having integral controls and having a communication interface for remote monitoring or control.

B. Communication Interface to Other Building Systems:

1. BAS shall have a communication interface with systems having a communication interface.

3.3 BAS SYSTEM INTERFACE WITH EXISTING SYSTEMS

A. Interface with Existing Systems:

1. BAS shall interface existing systems to achieve integration.
2. Integration of Existing Control System into BAS:
   a. Existing control system performance requirements shall be satisfied when monitoring and controlling existing control system through BAS.
   b. Operator shall be able to upload, download, monitor, alarm, report, trend, control and program every input and output point in existing system from DDC system using operator workstations and software provided. The combined systems shall share one database.

c. Interface of existing control system I/O points into BAS shall be transparent to operators. All operational capabilities shall be identical regardless of whether I/O already exists or I/O is being installed.

3.4 CONTROL DEVICES FOR INSTALLATION BY INSTALLERS

A. Deliver selected control devices, specified in indicated HVAC instrumentation and control device Sections, to identified equipment and systems manufacturers for factory installation and to identified installers for field installation.

B. Deliver the following to duct fabricator and Installer for installation in ductwork. Include installation instructions to Installer and supervise installation for compliance with requirements.

1. BAS control dampers, airflow sensors and switches, and pressure sensors.

C. Deliver the following to plumbing and HVAC piping installers for installation in piping. Include installation instructions to Installer and supervise installation for compliance with requirements.

1. BAS control valves, flow meters; pipe-mounted sensors, switches and transmitters; tank-mounted sensors, switches and transmitters; pipe- and tank-mounted thermos-wells.

3.5 CONTROL DEVICES FOR EQUIPMENT MANUFACTURER FACTORY INSTALLATION

A. When applicable, deliver control devices to air-handling or terminal unit equipment manufacturer for factory installation. Include installation instructions to air-handling unit manufacturer. Control devices may include, but are not limited to: Application specific controllers, control valves and dampers, actuators, sensors, switches, transmitters, and relays.

3.6 GENERAL INSTALLATION REQUIREMENTS

A. Install products to satisfy more stringent of all requirements indicated.

B. Install products level, plumb, parallel, and perpendicular with building construction.

C. Support products, tubing, piping wiring and raceways. Brace products to prevent lateral movement and sway or a break in attachment when subjected to a force.

D. If codes and referenced standards are more stringent than requirements indicated, comply with requirements in codes and referenced standards.

E. Fabricate openings and install sleeves in ceilings, floors, roof, and walls required by installation of products. Before proceeding with drilling, punching, and cutting, check for concealed work to avoid damage. Patch, flash, grout, seal, and refinish openings to match adjacent condition.

F. Firestop Penetrations made in fire-rated assemblies shall comply with requirements in applicable specification section covering penetration of fire-stopping.

G. Seal penetrations made in acoustically rated assemblies.

H. If product locations are not indicated, install products in locations that are accessible and that will permit service and maintenance from floor, equipment platforms, or catwalks without removal of permanently installed furniture and equipment.

I. Corrosive Environments:

1. Avoid or limit use of materials in corrosive airstreams and environments, including, but not limited to, the following:

   a. Laboratory exhaust-air streams.
   b. Process exhaust-air streams.

2. When conduit is in contact with a corrosive airstream and environment, use Type 316 stainless-steel conduit and fittings or conduit and fittings that are coated with a corrosive-resistant coating that is suitable for environment. Comply with requirements for installation of raceways and boxes specified in Division 26.
3. Where instruments are located in a corrosive airstream and are not corrosive resistant from manufacturer, field install products in NEMA 250, Type 4X enclosure constructed of Type 316L stainless steel.

3.7 WORKSTATION INSTALLATION

A. Desktop Workstations Installation:

1. Install workstation(s) at location(s) directed by Owner.
2. Install multiple-receptacle power strip with cord for use in connecting multiple workstation components to a single duplex electrical power receptacle.
3. Install software on workstation(s) and verify software functions properly.
4. Develop project-specific graphics, trends, reports, logs and historical database.

B. Portable Workstations Installation:

1. Turn over portable workstations to Owner at Substantial Completion.
2. Install software on workstation(s) and verify software functions properly.

C. Color Graphics Application:

1. Use system schematics indicated as starting point to create graphics.
2. Develop Project-specific library of symbols for representing system equipment and products.
3. Incorporate digital images of Project-completed installation into graphics where beneficial to enhance effect.
4. Refine graphics as necessary for Owner acceptance.

3.8 SERVER INSTALLATION

A. Install server(s) at location(s) directed by Owner.

B. Install number of servers required to suit requirements indicated. Review Project requirements and indicate layout of proposed location in Shop Drawings.

C. Install software indicated on server(s) and verify that software functions properly.

D. Develop Project-specific graphics, trends, reports, logs, and historical database.

3.9 GATEWAY INSTALLATION

A. Install gateways if required for BAS system communication interface requirements indicated.

1. Install gateway(s) required to suit indicated requirements.

B. Test gateway to verify that communication interface functions properly.

3.10 ROUTER INSTALLATION

A. Install routers if required for BAS system communication interface requirements indicated.

1. Install router(s) required to suit indicated requirements.

B. Test router to verify that communication interface functions properly.

3.11 CONTROLLER INSTALLATION

A. Install controllers in enclosures to comply with indicated requirements.

B. Connect controllers to field power supply.

C. Install controller with latest version of applicable software and configure to execute requirements indicated.

D. Test and adjust controllers to verify operation of connected I/O to achieve performance indicated requirements while executing sequences of operation.

E. Installation of Network and Programmable Application Controllers:

1. Quantity and location of network controllers shall be determined by BAS manufacturer to satisfy requirements indicated.
2. Install controllers in a protected location that is easily accessible by operators.
3. Top of controller shall be within 72 inches of finished floor.

F. Application-Specific Controllers:

1. Quantity and location of application-specific controllers shall be determined by BAS manufacturer to satisfy requirements indicated.
2. For controllers not mounted directly on equipment being controlled, install controllers in a protected location that is easily accessible by operators.

3.12 INSTALLATION OF WIRELESS ROUTERS FOR OPERATOR INTERFACE

A. Install wireless routers to achieve optimum performance and best possible coverage.

B. Mount wireless routers in a protected location that is within 60 inches of floor and easily accessible by operators.

C. Connect wireless routers to field power supply and to UPS units if network controllers are powered through UPS units.

D. Install wireless router with latest version of applicable software and configure wireless router with WPA2 security and password protection. Create access password with not less than 12 characters consisting of letters and numbers and at least one special character. Document password in operations and maintenance manuals for reference by operators.

E. Test and adjust wireless routers for proper operation with portable workstation and other wireless devices intended for use by operators.

3.13 ENCLOSURES INSTALLATION

A. Install the following items in enclosures, to comply with indicated requirements:

1. Gateways.
2. Routers.
3. Controllers.
4. Relays.
5. Accessories.
6. Instruments.

B. Attach wall-mounted enclosures to indoor wall using painted steel struts and hardware. Use stainless-steel strut and hardware for mounting enclosures located outdoors.

C. Align top or bottom of adjacent enclosures.

D. Install floor-mounted enclosures located in mechanical equipment rooms on concrete housekeeping pads. Attach enclosure legs using galvanized or stainless steel anchors.

E. Install continuous and fully accessible wireways to connect conduit, wire, and cable to multiple adjacent enclosures. Wireway used for application shall have protection equal to NEMA 250 rating of connected enclosures.

3.14 ELECTRIC POWER CONNECTIONS

A. Connect electrical power to BAS products requiring electrical power connections.

B. Coordinate location of all electrical power drops to products with Electrical Contractor.

3.15 IDENTIFICATION

A. Identify system components, wiring, cabling, and terminals.

B. Install self-adhesive labels laminated acrylic or melamine plastic signs with unique identification on face for each of the following:

1. Gateway.
2. Router.
3. Protocol analyzer.
4. BAS controllers.
5. Enclosures.

C. Install instrument identification on face of each instrument connected to a BAS controller.

D. Warning Labels and Signs:

1. Shall be permanently attached to equipment that can be automatically started by BAS.
2. Shall be located in highly visible location near power service entry points.

3.16 NETWORK INSTALLATION

A. Install optical fiber cable when connecting between the following network devices and when located in different buildings on campus and Owners fiber is not available for BAS use.

1. Operator workstations.
2. Operator workstations and network controllers.
3. Network controllers.

B. Install balanced twisted pair or optical fiber cable when connecting between the following network devices located in same building:

1. Operator workstations.
2. Operator workstations and network controllers.
3. Network controllers.

C. Install balanced twisted pair or copper cable (as required by equipment) when connecting between the following:

1. Gateways.
2. Gateways and network controllers or programmable application controllers.
3. Routers.
4. Routers and network controllers or programmable application controllers.
5. Network controllers and programmable application controllers.
6. Programmable application controllers.
7. Programmable application controllers and application-specific controllers.
8. Application-specific controllers.

D. Install cable in continuous raceway.

1. When pre-approved or where indicated on Drawings, cable trays may be used for copper cable in lieu of conduit.

3.17 NETWORK NAMING AND NUMBERING

A. Coordinate with Owner and provide unique naming and addressing for networks and devices.

B. ASHRAE 135 Networks:

1. MAC Address:

a. Every network device shall have an assigned and documented MAC address unique to its network.
b. Ethernet Networks: Document MAC address assigned at its creation.
c. ARCNET or MS/TP networks: Assign from 00 to 64.

2. Network Numbering:

a. Assign unique numbers to each new network.
b. Provide ability for changing network number through device switches or operator interface.
c. DDC system, with all possible connected LANs, can contain up to 65,534 unique networks.

3. Device Object Identifier Property Number:

a. Assign unique device object identifier property numbers or device instances for each device network.
b. Provide for future modification of device instance number by device switches or operator interface.
c. LAN shall support up to 4,194,302 unique devices.

4. Device Object Name Property Text:

a. Device object name property field shall support 32 minimum printable characters.
b. Assign unique device "Object Name" property names with plain-English descriptive names for each device.

1) Example 1: Device object name for device controlling boiler plant at Building 1000 would be "HW System B1000."
2) Example 2: Device object name for a VAV terminal unit controller could be "VAV unit 102".

5. Object Name Property Text for Other Than Device Objects:

a. Object name property field shall support 32 minimum printable characters.
b. Assign object name properties with plain-English names descriptive of application.

1) Example 1: "Zone 1 Temperature."
2) Example 2 "Fan Start and Stop."

6. Object Identifier Property Number for Other Than Device Objects:

a. Assign object identifier property numbers according to [**Drawings**] [**or**] [**tables**] indicated.
b. If not indicated, object identifier property numbers may be assigned at Installer's discretion but must be approved by Owner in advance, be documented and be unique for like object types within device.

3.18 CONTROL WIRE, CABLE AND RACEWAYS INSTALLATION

A. Comply with NEMA 1.

B. Wire and Cable Installation:

1. Comply with installation requirements of Divisions 26 and 27 when applicable.
2. Install cables with protective sheathing that is waterproof and capable of withstanding continuous temperatures of 90 deg C with no measurable effect on physical and electrical properties of cable.

a. Provide shielding to prevent interference and distortion from adjacent cables and equipment.

3. Terminate wiring in a junction box.

    a. Clamp cable over jacket in junction box.
    b. Individual conductors in the stripped section of the cable shall be slack between the clamping point and terminal block.

4. Terminate field wiring and cable not directly connected to instruments and control devices having integral wiring terminals using terminal blocks.
5. Install signal transmission components according to IEEE C2, REA Form 511a, NFPA 70, and as indicated.
6. Use shielded cable to transmitters.
7. Use shielded cable to temperature sensors.
8. Perform continuity and meager testing on wire and cable after installation.

C. Conduit Installation:

1. Comply with applicable sections of Division 26 and 27.

3.19 BAS SYSTEM I/O CHECKOUT PROCEDURES

A. Check installed products before continuity tests, leak tests and calibration.

B. Check instruments for proper location and accessibility.

C. Check instruments for proper installation on direction of flow, elevation, orientation, insertion depth, or other applicable considerations that will impact performance.

D. Check instrument tubing for proper isolation, fittings, slope, dirt legs, drains, material and support.

E. Control Damper Checkout:

1. For pneumatic dampers, verify that pressure gages are provided in each air line to damper actuator and positioner.
2. Verify that control dampers are installed correctly for flow direction.
3. Verify that proper blade alignment, either parallel or opposed, has been provided.
4. Verify that damper frame attachment is properly secured and sealed.
5. Verify that damper actuator and linkage attachment is secure.
6. Verify that actuator wiring is complete, enclosed and connected to correct power source.
7. Verify that damper blade travel is unobstructed.

F. Control Valve Checkout:

1. For pneumatic valves, verify that pressure gages are provided in each air line to valve actuator and positioner.
2. Verify that control valves are installed correctly for flow direction.
3. Verify that valve body attachment is properly secured and sealed.
4. Verify that valve actuator and linkage attachment is secure.
5. Verify that actuator wiring is complete, enclosed and connected to correct power source.
6. Verify that valve ball, disc or plug travel is unobstructed.
7. After piping systems have been tested and put into service, but before insulating and balancing, inspect each valve for leaks. Adjust or replace packing to stop leaks. Replace the valve if leaks persist.

G. Instrument Checkout:

1. Verify that instrument is correctly installed for location, orientation, direction and operating clearances.
2. Verify that attachment is properly secured and sealed.
3. Verify that conduit connections are properly secured and sealed.
4. Verify that wiring is properly labeled with unique identification, correct type and size and is securely attached to proper terminals.
5. Inspect instrument tag against approved submittal.
6. For instruments with tubing connections, verify that tubing attachment is secure and isolation valves have been provided.
7. For flow instruments, verify that recommended upstream and downstream distances have been maintained.
8. For temperature instruments:

    a. Verify sensing element type and proper material.
    b. Verify length and insertion.

3.20 BAS SYSTEM I/O ADJUSTMENT, CALIBRATION AND TESTING:

A. Calibrate each instrument installed that is not factory calibrated and provided with calibration documentation.

B. Provide a written description of proposed field procedures and equipment for calibrating each type of instrument. Submit procedures before calibration and adjustment.

C. For each analog instrument, make a three-point test of calibration for both linearity and accuracy.

D. Equipment and procedures used for calibration shall comply with instrument manufacturer's written instructions.

E. Provide diagnostic and test equipment for calibration and adjustment.

F. Field instruments and equipment used to test and calibrate installed instruments shall have accuracy at least twice the instrument accuracy being calibrated. An installed instrument with an accuracy of 1 percent shall be checked by an instrument with an accuracy of 0.5 percent.

G. Calibrate each instrument according to instrument instruction manual supplied by manufacturer.

H. If after calibration indicated performance cannot be achieved, replace out-of-tolerance instruments.

I. Comply with field testing requirements and procedures indicated by ASHRAE's Guideline 11, "Field Testing of HVAC Control Components," in the absence of specific requirements, and to supplement requirements indicated.

J. Analog Signals:

1. Check analog voltage signals using a precision voltage meter at zero, 50, and 100 percent.
2. Check analog current signals using a precision current meter at zero, 50, and 100 percent.

3. Check resistance signals for temperature sensors at zero, 50, and 100 percent of operating span using a precision-resistant source.

K. Digital Signals:

1. Check digital signals using a jumper wire.
2. Check digital signals using an ohmmeter to test for contact making or breaking.

L. Control Dampers:

1. Stroke and adjust control dampers following manufacturer's recommended procedure, from 100 percent open to 100 percent closed and back to 100 percent open.
2. Stroke control dampers with pilot positioners. Adjust damper and positioner following manufacturer's recommended procedure, so damper is 100 percent closed, 50 percent closed and 100 percent open at proper air pressure.
3. Check and document open and close cycle times for applications with a cycle time less than 30 seconds.
4. For control dampers equipped with positive position indication, check feedback signal at multiple positions to confirm proper position indication.

M. Control Valves:

1. Stroke and adjust control valves following manufacturer's recommended procedure, from 100 percent open to 100 percent closed and back to 100 percent open.
2. Stroke control valves with pilot positioners. Adjust valve and positioner following manufacturer's recommended procedure, so valve is 100 percent closed, 50 percent closed and 100 percent open at proper air pressures.
3. Check and document open and close cycle times for applications with a cycle time less than 30 seconds.
4. For control valves equipped with positive position indication, check feedback signal at multiple positions to confirm proper position indication.

N. Meters: Check sensors at zero, 50, and 100 percent of Project design values.

O. Sensors: Check sensors at zero, 50, and 100 percent of Project design values.

P. Switches: Calibrate switches to make or break contact at set points indicated.

Q. Transmitters:

1. Check and calibrate transmitters at zero, 50, and 100 percent of Project design values.
2. Calibrate resistance temperature transmitters at zero, 50, and 100 percent of span using a precision-resistant source.

3.21 BAS CONTROLLER CHECKOUT

A. Verify power supply.

1. Verify voltage, phase and hertz.
2. Verify that protection from power surges is installed and functioning.
3. Verify that ground fault protection is installed.
4. If applicable, verify if connected to UPS unit.
5. If applicable, verify if connected to a backup power source.

6. If applicable, verify that power conditioning units, transient voltage suppression and high-frequency noise filter units are installed.

B. Verify that wire and cabling is properly secured to terminals and labeled with unique identification.

C. Verify that spare I/O capacity is provided.

3.22 BAS CONTROLLER I/O CONTROL LOOP TESTS

A. Testing:

1. Test every I/O point connected to BAS controller to verify that safety and operating control set points are as indicated and as required to operate controlled system safely and at optimum performance.
2. Test every I/O point throughout its full operating range.
3. Test every control loop to verify operation is stable and accurate.
4. Adjust control loop proportional, integral and derivative settings to achieve optimum performance while complying with performance requirements indicated. Document testing of each control loop's precision and stability via trend logs.
5. Test and adjust every control loop for proper operation according to sequence of operation.
6. Test software and hardware interlocks for proper operation. Correct deficiencies.
7. Operate each analog point at the following:

    a. Upper quarter of range.
    b. Lower quarter of range.
    c. At midpoint of range.

8. Exercise each binary point.
9. For every I/O point in BAS, read and record each value at operator workstation, at BAS controller and at field instrument simultaneously. Value displayed at operator workstation, at BAS controller and at field instrument shall match.
10. Prepare and submit a report documenting results for each I/O point in BAS and include in each I/O point a description of corrective measures and adjustments made to achieve desire results.

3.23 BAS SYSTEM VALIDATION TESTS

A. Perform validation tests before requesting final review of system. Before beginning testing, first submit Pretest Checklist and Test Plan.

B. After approval of Test Plan, execute all tests and procedures indicated in plan.

C. After testing is complete, submit completed test checklist.

D. Pretest Checklist: Submit the following list with items checked off once verified:

1. Detailed explanation for any items that are not completed or verified.
2. Required mechanical installation work is successfully completed and HVAC equipment is working correctly.
3. HVAC equipment motors operate below full-load amperage ratings.
4. Required BAS system components, wiring, and accessories are installed.

5. Installed BAS system architecture matches approved Drawings.
6. Control electric power circuits operate at proper voltage and are free from faults.
7. Required surge protection is installed.
8. BAS system network communications function properly, including uploading and downloading programming changes.
9. Using BACnet protocol analyzer, verify that communications are error free.
10. Each controller's programming is backed up.
11. Equipment, products, tubing, wiring cable and conduits are properly labeled.
12. All I/O points are programmed into controllers.
13. Testing, adjusting and balancing work affecting controls is complete.
14. Dampers and actuators zero and span adjustments are set properly.
15. Each control damper and actuator goes to failed position on loss of power.
16. Valves and actuators zero and span adjustments are set properly.
17. Each control valve and actuator goes to failed position on loss of power.
18. Meter, sensor and transmitter readings are accurate and calibrated.
19. Control loops are tuned for smooth and stable operation.
20. View trend data where applicable.
21. Each controller works properly in standalone mode.
22. Safety controls and devices function properly.
23. Interfaces with fire-alarm system function properly.
24. Electrical interlocks function properly.
25. Operator workstations and other interfaces are delivered, all system and database software is installed, and graphic are created.
26. Record Drawings are completed.

E. Test Plan:

1. Prepare and submit a validation test plan including test procedures for performance validation tests.
2. Test plan shall address all specified functions of BAS system and sequences of operation.
3. Explain detailed actions and expected results to demonstrate compliance with requirements indicated.
4. Explain method for simulating necessary conditions of operation used to demonstrate performance.
5. Include a test checklist to be used to check and initial that each test has been successfully completed.
6. Submit test plan documentation 10 business days before start of tests.

F. Validation Test:

1. Verify operating performance of each I/O point in BAS.

    a. Verify analog I/O points at operating value.
    b. Make adjustments to out-of-tolerance I/O points.

        1) Identify I/O points for future reference.
        2) Simulate abnormal conditions to demonstrate proper function of safety devices.
        3) Replace instruments and controllers that cannot maintain performance indicated after adjustments.

2. Simulate conditions to demonstrate proper sequence of control.
3. Readjust settings to design values and observe ability of BAS to establish desired conditions.
4. After 24 Hours following Initial Validation Test:

a. Re-check I/O points that required corrections during initial test.
b. Identify I/O points that still require additional correction and make corrections necessary to achieve desired results.

5. After 24 Hours of Second Validation Test:

a. Re-check I/O points that required corrections during second test.
b. Continue validation testing until I/O point is normal on two consecutive tests.

6. Completely check out, calibrate, and test all connected hardware and software to ensure that BAS performs according to requirements indicated.
7. After validation testing is complete, prepare and submit a report indicating all I/O points that required correction and how many validation re-tests it took to pass. Identify adjustments made for each test and indicate instruments that were replaced.

G. BAS Network Bandwidth Test:

1. Test network bandwidth usage on all BAS networks to demonstrate bandwidth usage under BAS normal operating conditions and under simulated HLC.
2. To pass, none of BAS system networks shall use more than 70 percent of available bandwidth under normal and HLC operation.

3.24 BAS WIRELESS NETWORK VERIFICATION

A. BAS Installer shall design wireless BAS networks to comply with performance requirements indicated.

B. Installer shall verify wireless network performance through field testing and shall document results in a field test report.

C. Testing and verification of all wireless devices shall include, but not be limited to, the following:

1. Speed.
2. Online status.
3. Signal strength.

3.25 FINAL REVIEW

A. Submit written request to Engineer, General Contractor or Construction Manager when BAS is ready for final review. Written request shall state the following:

1. BAS has been thoroughly inspected for compliance with contract documents and found to be in full compliance.
2. BAS has been calibrated, adjusted and tested and found to comply with requirements of operational stability, accuracy, speed and other performance requirements indicated.
3. BAS monitoring and control of HVAC systems results in operation according to sequences of operation indicated.
4. BAS is complete and ready for final review.

B. Review by Engineer, and General Contractor or Construction Manager shall be made after receipt of written request. A field report shall be issued to document observations and deficiencies.

C. Take prompt action to remedy deficiencies indicated in field report and submit a second written request when all deficiencies have been corrected. Repeat process until no deficiencies are reported.

D. Should more than two reviews be required, BAS manufacturer and Installer shall compensate entity performing review for total costs, labor and expenses, associated with third and subsequent reviews. Estimated cost of each review shall be submitted and approved by BAS manufacturer and Installer before making the review.

E. Prepare and submit closeout submittals when no deficiencies are reported.

F. A part of BAS final review shall include a demonstration to parties participating in final review.

1. Provide staff familiar with BAS installed to demonstrate operation of BAS during final review.
2. Provide testing equipment to demonstrate accuracy and other performance requirements of BAS that is requested by reviewers during final review.
3. Demonstration shall include, but not be limited to, the following:

    a. Accuracy and calibration of I/O points randomly selected by reviewers. If review finds that some I/O points are not properly calibrated and not satisfying performance requirements indicated, additional I/O points may be selected by reviewers until total I/O points being reviewed that satisfy requirements equals quantity indicated.
    b. HVAC equipment and system hardwired and software safeties and life-safety functions are operating according to sequence of operation.
    c. Correct sequence of operation after electrical power interruption and resumption after electrical power is restored for randomly selected HVAC systems.
    d. Operation of randomly selected dampers and valves in normal-on, normal-off and failed positions.
    e. Reporting of alarm conditions for randomly selected alarms, including different classes of alarms, to ensure that alarms are properly received by operators and operator workstations.
    f. Trends, summaries, logs and reports set-up for Project.
    g. For HVAC systems randomly selected by reviewers, use graph trends to show that sequence of operation is executed in correct manner and that HVAC systems operate properly through complete sequence of operation including different modes of operations indicated. Show that control loops are stable and operating at set points and respond to changes in set point of 20 percent or more.
    h. Software's ability to communicate with controllers, operator workstations, uploading and downloading of control programs.
    i. Software's ability to edit control programs off-line.
    j. Data entry to show Project-specific customizing capability including parameter changes.
    k. Step through penetration tree, display all graphics, demonstrate dynamic update, and direct access to graphics.
    l. Execution of digital and analog commands in graphic mode.
    m. Spreadsheet and curve plot software and its integration with database.
    n. Online user guide and help functions.
    o. Multitasking by showing different operations occurring simultaneously on four quadrants of split screen.
    p. System speed of response compared to requirements indicated.
    q. For each Network and Programmable Application Controller:

        1) Memory: Programmed data, parameters, trend and alarm history collected during normal operation is not lost during power failure.

2) Operator Interface: Ability to connect directly to each type of digital controller with a portable workstation and mobile device. Show that maintenance personnel interface tools perform as indicated in manufacturer's technical literature.
3) Standalone Ability: Demonstrate that controllers provide stable and reliable standalone operation using default values or other method for values normally read over network.
4) Electric Power: Ability to disconnect any controller safely from its power source.
5) Wiring Labels: Match control drawings.
6) Network Communication: Ability to locate a controller's location on network and communication architecture matches Shop Drawings.
7) Nameplates and Tags: Accurate and permanently attached to control panel doors, instrument, actuators and devices.

r. For Each Operator Workstation:

1) I/O points lists agree with naming conventions.
2) Graphics are complete.
3) UPS unit, if applicable, operates.

s. Communications and Interoperability: Demonstrate proper interoperability of data sharing, alarm and event management, trending, scheduling, and device and network management. Requirements must be met even if only one manufacturer's equipment is installed.

1) Data Presentation: On each operator workstation, demonstrate graphic display capabilities.
2) Reading of Any Property: Demonstrate ability to read and display any used readable object property of any device on network.
3) Set Point and Parameter Modifications: Show ability to modify set points and tuning parameters indicated.
4) Peer-to-Peer Data Exchange: Network devices are installed and configured to perform without need for operator intervention to implement Project sequence of operation and to share global data.
5) Alarm and Event Management: Alarms and events are installed and prioritized according to Owner. Demonstrate that time delays and other logic are set up to avoid nuisance tripping. Show that operators with sufficient privileges are permitted.
6) Schedule Lists: Schedules are configured for start and stop, mode change, occupant overrides, and night setback as defined in sequence of operations.
7) Schedule Display and Modification: Ability to display any schedule with start and stop times for calendar year. Show that all calendar entries and schedules are modifiable from any connected operator workstation by an operator with sufficient privilege.
8) Archival Storage of Data: Data archiving is handled by operator workstation and server and local trend archiving and display is accomplished.
9) Modification of Trend Log Object Parameters: Operator with sufficient privilege can change logged data points, sampling rate, and trend duration.
10) Device and Network Management:

a) Display of network device status.
b) Display of BACnet Object Information.
c) Silencing devices transmitting erroneous data.
d) Time synchronization.
e) Remote device re-initialization.

f) Backup and restore network device programming and master database(s).
g) Configuration management of routers.

3.26 ADJUSTING

A. Occupancy Adjustments: When requested within 12-months from date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to two visits to Project during other-than-normal occupancy hours for this purpose.

3.27 MAINTENANCE SERVICE

A. Maintenance Service: Beginning at Substantial Completion, maintenance service shall include 12- months' full maintenance by BAS manufacturer's authorized service representative. Include preventive maintenance, repair or replacement of worn or defective components, cleaning, calibration and adjusting as required for proper operation. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.

3.28 SOFTWARE SERVICE AGREEMENT

A. Technical Support: Beginning at end of warranty period (one year from Substantial Completion), include in your bid a service agreement that shall include software support for two year(s).

B. Upgrade Service: At Substantial Completion, update software to latest version. Install and program software upgrades that become available within during the warranty period at no cost to Owner. Upgrading software shall include operating system and new or revised licenses for using software.

3.29 DEMONSTRATION

A. Engage a factory-authorized service representative with complete knowledge of Project-specific system installed to train Owner's maintenance personnel to adjust, operate, and maintain BAS.

B. Extent of Training:

1. Base extent of training on scope and complexity of BAS indicated and training requirements indicated. Provide extent of training required to satisfy requirements indicated even if more than minimum training requirements are indicated.
2. Inform Owner of anticipated training requirements if more than minimum training requirements are indicated.
3. Minimum Training Requirements:

    a. Provide not less than 8-hours of initial training. This training shall not be counted as the time spent with owner during start-up, testing, or demonstration.
    b. After three months, provide an additional 4-hours of dedicated training to review system operations with the Owner, and answer owner questions about operation of the BAS or mechanical components.
    c. At approximately 9 to 10-months from the substantial completion, provide 4 additional hours of Owner training. Prior to conducting the training, contact the owner and request in writing a list of questions or concerns the Owner has on the operation or use of the BAS controls. Use this training as a means to specifically

answer any questions and run through a refresher of how the system operates and BAS capabilities as far as trending, scheduling, etc.

C. Training Schedule:

1. Schedule training with Owner at least 10-business days before expected Substantial Completion.
2. Training shall occur within normal business hours at a mutually agreed on time. Unless otherwise agreed to, training shall occur Monday through Friday.

D. Training Attendee List and Sign-in Sheet:

1. Request from Owner in advance of training a proposed attendee list with name, phone number and e-mail address.
2. Provide a preprinted sign-in sheet for each training session with proposed attendees listed and no fewer than six blank spaces to add additional attendees.
3. Preprinted sign-in sheet shall include training session number, date and time, instructor name, phone number and e-mail address, and brief description of content to be covered during session. List attendees with columns for name, phone number, e-mail address and a column for attendee signature or initials.
4. Circulate sign-in sheet at beginning of each session and solicit attendees to sign or initial in applicable location.
5. At end of each training session, send Owner an e-mail with an attachment of scanned copy (PDF) of circulated sign-in sheet for each session.

E. Training Attendee Headcount:

1. Plan in advance of training for at least three attendees.
2. Make allowance for Owner to add up to two attendee(s) at time of training.
3. Headcount may vary depending on training content covered in session. Attendee access may be restricted to some training content for purposes of maintaining system security.
4. Training Attendee Prior Knowledge: For guidance in planning required training and instruction, assume attendees have a high school degree and only the basic user knowledge of computers and office applications, basic knowledge of HVAC systems, and little knowledge of BAS.
5. Provide each attendee with a color hard copy of all training materials and visual presentations.

F. Instructor Requirements:

1. Instructors shall have not less than two years of providing instructional training on not less than five past projects with similar BAS scope and complexity to system installed.

G. On-Site Training:

1. Owner will provide conditioned classroom or workspace with ample desks or tables, chairs, power and data connectivity for instructor and each attendee.
2. Instructor shall provide training materials, projector and other audiovisual equipment used in training.
3. Provide as much of training located on-site as deemed feasible and practical by Owner.
4. On-site training shall include regular walk-through tours, as required, to observe each unique product type installed with hands-on review of operation, calibration and service requirements.
5. Operator workstation provided with BAS shall be used in training. If operator workstation is not indicated, provide a temporary workstation to convey training content.

H. Training Content for Daily Operators:

1. Basic operation of system.
2. Understanding BAS architecture and configuration.
3. Understanding each unique product type installed including performance and service requirements for each.
4. Understanding operation of each system and equipment controlled by BAS including sequences of operation, each unique control algorithm and each unique optimization routine.
5. Logging on and off system.
6. Accessing graphics, reports and alarms.
7. Adjusting and changing set points and time schedules.
8. Recognizing BAS malfunctions.
9. Understanding content of operation and maintenance manuals including control drawings.
10. Understanding physical location and placement of BAS controllers and I/O hardware.
11. Accessing data from BAS controllers.
12. Operating portable operator workstations.
13. Running each specified report and log.
14. Displaying and demonstrating data entry to show Project-specific customizing capability. Demonstrating parameter changes.
15. Stepping through graphics penetration tree, displaying all graphics, demonstrating dynamic updating, and direct access to graphics.
16. Executing digital and analog commands in graphic mode.
17. Demonstrating BAS system performance through trend logs and command tracing.
18. Demonstrating on-line user guide, and help function and mail facility.
19. Demonstrating the following for HVAC systems and equipment controlled by BAS:

    a. Operation of HVAC equipment in normal-off, -on and failed conditions while observing individual equipment, dampers and valves for correct position under each condition.
    b. For HVAC equipment with factory-installed software, show that integration into BAS is able to communicate with BAS controllers or gateways, as applicable.
    c. Using graphed trends, show that sequence of operation is executed in correct manner, and HVAC systems operate properly through complete sequence of operation including seasonal change, occupied and unoccupied modes, warm-up and cool-down cycles and other modes of operation indicated.
    d. Reporting of alarm conditions for each alarm, and confirm that alarms are received at assigned locations, including operator workstations.

END OF SECTION

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. Pipes, tubes, and fittings.
2. Piping and tubing joining materials.
3. Manual gas shutoff valves.
4. Dielectric fittings.

1.3 DEFINITIONS

A. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.

B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.

C. 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.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of the following:

1. Piping specialties.
2. Valves. Include pressure rating, capacity, settings, and electrical connection data of selected models.
3. Dielectric fittings.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Handling Flammable Liquids: Remove and dispose of liquids from existing natural-gas piping according to requirements of authorities having jurisdiction.

B. 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.

C. Store and handle pipes and tubes having factory-applied protective coatings to avoid damaging coating, and protect from direct sunlight.

1.6 PROJECT CONDITIONS

A. Perform site survey, research public utility records, and verify existing utility locations. Contact utility-locating service for area where Project is located.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Minimum Operating-Pressure Ratings:

1. Piping and Valves: 100 psig minimum unless otherwise indicated.

B. Natural-Gas System Pressure within Buildings: 0.5 psig or less.

2.2 PIPES, TUBES, AND FITTINGS

A. Steel Pipe: ASTM A53/A53M, black steel, Schedule 40, Type E or S, Grade B.

1. Malleable-Iron Threaded Fittings: ASME B16.3, Class 150, standard pattern.
2. Wrought-Steel Welding Fittings: ASTM A234/A234M for butt welding and socket welding.
3. Unions: ASME B16.39, Class 150, malleable iron with brass-to-iron seat, ground joint, and threaded ends.

2.3 JOINING MATERIALS

A. Joint Compound and Tape: Suitable for natural gas.

B. Welding Filler Metals: Comply with AWS D10.12/D10.12M for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

2.4 MANUAL GAS SHUTOFF VALVES

A. See "Aboveground Manual Gas Shutoff Valve Schedule" Article for where each valve type is applied in various services.

B. General Requirements for Metallic Valves, NPS 2 and Smaller: Comply with ASME B16.33.

1. CWP Rating: 125 psig.
2. Threaded Ends: Comply with ASME B1.20.1.
3. Dryseal Threads on Flare Ends: Comply with ASME B1.20.3.
4. Tamperproof Feature: Locking feature for valves indicated in "Aboveground Manual Gas Shutoff Valve Schedule" Article.
5. Listing: Listed and labeled by an NRTL acceptable to authorities having jurisdiction for valves 1 inch and smaller.
6. Service Mark: Valves 1-1/4 inches to NPS 2 shall have initials "WOG" permanently marked on valve body.

C. Two-Piece, Full-Port, Bronze Ball Valves with Bronze Trim: MSS SP-110.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. A.Y. McDonald Mfg. Co.
    b. Apollo Valves; a part of Aalberts Integrated Piping Systems.
    c. BrassCraft Manufacturing Co.; a Masco company.
    d. R. W. Lyall & Company, Inc.; a Hubbell company.

2. Body: Bronze, complying with ASTM B584.
3. Ball: Chrome-plated bronze.
4. Stem: Bronze; blowout proof.
5. Seats: Reinforced TFE; blowout proof.
6. Packing: Threaded-body packnut design with adjustable-stem packing.
7. Ends: Threaded, flared, or socket as indicated in "Aboveground Manual Gas Shutoff Valve Schedule" Article.
8. CWP Rating: 600 psig.
9. Listing: Valves NPS 1 and smaller shall be listed and labeled by an NRTL acceptable to authorities having jurisdiction.
10. Service: Suitable for natural-gas service with "WOG" indicated on valve body.

D. Bronze Plug Valves: MSS SP-78.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. A.Y. McDonald Mfg. Co.

2. Body: Bronze, complying with ASTM B584.
3. Plug: Bronze.
4. Ends: Threaded, socket, or flanged as indicated in "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles.
5. Operator: Square head or lug type with tamperproof feature where indicated.
6. Pressure Class: 125 psig.
7. Listing: Valves NPS 1 and smaller shall be listed and labeled by an NRTL acceptable to authorities having jurisdiction.
8. Service: Suitable for natural-gas service with "WOG" indicated on valve body.

2.5 DIELECTRIC FITTINGS

A. General Requirements: Assembly of copper alloy and ferrous materials with separating nonconductive insulating material. Include end connections compatible with pipes to be joined.

B. Dielectric Unions:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. A.Y. McDonald Mfg. Co.
    b. Capitol Group.
    c. GF Piping Systems.
    d. HART Industrial Unions, LLC.
    e. Jomar Valve.
    f. Matco-Norca.
    g. WATTS.

h. Wilkins; a Zurn company.
i. Zurn Water, LLC.

2. Description:

a. Standard: ASSE 1079.
b. Pressure Rating: 125 psig minimum at 180 deg F.
c. End Connections: Solder-joint copper alloy and threaded ferrous.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine roughing-in for natural-gas piping system to verify actual locations of piping connections before equipment installation.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Close equipment shutoff valves before turning off natural gas to premises or piping section.

B. Inspect natural-gas piping according to NFPA 54 to determine that natural-gas utilization devices are turned off in piping section affected.

C. Comply with NFPA 54 requirements for prevention of accidental ignition.

3.3 OUTDOOR PIPING INSTALLATION

A. Comply with NFPA 54 for installation and purging of natural-gas piping.

B. Install fittings for changes in direction and branch connections.

3.4 INDOOR PIPING INSTALLATION

A. Comply with NFPA 54 for installation and purging of natural-gas piping.

B. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements are used to size pipe and calculate friction loss, expansion, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.

C. Arrange for pipe spaces, chases, slots, sleeves, and openings in building structure during progress of construction, to allow for mechanical installations.

D. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.

E. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

F. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

G. Locate valves for easy access.

H. Install natural-gas piping at uniform grade of 2 percent down toward drip and sediment traps.

I. Install piping free of sags and bends.

J. Install fittings for changes in direction and branch connections.

K. Verify final equipment locations for roughing-in.

L. Comply with requirements in Sections specifying gas-fired appliances and equipment for roughing-in requirements.

M. Drips and Sediment Traps: Install drips at points where condensate may collect, including service-meter outlets. Locate where accessible to permit cleaning and emptying. Do not install where condensate is subject to freezing.

1. Construct drips and sediment traps using tee fitting with bottom outlet plugged or capped. Use nipple a minimum length of 3 pipe diameters, but not less than 3 inches long and same size as connected pipe. Install with space below bottom of drip to remove plug or cap.

N. Use eccentric reducer fittings to make reductions in pipe sizes. Install fittings with level side down.

O. Connect branch piping from top or side of horizontal piping.

P. Install unions in pipes NPS 2 and smaller, adjacent to each valve, at final connection to each piece of equipment. Unions are not required at flanged connections.

Q. Do not use natural-gas piping as grounding electrode.

3.5 VALVE INSTALLATION

A. Install manual gas shutoff valve for each gas appliance ahead of corrugated stainless-steel tubing, aluminum, or copper connector.

B. Install regulators and overpressure protection devices with maintenance access space adequate for servicing and testing.

3.6 PIPING JOINT CONSTRUCTION

A. Ream ends of pipes and tubes and remove burrs.

B. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

C. Threaded Joints:

1. Thread pipe with tapered pipe threads complying with ASME B1.20.1.
2. Cut threads full and clean using sharp dies.
3. Ream threaded pipe ends to remove burrs and restore full inside diameter of pipe.
4. Apply appropriate tape or thread compound to external pipe threads unless dryseal threading is specified.
5. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

D. Welded Joints:

1. Construct joints according to AWS D10.12/D10.12M, using qualified processes and welding operators.
2. Bevel plain ends of steel pipe.
3. Patch factory-applied protective coating as recommended by manufacturer at field welds and where damage to coating occurs during construction.

3.7 HANGER AND SUPPORT INSTALLATION

A. Comply with requirements for pipe hangers and supports specified in Section 230500 "Common Work Results for HVAC."

B. Install hangers for steel piping, with maximum horizontal spacing and minimum rod diameters, to comply with MSS-58, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.

C. Support horizontal piping within 12 inches of each fitting.

D. Support vertical runs of steel piping to comply with MSS-58, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.

3.8 CONNECTIONS

A. Connect to utility's gas main according to utility's procedures and requirements.

B. Install natural-gas piping electrically continuous, and bonded to gas appliance equipment grounding conductor of the circuit powering the appliance according to NFPA 70.

C. Install piping adjacent to appliances to allow service and maintenance of appliances.

D. Connect piping to appliances using manual gas shutoff valves and unions. Install valve within 72 inches of each gas-fired appliance and equipment. Install union between valve and appliances or equipment.

E. Sediment Traps: Install tee fitting with capped nipple in bottom to form drip, as close as practical to inlet of each appliance.

3.9 LABELING AND IDENTIFYING

A. Comply with requirements in Section 230553 "Identification for HVAC Piping and Equipment" for piping and valve identification.

3.10 PAINTING

A. Paint exposed, exterior metal piping, valves, and piping specialties, except components, with factory-applied paint or protective coating.

1. Alkyd System: MPI EXT 5.1D.

a. Prime Coat: Alkyd anticorrosive metal primer.
b. Intermediate Coat: Exterior alkyd enamel matching topcoat.
c. Topcoat: Exterior alkyd enamel.
d. Color: Owner's standard.

B. Paint exposed, interior metal piping, valves, and piping specialties, except components, with factory-applied paint or protective coating.

1. Latex Over Alkyd Primer System: MPI INT 5.1Q.

a. Prime Coat: Alkyd anticorrosive metal primer.
b. Intermediate Coat: Interior latex matching topcoat.
c. Topcoat: Interior latex.
d. Color: Owner's standard.

2. Alkyd System: MPI INT 5.1E.

a. Prime Coat: Alkyd anticorrosive metal primer.
b. Intermediate Coat: Interior alkyd matching topcoat.
c. Topcoat: Interior alkyd.
d. Color: Owner's standard.

C. Damage and Touchup: Repair marred and damaged factory-applied finishes with materials and by procedures to match original factory finish.

3.11 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Tests and Inspections:

1. Test, inspect, and purge natural gas according to NFPA 54 and authorities having jurisdiction.

C. Natural-gas piping will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

3.12 OUTDOOR PIPING SCHEDULE

A. Aboveground natural-gas piping shall be one of the following:

1. Steel pipe with malleable-iron fittings and threaded joints.
2. Steel pipe with wrought-steel fittings and welded joints.

3.13 INDOOR PIPING SCHEDULE FOR SYSTEM PRESSURES LESS THAN 0.5 PSIG

A. Aboveground, distribution piping shall be one of the following:

1. Steel pipe with malleable-iron fittings and threaded joints.
2. Steel pipe with wrought-steel fittings and welded joints.

3.14 ABOVEGROUND MANUAL GAS SHUTOFF VALVE SCHEDULE

A. Distribution piping valves for pipe sizes NPS 2 and smaller shall be one of the following:

1. Two-piece, full-port, bronze ball valves with bronze trim.
2. Bronze plug valve.

END OF SECTION

SECTION 232113 - HYDRONIC PIPING

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. Copper tube and fittings.
2. Joining materials.
3. Dielectric fittings.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of the following:

1. Pipe and tube.
2. Fittings.
3. Joining materials.

1.4 QUALITY ASSURANCE

A. Installer Qualifications:

1. Installers of Pressure-Sealed Joints: Installers shall be certified by pressure-seal joint manufacturer as having been trained and qualified to join piping with pressure-seal pipe couplings and fittings.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Hydronic piping components and installation shall be capable of withstanding the following minimum working pressure and temperature unless otherwise indicated:

1. Hot-Water Heating Piping: 100 psig at 180 deg F
2. Chilled-Water Piping: 150 psig at 73 deg F.
3. Condensate-Drain Piping: 150 deg F.

2.2 COPPER TUBE AND FITTINGS

A. Drawn-Temper Copper Tube: ASTM B88, Type L.

B. DWV Copper Tube: ASTM B306, Type DWV.

C. Wrought-Copper, Solder-Joint Fittings: ASME B16.22, pressure fittings.

D. Wrought Copper Unions: ASME B16.22.

E. Copper-Tube, Pressure-Seal-Joint Fittings:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Elkhart Products Corporation.
b. Mueller Industries, Inc.
c. NIBCO INC.
d. Viega LLC.

2. Fittings: Cast-brass, cast-bronze, or wrought-copper with EPDM O-ring seal in each end.
3. Minimum 200-psig working-pressure rating at 250 deg F.

2.3 JOINING MATERIALS

A. Solder Filler Metals: ASTM B32, lead-free alloys. Include water-flushable flux according to ASTM B813.

B. Solvent Cements for PVC Piping: ASTM D2564. Include primer according to ASTM F656.

2.4 DIELECTRIC FITTINGS

A. General Requirements: Assembly of copper alloy and ferrous materials with separating nonconductive insulating material. Include end connections compatible with pipes to be joined.

B. Dielectric Unions:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. A. Y. McDonald Mfg. Co.
b. Capitol Manufacturing Company.
c. Central Plastics Company.
d. HART Industrial Unions, LLC.
e. Jomar Valve.
f. Matco-Norca.
g. WATTS.
h. Wilkins.
i. Zurn Industries.

2. Description:

a. Standard: ASSE 1079.
b. Pressure Rating: 125 psig minimum at 180 deg F.
c. End Connections: Solder-joint copper alloy and threaded ferrous.

PART 3 - EXECUTION

3.1 PIPING APPLICATIONS

A. Hot-water heating piping, aboveground, NPS 2 and smaller, shall be any of the following:

1. Type L, drawn-temper copper tubing, wrought-copper fittings, and soldered or pressure-seal joints.
2. Schedule 40, Grade B steel pipe; Class 150, malleable-iron fittings; and threaded joints.

B. Chilled-water piping, aboveground, NPS 2 and smaller, shall be any **of** the following:

1. Type L, drawn-temper copper tubing, wrought-copper fittings, and soldered or pressure-seal joints.
2. Schedule 40, Grade B steel pipe; Class 150, malleable-iron fittings; and threaded joints.

C. Condensate-Drain Piping, Copper: Type M or Type DWV, drawn-temper copper tubing, wrought-copper fittings, and soldered joints or Schedule 40 PVC plastic pipe and fittings and solvent-welded joints.

3.2 INSTALLATION OF PIPING

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements are used to size pipe and calculate friction loss, expansion, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.

B. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.

C. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

D. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

E. Install piping to permit valve servicing.

F. Install piping at indicated slopes.

G. Install piping free of sags and bends.

H. Install fittings for changes in direction and branch connections.

I. Install piping to allow application of insulation.

J. Select system components with pressure rating equal to or greater than system operating pressure.

K. Install groups of pipes parallel to each other, spaced to permit applying insulation and servicing of valves.

L. Install drains, consisting of a tee fitting, NPS 3/4 ball valve, and short NPS 3/4 threaded nipple with cap, at low points in piping system mains and elsewhere as required for system drainage.

M. Install piping at a uniform grade of 0.2 percent upward in direction of flow.

N. Reduce pipe sizes using eccentric reducer fitting installed with level side up.

O. Install branch connections to mains using tee fittings in main pipe, with the branch connected to the bottom of the main pipe. For up-feed risers, connect the branch to the top of the main pipe.

P. Install valves according to Section 230500 "Common Work Results for HVAC."

Q. Install unions in piping, NPS 2 and smaller, adjacent to valves, at final connections of equipment, and elsewhere as indicated.

R. Install shutoff valve immediately upstream of each dielectric fitting.

S. Comply with requirements in Section 230553 "Identification for HVAC Piping and Equipment" for identifying piping.

3.3 JOINT CONSTRUCTION

A. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

B. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

C. Soldered Joints: Apply ASTM B813, water-flushable flux, unless otherwise indicated, to tube end. Construct joints according to ASTM B828 or CDA's "Copper Tube Handbook," using lead-free solder alloy complying with ASTM B32.

D. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

E. Plastic Piping Solvent-Cemented Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:

1. Comply with ASTM F402 for safe-handling practice of cleaners, primers, and solvent cements.
2. PVC Nonpressure Piping: Join according to ASTM D2855.

F. Mechanically Formed, Copper-Tube-Outlet Joints: Use manufacturer-recommended tools and procedure, and brazed joints.

G. Pressure-Sealed Joints: Use manufacturer-recommended tools and procedure. Leave insertion marks on pipe after assembly.

3.4 INSTALLATION OF DIELECTRIC FITTINGS

A. Install dielectric fittings in piping at connections of dissimilar metal piping and tubing.

B. Dielectric Fittings for NPS 2 and Smaller: Use dielectric unions.

3.5 INSTALLATION OF HANGERS AND SUPPORTS

A. Comply with requirements in Section 230500 "Common Work Results for HVAC" for hangers, supports, and anchor devices.

B. Install hangers for copper tubing and steel piping, with maximum horizontal spacing and minimum rod diameters, to comply with MSS-58, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.

C. Install hangers for plastic piping, with maximum horizontal spacing and minimum rod diameters, to comply with manufacturer's written instructions, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.

D. Support horizontal piping within 12 inches of each fitting and coupling.

E. Support vertical runs of copper tubing and steel piping to comply with MSS-58, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.

F. Support vertical runs of CPVC and PVC piping to comply with manufacturer's written instructions, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.

3.6 TERMINAL EQUIPMENT CONNECTIONS

A. Sizes for supply and return piping connections shall be the same as or larger than equipment connections.

B. Install control valves in accessible locations close to connected equipment.

3.7 IDENTIFICATION

A. Identify system components. Comply with requirements for identification materials and installation in Section 230553 "Identification for HVAC Piping and Equipment."

3.8 FIELD QUALITY CONTROL

A. Prepare hydronic piping according to ASME B31.9 and as follows:

1. Leave joints, including welds, uninsulated and exposed for examination during test.
2. Provide temporary restraints for expansion joints that cannot sustain reactions due to test pressure. If temporary restraints are impractical, isolate expansion joints from testing.
3. Flush hydronic piping systems with clean water; then remove and clean or replace strainer screens.

4. Isolate equipment from piping. If a valve is used to isolate equipment, its closure shall be capable of sealing against test pressure without damage to valve. Install blinds in flanged joints to isolate equipment.
5. Install safety valve, set at a pressure no more than one-third higher than test pressure, to protect against damage by expanding liquid or other source of overpressure during test.

B. Perform the following tests on hydronic piping:

1. Use ambient temperature water as a testing medium unless there is risk of damage due to freezing. Another liquid that is safe for workers and compatible with piping may be used.
2. While filling system, use vents installed at high points of system to release air. Use drains installed at low points for complete draining of test liquid.
3. Isolate expansion tanks and determine that hydronic system is full of water.
4. Subject piping system to hydrostatic test pressure that is not less than 1.5 times the system's working pressure. Test pressure shall not exceed maximum pressure for any vessel, pump, valve, or other component in system under test. Verify that stress due to pressure at bottom of vertical runs does not exceed 90 percent of specified minimum yield strength or 1.7 times the "SE" value in Appendix A in ASME B31.9, "Building Services Piping."
5. After hydrostatic test pressure has been applied for at least 10 minutes, examine piping, joints, and connections for leakage. Eliminate leaks by tightening, repairing, or replacing components, and repeat hydrostatic test until there are no leaks.
6. Prepare written report of testing.

C. Perform the following before operating the system:

1. Open manual valves fully.
2. Inspect pumps for proper rotation.
3. Set makeup pressure-reducing valves for required system pressure.
4. Inspect air vents at high points of system and determine if all are installed and operating freely (automatic type), or bleed air completely (manual type).
5. Set temperature controls so all coils are calling for full flow.
6. Inspect and set operating temperatures of hydronic equipment, such as boilers, chillers, cooling towers, to specified values.
7. Verify lubrication of motors and bearings.

END OF SECTION

SECTION 233113 - METAL DUCTS

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. Single-wall rectangular ducts and fittings.
2. Single-wall round ducts and fittings.
3. Sheet metal materials.
4. Duct liner.
5. Sealants and gaskets.
6. Hangers and supports.

B. Related Sections:

1. Section 230593 "Testing, Adjusting, and Balancing for HVAC" for testing, adjusting, and balancing requirements for metal ducts.
2. Section 233300 "Air Duct Accessories" for dampers, duct-mounting access doors and panels, and flexible ducts.

1.3 DEFINITIONS

1.4 ACTION SUBMITTALS

A. Product Data: For each type of the following products:

1. Liners and adhesives.
2. Sealants and gaskets.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Structural Performance: Duct hangers and supports shall withstand the effects of gravity loads and stresses within limits and under conditions described in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" **and ASCE/SEI 7**

B. Airstream Surfaces: Surfaces in contact with airstream shall comply with requirements in ASHRAE 62.1.

C. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 5 - "Systems and Equipment," and Section 7 - "Construction and System Startup."

D. ASHRAE/IES Compliance: Applicable requirements in ASHRAE/IES 90.1, Section 6.4.4 - "HVAC System Construction and Insulation."

E. Duct Dimensions: Unless otherwise indicated, all duct dimensions indicated on Drawings are inside clear dimensions and do not include insulation or duct wall thickness.

2.2 SINGLE-WALL RECTANGULAR DUCTS AND FITTINGS

A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" based on indicated static-pressure class unless otherwise indicated.

1. Construct ducts of galvanized sheet steel unless otherwise indicated.

B. Transverse Joints: Fabricate joints in accordance with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-1, "Rectangular Duct/Transverse Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

1. For ducts with longest side less than 36 inches, select joint types in accordance with Figure 2-1.
2. For ducts with longest side 36 inches or greater, use flange joint connector Type T-22, T-24, T-24A, T-25a, or T-25b. Factory-fabricated flanged duct connection system may be used if submitted and approved by engineer of record.

C. Longitudinal Seams: Select seam types and fabricate in accordance with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-2, "Rectangular Duct/Longitudinal Seams," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

D. Elbows, Transitions, Offsets, Branch Connections, and Other Duct Construction: Select types and fabricate in accordance with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Ch. 4, "Fittings and Other Construction," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

2.3 SINGLE-WALL ROUND DUCTS AND FITTINGS

A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Ch. 3, "Round, Oval, and Flexible Duct," based on indicated static-pressure class unless otherwise indicated.

1. Construct ducts of galvanized sheet steel unless otherwise indicated.
2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Ductmate Industries, Inc.
b. Elgen Manufacturing.
c. Linx Industries (formerly Lindab).
d. McGill AirFlow LLC.
e. MKT Metal Manufacturing.
f. Nordfab Ducting.

g. SEMCO, LLC; a part of FlaktGroup.
h. Set Duct Manufacturing.
i. Sheet Metal Connectors, Inc.
j. Spiral Manufacturing Co., Inc.
k. Stamped Fittings Inc.

B. Transverse Joints: Select joint types and fabricate in accordance with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-1, "Round Duct Transverse Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

1. Transverse Joints in Ducts Larger Than 60 Inches in Diameter: Flanged.

C. Longitudinal Seams: Select seam types and fabricate in accordance with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-2, "Round Duct Longitudinal Seams," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

1. Fabricate round ducts larger than 90 inches in diameter with butt-welded longitudinal seams.
2. Fabricate flat-oval ducts larger than 72 inches in width (major dimension) with butt-welded longitudinal seams.

D. Tees and Laterals: Select types and fabricate in accordance with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-5, "90 Degree Tees and Laterals," and Figure 3-6, "Conical Tees," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

2.4 SHEET METAL MATERIALS

A. General Material Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.

B. Galvanized Sheet Steel: Comply with ASTM A653/A653M.

1. Galvanized Coating Designation: G90.
2. Finishes for Surfaces Exposed to View: Mill phosphatized.

C. Reinforcement Shapes and Plates: ASTM A36/A36M, steel plates, shapes, and bars; black and galvanized.

1. Where black- and galvanized-steel shapes and plates are used to reinforce aluminum ducts, isolate the different metals with butyl rubber, neoprene, or EPDM gasket materials.

D. Tie Rods: Galvanized steel, 1/4-inch-minimum diameter for lengths 36 inches or less; 3/8-inch-minimum diameter for lengths longer than 36 inches.

2.5 DUCT LINER

A. Flexible Elastomeric Duct Liner: Preformed, cellular, closed-cell, sheet materials complying with ASTM C534/C534M, Type II, Grade 1; and with NFPA 90A or NFPA 90B.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Aeroflex USA, Inc.

1) Aeroflex EPDM™

b. Armacell.

1) AP/ArmaFlex®

c. K-Flex USA.

1) Duct Liner Gray

2. Surface-Burning Characteristics: Maximum flame-spread index of 25 and maximum smoke-developed index of 50 when tested in accordance with UL 723; certified by an NRTL.
3. Liner Adhesive: As recommended by insulation manufacturer and complying with NFPA 90A or NFPA 90B.

a. Adhesive shall have a VOC content of 80 g/L or less.
b. Adhesive shall comply with the testing and product requirements

B. Insulation Pins and Washers:

1. Cupped-Head, Capacitor-Discharge-Weld Pins: Copper- or zinc-coated steel pin, fully annealed for capacitor-discharge welding, 0.106-inch-diameter shank, length to suit depth of insulation indicated with integral 1-1/2-inch galvanized carbon-steel washer.
2. Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch-thick galvanized steel, aluminum, or stainless steel; with beveled edge sized as required to hold insulation securely in place, but not less than 1-1/2 inches in diameter.

C. Shop Application of Duct Liner: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 7-11, "Flexible Duct Liner Installation."

1. Adhere a single layer of indicated thickness of duct liner with at least 90 percent adhesive coverage at liner contact surface area. Attaining indicated thickness with multiple layers of duct liner is prohibited.
2. Apply adhesive to transverse edges of liner facing upstream that do not receive metal nosing.
3. Butt transverse joints without gaps, and coat joint with adhesive.
4. Fold and compress liner in corners of rectangular ducts or cut and fit to ensure butted-edge overlapping.
5. Do not apply liner in rectangular ducts with longitudinal joints, except at corners of ducts, unless duct size and dimensions of standard liner make longitudinal joints necessary.
6. Apply adhesive coating on longitudinal seams in ducts with air velocity of 2500 fpm or greater.

7. Secure liner with mechanical fasteners 4 inches from corners and at intervals not exceeding 12 inches transversely; at 3 inches from transverse joints and at intervals not exceeding 18 inches longitudinally.
8. Secure transversely oriented liner edges facing the airstream with metal nosings that have either channel or "Z" profiles or are integrally formed from duct wall. Fabricate edge facings at the following locations:

    a. Fan discharges.
    b. Intervals of lined duct preceding unlined duct.
    c. Upstream edges of transverse joints in ducts where air velocities are higher than 2500 fpm or where indicated.

9. Secure insulation between perforated sheet metal inner duct of same thickness as specified for outer shell. Use mechanical fasteners that maintain inner duct at uniform distance from outer shell without compressing insulation.

    a. Sheet Metal Inner Duct Perforations: 3/32-inch diameter, with an overall open area of 23 percent.

10. Terminate inner ducts with buildouts attached to fire-damper sleeves, dampers, turning vane assemblies, or other devices. Fabricated buildouts (metal hat sections) or other buildout means are optional; when used, secure buildouts to duct walls with bolts, screws, rivets, or welds.

2.6 SEALANT AND GASKETS

A. General Sealant and Gasket Requirements: Surface-burning characteristics for sealants and gaskets shall be a maximum flame-spread index of 25 and a maximum smoke-developed index of 50 when tested in accordance with UL 723; certified by an NRTL.

B. Two-Part Tape Sealing System:

1. Tape: Woven cotton fiber impregnated with mineral gypsum and modified acrylic/silicone activator to react exothermically with tape to form hard, durable, airtight seal.
2. Tape Width: 3 inches.
3. Sealant: Modified styrene acrylic.
4. Water resistant.
5. Mold and mildew resistant.
6. Maximum Static-Pressure Class: 10-inch wg, positive and negative.
7. Service: Indoor and outdoor.
8. Service Temperature: Minus 40 to plus 200 deg F.
9. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum.
10. Sealant shall have a VOC content of 420 g/L or less.
11. Sealant shall comply with the testing and product requirements

C. Water-Based Joint and Seam Sealant:

1. Application Method: Brush on.
2. Solids Content: Minimum 65 percent.
3. Shore A Hardness: Minimum 20.
4. Water resistant.
5. Mold and mildew resistant.
6. VOC: Maximum 75 g/L (less water).

7. Maximum Static-Pressure Class: 10-inch wg, positive and negative.
8. Service: Indoor or outdoor.
9. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum sheets.

D. Solvent-Based Joint and Seam Sealant:

1. Application Method: Brush on.
2. Base: Synthetic rubber resin.
3. Solvent: Toluene and heptane.
4. Solids Content: Minimum 60 percent.
5. Shore A Hardness: Minimum 60.
6. Water resistant.
7. Mold and mildew resistant.
8. Sealant shall have a VOC content of 420 g/L or less.
9. Sealant shall comply with the testing and product requirements
10. Maximum Static-Pressure Class: 10-inch wg, positive or negative.
11. Service: Indoor or outdoor.
12. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum sheets.

E. Flanged Joint Sealant: Comply with ASTM C920.

1. General: Single-component, acid-curing, silicone, elastomeric.
2. Type: S.
3. Grade: NS.
4. Class: 25.
5. Use: O.
6. Sealant shall have a VOC content of 420 g/L or less.
7. Sealant shall comply with the testing and product requirements

F. Flange Gaskets: Butyl rubber, neoprene, or EPDM polymer with polyisobutylene plasticizer.

G. Round Duct Joint O-Ring Seals:

1. Seal shall provide maximum leakage class of 3 cfm/100 sq. ft. at 1-inch wg and shall be rated for 10-inch wg static-pressure class, positive or negative.
2. EPDM O-ring to seal in concave bead in coupling or fitting spigot.
3. Double-lipped, EPDM O-ring seal, mechanically fastened to factory-fabricated couplings and fitting spigots.

2.7 HANGERS AND SUPPORTS

A. Hanger Rods for Noncorrosive Environments: Galvanized-steel rods and nuts.

B. Strap and Rod Sizes: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 5-1, "Rectangular Duct Hangers Minimum Size," and Table 5-2, "Minimum Hanger Sizes for Round Duct."

C. Steel Cables for Galvanized-Steel Ducts: Galvanized steel complying with ASTM A603.

D. Steel Cable End Connections: Galvanized-steel assemblies with brackets, swivel, and bolts designed for duct hanger service; with an automatic-locking and clamping device.

E. Duct Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials.

F. Trapeze and Riser Supports:

1. Supports for Galvanized-Steel Ducts: Galvanized-steel shapes and plates.

PART 3 - EXECUTION

3.1 DUCT INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of duct system. Indicated duct locations, configurations, and arrangements were used to size ducts and calculate friction loss for air-handling equipment sizing and for other design considerations. Install duct systems as indicated unless deviations to layout are approved on Shop Drawings and coordination drawings.

B. Install ducts in accordance with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" unless otherwise indicated.

C. Install ducts in maximum practical lengths with fewest possible joints.

D. Install factory- or shop-fabricated fittings for changes in direction, size, and shape and for branch connections.

E. Unless otherwise indicated, install ducts vertically and horizontally, and parallel and perpendicular to building lines.

F. Install ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building.

G. Install ducts with a clearance of 1 inch, plus allowance for insulation thickness.

H. Where ducts pass through non-fire-rated interior partitions and exterior walls and are exposed to view, cover the opening between the partition and duct or duct insulation with sheet metal flanges of same metal thickness as the duct. Overlap openings on four sides by at least 1-1/2 inches.

I. Install heating coils, cooling coils, air filters, dampers, and all other duct-mounted accessories in air ducts where indicated on Drawings.

J. Protect duct interiors from moisture, construction debris and dust, and other foreign materials both before and after installation. Comply with SMACNA's "IAQ Guidelines for Occupied Buildings Under Construction," Appendix G, "Duct Cleanliness for New Construction Guidelines."

K. Elbows: Use long-radius elbows wherever they fit.

1. Fabricate 90-degree rectangular mitered elbows to include turning vanes.
2. Fabricate 90-degree round elbows with a minimum of three segments for 12 inches and smaller and a minimum of five segments for 14 inches and larger.

L. Branch Connections: Use lateral or conical branch connections.

3.2 DUCT SEALING

A. Seal ducts for duct static-pressure, seal classes, and leakage classes specified in "Duct Schedule" Article in accordance with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

B. Seal ducts at a minimum to the following seal classes in accordance with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible":

1. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
2. Outdoor, Supply-Air Ducts: Seal Class A.
3. Outdoor, Exhaust Ducts: Seal Class C.
4. Outdoor, Return-Air Ducts: Seal Class C.
5. Unconditioned Space, Supply-Air Ducts in Pressure Classes 2-Inch wg and Lower: Seal Class B.
6. Unconditioned Space, Supply-Air Ducts in Pressure Classes Higher Than 2-Inch wg: Seal Class A.
7. Unconditioned Space, Exhaust Ducts: Seal Class C.
8. Unconditioned Space, Return-Air Ducts: Seal Class B.
9. Conditioned Space, Supply-Air Ducts in Pressure Classes 2-Inch wg and Lower: Seal Class C.
10. Conditioned Space, Supply-Air Ducts in Pressure Classes Higher Than 2-Inch wg: Seal Class B.
11. Conditioned Space, Exhaust Ducts: Seal Class B.
12. Conditioned Space, Return-Air Ducts: Seal Class C.

3.3 HANGER AND SUPPORT INSTALLATION

A. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 5, "Hangers and Supports."

B. Building Attachments: Structural-steel fasteners appropriate for construction materials to which hangers are being attached.

C. Hanger Spacing: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 5-1, "Rectangular Duct Hangers Minimum Size," and Table 5-2, "Minimum Hanger Sizes for Round Duct," for maximum hanger spacing; install hangers and supports within 24 inches of each elbow and within 48 inches of each branch intersection.

D. Install upper attachments to structures. Select and size upper attachments with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

3.4 CONNECTIONS

A. Make connections to equipment with flexible connectors complying with Section 233300 "Air Duct Accessories."

B. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for branch, outlet and inlet, and terminal unit connections.

3.5 DUCT LINER INSTALLATION

A. When not noted to be lined for conductivity, the first 25 feet of supply and return duct at all air handling equipment shall be lined with 1/2 inch duct liner for sound absorption. The acoustical liner shall be installed even where duct wrap may be required.

B. Linings shall be interrupted at the area of operation of a fire damper and at not less than 6 inches upstream of and 6 inches downstream of electric-resistance and fuel-burning heaters in a duct system. Metal nosings or sleeves shall be installed over exposed duct liner edges that face opposite the direction of airflow.

3.6 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Leakage Tests:

1. Comply with SMACNA's "HVAC Air Duct Leakage Test Manual." Submit a test report for each test.
2. Test the following systems:

    a. Ducts with a Pressure Class Higher Than 3-Inch wg: Test representative duct sections totaling no less than 25 percent of total installed duct area for each designated pressure class.

3. Disassemble, reassemble, and seal segments of systems to accommodate leakage testing and for compliance with test requirements.
4. Testing of each duct section is to be performed with access doors, coils, filters, dampers, and other duct-mounted devices in place as designed. No devices are to be removed or blanked off so as to reduce or prevent additional leakage.
5. Test for leaks before applying external insulation.
6. Conduct tests at static pressures equal to maximum design pressure of system or section being tested. If static-pressure classes are not indicated, test system at maximum system design pressure. Do not pressurize systems above maximum design operating pressure.
7. Give seven days' advance notice for testing.

C. Duct System Cleanliness Tests:

1. Visually inspect duct system to ensure that no visible contaminants are present.

D. Duct system will be considered defective if it does not pass tests and inspections.

E. Prepare test and inspection reports.

3.7 DUCT CLEANING

A. Clean new duct system(s) before testing, adjusting, and balancing.

B. Use duct cleaning methodology as indicated in NADCA ACR.

C. Use service openings for entry and inspection.

1. Provide openings with access panels appropriate for duct static-pressure and leakage class at dampers, coils, and any other locations where required for inspection and cleaning access. Provide insulated panels for insulated or lined duct. Patch insulation and liner as recommended by duct liner manufacturer. Comply with Section 233300 "Air Duct Accessories" for access panels and doors.
2. Disconnect and reconnect flexible ducts as needed for cleaning and inspection.
3. Remove and reinstall ceiling to gain access during the cleaning process.

D. Particulate Collection and Odor Control:

1. When venting vacuuming system inside the building, use HEPA filtration with 99.97 percent collection efficiency for 0.3-micron-size (or larger) particles.
2. When venting vacuuming system to outdoors, use filter to collect debris removed from HVAC system, and locate exhaust downwind and away from air intakes and other points of entry into building.

E. Clean the following components by removing surface contaminants and deposits:

1. Air outlets and inlets (registers, grilles, and diffusers).
2. Supply, return, and exhaust fans including fan housings, plenums (except ceiling supply and return plenums), scrolls, blades or vanes, shafts, baffles, dampers, and drive assemblies.
3. Air-handling unit internal surfaces and components including mixing box, coil section, air wash systems, spray eliminators, condensate drain pans, humidifiers and dehumidifiers, filters and filter sections, and condensate collectors and drains.
4. Coils and related components.
5. Return-air ducts, dampers, actuators, and turning vanes except in ceiling plenums and mechanical equipment rooms.
6. Supply-air ducts, dampers, actuators, and turning vanes.
7. Dedicated exhaust and ventilation components and makeup air systems.

F. Mechanical Cleaning Methodology:

1. Clean metal duct systems using mechanical cleaning methods that extract contaminants from within duct systems and remove contaminants from building.
2. Use vacuum-collection devices that are operated continuously during cleaning. Connect vacuum device to downstream end of duct sections so areas being cleaned are under negative pressure.
3. Use mechanical agitation to dislodge debris adhered to interior duct surfaces without damaging integrity of metal ducts, duct liner, or duct accessories.
4. Clean fibrous-glass duct liner with HEPA vacuuming equipment; do not permit duct liner to get wet. Replace fibrous-glass duct liner that is damaged, deteriorated, or delaminated or that has friable material, mold, or fungus growth.
5. Clean coils and coil drain pans in accordance with NADCA ACR. Keep drain pan operational. Rinse coils with clean water to remove latent residues and cleaning materials; comb and straighten fins.
6. Provide drainage and cleanup for wash-down procedures.
7. Antimicrobial Agents and Coatings: Apply EPA-registered antimicrobial agents if fungus is present. Apply antimicrobial agents in accordance with manufacturer's written instructions after removal of surface deposits and debris.

3.8 STARTUP

A. Air Balance: Comply with requirements in Section 230593 "Testing, Adjusting, and Balancing for HVAC."

3.9 DUCT SCHEDULE

A. Fabricate ducts with galvanized sheet steel except as otherwise indicated and as follows:

1. Fabricate all ducts to achieve SMACNA pressure class, seal class, and leakage class as indicated below.

B. Supply Ducts:

1. Ducts Connected to Fan Coil Units, Furnaces, Heat Pumps, and Terminal Units:

a. Pressure Class: Positive 2-inch wg.
b. Minimum SMACNA Seal Class: C.
c. SMACNA Leakage Class for Rectangular: 16.
d. SMACNA Leakage Class for Round: 8.

2. Ducts Connected to Constant-Volume Air-Handling Units:

a. Pressure Class: Positive 3-inch wg.
b. Minimum SMACNA Seal Class: B.
c. SMACNA Leakage Class for Rectangular: 8.
d. SMACNA Leakage Class for Round: 4.

3. Ducts Connected to Variable-Air-Volume Air-Handling Units:

a. Pressure Class: Positive 4-inch wg.
b. Minimum SMACNA Seal Class: A.
c. SMACNA Leakage Class for Rectangular: 4.
d. SMACNA Leakage Class for Round: 2.

4. Ducts Connected to Equipment Not Listed Above:

a. Pressure Class: Positive 2-inch wg.
b. Minimum SMACNA Seal Class: C.
c. SMACNA Leakage Class for Rectangular: 16.
d. SMACNA Leakage Class for Round: 8.

C. Return Ducts:

1. Ducts Connected to Fan Coil Units, Furnaces, Heat Pumps, and Terminal Units:

a. Pressure Class: Positive or negative 2-inch wg.
b. Minimum SMACNA Seal Class: C.
c. SMACNA Leakage Class for Rectangular: 16.
d. SMACNA Leakage Class for Round: 8.

2. Ducts Connected to Air-Handling Units:

a. Pressure Class: Positive or negative 3-inch wg.

b. Minimum SMACNA Seal Class: B.
c. SMACNA Leakage Class for Rectangular: 8.
d. SMACNA Leakage Class for Round: 4.

3. Ducts Connected to Equipment Not Listed above:

a. Pressure Class: Positive or negative 2-inch wg.
b. Minimum SMACNA Seal Class: C.
c. SMACNA Leakage Class for Rectangular: 16.
d. SMACNA Leakage Class for Round: 8.

D. Exhaust Ducts:

1. Ducts Connected to Fans Exhausting (ASHRAE 62.1, Class 1 and 2) Air:

a. Pressure Class: Negative 3-inch wg.
b. Minimum SMACNA Seal Class: B if negative pressure, and A if positive pressure.
c. SMACNA Leakage Class for Rectangular: 8.
d. SMACNA Leakage Class for Round: 4.

E. Intermediate Reinforcement:

1. Galvanized-Steel Ducts: Galvanized steel or carbon steel coated with zinc-chromate primer.

F. Liner:

1. Supply-Air Ducts: Flexible elastomeric, 1 inch thick.
2. Return-Air Ducts: Flexible elastomeric, 1 inch thick.

G. Elbow Configuration:

1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-2, "Rectangular Elbows."

a. Velocity 1000 fpm or Lower:

1) Radius Type RE 1 with minimum 0.5 radius-to-diameter ratio.
2) Mitered Type RE 4 without vanes.

b. Velocity 1000 to 1500 fpm:

1) Radius Type RE 1 with minimum 1.0 radius-to-diameter ratio.
2) Radius Type RE 3 with minimum 0.5 radius-to-diameter ratio and two vanes.
3) Mitered Type RE 2 with vanes complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-3, "Vanes and Vane Runners," and Figure 4-4, "Vane Support in Elbows."

c. Velocity 1500 fpm or Higher:

1) Radius Type RE 1 with minimum 1.5 radius-to-diameter ratio.
2) Radius Type RE 3 with minimum 1.0 radius-to-diameter ratio and two vanes.
3) Mitered Type RE 2 with vanes complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-3, "Vanes and Vane Runners," and Figure 4-4, "Vane Support in Elbows."

2. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-2, "Rectangular Elbows."

    a. Radius Type RE 1 with minimum 1.5 radius-to-diameter ratio.
    b. Radius Type RE 3 with minimum 1.0 radius-to-diameter ratio and two vanes.
    c. Mitered Type RE 2 with vanes complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-3, "Vanes and Vane Runners," and Figure 4-4, "Vane Support in Elbows."

3. Round Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-4, "Round Duct Elbows."

    a. Minimum Radius-to-Diameter Ratio and Elbow Segments: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 3-1, "Mitered Elbows." Elbows with less than 90-degree change of direction have proportionately fewer segments.

        1) Velocity 1000 fpm or Lower: 0.5 radius-to-diameter ratio and three segments for 90-degree elbow.
        2) Velocity 1000 to 1500 fpm: 1.0 radius-to-diameter ratio and four segments for 90-degree elbow.
        3) Velocity 1500 fpm or Higher: 1.5 radius-to-diameter ratio and five segments for 90-degree elbow.
        4) Radius-to Diameter Ratio: 1.5.

    b. Round Elbows, 12 Inches and Smaller in Diameter: Stamped or pleated.

H. Branch Configuration:

1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-6, "Branch Connection."

    a. Rectangular Main to Rectangular Branch: 45-degree entry.
    b. Rectangular Main to Round Branch: Conical spin in.

2. Round and Flat Oval: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-5, "90 Degree Tees and Laterals," and Figure 3-6, "Conical Tees." Saddle taps are permitted in existing duct.

    a. Velocity 1000 fpm or Lower: 90-degree tap.
    b. Velocity 1000 to 1500 fpm: Conical tap.
    c. Velocity 1500 fpm or Higher: 45-degree lateral.

END OF SECTION

SECTION 233300 - AIR DUCT ACCESSORIES

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. Manual volume dampers.
2. Control dampers.
3. Flange connectors.
4. Duct silencers.
5. Turning vanes.
6. Duct-mounted access doors.
7. Flexible connectors.
8. Duct accessory hardware.

B. Related Requirements:

1. Section 233346 "Flexible Ducts" for insulated and non-insulated flexible ducts.
2. Section 233723 "HVAC Gravity Ventilators" for roof-mounted ventilator caps.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. For duct silencers, include pressure drop, dynamic insertion loss, and self-generated noise data. Include breakout noise calculations for high-transmission-loss casings.

1.4 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Reflected ceiling plans, or BIM model, drawn to scale, on which ceiling-mounted access panels and access doors required for access to duct accessories are shown and coordinated with each other, using input from installers of the items involved.

B. Source quality-control reports.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For air duct accessories to include in operation and maintenance manuals.

1.6 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Fusible Links: Furnish quantity equal to [**10**] <**Insert number**> percent of amount installed.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Comply with NFPA 90A and NFPA 90B.

B. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.

2.2 MANUAL VOLUME DAMPERS

A. Low-Leakage, Steel, Manual Volume Dampers:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Air Balance; a division of MESTEK, Inc.
b. Greenheck Fan Corporation.
c. McGill AirFlow LLC.
d. Nailor Industries Inc.
e. Pottorff.
f. Ruskin Company.
g. United Enertech.

2. Performance:

a. AMCA Certification: Test and rate in accordance with AMCA 511.
b. Leakage:

1) Class II: Leakage shall not exceed 10 cfm/sq. ft. against 1-inch wg differential static pressure.

3. Construction:

a. Linkage: Out of airstream.
b. Suitable for horizontal or vertical airflow applications.

4. Frames:

a. Hat, U, or angle shaped.
b. Thickness: 20-gauge galvanized sheet steel, minimum.
c. Mitered and welded corners.

d. Flanges for attaching to walls and flangeless frames for installing in ducts.

5. Blades:

a. Multiple or single blade.
b. Parallel- or opposed-blade design.
c. Stiffen damper blades for stability.
d. Galvanized, roll-formed steel; 16 gauge thick.

6. Blade Edging Seals:

a. Closed-cell neoprene or PVC.

7. Blade Jamb Seals: Vinyl.
8. Blade Axles: Galvanized steel.
9. Bearings:

a. Molded synthetic.
b. Dampers mounted with vertical blades to have thrust bearing at each end of every blade.

10. Tie Bars and Brackets: Galvanized steel.
11. Locking device to hold damper blades in a fixed position without vibration.

2.3 CONTROL DAMPERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Carnes Company.
2. Greenheck Fan Corporation.
3. McGill AirFlow LLC.
4. Nailor Industries Inc.
5. Pottorff.
6. Ruskin Company.
7. United Enertech.

B. General Requirements:

1. Unless otherwise indicated, use parallel-blade configuration for two-position control, equipment isolation service, and when mixing two airstreams. For other applications, use opposed-blade configuration.
2. Factory or field assemble multiple damper sections to provide a single damper assembly of size required by the application.

C. Performance:

1. AMCA Certification: Test and rate in accordance with AMCA 511.
2. Leakage:

a. Class II: Leakage shall not exceed 10 cfm/sq. ft. against 1-inch wg differential static pressure.

3. Pressure Drop: 0.05-inch wg at 1500 fpm across a 24-by-24-inch damper when tested in accordance with AMCA 500-D, Figure 5.3.
4. Velocity: Up to 3000 fpm.
5. Temperature: Minus 25 to plus 180 deg F.
6. Pressure Rating: Damper close-off pressure equal to fan shutoff pressure with a maximum blade deflection of 1/200 of blade length.

D. Construction:

1. Linkage out of airstream.
2. Suitable for horizontal or vertical airflow applications.
3. Frames:

    a. Hat, U, or angle shaped.
    b. 0.08-inch-thick extruded aluminum.
    c. Mitered and welded or interlocking, gusseted corners.
    d. Flanges for attaching to walls and flangeless frames for installing in ducts.

4. Blades:

    a. Multiple blade with maximum blade width of 4 to 6 inches.
    b. Parallel-blade design.
    c. Aluminum.
    d. 16-gauge-thick single skin or 14-gauge-thick air foil dual skin.

5. Blade Edging Seals:

    a. Replaceable closed-cell neoprene or PVC.

6. Blade Jamb Seal: Flexible stainless steel, compression type.
7. Blade Axles: 1/2-inch diameter; galvanized steel.
8. Blade-Linkage Hardware: Zinc-plated steel and brass; ends sealed against blade bearings. Linkage mounted out of air stream.
9. Bearings:

    a. Molded synthetic.
    b. Dampers mounted with vertical blades to have thrust bearings at each end of every blade.

E. Damper Actuator - Electric:

1. Electric - 24 V ac.
2. UL 873, plenum rated.
3. Two position with fail-safe spring return.

    a. Sufficient motor torque and spring torque to drive damper fully open and fully closed with adequate force to achieve required damper seal.
    b. Minimum 90-degree drive rotation.

4. Clockwise or counterclockwise drive rotation as required for application.
5. Environmental Operating Range:

    a. Temperature: Minus 40 to plus 130 deg F.
    b. Humidity: 5 to 95 percent relative humidity noncondensing.

6. Environmental enclosure: NEMA 2.
7. Actuator to be factory mounted and provided with a single-point wiring connection.

2.4 FLANGE CONNECTORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. CL WARD & Family Inc.
2. Ductmate Industries, Inc.
3. DynAir; a Carlisle Company.
4. Elgen Manufacturing.
5. Ward Industries; a brand of Hart & Cooley, Inc.

B. Description: Add-on or roll-formed, factory fabricated, slide-on transverse flange connectors, gaskets, and components.

C. Material: Galvanized steel.

D. Gauge and Shape: Match connecting ductwork.

2.5 DUCT SILENCERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. FlaktGroup.
2. Flexmaster U.S.A., Inc.
3. IAC Acoustics; a division of Sound Seal.
4. McGill AirFlow LLC.
5. Metal Form Mfg/Commercial Acoustics.
6. Pottorff.
7. Price Industries.
8. Ruskin Company.
9. Vibro-Acoustics.

B. General Requirements:

1. Factory fabricated.
2. Fire-Performance Characteristics: Adhesives, sealants, packing materials, and accessory materials shall have flame-spread index not exceeding 25 and smoke-developed index not exceeding 50 when tested in accordance with ASTM E84.
3. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.
4. Bearing AMCA's Certified Ratings Seal for prefabricated silencer sound and air performance.

C. Shape:

1. Rectangular straight with splitters or baffles.

D. Rectangular Silencer Outer Casing: ASTM A653/A653M, galvanized sheet steel, minimum 24 gauge thick.

E. Inner Casing and Baffles: ASTM A653/A653M, galvanized sheet metal, minimum 24 gauge thick, perforated.

F. Connection Sizes: Match connecting ductwork unless otherwise indicated.

G. Absorptive acoustic fiberglass:

1. Acoustic media shall be shot-free inorganic glass fiber with long, resilient fibers, bonded with thermosetting resin.
2. Glass fiber shall be packed with a minimum of 10% compression to eliminate voids and settling.

2.6 TURNING VANES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Aero-Dyne Sound Control Co.
2. CL WARD & Family Inc.
3. Ductmate Industries, Inc.
4. Duro Dyne Inc.
5. DynAir; a Carlisle Company.
6. Elgen Manufacturing.
7. Ward Industries; a brand of Hart & Cooley, Inc.

B. Manufactured Turning Vanes for Metal Ducts: Fabricate curved blades of galvanized sheet steel; support with bars perpendicular to blades set; set into vane runners suitable for duct mounting.

1. Acoustic Turning Vanes: Fabricate airfoil-shaped aluminum extrusions with perforated faces and fibrous-glass fill.

C. Manufactured Turning Vanes for Nonmetal Ducts: Fabricate curved blades of resin-bonded fiberglass with acrylic polymer coating; support with bars perpendicular to blades set; set into vane runners suitable for duct mounting.

D. General Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"; Figure 4-3, "Vanes and Vane Runners," and Figure 4-4, "Vane Support in Elbows."

E. Vane Construction:

1. Single wall for ducts up to 48 inches wide and double wall for larger dimensions.

2.7 DUCT-MOUNTED ACCESS DOORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Aire Technologies.
2. Arrow United Industries.
3. Cesco Products; a division of MESTEK, Inc.
4. CL WARD & Family Inc.

5. Ductmate Industries, Inc.
6. Duro Dyne Inc.
7. Elgen Manufacturing.
8. Flexmaster U.S.A., Inc.
9. McGill AirFlow LLC.
10. Ruskin Company.
11. United Enertech.
12. Ventfabrics, Inc.
13. Ward Industries; a brand of Hart & Cooley, Inc.

B. Duct-Mounted Access Doors: Fabricate access panels in accordance with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"; Figure 7-2 (7-2M), "Duct Access Doors and Panels," and Figure 7-3, "Access Doors - Round Duct."

1. Door:

a. Double wall, rectangular.
b. Galvanized sheet metal with insulation fill and thickness as indicated for duct pressure class.
c. 24-gauge-thick galvanized steel door panel.
d. Vision panel.
e. Hinges and Latches: 1-by-1-inch butt or piano hinge and cam latches.
f. Fabricate doors airtight and suitable for duct pressure class.

2. Frame: Galvanized sheet steel, with bend-over tabs and foam gaskets.

a. 24-gauge-thick galvanized steel or 0.032-inch-thick aluminum frame.

3. Number of Hinges and Locks:

a. Access Doors Less Than 12 Inches Square: No hinges and two sash locks.
b. Access Doors up to 18 Inches Square: Two hinges and two sash locks.
c. Access Doors up to 24 by 48 Inches: Continuous and two compression latches.
d. Access Doors Larger Than 24 by 48 Inches: Continuous and two compression latches with outside and inside handles.

2.8 FLEXIBLE CONNECTORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. CL WARD & Family Inc.
2. Ductmate Industries, Inc.
3. Duro Dyne Inc.
4. DynAir; a Carlisle Company.
5. Elgen Manufacturing.
6. Ventfabrics, Inc.
7. Ward Industries; a brand of Hart & Cooley, Inc.

B. Fire-Performance Characteristics: Adhesives, sealants, fabric materials, and accessory materials shall have flame-spread index not exceeding 25 and smoke-developed index not exceeding 50 when tested in accordance with ASTM E84.

C. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.

D. Materials: Flame-retardant or noncombustible fabrics.

E. Coatings and Adhesives: Comply with UL 181, Class 1.

F. Metal-Edged Connectors: Factory fabricated with a fabric strip 3-1/2 inches wide attached to two strips of 2-3/4-inch-wide, 0.028-inch-thick, galvanized sheet steel or 0.032-inch-thick aluminum sheets. Provide metal compatible with connected ducts.

G. Indoor System, Flexible Connector Fabric: Glass fabric double coated with neoprene.

1. Minimum Weight: 26 oz./sq. yd.
2. Tensile Strength: 480 lbf/inch in the warp and 360 lbf/inch in the filling.
3. Service Temperature: Minus 40 to plus 200 deg F.

H. Outdoor System, Flexible Connector Fabric: Glass fabric double coated with weatherproof, synthetic rubber resistant to UV rays and ozone.

1. Minimum Weight: 24 oz./sq. yd.
2. Tensile Strength: 530 lbf/inch in the warp and 440 lbf/inch in the filling.
3. Service Temperature: Minus 50 to plus 250 deg F.

I. High-Temperature System, Flexible Connectors: Glass fabric coated with silicone rubber.

1. Minimum Weight: 16 oz./sq. yd.
2. Tensile Strength: 285 lbf/inch in the warp and 185 lbf/inch in the filling.
3. Service Temperature: Minus 67 to plus 500 deg F.

J. Thrust Limits: Combination coil spring and elastomeric insert with spring and insert in compression, and with a load stop. Include rod and angle-iron brackets for attaching to fan discharge and duct.

1. Frame: Steel, fabricated for connection to threaded rods and to allow for a maximum of 30 degrees of angular rod misalignment without binding or reducing isolation efficiency.
2. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
3. Minimum Additional Travel: 50 percent of the required deflection at rated load.
4. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
5. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
6. Elastomeric Element: Molded, oil-resistant rubber or neoprene.
7. Coil Spring: Factory set and field adjustable for a maximum of 1/4-inch movement at start and stop.

2.9 DUCT ACCESSORY HARDWARE

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. CL WARD & Family Inc.
2. Ductmate Industries, Inc.
3. Duro Dyne Inc.

4. DynAir; a Carlisle Company.
5. Elgen Manufacturing.
6. Hardcast; a Carlisle Company.
7. United Enertech.
8. Ventfabrics, Inc.
9. Ward Industries; a brand of Hart & Cooley, Inc.

B. Instrument Test Holes: Cast iron or cast aluminum to suit duct material, including screw cap and gasket. Size to allow insertion of pitot tube and other testing instruments and of length to suit duct-insulation thickness.

C. Adhesives: High strength, quick setting, neoprene based, waterproof, and resistant to gasoline and grease.

2.10 MATERIALS

A. Galvanized Sheet Steel: Comply with ASTM A653/A653M.

1. Galvanized Coating Designation: G90.
2. Exposed-Surface Finish: Mill phosphatized.

B. Reinforcement Shapes and Plates: Galvanized-steel reinforcement where installed on galvanized sheet metal ducts; compatible materials for aluminum and stainless steel ducts.

C. Tie Rods: Galvanized steel, 1/4-inch minimum diameter for lengths 36 inches or less; 3/8-inch minimum diameter for lengths longer than 36 inches.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install duct accessories in accordance with applicable details in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for metal ducts and in NAIMA AH116 for fibrous-glass ducts.

B. Install duct accessories of materials suited to duct materials; use galvanized-steel accessories in galvanized-steel and fibrous-glass ducts, stainless steel accessories in stainless steel ducts, and aluminum accessories in aluminum ducts.

C. Where multiple damper sections are necessary to achieve required dimensions, provide reinforcement to fully support damper assembly when fully closed at full system design static pressure.

D. Install volume dampers at points on supply, return, and exhaust systems where branches extend from larger ducts. Where dampers are installed in ducts having duct liner, install dampers with hat channels of same depth as liner, and terminate liner with nosing at hat channel.

1. Install steel volume dampers in steel ducts.
2. Install aluminum volume dampers in aluminum ducts.

E. Set dampers to fully open position before testing, adjusting, and balancing.

F. Install test holes at fan inlets and outlets and elsewhere as indicated and as needed for testing and balancing.

G. Install duct access doors on sides of ducts to allow for inspecting, adjusting, and maintaining accessories and equipment at the following locations:

1. On both sides of duct coils.
2. Upstream from duct filters.
3. At outdoor-air intakes and mixed-air plenums.
4. At drain pans and seals.
5. Downstream from manual volume dampers, control dampers, backdraft dampers, and equipment.
6. At each change in direction and at maximum 50-ft. spacing.
7. Upstream from turning vanes.
8. Control devices requiring inspection.
9. Elsewhere as indicated.

H. Install access doors with swing against duct static pressure.

I. Access Door Sizes:

1. One-Hand or Inspection Access: 8 by 5 inches.
2. Two-Hand Access: 12 by 6 inches.
3. Head and Hand Access: 18 by 10 inche.
4. Head and Shoulders Access: 21 by 14 inches.
5. Body Access: 25 by 14 inches.
6. Body plus Ladder Access: 25 by 17 inches.

J. Label access doors according to Section 230553 "Identification for HVAC Piping and Equipment" to indicate the purpose of access door.

K. Install flexible connectors to connect ducts to equipment.

L. For fans developing static pressures of 5 inches wg and more, cover flexible connectors with loaded vinyl sheet held in place with metal straps.

M. Install duct test holes where required for testing and balancing purposes.

N. Install thrust limits at centerline of thrust, symmetrical on both sides of equipment. Attach thrust limits at centerline of thrust and adjust to a maximum of 1/4-inch movement during start and stop of fans.

3.2 FIELD QUALITY CONTROL

A. Tests and Inspections:

1. Operate dampers to verify full range of movement.
2. Inspect locations of access doors, and verify that size and location of access doors are adequate to perform required operation.
3. Inspect turning vanes for proper and secure installation, and verify that vanes do not move or rattle.

END OF SECTION

SECTION 233346 - FLEXIBLE DUCTS

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. Insulated flexible ducts.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

PART 2 - PRODUCTS

2.1 ASSEMBLY DESCRIPTION

A. Comply with NFPA 90A, "Installation of Air Conditioning and Ventilating Systems," and with NFPA 90B, "Installation of Warm Air Heating and Air Conditioning Systems."

B. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.

C. Comply with the Air Diffusion Council's "ADC Flexible Air Duct Test Code FD 72-R1."

D. Comply with ASTM E96/E96M, "Test Methods for Water Vapor Transmission of Materials."

2.2 INSULATED FLEXIBLE DUCTS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Flexmaster U.S.A., Inc. (1M)
2. H&C Flex Duct
3. Thermaflex; a Flex-Tek Group company. (M-KC)
4. Quietflex Manufacturing Company, L.P. (HPDFlex™)

B. Insulated, Flexible Duct: UL 181, Class 1, black polymer film supported by helically wound, spring-steel wire; fibrous-glass insulation; metalized vapor-barrier film.

1. Pressure Rating: 10-inch wg positive, 1-inch wg negative.

2. Maximum Air Velocity: 5500 fpm.
3. Temperature Range: Minus 20 to plus 250 deg F.
4. Insulation R-Value: Comply with ASHRAE/IES 90.1.

2.3 FLEXIBLE DUCT CONNECTORS

A. Clamps: Stainless-steel band with cadmium-plated hex screw to tighten band with a worm-gear action in sizes 3 through 18 inches, to suit duct size.

B. Non-Clamp Connectors: Liquid adhesive plus tape or adhesive plus sheet metal screws.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install flexible ducts according to applicable details in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for metal ducts.

B. Install in indoor applications only. Flexible ductwork should not be exposed to UV lighting.

C. Connect terminal units to supply ducts with maximum 12-inch lengths of flexible duct. Do not use flexible ducts to change directions.

D. Connect diffusers to ducts with maximum 60-inch lengths of flexible duct clamped or strapped in place.

E. Connect flexible ducts to metal ducts with **liquid adhesive plus tape**, **draw bands**, or adhesive plus sheet metal screws.

F. Install duct test holes where required for testing and balancing purposes.

G. Installation:

1. Install ducts fully extended.
2. Do not bend ducts across sharp corners.
3. Bends of flexible ducting shall not exceed a minimum of one duct diameter.
4. Avoid contact with metal fixtures, water lines, pipes, or conduits.
5. Install flexible ducts in a direct line, without sags, twists, or turns.

H. Supporting Flexible Ducts:

1. Suspend flexible ducts with bands 1-1/2 inches wide or wider and spaced a maximum of 48 inches apart. Maximum centerline sag between supports shall not exceed 1/2 inch per 12 inches.
2. Install extra supports at bends placed approximately one duct diameter from center line of the bend.
3. Ducts may rest on ceiling joists or truss supports. Spacing between supports shall not exceed the maximum spacing per manufacturer's written installation instructions.
4. Vertically installed ducts shall be stabilized by support straps at a maximum of 72 inches o.c.

END OF SECTION

SECTION 233713.13 - AIR DIFFUSERS

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. Round ceiling diffusers.
2. Square ceiling diffusers.
3. Perforated diffusers.

B. Related Requirements:

1. Section 233300 "Air Duct Accessories" for fire and smoke dampers and volume-control dampers not integral to diffusers.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Data Sheet: Indicate materials of construction, finish, and mounting details; and performance data including throw and drop, static-pressure drop, and noise ratings.
2. Diffuser Schedule: Indicate drawing designation, room location, quantity, model number, size, and accessories furnished.

PART 2 - PRODUCTS

2.1 ROUND CEILING DIFFUSERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Anemostat Products; a Mestek company.
2. Carnes Company.
3. Hart & Cooley Inc.
4. METALAIRE, Inc.
5. Nailor Industries Inc.
6. Price Industries.
7. Titus, a division of Air System Components; Johnson Controls, Inc.
8. Tuttle & Bailey; a division of Air System Components; Johnson Controls, Inc.

B. Devices shall be specifically designed for variable-air-volume flows.

C. Material: Steel.

D. Finish: Mill finish. To be painted in field by others. Color by Architect.

E. Face Style: Three cone.

F. Mounting: Duct connection.

G. Pattern: Fully adjustable.

2.2 SQUARE CEILING DIFFUSERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. A-J Manufacturing Co., Inc.
2. Anemostat Products; a Mestek company.
3. Carnes Company.
4. Hart & Cooley Inc.
5. Krueger-HVAC, a division of Air System Components; Johnson Controls, Inc.
6. METALAIRE, Inc.
7. Nailor Industries Inc.
8. Price Industries.
9. Titus, a division of Air System Components; Johnson Controls, Inc.
10. Tuttle & Bailey; a division of Air System Components; Johnson Controls, Inc.

B. Devices shall be specifically designed for variable-air-volume flows.

C. Material: Steel.

D. Finish: Baked enamel, white.

E. Face Size: 24 by 24 inches,12 by 12 inches.

F. Face Style: Four cone for 24 by 24. Three cone for 12 by 12.

G. Mounting: T-bar for 24 by 24. Mounting panel for 12 by 12.

H. Pattern: Adjustable.

2.3 PERFORATED DIFFUSERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. A-J Manufacturing Co., Inc.
2. Anemostat Products; a Mestek company.
3. Carnes Company.
4. Hart & Cooley Inc.
5. Krueger-HVAC, a division of Air System Components; Johnson Controls, Inc.
6. METALAIRE, Inc.
7. Nailor Industries Inc.
8. Price Industries.
9. Titus, a division of Air System Components; Johnson Controls, Inc.
10. Tuttle & Bailey; a division of Air System Components; Johnson Controls, Inc.

B. Devices shall be specifically designed for variable-air-volume flows.

C. Material: Steel backpan and pattern controllers, with steel face.

D. Finish: Baked enamel, white.

E. Face Size: 12 by 12 inches, 24 by 24 inches.

F. Face Style: Flush.

G. Mounting: T-bar.

2.4 SOURCE QUALITY CONTROL

A. Verification of Performance: Rate diffusers according to ASHRAE 70, "Method of Testing for Rating the Performance of Air Outlets and Inlets."

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas where diffusers are installed for compliance with requirements for installation tolerances and other conditions affecting performance of equipment.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install diffusers level and plumb.

B. Ceiling-Mounted Outlets and Inlets: Drawings indicate general arrangement of ducts, fittings, and accessories. Air outlet and inlet locations have been indicated to achieve design requirements for air volume, noise criteria, airflow pattern, throw, and pressure drop. Make final locations where indicated, as much as practical. For units installed in lay-in ceiling panels, locate units in the center of panel. Where architectural features or other items conflict with installation, notify Architect for a determination of final location.

C. Install diffusers with airtight connections to ducts and to allow service and maintenance of dampers, air extractors, and fire dampers.

3.3 ADJUSTING

A. After installation, adjust diffusers to air patterns indicated, or as directed, before starting air balancing.

END OF SECTION

SECTION 233713.23 - REGISTERS AND GRILLES

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. Fixed face grilles.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Data Sheet: Indicate materials of construction, finish, and mounting details; and performance data including throw and drop, static-pressure drop, and noise ratings.
2. Grille Schedule: Indicate drawing designation, room location, quantity, model number, size, and accessories furnished.

PART 2 - PRODUCTS

2.1 GRILLES

A. Fixed Face Grille (Louvered):

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. A-J Manufacturing Co., Inc.
b. Anemostat Products; a Mestek company.
c. Carnes Company.
d. Hart & Cooley Inc.
e. Krueger-HVAC, a division of Air System Components; Johnson Controls, Inc.
f. METALAIRE, Inc.
g. Nailor Industries Inc.
h. Price Industries.
i. Titus, a division of Air System Components; Johnson Controls, Inc.
j. Tuttle & Bailey; a division of Air System Components; Johnson Controls, Inc.

2. Material: Steel.
3. Finish: Mill, to be painted by others in field. Color by Architect.
4. Face Blade Arrangement: Horizontal; spaced 1/2 inch apart.
5. Frame: Border for exposed duct. Frame “hems” the raw edge of duct for a neat, clean grille mount.

B. Fixed Face Grille (Egg Crate):

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. A-J Manufacturing Co., Inc.
b. Anemostat Products; a Mestek company.
c. Carnes Company.
d. Hart & Cooley Inc.
e. Krueger-HVAC, a division of Air System Components; Johnson Controls, Inc.
f. METALAIRE, Inc.
g. Nailor Industries Inc.
h. Price Industries.
i. Titus, a division of Air System Components; Johnson Controls, Inc.
j. Tuttle & Bailey; a division of Air System Components; Johnson Controls, Inc.

2. Material: Aluminum.
3. Finish: Baked enamel, white.
4. Face Blade Arrangement: 1/2” by 1/2” by 1/2” aluminum grid core.

2.2 SOURCE QUALITY CONTROL

A. Verification of Performance: Rate registers and grilles according to ASHRAE 70, "Method of Testing for Rating the Performance of Air Outlets and Inlets."

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas where registers and grilles are installed for compliance with requirements for installation tolerances and other conditions affecting performance of equipment.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install grilles level and plumb.

B. Outlets and Inlets Locations: Drawings indicate general arrangement of ducts, fittings, and accessories. Air outlet and inlet locations have been indicated to achieve design requirements for air volume, noise criteria, airflow pattern, throw, and pressure drop. Make final locations where indicated, as much as practical. For units installed in lay-in ceiling panels, locate units in the center of panel. Where architectural features or other items conflict with installation, notify Architect for a determination of final location.

C. Install grilles with airtight connections to ducts and to allow service and maintenance of dampers.

END OF SECTION

SECTION 233723 - HVAC GRAVITY VENTILATORS

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. Hooded ventilators.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For gravity ventilators.

1. Include plans, elevations, sections, details, ventilator attachments to curbs, and curb attachments to roof structure.
2. Show weep paths, gaskets, flashing, sealant, and other means of preventing water intrusion.

1.4 COORDINATION

A. Coordinate sizes and locations of roof curbs, equipment supports, and roof penetrations with actual equipment provided.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. ASHRAE/IES 90.1 Compliance: Applicable requirements in ASHRAE/IES 90.1.

B. ASHRAE 62.1 Compliance: Section 5, "Systems and Equipment" and Section 7, "Construction and System Start-up."

C. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes, without buckling, opening of joints, overstressing of components, failure of connections, or other detrimental effects.

1. Temperature Change (Range):

a. Ambient: 120 deg F.
b. Material Surfaces: 180 deg F.

D. Water Entrainment: Limit water penetration through unit to comply with ASHRAE 62.1.

2.2 FABRICATION

A. Factory or shop fabricate gravity ventilators to minimize field splicing and assembly. Disassemble units to the minimum extent as necessary for shipping and handling. Clearly mark units for reassembly and coordinated installation.

B. Fabricate frames, including integral bases, to fit in openings of sizes indicated, with allowances made for fabrication and installation tolerances, adjoining material tolerances, and perimeter sealant joints.

C. Fabricate units with closely fitted joints and exposed connections accurately located and secured.

D. Fabricate supports, anchorages, and accessories required for complete assembly.

E. Perform shop welding by AWS-certified procedures and personnel.

2.3 HOODED VENTILATORS

A. Description: Hooded rectangular penthouse for relief air.

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Acme Engineering & Manufacturing Corp.
2. Carnes Company.
3. Greenheck Fan Corporation.
4. JencoFan.
5. Loren Cook Company.
6. PennBerry.
7. Safe Air – Dowco Products.
8. Twin City Fan & Blower.

C. Source Limitations: Obtain hooded ventilators from single manufacturer.

D. Construction:

1. Material: Aluminum, of thickness required to comply with structural performance requirements, but not less than 0.063-inch-thick base and 0.050-inch-thick hood; suitably reinforced.
2. Insulation: Mineral-fiber insulation and vapor barrier.
3. Bird Screening: Aluminum, 1/2-inch-square mesh or flattened, expanded aluminum, 3/4-inch diamond mesh wire.

E. Dampers:

1. Location: Hood neck.
2. Control: Motorized.

F. Roof Curbs: Galvanized-steel sheet; with mitered and welded corners; 1-1/2-inch-thick, rigid fiberglass insulation adhered to inside walls; and 1-1/2-inch wood nailer. Size as required to fit roof opening and ventilator base.

1. Configuration: Self-flashing without a cant strip, with mounting flange.
2. Overall Height: 14 inches.

2.4 MATERIALS

A. Aluminum Extrusions: ASTM B221, Alloy 6063-T5 or T-52.

B. Aluminum Sheet: ASTM B209, Alloy 3003 or 5005, with temper as required for forming or as otherwise recommended by metal producer for required finish.

C. Fasteners: Same basic metal and alloy as fastened metal or 300 Series stainless steel unless otherwise indicated. Do not use metals that are incompatible with joined materials.

1. Use types and sizes to suit unit installation conditions.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install gravity ventilators level, plumb, and at indicated alignment with adjacent work.

B. Secure gravity ventilators to roof curbs with zinc-plated hardware. Use concealed anchorages where possible. Refer to Section 077200 "Roof Accessories."

C. Install gravity ventilators with clearances for service and maintenance.

D. Install perimeter reveals and openings of uniform width for sealants and joint fillers, as indicated.

E. Install concealed gaskets, flashings, joint fillers, and insulation as installation progresses. Comply with Section 079200 "Joint Sealants" for sealants applied during installation.

F. Label gravity ventilators according to requirements specified in Section 230553 "Identification for HVAC Piping and Equipment."

G. Protect galvanized and nonferrous-metal surfaces from corrosion or galvanic action by applying a heavy coating of bituminous paint on surfaces that will be in contact with concrete, masonry, or dissimilar metals.

H. Repair finishes damaged by cutting, welding, soldering, and grinding. Restore finishes, so no evidence remains of corrective work. Return items that cannot be refinished in the field to the factory, make required alterations, and refinish entire unit or provide new units.

I. Refer to Section 077200 "Roof Accessories" for flashing and counterflashing of roof curbs.

3.2 CONNECTIONS

A. Duct installation and connection requirements are specified in Section 233113 "Metal Ducts." Drawings indicate general arrangement of ducts and duct accessories.

3.3 ADJUSTING

A. Adjust damper linkages for proper damper operation.

END OF SECTION 233723

SECTION 237416 - PACKAGED ROOFTOP AIR-CONDITIONING UNITS

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 packaged, large-capacity, rooftop air conditioning units (RTUs) with the following components:

1. Casings.
2. Fans, drives, and motors.
3. Coils.
4. Refrigerant circuit components.
5. Air filtration.
6. Gas furnaces.
7. Dampers.
8. Electrical power connections.
9. Controls.
10. Roof curbs.
11. Accessories.

1.3 DEFINITIONS

A. RTU: Rooftop unit. As used in this Section, this abbreviation means packaged, large-capacity, rooftop air-conditioning units. This abbreviation is used regardless of whether the unit is mounted on the roof or on a concrete base on ground.

1.4 ACTION SUBMITTALS

A. Product Data: For each RTU.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
2. Include rated capacities, dimensions, required clearances, characteristics, furnished specialties, and accessories.
3. Include unit dimensions and weight.
4. Include cabinet material, metal thickness, finishes, insulation, and accessories.
5. Fans:

    a. Include certified fan-performance curves with system operating conditions indicated.
    b. Include certified fan-sound power ratings.
    c. Include fan construction and accessories.
    d. Include motor ratings, electrical characteristics, and motor accessories.

6. Include certified coil-performance ratings with system operating conditions indicated.

7. Include filters with performance characteristics.
8. Include gas furnaces with performance characteristics.
9. Include factory selection calculations for each antimicrobial ultraviolet lamp installation.
10. Include dampers, including housings, linkages, and operators.

B. Shop Drawings: For each packaged, large-capacity, rooftop air-conditioning units.

1. Include plans, elevations, sections, and mounting details.
2. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
3. Include diagrams for power, signal, and control wiring.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For RTUs to include in emergency, operation, and maintenance manuals.

1.6 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Filters: One set of filters for each unit.

1.7 WARRANTY

A. Warranty: Manufacturer agrees to repair or replace components of outdoor, semi-custom, air-handling unit that fail in materials or workmanship within specified warranty period.

1. Limited warranty period for parts: Three years from date of Substantial Completion.
2. Limited warranty period for compressor: Five years from date of Substantial Completion.
3. Warranty period for labor: One year.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by an NRTL, and marked for intended location and application.

B. NFPA Compliance: Comply with NFPA 90A for design, fabrication, and installation of RTUs and components.

C. ASHRAE 62.1 Compliance: Applicable requirements in ASHRAE 62.1, Section 5 - "Systems and Equipment" and Section 7 - "Construction and Startup."

D. ASHRAE 15 Compliance: For refrigeration system safety.

E. ASHRAE/IES 90.1 Compliance: Applicable requirements in ASHRAE/IES 90.1, Section 6 - "Heating, Ventilating, and Air-Conditioning."

F. UL Compliance: Comply with UL 1995.

2.2 MANUFACTURERS

A. Subject to compliance with requirements, provide products by one of the following:

1. AAON.
2. CaptiveAire Systems.
3. Carrier Corporation.
4. Daikin Applied.
5. Trane.
6. YORK; a Johnson Controls company.

2.3 UNIT CASINGS

A. General Fabrication Requirements for Casings: Formed and reinforced double-wall insulated panels, fabricated to allow removal for access to internal parts and components, with joints between sections sealed.

B. Zinc coated, heavy gauge, galvanized steel.

C. Weather resistant pre-painted metal with galvanized substrate.

D. Air and water tight removable single side maintenance access panels with lifting handles.

E. Exposed vertical panels and top covers in the indoor air section insulated with a cleanable, foil-faced, fire-retardant permanent, odorless glass fiber material.

F. Base of unit insulated with 1/8”, foil-faced, closed-cell insulation.

G. Airstream Surfaces: Surfaces in contact with airstream shall comply with requirements in ASHRAE 62.1.

H. Condensate Drain Pans:

1. Location: Each type of cooling coil.
2. Construction:

    a. Single-wall, stainless steel sheet.

3. Drain Connection:

    a. Located at lowest point of pan and sized to prevent overflow. Terminate with threaded nipple on one end of pan.
    b. Minimum Connection Size: NPS 1.

2.4 FANS, DRIVES, AND MOTORS

A. Fan and Drive Assemblies: Statically and dynamically balanced and designed for continuous operation at maximum-rated fan speed and motor horsepower.

B. Supply-Air Fans: Plenum, backward-curved fan wheel.

C. Drives, Direct: Factory-mounted, direct drive.

D. Condenser-Coil Fan: Variable-speed propeller, mounted on shaft of permanently lubricated multispeed motors.

E. Motors:

1. External rotor, variable speed.
2. Efficiency: Premium efficient as defined in NEMA MG 1.
3. Controllers, Electrical Devices, and Wiring: Comply with requirements for electrical devices and connections specified in electrical Sections.

2.5 COILS

A. General Requirements for Coils:

1. Comply with AHRI 410.
2. Fabricate coils section to allow removal and replacement of coil for maintenance and to allow in-place access for service and maintenance of coil(s).
3. Coils shall not act as structural component of unit.

B. Supply-Air Refrigerant Coil:

1. Microchannel, all-aluminum, fully-brazed.
2. Ratings: Designed, tested, and rated according to ASHRAE 33 and AHRI 410.

a. Working Pressure: Minimum 300 psig.

2.6 REFRIGERANT CIRCUIT COMPONENTS

A. Number of Refrigerant Circuits: One.

B. Compressor: Hermetic, variable speed scroll, mounted on vibration isolators; with internal overcurrent and high-temperature protection, internal pressure relief, and crankcase heater.

C. Refrigeration Specialties:

1. Refrigerant: R-410A.
2. Expansion valve with replaceable thermostatic element.
3. Refrigerant filter/dryer.
4. Manual-reset high-pressure safety switch.
5. Automatic-reset low-pressure safety switch.
6. Minimum off-time relay.
7. Automatic-reset compressor motor thermal overload.
8. Brass service valves installed in compressor suction and liquid lines.
9. Low-ambient kit high-pressure sensor.

2.7 AIR FILTRATION

2.8 AIR FILTRATION

A. 2-inch MERV 8 minimum.

2.9 GAS FURNACES

A. Description: Factory assembled, piped, and wired; complying with ANSI Z21.47/CSA 2.3 and NFPA 54.

B. CSA Approval: Designed and certified by and bearing label of CSA.

C. Burners: Stainless steel.

1. Fuel: Natural gas.
2. Ignition: Electronically controlled electric spark or hot-surface igniter with flame sensor.
3. Gas Control Valve: Modulating.
4. Gas Train: Single-body, regulated, redundant, 24-V ac gas valve assembly containing pilot solenoid valve, pilot filter, pressure regulator, pilot shutoff, and manual shutoff.

D. Heat-Exchanger and Drain Pan: Stainless steel.

E. Induced draft combustion blower.

2.10 ELECTRICAL POWER CONNECTIONS

A. RTU shall have a single connection of power to unit with unit-mounted disconnect switch accessible from outside unit and control-circuit transformer with built-in overcurrent protection.

2.11 CONTROLS

A. In order to ensure future serviceability it is the intent of this specification that the local control contractor provide all programmable microprocessor based controls for all HVAC equipment with the exception of controls that are internal to the operation of equipment. It is acceptable if the equipment supplier has a DDC ready package available to include dampers, valves, actuators, sensors, relays and safeties, transformer etc. Any equipment provided devices from the factory must match those specified herein and be coordinated with the control contractor to ensure power and signal compatibility are met.

2.12 ROOF CURBS

A. Materials: Galvanized steel with corrosion-protection coating, watertight gaskets, and factory-installed wood nailer; complying with NRCA standards.

1. Curb Insulation and Adhesive: Comply with NFPA 90A or NFPA 90B.

a. Materials: ASTM C1071, Type I or II.

2. Application: Factory applied with adhesive and mechanical fasteners to the internal surface of curb.

    a. Liner Adhesive: Comply with ASTM C916, Type I.
    b. Mechanical Fasteners: Galvanized steel, suitable for adhesive attachment, mechanical attachment, or welding attachment to duct without damaging liner when applied as recommended by manufacturer and without causing leakage in cabinet.
    c. Liner materials applied in this location shall have air-stream surface coated with a temperature-resistant coating or faced with a plain or coated fibrous mat or fabric depending on service air velocity.
    d. Liner Adhesive: Comply with ASTM C916, Type I.

B. Curb Dimensions: Minimum height of 14 inches.

2.13 ACCESSORIES

A. Duplex, 115-V, ground-fault-interrupter outlet with 15-A overcurrent protection. Include transformer if required.

B. Filter differential pressure switch with sensor tubing on either side of filter. Set for final filter pressure loss.

C. Safeties:

1. Smoke detector.
2. Condensate overflow switch.
3. Phase-loss, balance, and reversal protection.
4. High- and low-pressure control.
5. Gas furnace airflow-proving switch.

D. Coil guards of painted, galvanized-steel wire.

E. Door switches to disable heating or reset set point when open.

F. Outdoor air intake weather hood.

2.14 MATERIALS

A. Steel:

1. ASTM A36/A36M for carbon structural steel.
2. ASTM A568/A568M for steel sheet.

B. Stainless Steel:

1. Manufacturer's standard grade for casing.
2. Manufacturer's standard type, ASTM A240/A240M for bare steel exposed to airstream or moisture.

C. Galvanized Steel: ASTM A653/A653M.

D. Aluminum: ASTM B209.

2.15 SOURCE QUALITY CONTROL

A. AHRI Compliance:

1. Comply with AHRI 340/360 for testing and rating energy efficiencies for RTUs.
2. Comply with AHRI 210/240 for testing and rating energy efficiencies for RTUs
3. Comply with AHRI 270 for testing and rating sound performance for RTUs.

B. AMCA Compliance:

1. Comply with AMCA 11 and bear the AMCA-Certified Ratings Seal for air and sound performance according to AMCA 211 and AMCA 311.
2. Damper leakage tested in accordance with AMCA 500-D.
3. Operating Limits: Classify according to AMCA 99.

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 RTUs.

B. Examine roughing-in for RTUs to verify actual locations of piping and duct connections before equipment installation.

C. Examine roofs for suitable conditions where RTUs will be installed.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Roof Curb: Install on roof structure, level and secure, according to NRCA's "NRCA Roofing Manual: Membrane Roof Systems" or AHRI Guideline B. Install RTUs on curbs and coordinate roof penetrations and flashing with roof construction specified in Section 077200 "Roof Accessories." Secure RTUs to upper curb rail, and secure curb base to roof framing with anchor bolts. Coordinate sizes and locations of roof curbs with actual equipment provided.

3.3 PIPING CONNECTIONS

A. Piping installation requirements are specified in other Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Where installing piping adjacent to RTU, allow space for service and maintenance.

C. Connect piping to unit mounted on vibration isolators with flexible connectors.

D. Connect condensate drain pans using NPS 1-1/4, ASTM B88, Type M copper tubing. Extend to nearest equipment or roof drain. Construct deep trap at connection to drain pan and install cleanouts at changes in direction.

E. Gas Piping: Comply with applicable requirements in Section 231123 "Facility Natural-Gas Piping." Connect gas piping to burner, full size of gas train inlet, and connect with union and shutoff valve with sufficient clearance for burner removal and service.

3.4 DUCT CONNECTIONS

A. Comply with duct installation requirements specified in other HVAC Sections. Drawings indicate the general arrangement of ducts. The following are specific connection requirements:

1. Install ducts to termination at top of roof curb.
2. Remove roof decking only as required for passage of ducts. Do not cut out decking under entire roof curb.
3. Connect supply ducts to RTUs with flexible duct connectors specified in Section 233300 "Air Duct Accessories."
4. Install return-air duct continuously through roof structure.

3.5 ELECTRICAL CONNECTIONS

A. Connect electrical wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

B. Ground equipment according to Section 260526 "Grounding and Bonding for Electrical Systems."

C. Install electrical devices furnished by manufacturer, but not factory mounted, according to NFPA 70 and NECA 1.

3.6 CONTROL CONNECTIONS

A. Install control and electrical power wiring to field-mounted control devices.

B. Connect control wiring according to Section 260523 "Control-Voltage Electrical Power Cables."

3.7 STARTUP SERVICE

A. Engage a factory-authorized service representative to perform startup service.

B. Complete installation and startup checks according to manufacturer's written instructions.

1. Inspect for visible damage to unit casing.
2. Inspect for visible damage to furnace combustion chamber.
3. Inspect for visible damage to compressor, coils, and fans.
4. Inspect internal insulation.
5. Verify that labels are clearly visible.
6. Verify that clearances have been provided for servicing.
7. Verify that controls are connected and operable.
8. Verify that filters are installed.
9. Clean condenser coil and inspect for construction debris.
10. Clean furnace flue and inspect for construction debris.
11. Connect and purge gas line.
12. Remove packing from vibration isolators.

13. Inspect operation of barometric relief dampers.
14. Verify lubrication on fan and motor bearings.
15. Inspect fan-wheel rotation for movement in correct direction without vibration and binding.
16. Adjust fan belts to proper alignment and tension.
17. Start unit according to manufacturer's written instructions.

    a. Start refrigeration system.
    b. Do not operate below recommended low-ambient temperature.
    c. Complete startup sheets and attach copy with Contractor's startup report.

18. Inspect and record performance of interlocks and protective devices; verify sequences.
19. Operate unit for an initial period as recommended or required by manufacturer.
20. Perform the following operations for both minimum and maximum firing. Adjust burner for peak efficiency.

    a. Measure gas pressure on manifold.
    b. Inspect operation of power vents.
    c. Measure combustion-air temperature at inlet to combustion chamber.
    d. Measure flue-gas temperature at furnace discharge.
    e. Perform flue-gas analysis. Measure and record flue-gas carbon dioxide and oxygen concentration.
    f. Measure supply-air temperature and volume when burner is at maximum firing rate and when burner is off. Calculate useful heat to supply air.

21. Calibrate thermostats.
22. Adjust and inspect high-temperature limits.
23. Inspect outdoor-air dampers for proper stroke and interlock with return-air dampers.
24. Start refrigeration system and measure and record the following when ambient is a minimum of 15 deg F above return-air temperature:

    a. Coil leaving-air, dry- and wet-bulb temperatures.
    b. Coil entering-air, dry- and wet-bulb temperatures.
    c. Outdoor-air, dry-bulb temperature.
    d. Outdoor-air-coil, discharge-air, dry-bulb temperature.

25. Inspect controls for correct sequencing of heating, mixing dampers, refrigeration, and normal and emergency shutdown.
26. Measure and record the following minimum and maximum airflows. Plot fan volumes on fan curve.

    a. Supply-air volume.
    b. Return-air volume.
    c. Relief-air volume.
    d. Outdoor-air intake volume.

27. Simulate maximum cooling demand and inspect the following:

    a. Compressor refrigerant suction and hot-gas pressures.
    b. Short circuiting of air through condenser coil or from condenser fans to outdoor-air intake.

28. Verify operation of remote panel including pilot-light operation and failure modes. Inspect the following:

    a. High-temperature limit on gas-fired heat exchanger.

b. Low-temperature safety operation.
c. Filter high-pressure differential alarm.
d. Economizer to minimum outdoor-air changeover.
e. Smoke and firestat alarms.

29. After startup and performance testing and prior to Substantial Completion, replace existing filters with new filters.

3.8 ADJUSTING

A. Adjust damper linkages for proper damper operation.

B. Comply with requirements in Section 230593 "Testing, Adjusting, and Balancing for HVAC" for air-handling system testing, adjusting, and balancing.

C. Occupancy Adjustments: When requested within 12 months from date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to [**two**] <**Insert number**> visits to Project during other-than-normal occupancy hours for this purpose.

3.9 CLEANING

A. After completing system installation and testing, adjusting, and balancing RTUs and air-distribution systems and after completing startup service, clean RTUs internally to remove foreign material and construction dirt and dust. Clean fan wheels, cabinets, dampers, coils, and filter housings, and install new, clean filters.

3.10 FIELD QUALITY CONTROL

A. Perform the following tests and inspections with the assistance of a factory-authorized service representative:

1. After installing RTUs and after electrical circuitry has been energized, test units for compliance with requirements.
2. Inspect for and remove shipping bolts, blocks, and tie-down straps.
3. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

B. RTU will be considered defective if it does not pass tests and inspections.

C. Prepare test and inspection reports.

3.11 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain RTUs.

END OF SECTION

SECTION 238219 - FAN COIL UNITS

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. Ducted fan coil units and accessories.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include rated capacities, operating characteristics, and furnished specialties and accessories.

B. Shop Drawings:

1. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
2. Include diagrams for power, signal, and control wiring.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For fan coil units to include in emergency, operation, and maintenance manuals.

1. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:

a. Maintenance schedules and repair part lists for motors, coils, integral controls, and filters.

1.5 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Fan Coil Unit Filters: Furnish one spare filters for each filter installed.

1.6 QUALITY ASSURANCE

A. Comply with NFPA 70.

B. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 5 - "Systems and Equipment" and Section 7 - "Construction and Startup."

C. ASHRAE/IES 90.1 Compliance: Applicable requirements in ASHRAE/IES 90.1, Section 6 - "Heating, Ventilating, and Air-Conditioning."

1.7 COORDINATION

A. Coordinate layout and installation of fan coil units and suspension system components with other construction that penetrates or is supported by ceilings, including light fixtures, HVAC equipment, fire-suppression-system components, and partition assemblies.

B. Coordinate size and location of wall sleeves for outdoor-air intake.

1.8 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of condensing units that fail in materials or workmanship within specified warranty period.

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Factory-packaged and -tested units rated according to AHRI 440, ASHRAE 33, and UL 1995.

2.2 DUCTED FAN COIL UNITS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Carrier Corporation.
2. Daikin Applied.
3. ENVIRO-TEC; by Johnson Controls company.
4. Greenheck Fan Corporation.
5. Johnson Controls.
6. Trane Inc.
7. YORK; a Johnson Controls company.

B. Coil Section Insulation: minimum 1/2-inch-thick, foil-covered, closed-cell foam complying with ASTM C1071 and attached with adhesive complying with ASTM C916.

1. Surface-Burning Characteristics: Insulation and adhesive shall have a combined maximum flame-spread index of 25 and smoke-developed index of 50 when tested according to ASTM E84 by a qualified testing agency.
2. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.

C. Coil Section Insulation: Insulate coil section according to Section 230616 "HVAC Equipment Insulation."

1. Surface-Burning Characteristics: Insulation and adhesive shall have a combined maximum flame-spread index of 25 and smoke-developed index of 50 when tested according to ASTM E84 by a qualified testing agency.
2. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.

D. Drain Pans: Plastic. Fabricate pans and drain connections to comply with ASHRAE 62.1. Drain pans shall be removable.

E. Chassis: Galvanized steel where exposed to moisture, with baked powder finish and removable access panel. Floor-mounting units shall have leveling screws.

F. Cabinet: Steel with baked-enamel finish in manufacturer's standard paint color as selected by Architect.

1. Horizontal Unit Bottom Panels: Fastened to unit with cam fasteners and hinge and attached with safety chain.

G. Filters: Minimum arrestance and a minimum efficiency reporting value (MERV) according to ASHRAE 52.2 and all addendums.

H. Hydronic Coils: Copper tube, with mechanically bonded aluminum fins spaced no closer than 0.1 inch, rated for a minimum working pressure of 200 psig and a maximum entering-water temperature of 220 deg F. Include manual air vent and drain valve.

I. Fan and Motor Board: Removable.

1. Fan: Forward curved, double width, centrifugal; directly connected to motor. Thermoplastic or painted-steel wheels, and aluminum, painted-steel, or galvanized-steel fan scrolls.
2. Motor: Permanently lubricated, multispeed; resiliently mounted on motor board.
3. Wiring Termination: Connect motor to chassis wiring with plug connection.

J. Basic Unit Controls:

1. Control voltage transformer.
2. Wall-mounting thermostat with the following features:

    a. Heat-cool-off switch.
    b. Fan on-auto switch.
    c. Fan-speed switch.
    d. Manual changeover.
    e. Adjustable deadband.
    f. Exposed set point.
    g. Exposed indication.
    h. Degree F indication.

3. Unoccupied-period-override push button.
4. Data entry and access port.

    a. Input data includes room temperature, and humidity set points and occupied and unoccupied periods.
    b. Output data includes room temperature and humidity, supply-air temperature, entering-water temperature, operating mode, and status.

K. DDC Terminal Controller:

1. Scheduled Operation: Occupied and unoccupied periods on seven-day clock with a minimum of four programmable periods per day.
2. Unoccupied-Period-Override Operation: Two hours.
3. Unit Supply-Air Fan Operation:

    a. Occupied Periods: Fan runs continuously.
    b. Unoccupied Periods: Fan cycles to maintain room setback temperature.

4. Hydronic-Cooling-Coil Operation:

    a. Occupied Periods: Modulate control valve to maintain room temperature.
    b. Unoccupied Periods: Close control valve.

L. Interface with DDC System for HVAC Requirements:

1. Interface relay for scheduled operation.
2. Interface relay to provide indication of fault at the central workstation.
3. Provide BACnet interface for central DDC system for HVAC workstation for the following functions:

    a. Adjust set points.
    b. Fan coil unit start, stop, and operating status.
    c. Data inquiry, including outdoor-air damper position, supply- and room-air temperature.
    d. Occupied and unoccupied schedules.

M. Electrical Connection: Factory wire motors and controls for a single electrical connection.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas, with Installer present, to receive fan coil units for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine roughing-in for piping and electrical connections to verify actual locations before fan coil unit installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install fan coil units level and plumb.

B. Install fan coil units to comply with NFPA 90A.

C. Suspend fan coil units from structure with elastomeric hangers.

D. Verify locations of thermostats, humidistats, and other exposed control sensors with Drawings and room details before installation. Install devices 48 inches above finished floor.

E. Install new filters in each fan coil unit within two weeks after Substantial Completion.

3.3 CONNECTIONS

A. Piping installation requirements are specified in other Sections. Drawings indicate general arrangement of piping, fittings, and specialties. Specific connection requirements are as follows:

1. Install piping adjacent to machine to allow service and maintenance.
2. Connect piping to fan coil unit factory hydronic piping package. Install piping package if shipped loose.
3. Connect condensate drain to indirect waste.

    a. Install condensate trap of adequate depth to seal against fan pressure. Install cleanouts in piping at changes of direction.

B. Connect supply-air and return-air ducts to fan coil units with flexible duct connectors specified in Section 233300 "Air Duct Accessories." Comply with safety requirements in UL 1995 for duct connections.

C. Ground equipment according to Section 260526 "Grounding and Bonding for Electrical Systems."

D. Connect wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

3.4 FIELD QUALITY CONTROL

A. Perform the following tests and inspections with the assistance of a factory-authorized service representative:

1. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
2. Operate electric heating elements through each stage to verify proper operation and electrical connections.
3. Test and adjust controls and safety devices. Replace damaged and malfunctioning controls and equipment.

B. Remove and replace malfunctioning units and retest as specified above.

C. Prepare test and inspection reports.

3.5 ADJUSTING

A. Adjust initial temperature and humidity set points.

B. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to two visits to Project during other-than-normal occupancy hours for this purpose.

3.6 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain fan coil units.

END OF SECTION

SECTION 238239.13 - CABINET UNIT HEATERS

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 cabinet unit heaters with centrifugal fans and electric-resistance heating coils.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include rated capacities, operating characteristics, furnished specialties, and accessories.

B. Shop Drawings:

1. Include plans, elevations, sections, and details.
2. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
3. Include location and size of each field connection.
4. Include details of anchorages and attachments to structure and to supported equipment.
5. Include equipment schedules to indicate rated capacities, operating characteristics, furnished specialties, and accessories.
6. Indicate location and arrangement of integral controls.
7. Wiring Diagrams: Power, signal, and control wiring.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For cabinet unit heaters to include in emergency, operation, and maintenance manuals.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Subject to compliance with requirements, provide products by one of the following:

1. Berko; Marley Engineered Products.
2. INDEECO.
3. Markel Products; TPI Corporation.
4. Marley Engineered Products.
5. QMark; Marley Engineered Products.

2.2 DESCRIPTION

A. Factory-assembled and -tested unit complying with AHRI 440.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. Comply with UL 2021.

2.3 PERFORMANCE REQUIREMENTS

A. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 5 - "Systems and Equipment" and Section 7 - "Construction and Startup."

B. ASHRAE/IESNA 90.1 Compliance: Applicable requirements in ASHRAE/IESNA 90.1, Section 6 - "Heating, Ventilating, and Air-Conditioning."

2.4 CABINETS

A. Material: Steel with baked-enamel or powder coat finish with manufacturer's standard paint, in color selected by Architect.

1. Back box: Minimum 20 gauge galvanized sheet steel, with knockouts for power leads.
2. Faceplate: Minimum 14 gauge cold-rolled steel, louvered, with mesh screen beneath, tamper-resistant screws.

2.5 COILS

A. Electric-Resistance Heating Coil: Nickel-chromium heating wire, free from expansion noise and hum, mounted in ceramic inserts in galvanized-steel housing; with fuses in terminal box for overcurrent protection and limit controls for high-temperature protection. Terminate elements in stainless-steel machine-staked terminals secured with stainless-steel hardware.

2.6 CONTROLS

A. Fan and Motor Board: Removable.

1. Fan: Five bladed aluminum.
2. Motor: Totally enclosed.

B. Fan Delay Switch:

1. Fan control shall be of bi-metallic, snap-action type and shall activate fan after heating element reaches operating temperature. The fan shall continue to operate after the thermostat is satisfied and until the heating element is cool.

C. Thermal Cutout:

1. A thermal cutout shall be built into the system to shut off the heater in the event of overheating.

D. Disconnect Switch:

1. A double-pole single throw disconnect switch shall be mounted on the back box for positive disconnect of power supply. It will be completely concealed behind faceplate.

E. Thermostat:

1. Tamper-resistant thermostat shall be of the bi-metal, snap-action type with enclosed contacts, completely concealed behind the faceplate.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas to receive cabinet unit heaters for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine roughing-in for electrical connections to verify actual locations before unit-heater installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install cabinet unit heaters to comply with NFPA 90A.

3.3 CONNECTIONS

A. Comply with safety requirements in UL 1995.

B. Ground equipment according to Section 260526 "Grounding and Bonding for Electrical Systems."

C. Connect wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

3.4 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
2. Operate electric heating elements through each stage to verify proper operation and electrical connections.
3. Test and adjust controls and safety devices. Replace damaged and malfunctioning controls and equipment.

B. Units will be considered defective if they do not pass tests and inspections.

C. Prepare test and inspection reports.

3.5 ADJUSTING

A. Adjust initial temperature set points.

END OF SECTION

SECTION 311000
SITE CLEARING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:
   1. Protecting existing trees and grass to remain.
   2. Removing existing trees, shrubs, groundcovers, plants, and grass.
   3. Clearing and grubbing.
   4. Stripping and stockpiling topsoil.
   5. Removing above and below-grade site improvements, including sidewalks, pavement.
   6. Removal and disconnecting and capping or sealing of site utilities including water, storm, sanitary, gas, electric.
   7. Installation, maintenance and removal of temporary erosion and sedimentation control measures.

1.2 MATERIAL OWNERSHIP

A. Except for stripped topsoil or other materials indicated to remain Owner's property, cleared and/or removed materials shall become Contractor's property and shall be removed from Project site.

1.3 PROJECT CONDITIONS

A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during site-clearing operations.
   1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
   2. Provide alternate routes around closed or obstructed traffic ways if required by authorities having jurisdiction.

B. Salvable Improvements: Carefully remove items indicated to be salvaged and store on Owner's premises where indicated.

C. Utility Locator Service:
   1. Contact local “Miss Dig” by phone at 811 or 800-482-7171 or via the web at either elocate.missdig.org for a single address or rte.missdig.org, a minimum of 72 hours (excluding Saturdays, Sundays and Holidays) in advance of any excavation. Request underground utilities to be located and marked within and surrounding the construction area.
   2. Coordinate with the Owner’s representative for marking privately owned utilities.

D. Do not commence site clearing operations until temporary erosion and sedimentation control measures are in place.

PART 2 - EXECUTION

2.1 PREPARATION

A. Protect and maintain benchmarks and survey control points from disturbance during construction.

B. Locate and clearly flag trees and vegetation to remain or to be relocated.

C. Protect existing site improvements to remain from damage during construction.
   1. Restore damaged improvements to their original condition, as acceptable to Owner.

2.2 TEMPORARY EROSION AND SEDIMENTATION CONTROL

A. Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to requirements of authorities having jurisdiction, sediment and erosion control measures shown on the Drawings, and a sediment and erosion control plan, specific to the site, that complies with EPA 832/R-92-005 and requirements of the Michigan Department of Management and Budget.

B. Inspect, repair, and maintain erosion and sedimentation control measures daily during construction until permanent vegetation has been established.

C. Once permanent vegetation has been well established, remove erosion and sedimentation controls. Restore and stabilize areas disturbed during removal of temporary erosion and sedimentation control measures.

2.3 TREE PROTECTION

A. Erect and maintain temporary fencing around tree protection zones before starting site clearing. Remove fence when construction is complete.

B. Do not excavate within tree protection zones, unless otherwise indicated.

C. Repair or replace trees and vegetation indicated to remain that are damaged by construction operations, in a manner approved by Engineer.

2.4 UTILITIES

A. Locate, identify, disconnect, and seal or cap off utilities indicated to be removed.
   1. Arrange with utility companies to shut off indicated utilities.

B. Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:
   1. Notify Engineer not less than two days in advance of proposed utility interruptions.
   2. Do not proceed with utility interruptions without Engineer’s written permission.

C. Removal of underground utilities is included in Division 02 Section Structure Demolition covering site utilities.

2.5 CLEARING AND GRUBBING

A. Fill depressions caused by clearing and grubbing operations with satisfactory soil material unless further excavation or earthwork is indicated.
   1. Place fill material in horizontal layers not exceeding a loose depth of 8 inches and compact each layer to a density equal to adjacent original ground.

B. Remove trees, shrubs, grass, and other vegetation, improvements, or obstructions, as required, to permit installation of new construction. Remove similar items elsewhere on site or premises as specifically indicated. Removal includes digging out and off-site disposal of stumps and roots.
   1. Cut minor roots and branches of trees indicated to remain in a clean and careful manner where such roots and branches obstruct installation of new construction.

2.6 TOPSOIL STRIPPING

A. Remove sod and grass before stripping topsoil.

B. Strip topsoil to whatever depths are encountered in a manner to prevent intermingling with underlying subsoil or other waste materials.

C. Stockpile topsoil materials away from edge of excavations without intermixing with subsoil. Grade and shape stockpiles to drain surface water. Cover to prevent windblown dust.

2.7 SITE IMPROVEMENTS

A. Remove existing above- and below-grade improvements as indicated and as necessary to facilitate new construction.

B. Remove debris, rock, paving and curbs at areas indicated on the drawings for removal. Neatly saw cut edges full depth at a right angle to the surface. Where saw cuts area required in concrete slabs and/or curb and gutter. Saw cut at the nearest joint.

C. Remove all existing pavement structure (including curbs), as shown on the drawings.
   1. Remove pavement to existing edge or joint, where remaining dimension is less than 3 feet.
   2. Provide a butt joint where new pavement meets existing pavement.

2.8 DISPOSAL

A. Disposal: Remove surplus soil material, unsuitable topsoil, obstructions, demolished materials, and waste materials including trash and debris, and legally dispose of them off Owner's property.
   1. Separate recyclable materials produced during site clearing from other non-recyclable materials. Store or stockpile without intermixing with other materials and transport them to recycling facilities.
   2. The contractor shall comply with all applicable Federal, State and Local laws and ordinances regarding transportation and disposal of removed items and waste material. This shall include all M.I.O.S.H.A. regulations.
   3. Continuously clean-up and remove waste materials from the project site. Do not allow waste materials to accumulate on site.

END OF SECTION 311000

SECTION 312000
EARTH MOVING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:
   1. Excavating and backfilling for utility trenches.
   2. Excavating and backfilling for buildings and structures.
   3. Preparing subgrades for slabs-on-grade, walks, pavements, lawns and grasses, and exterior plantings.
   4. Subbase course for concrete walks.
   5. Subbase and base course for asphalt paving.
   6. Drainage course for slabs-on-grade.

1.2 RELATED WORK

A. Examine Contract Documents for requirements that affect work of this section. Other specification sections that directly relate to work of this Section include, but are not limited to:

   1. Section 311000 – Site Clearing
   2. Section 321216 – Asphalt Paving
   3. Section 321313 – Concrete Paving

1.3 REFERENCES

A. MDOT – Michigan Department of Transportation, "Standard Specifications for Construction", latest edition.

B. ASTM - American Society of Testing Materials, latest edition.

C. Local utility standards when working within 24 inches of a utility line.

1.4 DEFINITIONS

A. Backfill: Soil material used to fill an excavation.
   1. Initial Backfill: Backfill placed beside and over pipe in a trench, including haunches to support sides of pipe.
   2. Final Backfill: Backfill placed over initial backfill to fill a trench.

B. Base Course: Course placed between the subbase course and hot-mix asphalt paving.

C. Bedding Course: Course placed over the excavated subgrade in a trench before laying pipe.

D. Borrow Soil: Satisfactory soil imported from off-site for use as fill or backfill.

E. Drainage Course: Course supporting the slab-on-grade that also minimizes upward capillary flow of pore water.

F. Excavation: Removal of material encountered above subgrade elevations and to lines and dimensions indicated.
   1. Authorized Additional Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions as directed by Engineer. Authorized additional excavation and replacement material will be paid for according to Contract provisions changes in the Work.
   2. Unauthorized Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions without direction by Engineer. Unauthorized excavation, as well as remedial work directed by Engineer, shall be without additional compensation.

G. Fill: Soil materials used to raise existing grades.

H. Maximum Density: Maximum dry weight in pounds per cubic foot of a specific material.

I. Optimum Moisture: Percentage of water at maximum density.

J. Rock: All boulders or rock approximately one cubic yard or more and all solid or ledge rock, slate, shale, sandstone and other hard materials that require continuous use of pneumatic tools, heavy rippers or continuous drilling and blasting for removal. Pavements are not included.

K. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below the ground surface.

L. Subbase Course: Course placed between the subgrade and base course for hot-mix asphalt pavement, or course placed between the subgrade and a cement concrete pavement or a cement concrete or hot-mix asphalt walk.

M. Subgrade: Surface or elevation remaining after completing excavation, or top surface of a fill or backfill immediately below subbase, drainage fill, or topsoil materials.

N. Utilities: On-site underground pipes, conduits, ducts, and cables, as well as underground services within buildings.

1.5 PROJECT CONDITIONS

A. Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted in writing by Engineer and then only after arranging to provide temporary utility services according to requirements indicated.

1.6 SUBMITTALS

A. Materials Source: Submit name of imported fill materials suppliers. Aggregate supplier shall provide current test results of materials supplied verifying that supplied products meet product requirements.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

A. General: Provide borrow soil materials when sufficient satisfactory soil materials are not available from on-site excavations.

B. Subbase Material: Granular material MDOT 902.08, Table 902-3, Class II or IIA.

C. Base Course: For bases to be surfaced with concrete or bituminous mixtures, use Aggregate 21AA unless otherwise specified. MDOT 302.02 and 902.06.

D. Bedding Course: MDOT Class II.

E. Aggregate Surface Course:
   1. Use Aggregate 21AA when the Aggregate surface course is to receive a bituminous surface at a later date. MDOT 306.02 and 902.06.
   2. Use Aggregate 23A when the Aggregate Surface Course is to be constructed without a bituminous surface. MDOT 306.02 and 902.06

PART 3 - EXECUTION

3.1 PREPARATION

A. Contact local “Miss Dig” by phone at 811 or 800-482-7171 or via the web at either elocate.missdig.org for a single address or rte.missdig.org, a minimum of 72 hours (excluding Saturdays, Sundays and Holidays) in advance of any excavation.

B. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations.

C. Preparation of subgrade for earthwork operations including removal of vegetation, topsoil, debris, obstructions, and deleterious materials from ground surface is specified in Division 31 Section "Site Clearing."

D. Protect and maintain erosion and sedimentation controls, which are specified in Division 31 Section "Site Clearing" during all earthwork operations.

3.2 EXCAVATION

A. Unclassified Excavation: Excavate to subgrade elevations regardless of the character of surface and subsurface conditions encountered. Unclassified excavated materials may include rock, soil materials, and obstructions. No changes in the Contract Sum or the Contract Time will be authorized for rock excavation or removal of obstructions.
   1. If excavated materials intended for fill and backfill include unsatisfactory soil materials and rock, replace with satisfactory soil materials.

3.3 EXCAVATION FOR STRUCTURES

A. Excavate to indicated elevations and dimensions within a tolerance of plus or minus 1 inch (25 mm). If applicable, extend excavations a sufficient distance from structures for placing and removing concrete formwork, for installing services and other construction, and for inspections.
   1. Excavations for Footings and Foundations: Do not disturb bottom of excavation. Excavate by hand to final grade just before placing concrete reinforcement. Trim bottoms to required lines and grades to leave solid base to receive other work.

3.4 EXCAVATION FOR WALKS AND PAVEMENTS

A. Excavate surfaces under walks and pavements to indicated lines, cross sections, elevations, and subgrades.

3.5 EXCAVATION FOR UTILITY TRENCHES

A. Excavate trenches to indicated gradients, lines, depths, and elevations.

B. Excavate trenches to uniform widths to provide the following clearance on each side of pipe or conduit. Excavate trench walls vertically from trench bottom to 12 inches higher than top of pipe or conduit, unless otherwise indicated.
   1. Clearance: As indicated on Detail Sheet.

C. Trench Bottoms: Excavate and shape trench bottoms to provide uniform bearing and support of pipes and conduit. Shape subgrade to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits. Remove projecting stones and sharp objects along trench subgrade.

3.6 SUBGRADE INSPECTION

A. Proof-roll subgrade below the building slabs and pavements with heavy pneumatic-tired equipment to identify soft pockets and areas of excess yielding. Do not proof-roll wet or saturated subgrades.

B. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by Engineer, without additional compensation.

3.7 STORAGE OF SOIL MATERIALS

A. Stockpile borrow soil materials and excavated satisfactory soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
   1. Stockpile soil materials away from edge of excavations. Do not store within drip line of remaining trees.

3.8 UTILITY TRENCH BACKFILL

A. Place backfill on subgrades free of mud, frost, snow, or ice.

B. Place and compact bedding course on trench bottoms and where indicated. Shape bedding course to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits.

C. Backfill trenches excavated under footings and within 18 inches of bottom of footings with satisfactory soil; fill with concrete to elevation of bottom of footings. Concrete is specified in Division 03 Section "Cast-in-Place Concrete."

D. Place and compact initial backfill of satisfactory soil, free of particles larger than 1 inch in any dimension, to a height of 12 inches over the utility pipe or conduit.
   1. Carefully compact initial backfill under pipe haunches and compact evenly up on both sides and along the full length of utility piping or conduit to avoid damage or displacement of piping or conduit. Coordinate backfilling with utilities testing.

E. Place and compact final backfill of satisfactory soil to final subgrade elevation.

3.9 SOIL FILL

A. Plow, scarify, bench, or break up sloped surfaces steeper than 1 vertical to 4 horizontal so fill material will bond with existing material.

B. Place and compact fill material in layers to required elevations as follows:
   1. Under grass and planted areas, use satisfactory soil material.
   2. Under walks and pavements, use satisfactory soil material.
   3. Under steps and ramps, use engineered fill.
   4. Under building slabs, use engineered fill.
   5. Under footings and foundations, use engineered fill.

3.10 SOIL MOISTURE CONTROL

A. Uniformly moisten or aerate subgrade and each subsequent fill or backfill soil layer before compaction to within 2 percent of optimum moisture content.
   1. Do not place backfill or fill soil material on surfaces that are muddy, frozen, or contain frost or ice.
   2. Remove and replace, or scarify and air dry otherwise satisfactory soil material that exceeds optimum moisture content by 2 percent and is too wet to compact to specified dry unit weight.

3.11 COMPACTION OF SOIL BACKFILLS AND FILLS

A. Place backfill and fill soil materials in layers not more than 8 inches in loose depth for material compacted by heavy compaction equipment, and not more than 4 inches in loose depth for material compacted by hand-operated tampers.

B. Place backfill and fill soil materials evenly on all sides of structures to required elevations, and uniformly along the full length of each structure.

C. Compact soil materials to not less than the following percentages of maximum dry unit weight according to ASTM D 698 or ASTM D 1557:
   1. Under structures, building slabs, steps, and pavements, scarify and recompact top 12 inches of existing subgrade and each layer of backfill or fill soil material at 95 percent.

2. Under lawn or unpaved areas, scarify and recompact top 6 inches below subgrade and compact each layer of backfill or fill soil material at 85 percent.
3. For utility trenches, compact each layer of initial and final backfill soil material at 85 percent.

3.12 GRADING

A. General: Uniformly grade areas to a smooth surface, free of irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated.

B. Site Grading: Slope grades to direct water away from buildings and to prevent ponding. Finish subgrades to required elevations within the following tolerances:
1. Lawn or Unpaved Areas: Plus or minus 1 inch.
2. Walks: Plus or minus 1 inch.
3. Pavements: Plus or minus 1/2 inch.

C. Grading inside Building Lines: Finish subgrade to a tolerance of 1/2 inch when tested with a 10-foot straightedge.

3.13 SUBBASE AND BASE COURSES

A. Place subbase and base course on subgrades free of mud, frost, snow, or ice.

B. On prepared subgrade, place subbase and base course under pavements and walks as follows:

1. Shape subbase and base course to required crown elevations and cross-slope grades.
2. Compact subbase and base course at optimum moisture content to required grades, lines, cross sections, and thickness to not less than 95 percent of maximum dry unit weight according to ASTM D 698 or ASTM D 1557.

3.14 DRAINAGE COURSE

A. Place drainage course on subgrades free of mud, frost, snow, or ice.

B. On prepared subgrade, place and compact drainage course under cast-in-place concrete slabs-on-grade as follows:
1. Place drainage course that exceeds 6 inches in compacted thickness in layers of equal thickness, with no compacted layer more than 6 inches thick or less than 3 inches thick.
2. Compact each layer of drainage course to required cross sections and thicknesses to not less than 95 percent of maximum dry unit weight according to ASTM D 698.

3.15 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified MDOT certified independent geotechnical engineering testing agency to perform field quality-control testing.

B. Allow testing agency to inspect and test subgrades and each fill or backfill layer. Proceed with subsequent earthwork only after test results for previously completed work comply with requirements.

C. Footing Subgrade: At footing subgrades, at least one test of each soil stratum will be performed to verify design bearing capacities. Subsequent verification and approval of other footing subgrades may be based on a visual comparison of subgrade with tested subgrade when approved by Engineer.

D. Testing agency will test compaction of soils in place according to ASTM D 1556, ASTM D 2167, ASTM D 2922, and ASTM D 2937, as applicable and provide copies of the test reports to the engineer.

E. When testing agency reports that subgrades, fills, or backfills have not achieved degree of compaction specified, scarify and moisten or aerate, or remove and replace soil to depth required; recompact and retest until specified compaction is obtained.

3.16 PROTECTION

A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.

B. Repair and reestablish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.

C. Where settling occurs before Project correction period elapses, remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing.
   1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to greatest extent possible.

3.17 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Disposal: Remove surplus satisfactory soil and waste material, including unsatisfactory soil, trash, and debris, and legally dispose of it off Owner's property.

END OF SECTION 312000

SECTION 321313
CONCRETE PAVING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes exterior cast-in-place concrete materials for the following:
   1. Sidewalks.
   2. Concrete Pads.

1.2 RELATED WORK

A. Examine Contract Documents for requirements that affect work of this section. Other specification sections that directly relate to work of this Section include, but are not limited to:
   1. Section 033000 – Cast in Place Concrete
   2. Section 312000 – Earth Moving
   3. Section 321374 – Concrete Paving Joint Sealants

1.3 REFERENCES:

A. MDOT – Michigan Department of Transportation, "Standard Specifications for Construction", latest edition.

B. ASTM - American Society of Testing Materials, latest edition.

1.4 SUBMITTALS

A. Concrete Mix Designs: Provide job-mix formula prepared by independent AASHTO Accredited lab or approved by MDOT

B. Concrete Test Specimens: Deliver to the place of inspection and testing.

C. Certification of quality by producer for the following:
   1. Cementitious materials
   2. Admixtures
   3. Aggregates

D. Curing Compound Concrete Test Results: For each specimen.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Manufacturer of ready-mixed concrete products who complies with ASTM C 94/C 94M requirements for production facilities and equipment.

B. ACI Publications: Comply with ACI 301, "Specification for Structural Concrete," unless modified by requirements in the Contract Documents.

PART 2 - PRODUCTS

2.1 MATERIALS:

A. Plain-Steel Welded Wire Reinforcement: Conform to MDOT 905.06.

B. Concrete sidewalks and slabs: Unless otherwise specified use concrete Grade 3500. Conform to MDOT 803.02, 701.02, 6 sacks per cubic yard minimum.

C. Concrete Joint Filler: Conform to MDOT 914.03 and 914.04 A.

2.2 CONCRETE MIXTURES

A. Prepare design mixtures, proportioned according to ACI 301, with the following properties.
1. Compressive Strength (28 Days): 3500 psi.
2. Slump Limit: 4 inches plus or minus 1 inch.
3. Air Content: 6 percent plus or minus 1.5 percent.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Proof-roll prepared subbase surface below concrete pavements with heavy pneumatic-tired equipment to identify soft pockets and areas of excess yielding.

B. Examine areas and conditions, with paver present, for compliance with requirements for correct and level finished grade and other conditions affecting performance. Notify the contractor of conditions detrimental to the proper and timely installation and completion of the work.

C. Do not proceed with the work until unsatisfactory conditions have been corrected by the contractor in a manner acceptable and to the satisfaction of the Engineer or Owner's Representative.

D. Beginning of installation means acceptance of existing conditions.

3.2 EDGE FORMS AND SCREED CONSTRUCTION

A. Set, brace, and secure edge forms, bulkheads, and intermediate screed guides for pavement to required lines, grades, and elevations. Install forms to allow continuous progress of work and so forms can remain in place at least 24 hours after concrete placement.

B. Clean forms after each use and coat with form-release agent to ensure separation from concrete without damage.

3.3 STEEL REINFORCEMENT

A. General: Comply with CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.

3.4 JOINTS

A. General: Form construction, isolation, and contraction joints and tool edgings true to line with faces perpendicular to surface plane of concrete. Construct transverse joints at right angles to centerline, unless otherwise indicated.

B. Construction Joints: Set construction joints at side and end terminations of pavement and at locations where pavement operations are stopped for more than one-half hour unless pavement terminates at isolation joints.

C. Isolation Joints: Form isolation joints of preformed joint-filler strips abutting concrete curbs, catch basins, manholes, inlets, structures, walks, other fixed objects, and where indicated.

D. Contraction Joints: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of the concrete thickness to match jointing of existing adjacent concrete pavement.

E. Edging: Tool edges of pavement, gutters, curbs, and joints in concrete after initial floating with an edging tool to a 1/4-inch radius. Repeat tooling of edges after applying surface finishes. Eliminate tool marks on concrete surfaces.

3.5 CONCRETE PLACEMENT

A. Moisten subbase to provide a uniform dampened condition at time concrete is placed.

B. Comply with ACI 301 requirements for measuring, mixing, transporting, and placing concrete.

C. Deposit and spread concrete in a continuous operation between transverse joints. Do not push or drag concrete into place or use vibrators to move concrete into place.

D. Screed pavement surfaces with a straightedge and strike off.

E. Commence initial floating using bull floats or darbies to impart an open textured and uniform surface plane before excess moisture or bleed water appears on the surface. Do not further disturb concrete surfaces before beginning finishing operations or spreading surface treatments.

3.6 FLOAT FINISHING

A. General: Do not add water to concrete surfaces during finishing operations.

B. Float Finish: Begin the second floating operation when bleed-water sheen has disappeared and concrete surface has stiffened sufficiently to permit operations. Float surface with power-driven floats, or by hand floating if area is small or inaccessible to power units. Finish surfaces to true planes. Cut down high spots and fill low spots. Refloat surface immediately to uniform granular texture.
   1. Burlap Finish: Drag a seamless strip of damp burlap across float-finished concrete, perpendicular to line of traffic, to provide a uniform, gritty texture.
   2. Medium-to-Fine-Textured Broom Finish: Draw a soft bristle broom across float-finished concrete surface perpendicular to line of traffic to provide a uniform, fine-line texture.
   3. Medium-to-Coarse-Textured Broom Finish: Provide a coarse finish by striating float-finished concrete surface 1/16 to 1/8 inch deep with a stiff-bristled broom, perpendicular to line of traffic.

C. Slip-Resistive Aggregate Finish: Before final floating, spread slip-resistive aggregate finish on pavement surface according to manufacturer's written instructions.
   1. Cure concrete with curing compound recommended by slip-resistive aggregate manufacturer. Apply curing compound immediately after final finishing.
   2. After curing, lightly work surface with a steel wire brush or abrasive stone and water to expose nonslip aggregate.

3.7 CONCRETE PROTECTION AND CURING

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.

B. Comply with ACI 306.1 for cold-weather protection.

C. Evaporation Retarder: Apply evaporation retarder to concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.

D. Begin curing after finishing concrete but not before free water has disappeared from concrete surface.

E. Curing Methods: Cure concrete by moisture curing, moisture-retaining-cover curing curing compound or a combination of these methods.

3.8 PAVEMENT TOLERANCES

A. Comply with tolerances of ACI 117 and as follows:
   1. Elevation: 1/4 inch.
   2. Thickness: Plus 3/8 inch, minus 1/4 inch.
   3. Surface: Gap below 10-foot- long, unleveled straightedge not to exceed 1/4 inch.
   4. Joint Spacing: 3 inches.
   5. Contraction Joint Depth: Plus 1/4 inch, no minus.
   6. Joint Width: Plus 1/8 inch, no minus.

3.9 TESTING AND INSPECTION:

A. Observation: By Owner’s designated authorized representative.
   1. Inspection of forms by Owner’s representative is required prior to pouring concrete.

B. Acceptance Testing:
   1. Contractor shall employ a certified American Concrete Institute/Michigan Concrete Association Concrete Field Testing Technician.
   2. Concrete:
      a. Sample: ASTM C172
      b. Frequency: Once for each 50 cubic yards, or less, of each class of concrete placed each day.
      c. One additional test cylinder will be taken during cold weather and be cured on site under the same conditions as the concrete it represents.
      d. One slump test will be taken for each set of test cylinders made.
      e. Perform following from sample:
         1) Mold three 6-inch cylinder compressive strength specimens: ASTM C31.

2) Slump test: ASTM C143.
3) Air test: ASTM C231.
4) Yield test: ASTM C138.
5) Strength test: ASTM C139.

3. If initial testing indicates nonconformance to specifications, additional testing shall be paid by Contractor. Replace nonconforming material at no additional cost.

3.10 PAVEMENT MARKING

A. Allow concrete pavement to cure for 28 days and be dry before starting pavement marking.

B. Sweep and clean surface to eliminate loose material and dust.

C. Apply paint with mechanical equipment to produce pavement markings of dimensions indicated with uniform, straight edges. Apply at manufacturer's recommended rates to provide a minimum wet film thickness of 15 mils.

3.11 REPAIRS AND PROTECTION

A. Remove and replace concrete pavement that is broken, damaged, or defective or that does not comply with requirements in this Section.

B. Protect concrete from damage. Exclude traffic from pavement for at least 14 days after placement.

C. Maintain concrete pavement free of stains, discoloration, dirt, and other foreign material. Sweep concrete pavement not more than two days before date scheduled for Substantial Completion inspections.

END OF SECTION 321313

SECTION 321373
CONCRETE PAVING JOINT SEALANTS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:
   1. Expansion and contraction joints within cement concrete pavement.
   2. Joints between cement concrete and asphalt pavement.

1.2 RELATED WORK

A. Examine Contract Documents for requirements that affect work of this section. Other specification sections that directly relate to work of this Section include, but are not limited to:
   1. Section 321313 – Concrete Paving

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Samples: For each type and color of joint sealant required.

C. Compatibility and Adhesion Test Reports: From sealant manufacturer.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Products: MDOT approved.

2.2 MATERIALS, GENERAL

A. Compatibility: Provide joint sealants, backing materials, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer based on testing and field experience.

B. Conform with MDOT Section 914.

2.3 INSTALLATION

A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions.

B. Joint Priming: Prime joint substrates where indicated or where recommended in writing by joint-sealant manufacturer, based on preconstruction joint-sealant-substrate tests or prior experience.

C. Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.

D. Install backer materials to support sealants during application and at position required to produce optimum sealant movement capability. Do not leave gaps between ends of backer materials. Do not stretch, twist, puncture, or tear backer materials. Remove absorbent backer materials that have become wet before sealant application and replace them with dry materials.

E. Install sealants at the same time backings are installed to completely fill recesses provided for each joint configuration and to produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.

F. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.

G. Clean off excess sealants or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved by manufacturers of joint sealants and of products in which joints occur.

END OF SECTION 321373

SECTION 323113
CHAIN LINK FENCES AND GATES

PART 1 - GENERAL

1.1 SUMMARY

A. This section includes the following:
   1. Furnishing and installing industrial/commercial chain link fences and gates and related hardware.

1.2 RELATED WORK

A. Examine Contract Documents for requirements that affect work of this section. Other specification sections that directly relate to work of this Section include, but are not limited to:
   1. Section 033000 – Cast in Place Concrete

1.3 REFERENCES:

A. Except as herein specified or as indicated on the Drawings, the work of this Section shall comply with the following:
   1. ASTM A491 Specification for Aluminum-Coated Steel Chain Link Fabric.
   2. ASTM A780 Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings.
   3. ASTM F552 Standard Terminology Relating of Chain Link Fence.
   4. ASTM F567 Standard Practice for Installation of Chain Link Fencing.
   5. ASTM F626 Specification for Fence Fittings.
   6. ASTM F900 - Standard Specification for Industrial and Commercial Swing Gates.
   7. ASTM F1043 Specification for Strength and Protective Coatings of Steel Industrial Chain Link Fence Framework.
   8. ASTM F1083 Specification for Pipe, Steel, Hot-Dipped Zinc-Coated (Galvanized Welded, for Fence Structures.
   9. ASTM F1184 Specification for Industrial and Commercial Horizontal Slide Gates.
   10. ASTM F2200 Specification for Automated Vehicular Gate Construction.
   11. ASTM - American Society of Testing Materials, latest edition.

1.4 DEFINITIONS

A. Corner posts: Posts located at a change in horizontal alignment.

B. End posts: Posts located at the beginning or end of a length of fence.

C. Gateposts: Posts which support the weight of a gate. Gateposts may function also as terminal posts but generally are sized differently.

D. Line posts: Posts between terminal posts.

E. Pull posts: Posts located within a length of fence at certain distances, and at changes in vertical alignment, to facilitate stretching of fabric.

F. Terminal posts: Posts set where fence fabric terminates, and between which the fabric is stretched; a term which includes end, corner, and pull posts.

1.5 SUBMITTALS:

A. Manufactures Product Data:
1. Provide manufacturer's product literature;
2. Technical specifications;
3. Construction details;
4. Material descriptions;
5. Fittings and accessories;
6. Finishes including coating data and color choices.

B. Shop Drawings:
1. Dimensions;
2. Details of fabrication and installation;
3. Fence layout;
4. Location, size and spacing of posts and accessories;
5. Anchorage details including details of the foundation system.

C. Certificates: Submit Manufacturer's certification that materials meet Specification requirements

1.6 DELIVERY, STORAGE AND HANDLING

A. Materials delivered to the site shall be examined for concealed damage or defects in shipping. Any defects shall be noted and reported to the Owner's Representative.

B. Replacements, if necessary, shall be immediately re-ordered, so as to minimize any conflict with the construction schedule.

C. Sound materials shall be stored above the ground under protective cover or indoors so as to provide proper protection. Protect from damage during delivery, storage, handling and installation.

1.7 SEQUENCING AND SCHEDULING

A. Coordinate the Work with installation of work of related trades as the Work proceeds.

B. Sequence the Work in order to prevent deterioration of installed system.

PART 2 - PRODUCTS

2.1 MANUFACTURES

A. Source Limitations:
1. Obtain items as complete units, including fittings, accessories, bases, etc.

B. Products of the following Manufacturers, provided they comply with requirements of the Contract Documents, will be among those considered acceptable:
   1. Framework, posts, rails, fabric and fittings for chain link fence system:
      a. Century Fence
      b. Stephens Pipe & Steel, LLC
      c. Merchants Metals
      d. Master Halco
      e. Or approved equal.

2.2 CHAIN LINK FABRIC

A. Steel Chain Link Fabric: Heights indicated on drawings, 2 inch mesh, 9 gauge core (0.148 in),
   1. Aluminum-coated steel fabric (Aluminized): ASTM A491.
   2. Zinc-coated, galvanized steel fabric (Class 1, 1.2 oz, GBW): ASTM A392.
   3. Steel chain mesh produced in one piece.
   4. Fabric Selvage: Knuckle finish, top and bottom.

2.3 ROUND STEEL PIPE FENCE FRAMEWORK

A. Round steel pipe and rail: Schedule 40 standard weight pipe, in accordance with ASTM F1083, 1.8 oz/ ft² (550 g/m²) hot dip galvanized zinc exterior and 1.8 oz/ft² (550 g/m²) hot dip galvanized zinc interior coating.
   1. Regular Grade: Minimum steel yield strength 30,000 psi (205 MPa)
   2. Line post:
      a. Up to 6 ft: Outside diameter 1.900 inches, F1083 Schedule 40 weight 2.72 lb/ft
      b. Over 6 to 8 ft: Outside diameter 2.375 inches, F1083 Schedule 40 weight 3.65 lb/ft
   3. End, Corner, Pull post:
      a. Up to 6 ft: Outside diameter 2.375 inches, F1083 Schedule 40 weight 3.65 lb/ft
      b. Over 6 to 8 ft: Outside diameter 2.875 inches, F1083 Schedule 40 weight 5.79 lb/ft
   4. Top, brace, bottom and intermediate rails: Outside diameter 1.660 inches, F1083 Schedule 40 weight 2.27 lb/ft.

B. Round steel pipe and rail: WT-40 cold-rolled electric-resistance welded pipe in accordance with ASTM F1043, 0.9 oz/ ft² (305 g/m²) hot dip galvanized zinc exterior and clear polymeric overcoat, Type D interior 90% zinc-rich coating having a minimum thickness of 0.30 mils.
   1. Regular Grade: Minimum steel yield strength 50,000 psi (344 MPa)
   2. Line post:
      a. Up to 6 ft: Outside diameter 1.900 inches, F1043 WT-40 weight 2.28 lb/ft
      b. Over 6 to 8 ft: Outside diameter 2.375 inches, F1043 WT-40 weight 3.12 lb/ft
   3. End, Corner, Pull post:
      a. Up to 6 ft: Outside diameter 2.375 inches, F1043 WT-40 weight 3.12 lb/ft
      b. Over 6 to 8 ft: Outside diameter 2.875 inches, F1043 WT-40 weight 4.64 lb/ft
   4. Top, brace, bottom and intermediate rails: Outside diameter 1.660 inches, F1043 WT-40 weight 1.84 lb/ft.

2.4 TENSION WIRE

A. Metallic Coated Steel Marcelled Tension Wire: 7 gauge core (0.177 in.) marcelled wire complying with ASTM A824.
   1. Type I Aluminum–Coated (Aluminized) 0.40 oz/ft² (122 g/m²).

2.5 FITTINGS

A. Tension and Brace Bands: Galvanized pressed steel complying with ASTM F626, minimum steel thickness of 12 gauge (0.105 in.), minimum width of 3/4 in. and minimum zinc coating of 1.20 oz/ft². Secure bands with 5/16 in. galvanized steel carriage bolts.

B. Terminal Post Caps, Line Post Loop Tops, Rail and Brace Ends, Boulevard Clamps, Rail Sleeves: In compliance to ASTM F626, pressed steel galvanized after fabrication having a minimum zinc coating of 1.20 oz/ft².

C. Truss Rod Assembly: In compliance with ASTM F626, 3/8 in. or 5/16" diameter steel truss rod with a pressed steel tightener, minimum zinc coating of 1.2 oz/ft², assembly capable of withstanding a tension of 2,000 lbs. (970 kg).

D. Tension Bars: In compliance with ASTM F626. Galvanized steel one-piece length 2 in. less than the fabric height. Minimum zinc coating 1.2 oz. /ft². Bars for 2 in. mesh shall have a minimum cross section of 3/16 in. by 3/4 in.

2.6 TIE WIRE AND HOG RINGS

A. Basic commercial / industrial applications - specify 9 gauge core aluminum alloy ties and hog rings per ASTM F626.

2.7 BARBED WIRE

A. Coating Type A – Aluminum-Coated: Strand wire coating Type A – 0.30 oz/sft with aluminum alloy barbs.

B. Comply with ASTM A121, Design Number 12-4-5-14R, double 12-1/2 gauge (0.099) twisted strand wire, with 4 point 14 gauge round barbs space 5 inches on center

2.8 BARBED WRE ARMS

A. In compliance with ASTM F626, pressed steel galvanized after fabrication, minimum zinc coating of 1.20 oz/sft, capable of supporting a vertical 250 lb load.

B. Type I – Three strand 45 degree

2.9 SWING GATES

A. Galvanized steel pipe welded fabrication in compliance with ASTM F900. Gate frame members 1.900 in. OD (48.3 mm) ASTM F 1083 schedule 40 galvanized steel pipe. Frame members spaced no greater than 8 ft. (2440 mm) apart vertically and horizontally. Welded joints protected by applying zinc-rich paint in accordance with ASTM Practice A780. Positive locking gate latch, pressed steel galvanized after fabrication. Galvanized malleable iron or heavy gauge pressed steel post and frame hinges. Provide lockable drop bar and gate holdbacks with double gates. Match gate fabric to that of the fence system. Gateposts per ASTM F1083 schedule 40 galvanized steel pipe. See table below for required post out diameter and weight.

B. Regular Grade ASTM F1083 Schedule 40 pipe

Gate fabric height up to and including 6 ft. (1.2m)		
Gate leaf width	**Post Outside Diameter**	**Weight**
up to 4 ft. (1.2 m)	2.375 in. (60.3 mm)	3.65 lb/ft (5.4 kg/m)
over 4 ft. to 10 ft. (1.2 to 3.05 m)	2.875 in. (73.0 mm)	5.79 lb/ft (8.6 kg/m)
over 10 ft. to 18 ft. (3.05 to 5.5 m)	4.000 in. (101.6 mm)	9.11 lb/ft (13.6 kg/m)
Gate fabric height over 6 ft. to 12 ft. (1.2 to 2.4m)		
Gate leaf width		
up to 6 ft. (1.8 m)	2.875 in. (73.0 mm)	5.79 lb/ft (8.6 kg/m)
over 6 ft. to 12 ft. (1.8 to 3.7 m)	4.000 in. (101.6 mm)	9.11 lb/ft (13.6 kg/m)
over 12 ft. to 18 ft. (2.4 to 5.5 m)	6.625 in. (168.3 mm)	18.97 lb/ft (28.2 kg/m)
over 18 ft. to 24 ft. (5.5 to 7.3 m)	8.625 in. (219.1 mm)	28.58 lb/ft (42.5 kg/m)

2.10 CONCRETE

A. Concrete for post footings shall be MDOT P2 Concrete Mix and shall have a 28-day compressive strength of 3,000 psi.

PART 3 - EXECUTION

3.1 EXAMINATION:

A. Verify that line of fence has been properly identified.

B. Verify that proper grade has been established.

C. Verify location of underground utilities and structures.

D. Begin fence construction only after adequate clearance on both sides of fence is available.

3.2 FRAMEWORK INSTALLATION

A. Posts:
1. Posts shall be set plumb in concrete footings in accordance with ASTM F567. Minimum footing depth, 36 in. plus an additional 3 in. depth for each 1 ft. increase in the fence height over 4 ft. up to 42 in. Fences over 42 in. shall have footings sized by the fencing contractor. Minimum footing diameter four times the largest cross section of the post up to a 4.00” dimension and three times the largest cross section of post greater than a 4.00”. Top of concrete footing to be 6 inches below grade. Line posts installed at intervals not exceeding 10 ft. on center.
   a. All posts may be set plumb and driven in lieu of concrete set.
      1) Terminal posts driven 48 in. to 60 in. per site conditions.
      2) Line posts driven 48 in. to 60 in. per site conditions.

B. Loop top. Splice rail using top rail sleeves minimum 6 in. long. Rail shall be secured to the terminal post by a brace band and rail end. Bottom rail or intermediate rail shall be field cut and secured to the line posts using boulevard clamps or brace band with rail end.

C. Terminal posts: End, corner, pull and gate posts shall be braced and trussed for fence 6 ft. and higher and for fences 5 ft. in height not having a top rail. The horizontal brace rail and diagonal truss rod shall be installed in accordance with ASTM F567.

D. Tension wire: Shall be installed 4 in. up from the bottom of the fabric. Fences without top rail shall have a tension wire installed 4 in. down from the top of the fabric. Tension wire to be stretched taut, independently and prior to the fabric, between the terminal posts and secured to the terminal post using a brace band. Secure the tension wire to each line post with a tie wire.

3.3 CHAIN LINK FABRIC INSTALLATION

A. Chain Link Fabric: Install fabric to inside of the framework maintaining a ground clearance of no more than 2 inches. Attach fabric to the terminal post by threading the tension bar through the fabric; secure the tension bar to the terminal post with tension bands and 5/16 in. carriage bolts spaced no greater than 12 inches on center. Chain link fabric to be stretched taut free of sag. Fabric to be secured to the line post with tie wires spaced no greater than 12 inches on center and to horizontal rail spaced no greater than 18 inches on center. Aluminum alloy tie wire shall be installed following ASTM F567: Wrap the tie around the post or rail and attached to a fabric wire picket on each side of the post or rail by twisting the tie wire around the fabric wire picket two full turns, cut off excess wire and bend over to prevent injury. Or preformed 9 gauge power-fastened wire ties shall be installed following ASTM F626: Wrap the tie a full 360° around the post or rail and fabric wire picket, using a variable speed drill, twist the two ends together three full turns, cut off any excess wire and bend over to prevent injury. Secure the fabric to the tension wire by crimping hogs rings around a fabric wire picket and tension wire.

3.4 GATE INSTALLATION

A. Swing Gates: Installation of swing gates and gateposts in compliance with ASTM F 567. Direction of swing shall be inward. Gates shall be plumb in the closed position having a bottom clearance of 3 in., grade permitting. Hinge and latch offset opening space shall be no greater than 3 in. in the closed position. Double gate drop bar receivers shall be set in a concrete footing minimum 6 in. diameter 24 in. deep. Gate leaf holdbacks shall be installed for all double gates.

3.5 NUTS AND BOLTS

A. Bolts: Carriage bolts used for fittings shall be installed with the head on the secure side of the fence. All bolts shall be peened over to prevent removal of the nut.

3.6 ELECTRICAL GROUNDING

A. Grounding: Grounding of the fence and gates is not the responsibility of the fence contractor and not included in the fencing scope of work for this contract. Grounding, when required, shall be specified and included in Contract Section 33 79 00 Site Grounding. A licensed electrical contractor shall install grounding when required.

3.7 CLEAN UP

A. Clean Up: The area of the fence line shall be left neat and free of any debris caused by the installation of the fence.

3.8 ADJUSTING:

A. General:
   1. Adjust brace rails and tension rods for rigid installation.
   2. Tighten hardware, fasteners, and accessories.

END OF SECTION 323113

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SECTION 329200
TURF RESTORATION

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the work required for the restoration of areas disturbed by construction including:
   1. Topsoil,
   2. Seeding,
   3. Mulch,
   4. Fertilizer,
   5. Hydroseeding,
   6. Sodding.

1.2 RELATED WORK

A. Examine Contract Documents for requirements that affect work of this section. Other specification sections that directly relate to work of this Section include, but are not limited to:
   1. Section 312000 – Earth Moving

1.3 REFERENCES

A. MDOT – Michigan Department of Transportation, "Standard Specifications for Construction", latest edition.

1.4 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 include 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. 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.

E. Weeds: Include Dandelion, Jimsonweed, Quackgrass, Horsetail, Morning Glory, Rush Grass, Mustard, Lambsquarter, Chickweed, Cress, Crabgrass, Canadian Thistle, Nutgrass, Poi-son Oak, Blackberry, Tansy Ragwort, Bermuda Grass, Johnson Grass, Poison Ivy, Nut Sedge, Nimble Will, Bindweed, Bent Grass, Wild Garlic, Perennial Sorrel, and Brome Grass

1.5 SUBMITTALS

A. Topsoil
   1. Analysis: Certification of suitability by local agricultural agent.

B. Grass Seed:
   1. From seed vendor for each grass-seed monostand or mixture, stating the botanical and common name, percentage by weight of each species and variety, and percentage of purity, germination, and weed seed. Include the year of production and date of packaging.

C. Mulch
   1. Source and Content: Certification by supplier.

D. Fertilizer
   1. Analysis: Certification of suitability by local agricultural agent.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: A qualified landscape installer whose work has resulted in successful turf establishment.
   1. Professional Membership: Installer shall be a member in good standing of either the Professional Landcare Network or the American Nursery and Landscape Association.
   2. Pesticide Applicator: State licensed, commercial.
   3. Seeding, Mulching, Sodding and Weed Control shall comply with Michigan Department of Transportation (MDOT) Specification for Construction, most recent edition.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Seed and Other Packaged Materials:
   1. 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. Sod:
   1. Harvest, deliver, store, and handle sod according to requirements in "Specifications for Turfgrass Sod Materials" and "Specifications for Turfgrass Sod Transplanting and Installation" sections in TPI's "Guideline Specifications to Turfgrass Sodding." Deliver sod within 24 hours of harvesting and in time for planting promptly. Protect sod from breakage and drying.

C. Bulk Materials:
   1. Do not dump or store bulk materials near structures, utilities, or on existing turf areas or plants. Storage on walkways and pavements shall be coordinated with the owner.
   2. Provide erosion-control measures, as required, to prevent erosion or displacement of bulk materials; discharge of soil-bearing water runoff; and airborne dust reaching adjacent properties, water conveyance systems, and/or walkways.
   3. Accompany each delivery of bulk materials with appropriate certificates.

1.8 JOB REQUIREMENTS

A. Areas Disturbed by Construction

1. Restoration of lawn areas: Fine grade to 4 inches below finish elevations. Remove all stones and debris greater than ½" diameter. Place topsoil, seed, fertilizer, mulch and mulch anchoring as show on the detail sheet.

B. Scheduling:
   1. Restoration of lawns and other surface features: Promptly following curb and gutter, site improvements and paving.
   2. Clean up: Ongoing and promptly following turf restoration.

C. Seasonal Limitations: MDOT 816.03.C.4.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Topsoil: MDOT 815.03.A and 816.03
   1. Topsoil shall be screened.

B. Chemical Fertilizer:
   1. Furnish and apply fertilizer(s) as needed. It is the Contractor's responsibility to perform soil tests, as required, to select the fertilizer type(s) and the rate at which it is applied for all listed applications. Phosphorus is allowed for use only at the time of planting and when required by soil conditions.

C. Grass Seed: MDOT 816.03.C
   1. High Traffic Lawns: Twenty Five percent (25%) Perennial Ryegrass, Fifteen percent (15%) Kentucky Bluegrass, Forty percent (40%) Creeping Red Fescue, (20%) Tall Fescue.
   2. Other areas: Ten percent (10%) Perennial Ryegrass, Thirty Five percent (35%) Atlantis Kentucky Bluegrass, Twenty Five percent (25%) Park Kentucky Bluegrass, Fifteen percent (15%) Creeping Red Fescue, Ten percent (10%) Annual Ryegrass, Five percent (5%) Chewings Fescue.

D. Sod
   1. Turfgrass Sod: Sodding to comply with MDOT specifications MDOT 816.03.D for Turf Establishment.

E. Mulch
   1. Mulch Blanket: Excelsior or straw mulch blanket listed on the current Qualified Products List, MDOT Materials Sampling Guide. Straw mulch if specified in plans.
      a. All slopes equal to or steeper than 1 ft vertical per 4 ft horizontal shall have an excelsior mulch blanket rated for the slope(s) indicated on the plans installed per manufacturer's recommendations.
   2. Mulch Anchoring: Qualified Products List, MDOT Materials Sampling Guide.

F. Pesticides
   1. General: Pesticide, 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. Do not use restricted pesticides.
   2. Pre-Emergent Herbicide (Selective and Nonselective): Effective for controlling the germination or growth of weeds within planted areas at the soil level directly below the mulch layer.

3. Post-Emergent Herbicide (Selective and Nonselective): Effective for controlling weed growth that has already germinated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas to be planted for compliance with requirements and other conditions affecting installation and performance of the Work.
   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.
      a. 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 Engineer and replace with new planting soil.
   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.

3.2 PREPARATION

A. Protect structures; utilities; sidewalks; pavements; and other facilities, trees, shrubs, and plantings 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.

B. Verify trench backfilling have been inspected.

3.3 TOPSOIL

A. Construction methods: MDOT 816.03.

B. Verify Engineer has approved topsoil material prior to starting work.

C. Place topsoil in preparation of seeding or sodding at the specified thickness.

D. Place topsoil in dry weather.

3.4 TURF AREA PREPARATION

A. General: Prepare planting area for soil placement and mix planting soil according to MDOT Specifications.

B. Fine grade soil surface to eliminate uneven areas, ruts and low spots. Remove weeds, debris, roots, branches, stones in excess of ½” in size.

C. Loosen soil to a depth of four inches (4") in lawn areas by approved method of scarification and grade to remove ridges and depressions. Remove all stones or foreign matter from top two inches (2") of soil

D. Placing Planting Soil: Place and mix planting soil in place over exposed subgrade.
   1. Reduce elevation of planting soil to allow for soil thickness of sod.

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 Engineer's acceptance of finish grading; restore planting areas if eroded or otherwise disturbed after finish grading.

3.5 SEEDING

A. Do not sow immediately following rain, when the ground is too dry, or during windy periods. No seeding shall occur on frozen ground or at temperatures are lower than 32° F (0° C).

B. All seeding is to be done in dry or moderately dry soil and at times when the wind does not exceed a velocity of five (5) miles per hour.

C. Immediately before sowing the seed, the earth surface shall be re-worked until it is a fine, pulverized, smooth seedbed, showing not more than 1/4" variance from grade.

D. Apply seed mixture, as specified at a rate of 2.5-4 lbs/100 sq. ft. Apply seed by drilling in two directions, at a rate of 1.25-2 lbs. /1000 sq. ft. in each direction. Seed shall be uniformly spread over the previously fine graded and fertilized topsoil. Hand sew seed around irrigation system heads and other obstructions.

E. Sow seed with spreader or seeding machine. Do not broadcast or drop seed when wind velocity exceeds 5 mph.
   1. Evenly distribute seed by sowing equal quantities in two directions at right angles to each other.
   2. Do not use wet seed or seed that is moldy or otherwise damaged.
   3. Do not seed against existing trees. Limit extent of seed to outside edge of planting saucer.

F. Rake seed lightly into top 1/8 inch of soil, roll lightly, and water with fine spray.

G. Protect seeded areas with slopes exceeding 1:4 with erosion-control blankets and 1:6 with erosion-control fiber mesh installed and stapled according to manufacturer's written instructions.

H. Protect seeded areas with erosion-control mats where indicated on Drawings; install and anchor according to manufacturer's written instructions.

I. Protect seeded areas with slopes not exceeding 1:6 by spreading straw mulch. Spread uniformly at a minimum rate of 2 tons/acre to form a continuous blanket 1-1/2 inches in loose thickness over seeded areas. Spread by hand, blower, or other suitable equipment.
   1. Anchor straw mulch by crimping into soil with suitable mechanical equipment.
   2. Bond straw mulch by spraying mulch anchoring from the MDOT Qualified Products list. Take precautions to prevent damage or staining of structures or other plantings adjacent to mulched areas. Immediately clean damaged or stained areas.

J. Protect seeded areas from hot, dry weather or drying winds by applying compost mulch within 24 hours after completing seeding operations. Soak areas, scatter mulch uniformly to a thickness of 3/16 inch and roll surface smooth.

3.6 MULCHING

A. Biodegradable wood excelsior, straw, or coconut-fiber mat enclosed in a photodegradable plastic mesh. Include manufacturer's recommended steel wire staples, 6 inches (150mm) long.

B. Contractor shall return to site six (6) weeks after installation to remove mesh.

3.7 FERTILIZER

A. Construction methods: MDOT 816.03B. Application rate: 150 lbs/acre.

3.8 HYDROSEEDING

A. Hydroseeding shall comply with MDOT Specifications.

3.9 SODDING

A. Sodding shall comply with MDOT Specifications.

3.10 TURF MAINTENANCE

A. If an area washes out after this work has been properly completed and approved by the owners representative, make the required corrections to prevent future washouts and re-place the topsoil, fertilizer, seed and mulch. This replacement will be paid for as additional work using the applicable contract items. If an area washes out for reasons attributable to the Contractor's activity or failure to take proper precautions, replacement will be at the Contractor's expense

B. General:
   1. Maintain and establish turf by watering, fertilizing, weeding, mowing, trimming, replanting, and performing other operations as required to establish healthy, viable turf. 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.
   2. 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.
   3. In areas where mulch has been disturbed by wind or maintenance operations, add new mulch and anchor as required to prevent displacement.
   4. Apply treatments as required to keep turf and soil free of pests, weeds and pathogens or disease. Use integrated pest management practices whenever possible to minimize the use of pesticides and reduce hazards.

C. Watering: 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, if required by the Engineer.

1. 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.
2. Water turf with fine spray at a minimum rate of 1 inch per week unless rainfall precipitation is adequate.

D. Mow turf as soon as top growth is tall enough to cut. Repeat mowing to maintain specified height without cutting more than one-third of grass height. Remove no more than one-third of grass-leaf growth in initial or subsequent mowings. Do not delay mowing until grass blades bend over and become matted. Do not mow when grass is wet.
1. Seeded lawns shall never reach a height of three (3) inches prior to a cutting and shall be cut to a height of two (2) inches. The contractor is responsible for setting up a watering schedule and adjusting accordingly as environment conditions change throughout the growing season.
2. If, for reasons beyond the Sub-contractor's control, the height of the grass has exceeded three (3) inches, the mower blades shall be raised so that at no time will more than 1/3 of the grass leaf surface be removed.

E. Contractor shall provide additional fertilizer applications as necessary, to stimulate rapid turfgrass growth

F. Contractor shall notify the Owner through the Engineering in writing one (1) week in advance of the final lawn cutting to allow the Owner and the Engineer to inspect the lawns and schedule the contractors maintenance work. The Owner will accept the lawns after a minimum of three (3) cuttings if a uniform cover of grass is established and is acceptable to Owner and Engineer.

G. If an infestation of weeds or crab grass develops prior to acceptance of the lawn, the Contractor shall immediately treat the infestation by hand weeding or chemical control. The chemical control shall be furnished and installed by the contractor as recommended by the manufacturer and approved by the Engineer. At least two weeks shall elapse after chemical control is applied before a request or inspection for acceptance is made to the Engineer

3.11 SATISFACTORY TURF

A. Turf installations shall meet the following criteria as determined by Engineer:

1. Satisfactory Seeded Turf:
   a. 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 sq. ft. and bare spots not exceeding 5 by 5 inches.
2. Satisfactory Sodded Turf:
   a. At end of maintenance period, a healthy, well-rooted, even-colored, viable turf has been established, free of weeds, open joints, bare areas, and surface irregularities.

B. Use specified materials to reestablish turf that does not comply with requirements, and continue maintenance until turf is satisfactory.

3.12 PESTICIDE APPLICATION

A. Apply pesticides and other chemical products and biological control agents according to requirements of authorities having jurisdiction and manufacturer's written recommendations. Coordinate applications with City’s operations and others in proximity to the Work. Notify the Engineer before each application is performed.

B. Post-Emergent Herbicides (Selective and Nonselective): Apply only as necessary to treat already-germinated weeds and according to manufacturer's written recommendations.

3.13 CLEANUP AND PROTECTION

A. Promptly remove soil and debris created by turf work from paved areas. Clean wheels of vehicles before leaving site to avoid tracking soil onto roads, walks, or other paved areas.

B. Remove surplus soil and waste material, including excess subsoil, unsuitable soil, trash, and debris, and legally dispose of them off property.

C. Erect temporary fencing or barricades and warning signs as required to protect newly planted areas from traffic. Maintain fencing and barricades throughout initial maintenance period and remove after plantings are established.

D. Remove nondegradable erosion-control measures after grass establishment period.

END OF SECTION 329200

SECTION 334200
STORM UTILITY DRAINAGE PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. This section includes the following:
1. Pipe and fittings.
2. Nonpressure transition couplings.
3. Pressure pipe couplings.
4. Expansion joints and deflection fittings.
5. Backwater valves.
6. Cleanouts.
7. Drains.
8. Encasement for piping.
9. Manholes.
10. Channel drainage systems.
11. Catch basins.
12. Storm water inlets.
13. Storm water detention structures.
14. Pipe outlets.
15. Dry wells.
16. Storm water disposal systems.

1.2 RELATED WORK

A. Examine Contract Documents for requirements that affect work of this section. Other specification sections that directly relate to work of this Section include, but are not limited to:
1. Section 033000 – Cast In-Place Concrete.
2. Section 312000 – Earth Moving.

1.3 REFEENCES

A. This section references American Society for Testing and Materials (ASTM), American National Standards Institute (ANSI), and American Water Works Association (AWWA), UNI-Bell PVC Pipe Association (UNI), which are made part hereof by such references, and shall be the latest edition and revision thereof. All material, manufacturing, operations, testing, inspection and production of Poly (Vinyl Chloride) (PVC) sewer pipe shall conform to the following referenced standards:
1. ASTM C33 Standard Specification for Concrete Aggregates
2. ASTM D448 Standard Classification for Sizes of Aggregate for Road & Bridge Construction.
3. ASTM F477 Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe.
4. ASTM F679 Standard Specification for Poly (Vinyl Chloride) (PVC) Large-Diameter Plastic Gravity Sewer Pipe and Fittings.
5. ASTM F789 Standard Specification for Type PS-46 and Type PS-115 Poly (Vinyl Chloride) (PVC) Plastic Gravity Flow Sewer Pipe and Fittings.

6. ASTM F794 Standard Specification for Poly (Vinyl Chloride) (PVC) Profile Gravity Sewer Pipe and Fittings Based on Controlled Inside Diameter.
7. ASTM D3034 Standard Specification for Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
8. UNI-B-6 Recommended Practice for Low-Pressure Air Testing of Installed Sewer Pipe.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings:
1. Manholes: Include plans, elevations, sections, details, frames, and covers.
2. Catch basins, storm water inlets and dry wells. Include plans, elevations, sections, details, frames, covers, and grates.
3. Storm water Detention Structures: Include plans, elevations, sections, details, frames, covers.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Do not store plastic manholes, pipe, and fittings in direct sunlight.

B. Protect pipe, pipe fittings, and seals from dirt and damage.

C. Handle manholes in accordance with manufacturer's written rigging instructions.

D. Handle catch basins and storm water inlets in accordance with manufacturer's written rigging instructions.

1.6 FIELD CONDITIONS

A. Interruption of Existing Storm Drainage Service: Do not interrupt service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary service in accordance with requirements indicated:
1. Notify Owner no fewer than two days in advance of proposed interruption of service.
2. Do not proceed with interruption of service without Owner's written permission.

PART 2 - PRODUCTS

2.1 STEEL PIPE AND FITTINGS

A. Corrugated-Steel Pipe and Fittings: ASTM A 760/A 760M, Type I with fittings of similar form and construction as pipe.
1. Special-Joint Bands: Corrugated steel with O-ring seals.
2. Standard-Joint Bands: Corrugated steel.
3. Coating: Aluminum.

2.2 PVC TRUSS PIPE AND FITTINGS

A. PVC Truss Pipe and Fittings: ASTM D 2680-01, with bell-and-spigot ends for gasketed joints.

1. NPS 3 to NPS 6: SDR 35.
2. NPS 8 to NPS 12: SDR 42.

B. Gaskets: ASTM F 477, elastomeric seals.

2.3 PE PIPE AND FITTINGS

A. Corrugated PE Drainage Pipe and Fittings NPS 3 to NPS 10 : AASHTO M 252M, Type S, with smooth waterway for coupling joints.
1. Silttight Couplings: PE sleeve with ASTM D 1056, Type 2, Class A, Grade 2 gasket material that mates with tube and fittings.
2. Soiltight Couplings: AASHTO M 252M, corrugated, matching tube and fittings.

B. Corrugated PE Pipe and Fittings NPS 12 to NPS 60; AASHTO M 294M, Type S, with smooth waterway for coupling joints.
1. Silttight Couplings: PE sleeve with ASTM D 1056, Type 2, Class A, Grade 2 gasket material that mates with pipe and fittings.
2. Soiltight Couplings: AASHTO M 294M, corrugated, matching pipe and fittings.

2.4 PVC PIPE AND FITTINGS

A. PVC Cellular-Core Piping:
1. PVC Cellular-Core Pipe and Fittings: ASTM F 891, Sewer and Drain Series, PS 50 minimum stiffness, PVC cellular-core pipe with plain ends for solvent-cemented joints.
2. Fittings: ASTM D 3034, SDR 35 or SDR 26, PVC socket-type fittings.

B. PVC Corrugated Sewer Piping:
1. Pipe: ASTM F 949, PVC, corrugated pipe with bell-and-spigot ends for gasketed joints.
2. Fittings: ASTM F 949, PVC molded or fabricated, socket type.
3. Gaskets: ASTM F 477, elastomeric seals.

C. PVC Profile Sewer Piping:
1. Pipe: ASTM F 794, PVC profile, gravity sewer pipe with bell-and-spigot ends for gasketed joints.
2. Fittings: ASTM D 3034, PVC with bell ends.
3. Gaskets: ASTM F 477, elastomeric seals.

D. PVC Type PSM Sewer Piping:
1. Pipe: ASTM D 3034, SDR 35 or SDR 26, PVC Type PSM sewer pipe with bell-and spigot ends for gasketed joints.
2. Fittings: ASTM D 3034, PVC with bell ends.
3. Gaskets: ASTM F 477, elastomeric seals.

E. PVC Gravity Sewer Piping:
1. Pipe and Fittings: ASTM F 679, T-1 wall thickness, PVC gravity sewer pipe with bell-and-spigot ends and with integral ASTM F 477, elastomeric seals for gasketed joints.
2. Pipe: AWWA C900, Class 200 PVC pipe with bell-and-spigot ends for gasketed joints.
3. Fittings: AWWA C900, Class 200 PVC pipe with bell ends
4. Gaskets: ASTM F 477, elastomeric seals.

2.5 CONCRETE PIPE AND FITTINGS

A. A. Reinforced-Concrete Sewer Pipe and Fittings: ASTM C 76.
1. Bell-and-spigot or tongue-and-groove ends and gasketed joints with ASTM C 443, rubber gaskets.
2. Class III, Wall B or C.
3. Class IV, Wall B or C.
4. Class V, Wall B or C.
5. Wall B may be used for all pipe sizes less than 24-inch, where depth is less than 16 feet.
6. Wall C shall be used for pipe sizes 24-inch and larger at any depth and for all pipe size where depth is 16 to 25-feet.
7. The minimum strength class (D-Load) for the pipe shall be in accordance with the following table.

REINFORCED CONCRETE PIPE Class vs. Depth to Invert			
Pipe Size	Class III	Class IV	Class V
12”	1-15	15-24	24-35
15”	1-15	15-24	24-35
18”	1-15	15-24	24-35
21”	1-15	15-24	24-35
24”	1-15	15-24	24-35
27”	1-15	15-24	24-35
30”	1-15	15-24	24-35
33”	1-15	15-24	24-35
36”	1-15	15-24	24-35
42”	1-15	15-24	24-35
48”	1-15	15-24	24-35

8. The minimum pipe class required when the pipe is 6-feet or less shall be Class IV.

2.6 NONPRESSURE TRANSITION COUPLINGS

A. Comply with ASTM C 1173, elastomeric, sleeve-type, reducing or transition coupling, for joining underground nonpressure piping. Include ends of same sizes as piping to be joined, and corrosion-resistant-metal tension band and tightening mechanism on each end.

B. Sleeve Materials:
1. For Concrete Pipes: ASTM C 443 rubber.
2. For Cast-Iron Soil Pipes: ASTM C 564, rubber.
3. For Plastic Pipes: ASTM F 477, elastomeric seal or ASTM D 5926, PVC.
4. For Dissimilar Pipes: ASTM D 5926, PVC or other material compatible with pipe materials being joined.

C. Ring-Type, Flexible Couplings:
1. Description: Elastomeric compression seal with dimensions to fit inside bell of larger pipe and for spigot of smaller pipe to fit inside ring.

2.7 CLEANOUTS

A. Plastic Cleanouts:
1. Description: PVC body with PVC threaded plug. Include PVC sewer pipe fitting and riser to cleanout of same material as sewer piping.

2.8 MANHOLES

A. Standard Precast Concrete Manholes:
   1. Description: ASTM C 478, precast, reinforced concrete, of depth indicated, with provision for sealant joints.
   2. Diameter: 48 inches minimum unless otherwise indicated.
   3. Ballast: Increase thickness of precast concrete sections or add concrete to base section as required to prevent flotation.
   4. Base Section: 6-inch minimum thickness for floor slab and 4-inch minimum thickness for walls and base riser section, and separate base slab or base section with integral floor.
   5. Riser Sections: 4-inch minimum thickness, and lengths to provide depth indicated.
   6. Top Section: Eccentric-cone type unless concentric-cone or flat-slab-top type is indicated, and top of cone of size that matches grade rings.
   7. Joint Sealant: ASTM C 990, bitumen or butyl rubber.
   8. Resilient Pipe Connectors: ASTM C 923, cast or fitted into manhole walls, for each pipe connection.
   9. Steps: Individual FRP steps or ASTM A 615/A 615M, deformed, 1/2-inch steel reinforcing rods encased in ASTM D 4101, PP. wide enough to allow worker to place both feet on one step and designed to prevent lateral slippage off step. Cast or anchor steps into sidewalls at 12- to 16-inch intervals. Omit steps if total depth from floor of manhole to finished grade is less than 60 inches. Steps to be a minimum 10-inch wide.
   10. Grade Rings: Reinforced-concrete rings, 6- to 9-inch total thickness, to match diameter of manhole frame and cover, and height as required to adjust manhole frame and cover to indicated elevation and slope. Adjustment rings shall be 2-inch, 3-inch or 4-inch thickness.

B. Manhole Frames and Covers:
   1. Description: Size and type to be called out on the drawings. Include indented top design with lettering cast into cover, using wording equivalent to "STORM SEWER."
   2. Material: ASTM A 536, Grade 60-40-18 ductile or ASTM A 48/A 48M, Class 35 gray iron unless otherwise indicated.

2.9 CONCRETE

A. General: Cast-in-place concrete according to ACI 318, ACI 350/350R, and the following:
   1. Cement: ASTM C 150, Type II.
   2. Fine Aggregate: ASTM C 33, sand.
   3. Coarse Aggregate: ASTM C 33, crushed gravel.
   4. Water: Potable.

B. Portland Cement Design Mix: 4000 psi minimum, with 0.45 maximum water/cementitious materials ratio.
   1. Reinforcing Fabric: ASTM A 185/A 185M, steel, welded wire fabric, plain.
   2. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 (420 MPa) deformed steel.

C. Manhole Channels and Benches: Factory or field formed from concrete. Portland cement design mix, 4000 psi minimum, with 0.45 maximum water/cementitious materials ratio. Include channels and benches in manholes.
   1. Channels: Concrete invert, formed to same width as connected piping, with height of vertical sides to three-fourths of pipe diameter. Form curved channels with smooth, uniform radius and slope.
      a. Invert Slope: 1 percent through manhole.
   2. Benches: Concrete, sloped to drain into channel.
      a. Slope: 4 percent.

D. Ballast and Pipe Supports: Portland cement design mix, 3000 psi minimum, with 0.58 maximum water/cementitious materials ratio.
   1. Reinforcing Fabric: ASTM A 185/A 185M, steel, welded wire fabric, plain.
   2. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 (420 MPa) deformed steel.

2.10 2.14 CATCH BASINS

A. Standard Precast Concrete Catch Basins:
   1. Description: ASTM C 478, precast, reinforced concrete, of depth indicated, with provision for sealant joints.
   2. Base Section: 6-inch minimum thickness for floor slab and 4-inch minimum thickness for walls and base riser section, and separate base slab or base section with integral floor.
   3. Riser Sections: 4-inch minimum thickness, 48-inch diameter, and lengths to provide depth indicated.
   4. Top Section: Eccentric-cone type unless concentric-cone or flat-slab-top type is indicated. Top of cone of size that matches grade rings.
   5. Joint Sealant: ASTM C 990, bitumen or butyl rubber.
   6. Adjusting Rings: Interlocking rings with level or sloped edge in thickness and shape matching catch basin frame and grate. Include sealant recommended by ring manufacturer.
   7. Grade Rings: Include two or three reinforced-concrete rings, of 6- to 9-inch total thickness, that match 24-inch- diameter frame and grate. Adjustment rings shall be 2- inch, 3-inch or 4-inch thickness.
   8. Steps: Individual FRP steps or ASTM A 615/A 615M, deformed, 1/2-inch steel reinforcing rods encased in ASTM D 4101, PP, wide enough to allow worker to place both feet on one step and designed to prevent lateral slippage off step, min 10-inches. Cast or anchor steps into sidewalls at 12- to 16-inch intervals. Omit steps if total depth from floor of catch basin to finished grade is less than 60 inches.
   9. Pipe Connectors: ASTM C 923, resilient, of size required, for each pipe connecting to base section.

B. Frames and Grates: Size and type to be called out on the drawings.

2.11 STORMWATER INLETS

A. Curb Inlets: Made with vertical curb opening, of materials and dimensions according to the Standard Details.
   1. Frames and Grates: Heavy duty, according to the Standard Details.

2.12 STORMWATER DETENTION STRUCTURES

A. Cast-in-Place Concrete, Storm water Detention Structures: Constructed of reinforced concrete bottom, walls, and top; designed according to ASTM C 890 for A-16 (AASHTO HS20-44), heavy-traffic, structural loading; of depth, shape, dimensions, and appurtenances indicated.
   1. Ballast: Increase thickness of concrete as required to prevent flotation.
   2. Grade Rings: Include two or three reinforced-concrete rings, of 6- to 9-inch total thickness, that match 24-inch- diameter frame and cover.
   3. Steps: Individual FRP steps or ASTM A 615/A 615M, deformed, 1/2-inch steel reinforcing rods encased in ASTM D 4101, PP, wide enough to allow worker to place both feet on one step and designed to prevent lateral slippage off step. Cast or anchor steps into sidewalls at 12- to 16-inch intervals. Omit steps if total depth from floor of structure to finished grade is less than 60 inches.

B. Manhole Frames and Covers: ASTM A 536, Grade 60-40-18, ductile-iron castings designed for heavy-duty service. Include 24-inch ID by 7- to 9-inch riser with 4-inch minimum width flange, and 26-inch-diameter cover. Include indented top design with lettering cast into cover, using wording equivalent to "STORM SEWER."

2.13 PIPE OUTLETS

A. Head Walls: Cast-in-place reinforced concrete, with apron and tapered sides.

B. Riprap Basins: Broken, irregularly sized and shaped, graded stone according to MDOT Standards for Slope Protection

PART 3 - EXECUTION

3.1 EARTHWORK

A. Excavation, trenching, and backfilling are specified in Section 312000 "Earth Moving."

3.2 PIPING INSTALLATION

A. General Locations and Arrangements: Drawing plans and details indicate general location and arrangement of underground storm drainage piping. Location and arrangement of piping layout take into account design considerations. Install piping as indicated, to extent practical. Where specific installation is not indicated, follow piping manufacturer's written instructions.

B. Install piping beginning at low point, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream. Install gaskets, seals, sleeves, and couplings in accordance with manufacturer's written instructions for use of lubricants, cements, and other installation requirements.

C. Install manholes for changes in direction unless fittings are indicated. Use fittings for branch connections unless direct tap into existing sewer is indicated.

D. Install proper size increasers, reducers, and couplings where different sizes or materials of pipes and fittings are connected. Reducing size of piping in direction of flow is prohibited.

E. Install gravity-flow, nonpressure drainage piping in accordance with the following:
1. Install piping pitched down in direction of flow.
2. Install piping NPS 6 and larger with restrained joints at tee fittings and at changes in direction. Use corrosion-resistant rods, pipe or fitting manufacturer's proprietary restraint system, or cast-in-place concrete supports or anchors.
3. Install piping with 36-inch- minimum cover.
4. Install corrugated-steel piping in accordance with ASTM A 798/A 798M.
5. Install corrugated-aluminum piping in accordance with ASTM B 788/B 788M.
6. Install PE corrugated sewer piping in accordance with ASTM D 2321.
7. Install PVC cellular-core piping in accordance with ASTM D 2321 and ASTM F 1668.
8. Install PVC sewer piping in accordance with ASTM D 2321 and ASTM F 1668.
9. Install PVC profile gravity sewer piping in accordance with ASTM D 2321 and ASTM F 1668.
10. Install PVC water-service piping in accordance with ASTM D 2321 and ASTM F 1668.

11. Install reinforced-concrete sewer piping in accordance with ASTM C 1479 and ACPA's "Concrete Pipe Installation Manual."

3.3 PIPE JOINT CONSTRUCTION

A. Join gravity-flow, nonpressure drainage piping in accordance with the following:
   1. Join corrugated-steel sewer piping in accordance with ASTM A 798/A 798M.
   2. Join corrugated-aluminum sewer piping in accordance with ASTM B 788/B 788M.
   3. Join corrugated-PE piping in accordance with ASTM D 3212 for push-on joints.
   4. Join PVC cellular-core piping in accordance with ASTM D 2321 and ASTM F 891 for solvent-cemented joints.
   5. Join PVC corrugated sewer piping in accordance with ASTM D 2321 for elastomeric-seal joints.
   6. Join PVC sewer piping in accordance with ASTM D 2321 and ASTM D 3034 for elastomeric-seal joints or ASTM D 3034 for elastomeric-gasketed joints.
   7. Join PVC profile gravity sewer piping in accordance with ASTM D 2321 for elastomeric-seal joints or ASTM F 794 for gasketed joints.
   8. Join reinforced-concrete sewer piping in accordance with ACPA's "Concrete Pipe Installation Manual" for rubber-gasketed joints.
   9. Join dissimilar pipe materials with nonpressure-type flexible couplings.

3.4 CLEANOUT INSTALLATION

A. Install cleanouts and riser extensions from sewer pipes to cleanouts at grade. Use cast-iron soil pipe fittings in sewer pipes at branches for cleanouts, and use cast-iron soil pipe for riser extensions to cleanouts. Install piping so cleanouts open in direction of flow in sewer pipe.

B. Set cleanout frames and covers in pavement and sidewalk areas with tops flush with pavement surface.

3.5 MANHOLE INSTALLATION

A. General: Install manholes, complete with appurtenances and accessories indicated.

B. Install precast concrete manhole sections with sealants in accordance with ASTM C 891.

C. Where specific manhole construction is not indicated, follow manhole manufacturer's written instructions.

D. Set tops of frames and covers flush with finished surface of manholes that occur in pavements. Set tops 3 inches above finished surface elsewhere unless otherwise indicated.

3.6 CATCH BASIN INSTALLATION

A. Construct catch basins to sizes and shapes indicated.

B. Set frames and grates to elevations indicated.

3.7 STORMWATER INLET AND OUTLET INSTALLATION

A. Construct inlet head walls, aprons, and sides of reinforced concrete, as indicated.

B. Construct riprap of broken stone, as indicated.

C. Install outlets that spill onto grade, anchored with concrete, where indicated.

D. Install outlets that spill onto grade, with flared end sections that match pipe, where indicated.

E. Construct energy dissipaters at outlets, as indicated.

3.8 CONCRETE PLACEMENT

A. Place cast-in-place concrete in accordance with ACI 318.

3.9 CHANNEL DRAINAGE SYSTEM INSTALLATION

A. Install with top surfaces of components, except piping, flush with finished surface.

B. Assemble channel sections to form slope down toward drain outlets. Use sealants, adhesives, fasteners, and other materials recommended by system manufacturer.

C. Embed channel sections and drainage specialties in 4-inch minimum concrete around bottom and sides.

D. Fasten grates to channel sections if indicated.

E. Assemble channel sections with flanged or interlocking joints.

F. Embed channel sections in 4-inch minimum concrete around bottom and sides

3.10 CONNECTIONS

A. Make connections to existing piping and underground manholes.
   1. Use commercially manufactured wye fittings for piping branch connections. Remove section of existing pipe; install wye fitting into existing piping; and encase entire wye fitting, plus 6-inch overlap, with not less than 6 inches of concrete with 28-day compressive strength of 3000 psi.
   2. Make branch connections from side into existing piping, NPS 4 to NPS 20. Remove section of existing pipe, install wye fitting into existing piping, and encase entire wye with not less than 6 inches of concrete with 28-day compressive strength of 3000 psi.
   3. Make branch connections from side into existing piping, NPS 21 or larger, or to underground manholes and structures by cutting into existing unit and creating an opening large enough to allow 3 inches of concrete to be packed around entering connection. Cut end of connection pipe passing through pipe or structure wall to conform to shape of and be flush with inside wall unless otherwise indicated. On outside of pipe, manhole, or structure wall, encase entering connection in 6 inches of concrete for minimum length of 12 inches to provide additional support of collar from connection to undisturbed ground.
      a. Use concrete that will attain a minimum 28-day compressive strength of 3000 psi unless otherwise indicated.

b. Use epoxy-bonding compound as interface between new and existing concrete and piping materials.

4. Protect existing piping, manholes, and structures to prevent concrete or debris from entering while making tap connections. Remove debris or other extraneous material that may accumulate.

B. Pipe couplings, expansion joints, and deflection fittings with pressure ratings at least equal to piping rating may be used in applications below unless otherwise indicated.

1. Use nonpressure-type flexible couplings where required to join gravity-flow, nonpressure sewer piping unless otherwise indicated.
   a. Shielded flexible couplings for same or minor difference OD pipes.
   b. Unshielded, increaser/reducer-pattern, flexible couplings for pipes with different OD.
   c. Ring-type flexible couplings for piping of different sizes where annular space between smaller piping's OD and larger piping's ID permits installation.

3.11 IDENTIFICATION

A. Materials and their installation are specified in Section 312000 "Earth Moving." Arrange for installation of green warning tape directly over piping and at outside edge of underground structures.

1. Use warning tape or detectable warning tape over ferrous piping.
2. Use detectable warning tape over nonferrous piping and over edges of underground structures.

3.12 FIELD QUALITY CONTROL

A. Inspect interior of piping to determine whether line displacement or other damage has occurred. Inspect after approximately 24 inches of backfill is in place, and again at completion of Project.

1. Submit separate reports for each system inspection.
2. Defects requiring correction include the following:
   a. Alignment: Less than full diameter of inside of pipe is visible between structures.
   b. Deflection: Flexible piping with deflection that prevents passage of ball or cylinder of size not less than 92.5 percent of piping diameter.
   c. Damage: Crushed, broken, cracked, or otherwise damaged piping.
   d. Infiltration: Water leakage into piping.
   e. Exfiltration: Water leakage from or around piping.
3. Replace defective piping using new materials, and repeat inspections until defects are within allowances specified.
4. Reinspect and repeat procedure until results are satisfactory.

B. Test new piping systems, and parts of existing systems that have been altered, extended, or repaired, for leaks and defects.

1. Do not enclose, cover, or put into service before inspection and approval.
2. Test completed piping systems in accordance with requirements of authorities having jurisdiction.
3. Schedule tests and inspections by authorities having jurisdiction with at least 24 hours' advance notice.
4. Submit separate report for each test.
5. Gravity-Flow Storm Drainage Piping: Test in accordance with requirements of authorities having jurisdiction, UNI-B-6, and the following:
6. Exception: Piping with soiltight joints unless required by authorities having jurisdiction.
7. Option: Test plastic piping in accordance with ASTM F 1417.

C. Leaks and loss in test pressure constitute defects that must be repaired.

D. Replace leaking piping using new materials, and repeat testing until leakage is within allowances specified.

3.13 CLEANING

A. Clean interior of piping of dirt and superfluous materials. Flush with potable water.

END OF SECTION 334200

DRIESENGA & ASSOCIATES, INC.
Engineering · Surveying · Testing

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December 1, 2023 *via electronic mail*

Mr. Kurtis Pake
BANGOR TOWNSHIP SCHOOLS
3359 East Midland Road, Bay City, MI 48706

Re: Geotechnical Report
Bangor Township Schools 2023 Bond Project
- **Bangor West Elementary School**
  3175 Wilder Road, Bay City 48706
- **Christa McAuliffe Middle School**
  3281 Kiesel Road, Bay City 48706
- **John Glenn High School**
  3201 Kiesel Road, Bay City 48706

Driesenga & Associates, Inc. Project No 2340694.3A

Dear Mr. Pake:

Driesenga & Associates, Inc. is pleased to submit the attached report of subsurface exploration performed for the above-referenced project. The report presents the exploration procedures, subsurface conditions encountered, and our recommendations for development of the site with respect to proposed earthwork, foundation construction, and pavement design. As the project nears construction you can contact Beni Traore at 517-505-0220 in our local office to provide a quote for construction materials testing and survey needs.

Proper execution of our recommendations will affect the design, construction and performance of the structure and related facilities, and the potential associated risks involved. Therefore, the issues and recommendations presented in this report should be discussed with the project team, including Driesenga & Associates, Inc. This will increase the likelihood that the issues are understood and our recommendations are applied in a manner consistent with the project budget, tolerance of risk, and expectations for performance and maintenance.

We appreciate the opportunity to be of service to you. If you have any questions concerning this report, or if we can be of further service as design and construction progresses, please contact our office.

Sincerely,
DRIESENGA & ASSOCIATES, INC.

Michael Stork
Senior Project Geologist

Musana Nabil
Senior Project Engineer

STATE OF MICHIGAN
RANDAL H. PAIL
ENGINEER
No. 58180
REGISTERED PROFESSIONAL ENGINEER

Randy Pail, P.E.
Director of Geotechnical Engineering

Cc: Mr. Brian Kudej – IDI

GEOTECHNICAL REPORT

SITE:

BANGOR TOWNSHIP SCHOOLS 2023 BOND PROJECT

BANGOR WEST ELEMENTARY SCHOOL
3175 WILDER ROAD, BAY CITY 48706

CHRISTA MCAULIFFE MIDDLE SCHOOL
3281 KIESEL ROAD, BAY CITY 48706

JOHN GLENN HIGH SCHOOL
3201 KIESEL ROAD, BAY CITY 48706

October 6, 2023
PROJECT NO. 2340694.3A

PREPARED FOR:

BANGOR TOWNSHIP SCHOOLS
3359 EAST MIDLAND ROAD, BAY CITY, MI 48706

Prepared by:

DRIESENGA & ASSOCIATES, INC.
Engineering · Surveying · Testing

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APPENDICES

1.0 INTRODUCTION

1.1 LOCATION

This report presents the results of the geotechnical investigation completed for the proposed improvements to the Bangor Township Schools as shown on Figure 1 – Site Location (Appendix A) and located at the following locations:

- Bangor West Elementary School
  3175 Wilder Road, Bay City 48706
- Christa McAuliffe Middle School
  3281 Kiesel Road, Bay City 48706
- John Glenn High School
  3201 Kiesel Road, Bay City 48706

1.2 PURPOSE

The purpose of this investigation was to determine the subsurface profile, the engineering characteristics of the subsurface soils, and to provide recommendations in regard to the proposed design and construction based on our interpretation of the test results. This report was prepared in general accordance with our proposal dated August 17, 2023, as authorized by Mr. Kurtis Pake of Bangor Township Schools. on August 21, 2023

1.3 SCOPE

The field exploration to estimate engineering characteristics of the site soils included performing a site reconnaissance, advancing the soil borings, performing standard penetration tests, and recovering split-spoon samples. Soil boring locations were determined in the field by measuring from existing site features. Existing ground surface elevations were not provided and obtaining them was beyond the scope of this investigation.

Twenty-eight (28) soil borings, designated SB-1 to SB-28, were advanced in the vicinity of the proposed improvements on September 5 & 12, 2022, at the approximate locations shown on Figures 2 and 3 - Boring Locations (Appendix A). The soil borings were advanced with hollow-stem augers to depths ranging between five (5) to twenty (20) feet below the ground surface. During drilling, soil samples were collected from split-spoon sampling via standard penetration testing (ASTM method D 1586) at intervals of 2.5 feet to a depth of 10 feet, and intervals of 5 feet from a depth of 10 feet to the end of each boring. The soil boring logs are contained in Appendix B. The field and laboratory procedures are described in Appendix C.

1.4 DESIGN INFORMATION

We understand the project consist of the following:

- **Bangor West Elementary School:** Reconfigure parking lot, remove and replace playground hardscape, and construction of auxiliary gym.
- **Christa McAuliffe Middle School:** Construction of single-story classroom addition.
- **John Glenn High School:** Construction of single-story classroom addition and construction of auxiliary gym.

It is understood the structures is to be a one-story with poured concrete footings and masonry block foundation walls. The project will also include some improvements to the parking areas.

Structural load information was not available as of the time of this report, but should be provided to Driesenga & Associates, Inc. for review in light of the recommendations contained herein as soon as available. For calculation purposes, maximum loads of 3,000 pounds per lineal foot of wall and 50 kips per column were assumed for the single-story classroom additions. At the auxiliary gymnasium addition, maximum loads of 6,000 pounds per lineal foot were assumed. Understanding that the new construction will not include any basement areas, exterior footing depths are assumed to be a minimum of 3.5 feet below the final ground surface elevation.

We have assumed maximum tolerable settlements of 1 inch total and ½ inch differential. We anticipate cuts and fills on the order of 2.0 feet or less will be required to establish site grades. Any significant deviation from these assumptions should be brought to the attention of Driesenga & Associates, Inc. as soon as possible.

2.0 SITE CONDITIONS

2.1 GENERAL

The stratification of the soils, as shown on the soil boring logs in Appendix B, represents the soil conditions at the actual soil boring locations. Variations may occur away from or between the soil borings. Stratigraphic lines shown on the soil boring logs represent the approximate boundary between the soil types, but the transition may be gradual. They are not intended to show exact depths of change from one soil type to another. In addition, changes in soil type may occur between the sample intervals that are consequently not observed by the driller.

The soil boring logs in Appendix B include the drilling method, materials encountered, penetration resistances, and pertinent field observations made during the drilling operations along with the results of the laboratory testing.

2.2 SURFACE CONDITIONS

The areas of the new additions are currently maintained lawn, sidewalks and asphalt parking areas. The areas are relatively level with grade changes of approximately 1 foot or less. The existing buildings are surrounded by maintained lawn, asphalt parking, and driveway areas associated with school uses.

2.3 DESCRIPTION OF SUBSURFACE SOILS

Surface materials encountered at the site generally consist of 3 to 12 inches of topsoil or 2 to 6 inches of asphalt with 5 to 16 inches of aggregate base underlain various clay and sand fill layers to a depth of 2 to 6 feet. Portions of the clay fill layers at soil borings B-1, 2, 5, 6, 7, 8, 9 15 and 23 through 28, were observed to be black in color with varying amounts of organics. The native soils

consisted of medium stiff to hard, brown and gray, silty/sandy clays to the explored depth of the soil borings.

Hand Penetrometer tests were performed on representative portions of cohesive soil samples to obtain an indication of the unconfined compressive of the material. As indicated on the soil boring logs, the estimated unconfined compressive strength ranged from 2.0 to over 4.5 tons per square foot (tsf).

The estimated group symbol, according to the USCS, is shown in the USCS column just before the textural description of the various strata on the soil boring logs in Appendix B.

2.4 GROUNDWATER OBSERVATIONS

Groundwater was encountered at a depth of approximately 5 and 2.5 feet in soil borings SB-1, and SB-2, respectively. Groundwater was not encountered in the remainder of the soil borings. Considering the primarily clay soils encountered in the soil borings, the encountered groundwater is considered to be "perched" groundwater trapped within sand layers or strata that exist at the site. Hydrostatic groundwater levels and the elevations and volumes of groundwater should be expected to fluctuate throughout the year, based on variations in precipitation, evaporation, run-off, and other factors. The groundwater levels (or lack thereof) indicated by the soil borings and presented in this section represent conditions at the time the readings were taken. The actual groundwater levels at the time of construction may vary.

Groundwater measurements were collected during drilling and attempted shortly after completion of the drilling operations. After drilling and collection of groundwater readings, the boreholes were backfilled with auger cuttings and the surface was repaired approximating previous conditions. Since the boreholes were backfilled shortly after drilling, long-term groundwater level information is not available from the soil borings. To obtain long-term groundwater levels, groundwater observation wells would be required.

2.5 SEISMIC SITE CLASS

The proposed building's seismic class was determined for use in the structural design of the proposed project. Soils information was obtained from the soil borings completed on-site, as well as information obtained from the "Soil Survey of Bay County" by the United States Department of Agriculture, the "Quaternary Geology of Michigan" completed by W.R. Farrand, the USGS Topographic Quadrangle and the Hydrogeologic Atlas of Michigan. It is assumed that the proposed structure falls under Building Class II according to the 2015 Michigan Building Code (MBC) Table 1604.5. Based on this information it is our determination that seismic site class D be used according to the ASCE 7 – Table 20.3-1 for structural calculations.

2.6 LIMITATIONS

Soil and groundwater conditions have been observed and interpreted at the soil boring locations only. This information has been used as the basis for our analyses and the recommendations that follow. Although we have allowed for minor variations in subsurface conditions in the development of our recommendations, conditions can vary away from and between soil boring locations. Should this become evident during construction, we should be contacted to review our recommendations. This geotechnical evaluation and report were prepared for geotechnical purposes only. We did not perform environmental related borings or analytical tests.

3.0 RECOMMENDATIONS

3.1 SITE PREPARATION

To increase the likelihood that the recommended allowable soil bearing capacities are achieved and tolerable settlements are not exceeded, the recommendations contained herein should be followed. Within the building footprint and any areas to receive fill, all existing building material, topsoil, ***old fill, organic-containing material***, frozen soil and other unsuitable material should be removed. The clearing should extend a minimum of 5 feet beyond the limits of proposed building and pavement areas and areas to receive structural fill.

It is strongly recommended that the building pad and pavement subgrade areas be evaluated by Driesenga & Associates, Inc. after the area has been cleared and stripped. This evaluation may be performed by proofrolling with a loaded tandem axle dump truck or another method selected by the geotechnical engineer. To identify any areas of soft subgrade soil. Where soft subgrade soils are encountered, remedial actions as recommended by the geotechnical engineer will be required.

Existing fill was encountered in the soil borings and extended about 2 to 6 feet below the existing ground surface. Without documentation of the placement of the fill, we consider it to be "uncontrolled fill." If documentation of the existing fill is available, we would be pleased to review it to determine its suitability of slab, pavement, and/or structural fill support.

Deeper and/or looser uncontrolled fill may be encountered at the site, particularly adjacent to existing or former structures, or in the vicinity of existing utilities. The existing fill ***may*** be suitable for support of slabs, pavements, and/or structural fill after additional evaluation and special preparation and only where it is not underlain by buried topsoil or other organic, deleterious or otherwise unsuitable soils and the owner accepts the risks in doing so. ***Some of the soil samples in the existing fill contained organics.*** Existing fill with excessive organics (over 4%), voids or debris should be removed and replaced with structural fill. Test pits should be performed to

identify unsuitable fill. The test pits could be performed prior to construction. However, suitability of the existing fill will need to be determined on a case-by-case basis during construction. The remaining fill, after removing unsuitable fill, is anticipated to be suitable to support floor slabs, pavements and structural fill, provided an increased risk of unsatisfactory performance is acceptable. We believe the risk of unsatisfactory performance such as cracking and settlement associated with the construction of slabs-on-grade and pavements on or above the existing fill is relatively low after preparation.

Ultimately, if the risk of poor slab and/or pavement performance is not acceptable, complete removal of the existing fill and replacement with structural fill should be performed. Based on the soil borings, the existing fill could extend 6 feet or more below the existing ground surface. If performed, the removal of the existing fill should extend a minimum of 10 feet beyond the edges of the proposed building, or laterally on a two vertical to one horizontal slope from the bottom outside edge of the foundation, whichever is greater. This action should reduce the amount and depth of undercutting during foundation construction since the unsuitable fill and any unsuitable soils directly beneath fill would be removed. For this case, the test pit evaluation would not be necessary. However, a test pit evaluation could be performed to provide a better estimate of the nature, depth and extent of the existing fill.

Trees were located within the project area when this investigation was conducted. Large trees may have relatively widespread root structures and related organic veins. The earthwork activities within the building and pavement areas should include complete removal of the tree roots and organic veins.

Care should be exercised when excavating for the building additions. Excavations should not extend below existing footings, floor slabs, utilities or other structures without first properly underpinning, or supporting the structures with properly designed and installed sheeting.

The contractor should remove standing water from the subgrade and prevent surface water from reaching the footing excavations and the prepared subgrade. In addition, construction traffic should use haul roads and should not haphazardly traffic the site. Subgrade soils that become disturbed should be removed and replaced with structural fill or crushed aggregate. Under wet weather conditions, the subgrade may be protected by placing crushed aggregate on the exposed subgrade.

Where clay or clayey soils are exposed, significant disturbance of the subgrade may result from repeated construction traffic on the soils. The exposed subgrade may need to be stabilized after removal of topsoil to support construction traffic or to reduce subgrade disturbance. Also, the clays/clayey soils may become disturbed due to ponded water and/or repeated construction traffic. Therefore, the contractor should remove standing water from the subgrade and prevent surface water from reaching the footing excavations and the subgrade. In addition, construction traffic should use haul roads and should not haphazardly traffic the site. The client should understand that construction costs may be higher during wet, snowy and/or colder months and that site preparation may be more extensive due to the effects of moisture on the soils. The contractor should limit the number and size of construction equipment on the site, should grade the site during stripping operations to allow surface water to drain from areas of proposed development, and should remove water from areas where it collects. In addition, site utilities should be installed early in the project to channel groundwater into the sand-filled trenches. Even with the above precautions, a significant amount of subgrade disturbance may result. Subgrade soils that become disturbed should be removed and replaced with structural fill or crushed aggregate. We recommend including a contingency in the construction budget to provide for subgrade improvements.

Aeration by methods such as disking may be required to reduce subgrade moisture content to the optimum moisture content range for compaction. In cold and/or wet weather conditions such as during the winter and spring months, it may not be possible to reduce the subgrade moisture content and granular fill or crushed aggregate may need to be imported to the site.

It is recommended that any fill materials be placed in or near horizontal maximum 8-inch-thick loose lifts and compacted to a minimum of 95% of Modified Proctor MDD, or 98% of Michigan Cone MDD. If a vibratory roller is used for compaction, the loose lift thickness may be increased to 12 inches. Soils used for structural fill should consist of clean sand meeting SW or SP classification in accordance with USCS criteria. Care should be taken not to disturb or undermine the existing foundations.

3.2 FOUNDATIONS

Considering the subsurface conditions on this site and the assumed proposed construction, it is acceptable for the proposed Structure to be supported on conventional spread footings. Footings bearing on newly placed structural fill placed over suitable native soils or directly on the native soils may be designed for a maximum net allowable soil bearing pressure of 3,000 psf. The footings should not be placed on the existing fill material.

To attain the recommended bearing pressure where foundations bear on clay soils, improvement of the foundation subgrade may be required in some areas. The soil conditions may vary from those disclosed by the soil borings and undercuts may be required. The amount of improvement will depend on the finished floor elevation, the amount of disturbance during earthwork operations, and the soil and groundwater conditions at the foundation bearing level(s). We do not anticipate compaction of the clay soils will be effective and improvements may include mixing a layer of coarse crushed aggregate into the subgrade. If the subgrade conditions cannot be improved either by compaction or mixing in crushed aggregate, the unsuitable soil should be removed and replaced with structural fill. In areas where undercutting is required, the undercut should extend laterally on a two vertical to one horizontal slope from the edge of the footing.

All perimeter footings and footings in unheated areas should bear at least 42 inches below finished grade for protection from frost action. To reduce the likelihood of frost heave, trench footings should be formed vertically and should not be allowed to widen near the top. If interior footings

are to bear on compacted fill, the fill should be placed in accordance with the recommendations of Section 3.1. Interior foundations can be constructed on suitable natural soils or on structural fill overlying suitable natural subgrade just below the floor slab. However, the footings and proposed bearing soils should be protected from freezing during construction if work is conducted in the cold winter months. Due to the sands encountered at the site, construction of trench footings is probably not feasible. Therefore, we anticipate footing excavations will need to be sloped back and the foundations formed. The placement of footing concrete should be done as soon as footing excavations have been completed and approved to reduce the potential for disturbance or freezing of the footing subgrade.

New foundations adjacent to existing foundations should be constructed at the same level as the existing foundations. New foundation bearing levels can be stepped up or down to match existing foundation bearing levels as needed. We recommend limiting vertical steps to 2 feet every 4 horizontal feet. Excavation for new foundations should not extend below existing foundations without first properly underpinning or shoring the existing foundations.

Prior to concrete placement, the bearing surface should be free of loose soil and standing water. The contractor should avoid stockpiling excavated materials immediately adjacent to the excavation walls. It is recommended that stockpiled materials be kept back from the excavation a minimum distance equal to half the excavation depth to prevent surcharging the excavation walls.

Total and differential settlement of foundations properly designed and constructed based on our recommendations are not expected to exceed 1 inch and ½ inch, respectively.

3.3 FLOORS

The soil below the floor slab should be prepared in accordance with the recommendations in Section 3.1. A noncohesive soils mat such as MDOT Class II sand should be provided directly

below the floor slabs. The mat should be a minimum of 8 inches in thickness and compacted to a minimum of 95% of Modified Proctor MDD.

We recommend providing vapor barriers below floor slabs that will receive an impermeable floor finish/seal. Even if these floor coverings are not planned, the vapor barrier can reduce the transmission of moisture vapor from the ground into the building. However, the placement of a vapor barrier affects construction of the floor slab, concrete curing, and the rate of moisture loss as the concrete dries. These factors could affect the performance of the slab. The manufacturer of the vapor barrier should be consulted in regard to the depth of the barrier below the slab.

The floor slab should be suitably reinforced and proper joints should be provided at the junctions of the slab and foundation system so that a small amount of independent movement can occur without causing damage. A minimum of 6 inches of structural fill should be provided between the bottom of the slab and the top of the shallow spread footing below. Otherwise, other arrangements should be made to allow for potential relative settlements, such as grade beams, thickened slabs with appropriate reinforcing steel or other appropriate details. A modulus of subgrade reaction of 150 pci should be used in the design of slabs-on-grade.

3.4 PAVEMENTS

Specific traffic information was not available in developing these pavement recommendations. For design purposes, we have assumed that passenger vehicles and light trucks will traffic all light/medium duty pavement areas. Heavy duty pavement areas will include entrances, service drives and bus parking areas, and will be trafficked by light to moderately loaded service vehicles, buses, refuse trucks, and fire engines.

The pavement subgrade should be prepared as described in Section 3.1. Above the subgrade, the sand subbase should be constructed using a minimum of 12 inches of Michigan Department of Transportation (MDOT) Class II Fine Aggregate fill (MDOT Division 3, Section 301 “2012

Standard Specifications for Construction", April 1, 2011) compacted to a minimum of 95% of the material's MDD as determined by Modified Proctor.

Due to the clayey soils encountered at the site, site grading and stormwater controls will be important to protect paved drives and parking areas. To further protect new paved areas, perimeter underdrains should be placed beneath pavement edges within the bottom portion of the pavement sand subbase. Four (4) inch-diameter sock-tube backfilled with at least 6 inches of peastone cover should be used. The drains should flow via gravity to a common low point and into the off-site storm sewer system.

The aggregate base for pavement areas should follow MDOT Dense-Graded Aggregate Base Course Materials – Division 3, Section 302 and Division 9, Section 902, using a 21AA (Grading Requirements per MDOT Table 902-1) Limestone Dense-Graded Aggregate material with a minimum compacted thickness of 8 inches. This gravel base may be placed in one (1) lift and should be compacted to a minimum of 95% of the material's MDD as determined by Modified Proctor.

Light/medium duty bituminous pavement should consist of a 1.5 inch base course and a 1.5 inch surface course for a total thickness of 3.0 inches. Heavy duty bituminous pavement should consist of a 2.5 inch base course and a 1.5 inch surface course for a total thickness of 4.0 inches. The HMA material and binder should be selected in accordance with the Local Agency Programs Hot Mix Asphalt Selection Guidelines Revised November 1, 2017 and FHWA Approved December 26, 2017 (Appendix C). Compaction of asphalt courses should range between 92% and 96% of the Theoretical Maximum Density (TMD).

Construction traffic should be minimized on the new pavement. If excessive construction traffic is anticipated on the pavement structure, the initial asphalt lift thickness could be increased and placement of the final lift could be delayed until the majority of the construction activities have

been completed. This action will allow repair of localized failure, if any does occur, as well as reduce load damage on the pavement system.

A bond coat of emulsion should be used between the base course and wearing course when more than 48 hours have elapsed between placement of the courses, or the surface of the base course has been contaminated by soil or dust. Performance grade asphalt cement should be used in the production of all bituminous mixtures. Reclaimed Asphalt Pavement (RAP) should not be used in the surface course.

After the pavement is complete, we recommend instituting a regular maintenance program that includes sealing of cracks and patching of distressed areas. This should reduce the effect of water infiltration and associated frost action.

In areas where the durability of Portland cement concrete (PCC) is desired over bituminous pavement (i.e., loading areas, dumpster pads) a rigid pavement is recommended. Concrete pavement should be constructed on a base layer of at least 6 inches of Michigan Department of Transportation (MDOT) Class II sand subbase (Division 9, Section 902, Grading Requirements per Table 902-3). The concrete slab should consist of a minimum of 6 inches of 4,000 psi, air entrained concrete (MDOT Division 6, Section 601 – PCC Pavement and Division 9, Section 901 – Cement and Lime); however, actual design of the slab including reinforcement type and spacing should be performed by the Project Structural Engineer.

These recommendations assume typical conditions during the June through September construction season. Any substitution of materials or deviation from these stated assumptions should be reviewed to assess potential impact on the recommended design.

3.5 GROUNDWATER CONTROL

Given that groundwater was encountered only at soil borings SB-1 and SB-2, at a depth of 2.5 and 5 feet. The groundwater is likely perched and seepage should be manageable. Therefore, groundwater problems are not anticipated to be a significant issue during construction. However, because the native clay foundation materials generally tend to soften when exposed to free water, every effort should be made to keep the excavations dry if perched water is encountered or if rainfall occurs while the footing excavations are open. Ideally, the footings should be excavated, formed, and poured on the same day to reduce the potential for rainwater to affect footing subsoils. Any water which enters the footing excavation can likely be controlled by a gravity drain system, sump pump, or other minor dewatering procedure. Concrete should not be placed in footing excavations containing water. Upon removal of any trapped water, the soils should be reviewed by a soils engineer and any soft areas replaced with structural fill per Section 3.1, as necessary.

As stated in Section 3.4, perimeter underdrains should be placed beneath all pavement edges within the lower portion of the 12 inches sand subbase. Four (4) inch-diameter sock-tube backfilled with at least 6 inches of peastone cover should be used. The drains should flow via gravity to a common low point and into the on-site storm sewer system. In addition, finger drains should extend radially out from the catch basins and gutter inlets.

Perimeter foundation drains should be installed along foundations where interior finished floor elevations are lower than perimeter grades, or where exterior grades slope toward the building. In addition, all roof drains should be diverted to downspouts which carry water away from foundations and supporting walls. Where granular engineered fill is placed within the native clay soils, adequate drainage of the granular material should be provided so as to avoid creating an area for water to collect.

3.6 TEMPORARY EXCAVATION STABILITY

If excavations are anticipated for the proposed structure and/or utilities, shoring and bracing or flattening (laying back) of the slopes may be required to obtain a safe working environment. Excavations should be sloped or shored in accordance with local, state and federal regulations, including OSHA (CFR Part 1926) excavation trench safety standards. We recommend that all excavated soils be placed away from the edges of the excavation at a distance equaling or exceeding the depth of the excavation. In addition, surface runoff water should be diverted away from the crest of the excavated slopes to prevent erosion and sloughing.

Localized areas of soft or unsuitable soils not detected by our borings or in unexplored areas may be encountered once construction begins. Vertical cuts in these soils may be unstable and may present a significant hazard because they can fail without warning. Therefore, temporary construction slopes greater than 5 feet high should not be steeper than one horizontal to one vertical (1H: 1V) and excavated material should not be placed within 10 feet of the crest of any excavated slope.

Unbraced excavations may experience some minor localized instability (i.e., sloughing). To reduce potential sloughing, excavated slopes should be covered with plastic for protection from rainfall and moisture changes. It should be emphasized that continuous observations by personnel from our office are important during trenching or excavation operations at the site.

4.0 GENERAL COMMENTS

If significant changes are made in the plans and specifications or location of the proposed additions, a consultation should be arranged to review such changes with respect to the prevailing soil conditions. It may then be necessary to submit supplementary recommendations. If deviations from the noted subsurface conditions are encountered during construction, they should also be brought to the attention of Driesenga & Associates, Inc.

Driesenga & Associates, Inc. should be afforded the opportunity to review the project design drawings and specifications to verify the factors affecting subgrade and foundation performance comply with our recommendations.

It is recommended that the services of Driesenga & Associates, Inc. be engaged to observe excavation for the footings and to test and evaluate the soils in the footing excavations prior to placement of foundations in order to determine that the soils have the required bearing capacities. Monitoring and testing should also be performed to verify that suitable materials are used for controlled fills and that they are properly placed and compacted.

This report and any future reports or addenda performed for this site should be supplied to potential bidders prior to them submitting their proposals. We also recommend the construction contract include provisions for dealing with differing conditions. Contingency funds should be reserved for potential problems during earthwork and foundation construction.

This report was for geotechnical purposes only. We did not sample for environmental purposes or perform any analytical testing. However, the contractor should be prepared to handle environmental conditions encountered at this site that may affect the excavation, removal, or disposal of soil; dewatering of excavations; and health and safety of workers. Any Environmental Assessment reports prepared for this property should be made available for review by bidders and the successful contractor.

This report has been prepared solely for the use of the client for the project specifically described in this report. This report cannot be relied upon by other parties not involved in this project, unless written permission is granted by Driesenga & Associates, Inc. If this report or any of its contents are utilized by parties other than our original client and the project team members, Driesenga & Associates, Inc. can not be held responsible for the suitability of the field exploration, scope of services, or recommendations made for the new project. Driesenga & Associates, Inc. also is not responsible for the interpretation of our soil boring logs and the recommendations provided herein by other parties.

Driesenga & Associates, Inc. will evaluate this report for other parties and developments at this site, provided our original Client agrees to release this information in writing. However, before this report can be relied upon by other parties. Driesenga & Associates, Inc. must review the proposed development since the new project will likely require additional field exploration, laboratory tests, analysis, and modifications to our recommendations to adequately address the needs of the new project.

APPENDIX A

·FIGURE NUMBER 1 – SITE LOCATION·

·FIGURE NUMBER 2 & 3 – BORING LOCATIONS·

Figure Number: 1
Site Location

Project Name
Bangor Township Schools 2023 Bond Project

Project Number
2340694.3A

Project Location
3175 Wilder Road & 3281 & 3201 Kiesel Road
Bay City, MI 48706

DRIESENGA & ASSOCIATES, INC.
Engineering · Surveying · Testing

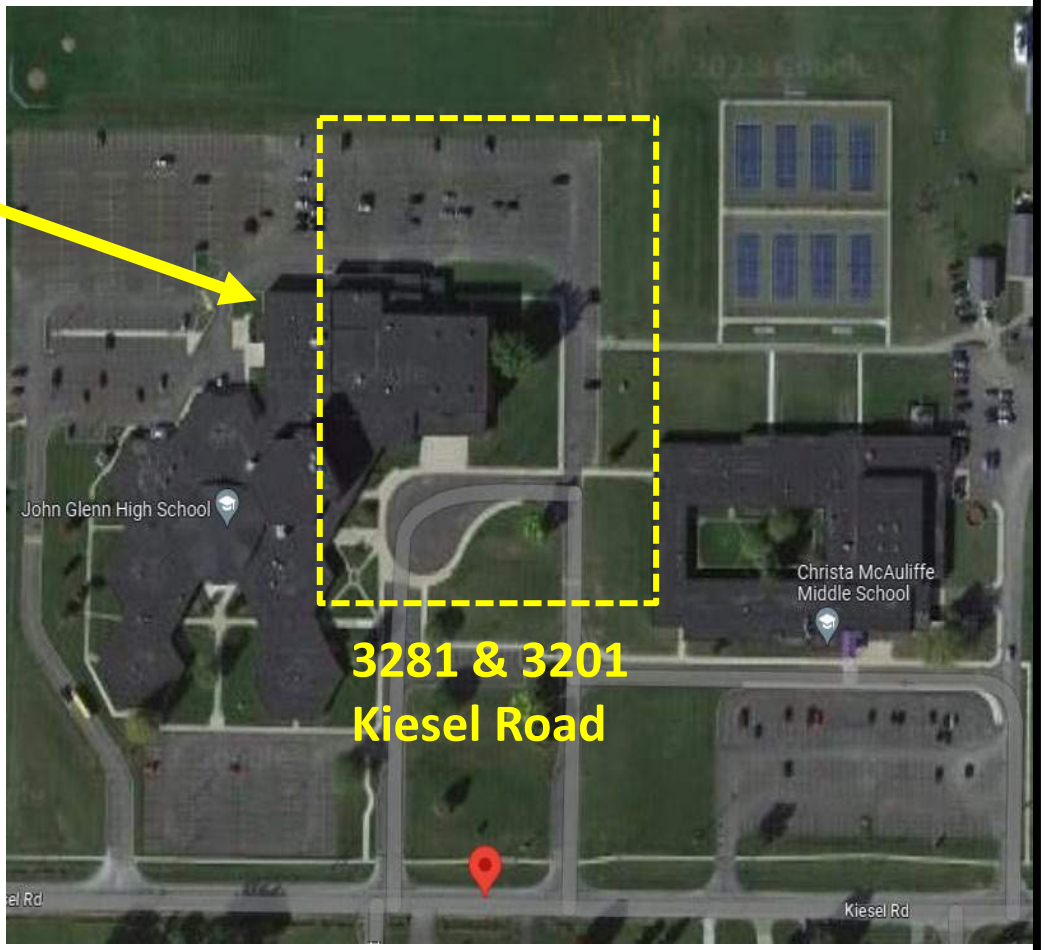


Figure Number: 2
Boring Locations

Project Name
Bangor Township Schools
2023 Bond Project

Project Number
2340694.3A

Project Location
3175 Wilder Road &
3281 & 3201 Kiesel Road
Bay City, MI 48706

DRIESENGA & ASSOCIATES, INC.
Engineering · Surveying · Testing

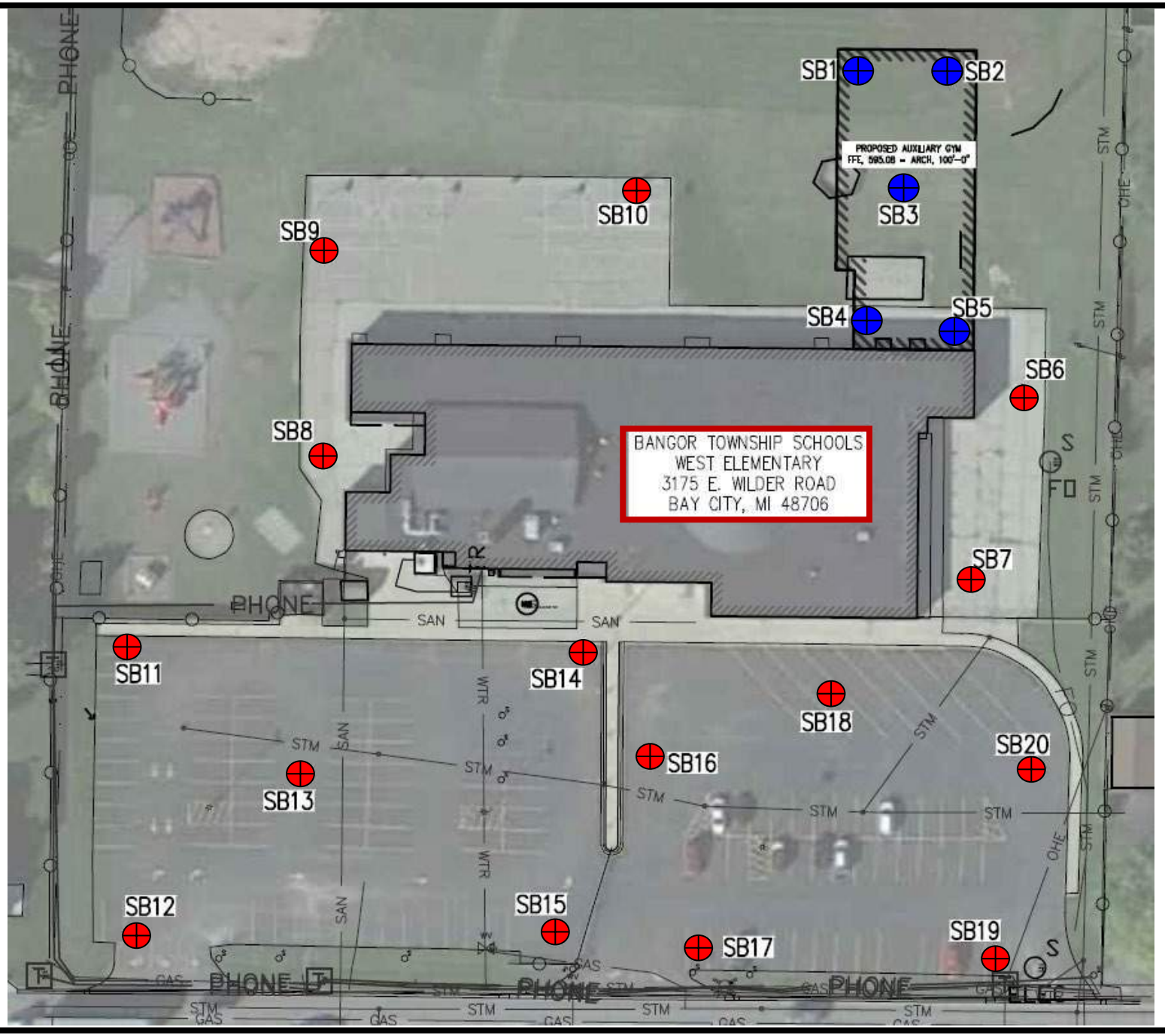


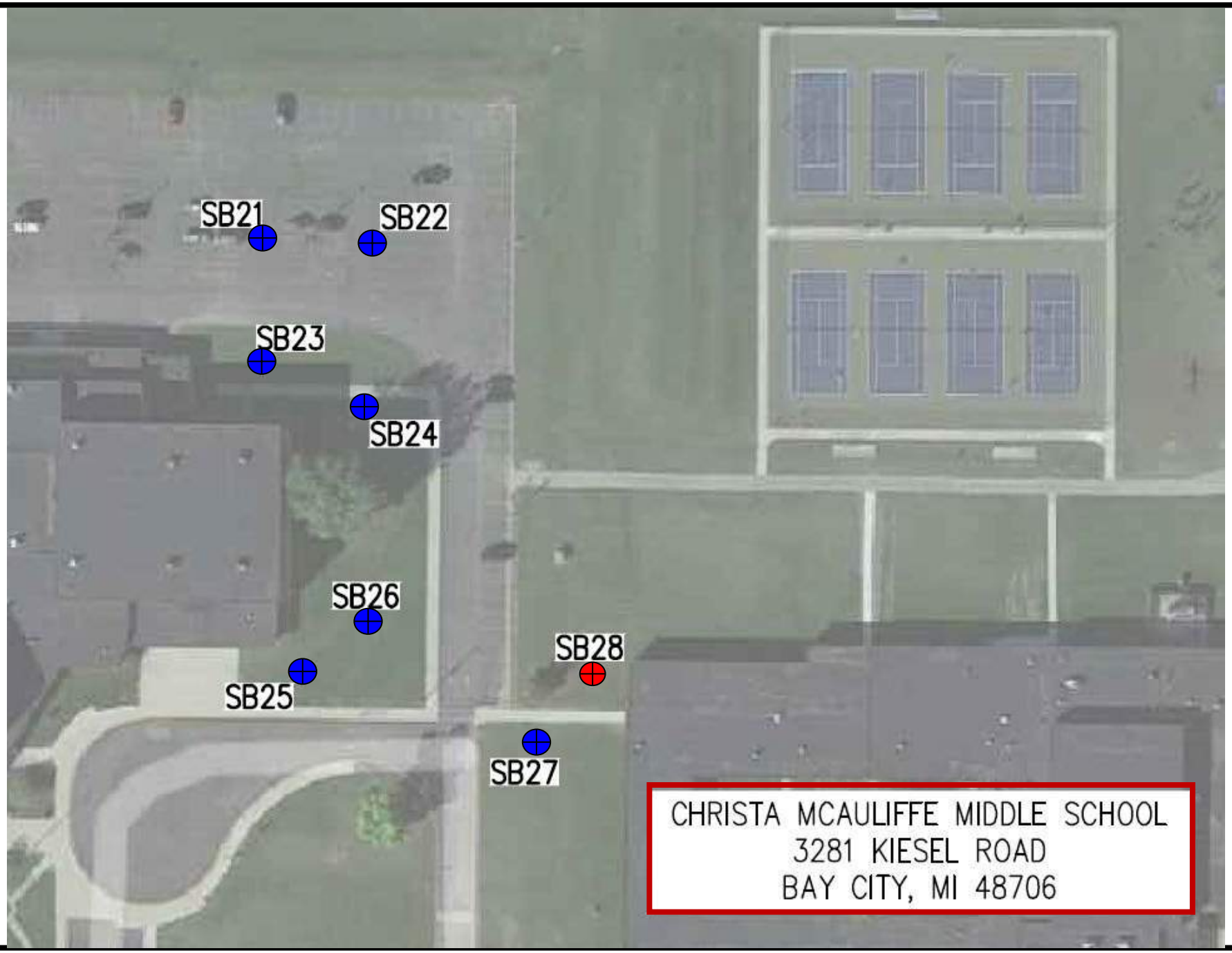
Figure Number: 3
Boring Locations

Project Name
Bangor Township Schools
2023 Bond Project

Project Number
2340694.3A

Project Location
3175 Wilder Road &
3281 & 3201 Kiesel Road
Bay City, MI 48706

DRIESENGA & ASSOCIATES, INC.
Engineering · Surveying · Testing



APPENDIX B

·SOIL BORING LOGS·

DRIESENGA & ASSOCIATES, INC.
Engineering · Surveying · Testing

SB-1

Project: Bangor Township Schools
3175 Wilder Rd & 3281 & 3201 Kiesel Rd,
Bay City, Michigan

Project No. 2340694.3A

Client: Bangor Township Schools

Date Started	: September 5, 2023	Drilling Company	: Brax Drilling
Date Completed	: September 5, 2023	Field Sampling	: Al Rau
Hole Diameter	: 6-inches	Reviewed By	: A. Elsadek
Drilling Method	: Hollow-Stem Auger	GW Encountered	: 5'
Sampling Method	: Split-Spoon Sampler	GW Completed	: N/A

Water Levels
▼ During Drilling
▽ After Completion

Auto-Hammer Used for SPT

Depth in Feet	Elev.	USCS	GRAPHIC	DESCRIPTION	Samples	Blow Count	N Value	Pocket Pen (tsf)	Water Level	Moisture Content %
0				TOPSOIL - 6 inches						
		CL/Fill		Fill - Sandy CLAY, very stiff, black, with organics, with gravel, moist	1	6 3 3	6			
		CL/Fill		Fill - Sandy CLAY, very stiff, brown and grey, trace gravel, moist	2	3 3 5	8		▼	
5										
		CL		Sandy CLAY, very stiff to hard, brown, with pebbles and gravel, wet	3	3 7 9	16	3.0		
					4	4 7 14	21	>4.5		
10										
		CL		Silty CLAY, very stiff to hard, grey, with gravel, wet	5	5 8 12	20	>4.5		
15										
					6	3 7 9	16	3.0		
20				E.O.B. @ 20'						
25										

DRIESENGA & ASSOCIATES, INC.
Engineering · Surveying · Testing

SB-2

Project: Bangor Township Schools
3175 Wilder Rd & 3281 & 3201 Kiesel Rd,
Bay City, Michigan

Project No. 2340694.3A

Client: Bangor Township Schools

Date Started	: September 5, 2023	Drilling Company	: Brax Drilling
Date Completed	: September 5, 2023	Field Sampling	: Al Rau
Hole Diameter	: 6-inches	Reviewed By	: A. Elsadek
Drilling Method	: Hollow-Stem Auger	GW Encountered	: 2.5
Sampling Method	: Split-Spoon Sampler	GW Completed	: N/A

Water Levels
▼ During Drilling
▽ After Completion

Auto-Hammer Used for SPT

Depth in Feet	Elev.	USCS	GRAPHIC	DESCRIPTION	Samples	Blow Count	N Value	Pocket Pen (tsf)	Water Level	Moisture Content %
0				TOPSOIL - 12 inches						
		CL/Fill		Fill - Silty Sandy CLAY, very stiff, black, with organics, with gravel, moist	1	3 4 4	8		▼	
5		CL		Silty CLAY, medium stiff, brown, with gravel, wet	2	2 2 2	4	1.0		
		CL		Sandy CLAY, very stiff to hard, brown, with gravel, wet	3	4 7 10	17	4.0		
10					4	5 7 9	16	>4.5		
		CL		Silty CLAY, hard, grey, with gravel, wet	5	4 10 13	23	>4.5		
15										
					6	4 7 10	17	>4.5		
20				E.O.B. @ 20'						
25										

DRIESENGA & ASSOCIATES, INC.
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SB-3

Project: Bangor Township Schools
3175 Wilder Rd & 3281 & 3201 Kiesel Rd,
Bay City, Michigan

Project No. 2340694.3A

Client: Bangor Township Schools

Date Started	: September 5, 2023	Drilling Company	: Brax Drilling
Date Completed	: September 5, 2023	Field Sampling	: Al Rau
Hole Diameter	: 6-inches	Reviewed By	: A. Elsadek
Drilling Method	: Hollow-Stem Auger	GW Encountered	: N/A
Sampling Method	: Split-Spoon Sampler	GW Completed	: N/A

Water Levels
▼ During Drilling
▽ After Completion

Auto-Hammer Used for SPT

Depth in Feet	Elev.	USCS	GRAPHIC	DESCRIPTION	Samples	Blow Count	N Value	Pocket Pen (tsf)	Water Level	Moisture Content %
0				TOPSOIL - 10 inches						
		CL/Fill		Fill - Silty Sandy CLAY, medium stiff, brown, with gravel, moist	1	1 2 2	4			
5					2	0 1 3	4			
		CL		Silty Sandy CLAY, very stiff to hard, brown, with gravel, moist	3	3 7 10	17	4.5		
10					4	4 7 11	18	>4.5		
		CL		Silty CLAY, very stiff to hard, grey, with pebbles and gravel, moist	5	5 9 12	21	4.5		
15										
					6	3 8 9	17	3.5		
20				E.O.B. @ 20'						
25										

DRIESENGA & ASSOCIATES, INC.
Engineering · Surveying · Testing

SB-4

Project: Bangor Township Schools
3175 Wilder Rd & 3281 & 3201 Kiesel Rd,
Bay City, Michigan

Project No. 2340694.3A

Client: Bangor Township Schools

Date Started	: September 5, 2023	Drilling Company	: Brax Drilling
Date Completed	: September 5, 2023	Field Sampling	: Al Rau
Hole Diameter	: 6-inches	Reviewed By	: A. Elsadek
Drilling Method	: Hollow-Stem Auger	GW Encountered	: N/A
Sampling Method	: Split-Spoon Sampler	GW Completed	: N/A

Water Levels
▼ During Drilling
▽ After Completion

Auto-Hammer Used for SPT

Depth in Feet	Elev.	USCS	GRAPHIC	DESCRIPTION	Samples	Blow Count	N Value	Pocket Pen (tsf)	Water Level	Moisture Content %
0				ASPHALT - 4 inches						
				Aggregate Base - 6 inches						
		CL/Fill		Fill - Silty CLAY, stiff, brown and grey, with gravel, moist	1	2 2 3	5			
					2	2 2 3	5			
5		CL		Silty CLAY, stiff to very stiff, light brown, with pebbles and gravel, moist	3	2 3 5	8	3.0		
		CL		Silty Sandy CLAY, hard, light brown, with gravel, moist	4	4 9 16	25	>4.5		
10										
		CL		Silty CLAY, very stiff to hard, grey, with pebbles, moist	5	5 9 13	22	>4.5		
15										
					6	4 6 11	17	4.0		
20				E.O.B. @ 20'						
25										

DRIESENGA & ASSOCIATES, INC.
Engineering · Surveying · Testing

SB-5

Project: Bangor Township Schools
3175 Wilder Rd & 3281 & 3201 Kiesel Rd,
Bay City, Michigan

Project No. 2340694.3A

Client: Bangor Township Schools

Date Started	: September 5, 2023	Drilling Company	: Brax Drilling
Date Completed	: September 5, 2023	Field Sampling	: Al Rau
Hole Diameter	: 6-inches	Reviewed By	: A. Elsadek
Drilling Method	: Hollow-Stem Auger	GW Encountered	: N/A
Sampling Method	: Split-Spoon Sampler	GW Completed	: N/A

Water Levels
▼ During Drilling
▽ After Completion

Auto-Hammer Used for SPT

Depth in Feet	Elev.	USCS	GRAPHIC	DESCRIPTION	Samples	Blow Count	N Value	Pocket Pen (tsf)	Water Level	Moisture Content %
0				ASPHALT - 4 inches						
				Aggregate Base - 6 inches						
		SM/Fill		Fill - Silty SAND, loose, brown, fine to medium grained, moist	1	2 2 2	4			
		CL/Fill		Fill - Silty Sandy CLAY, medium stiff to stiff, black, trace gravel, moist	2	1 2 2	4			
5										
		CL		Silty Sandy CLAY, hard, light brown, with gravel, moist	3	4 7 9	16	4.5		
					4	5 8 4	12	>4.5		
10										
		CL		Silty CLAY, very stiff to hard, grey, trace gravel, moist	5	4 9 12	21	4.5		
15										
					6	3 7 9	16	4.0		
20				E.O.B. @ 20'						
25										

DRIESENGA & ASSOCIATES, INC.
Engineering · Surveying · Testing

SB-6

Project: Bangor Township Schools
3175 Wilder Rd & 3281 & 3201 Kiesel Rd,
Bay City, Michigan

Project No. 2340694.3A

Client: Bangor Township Schools

Date Started	: September 5, 2023	Drilling Company	: Brax Drilling
Date Completed	: September 5, 2023	Field Sampling	: Al Rau
Hole Diameter	: 6-inches	Reviewed By	: A. Elsadek
Drilling Method	: Hollow-Stem Auger	GW Encountered	: N/A
Sampling Method	: Split-Spoon Sampler	GW Completed	: N/A

Water Levels
▼ During Drilling
▽ After Completion

Auto-Hammer Used for SPT

Depth in Feet	Elev.	USCS	GRAPHIC	DESCRIPTION	Samples	Blow Count	N Value	Pocket Pen (tsf)	Water Level	Moisture Content %
0				ASPHALT - 4 inches						
				Aggregate Base - 6 inches						
		CL/Fill		Fill - Silty Sandy CLAY, medium stiff, black, moist	1	1 2 2	4			
		CL/Fill		Fill - Sandy CLAY, medium stiff, brown, trace gravel, moist	2	2 2 3	5			
				E.O.B. @ 4'						
5										
10										

DRIESENGA & ASSOCIATES, INC.
Engineering · Surveying · Testing

SB-7

Project: Bangor Township Schools
3175 Wilder Rd & 3281 & 3201 Kiesel Rd,
Bay City, Michigan

Project No. 2340694.3A

Client: Bangor Township Schools

Date Started	: September 5, 2023	Drilling Company	: Brax Drilling
Date Completed	: September 5, 2023	Field Sampling	: Al Rau
Hole Diameter	: 6-inches	Reviewed By	: A. Elsadek
Drilling Method	: Hollow-Stem Auger	GW Encountered	: N/A
Sampling Method	: Split-Spoon Sampler	GW Completed	: N/A

Water Levels
▼ During Drilling
▽ After Completion

Auto-Hammer Used for SPT

Depth in Feet	Elev.	USCS	GRAPHIC	DESCRIPTION	Samples	Blow Count	N Value	Pocket Pen (tsf)	Water Level	Moisture Content %
0				ASPHALT - 2 inches						
				Aggregate Base - 6 inches						
		CL/Fill		Fill - Silty Sandy CLAY, medium stiff, black, with organics, trace gravel, moist	1	1 2 3	5			
		CL/Fill		Fill - Silty Sandy CLAY, medium stiff, brown, with gravel, moist	2	1 2 3	5			
				E.O.B. @ 4'						
5										
10										

DRIESENGA & ASSOCIATES, INC.
Engineering · Surveying · Testing

SB-8

Project: Bangor Township Schools
3175 Wilder Rd & 3281 & 3201 Kiesel Rd,
Bay City, Michigan

Project No. 2340694.3A

Client: Bangor Township Schools

Date Started	: September 5, 2023	Drilling Company	: Brax Drilling
Date Completed	: September 5, 2023	Field Sampling	: Al Rau
Hole Diameter	: 6-inches	Reviewed By	: A. Elsadek
Drilling Method	: Hollow-Stem Auger	GW Encountered	: N/A
Sampling Method	: Split-Spoon Sampler	GW Completed	: N/A

Water Levels
▼ During Drilling
▽ After Completion

Auto-Hammer Used for SPT

Depth in Feet	Elev.	USCS	GRAPHIC	DESCRIPTION	Samples	Blow Count	N Value	Pocket Pen (tsf)	Water Level	Moisture Content %
0				ASPHALT - 3 inches						
				Aggregate base - 15 inches						
		CL/Fill		Fill - Silty CLAY, stiff, black, trace gravel, moist	1	2 3 3	6			
		CL/Fill		Fill - Silty Sandy CLAY, medium stiff, light brown, with gravel, moist	2	2 3 4	7			
				E.O.B. @ 4'						
5										
10										

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SB-9

Project: Bangor Township Schools
3175 Wilder Rd & 3281 & 3201 Kiesel Rd,
Bay City, Michigan

Project No. 2340694.3A

Client: Bangor Township Schools

Date Started	: September 5, 2023	Drilling Company	: Brax Drilling
Date Completed	: September 5, 2023	Field Sampling	: Al Rau
Hole Diameter	: 6-inches	Reviewed By	: A. Elsadek
Drilling Method	: Hollow-Stem Auger	GW Encountered	: N/A
Sampling Method	: Split-Spoon Sampler	GW Completed	: N/A

Water Levels
▼ During Drilling
▽ After Completion

Auto-Hammer Used for SPT

Depth in Feet	Elev.	USCS	GRAPHIC	DESCRIPTION	Samples	Blow Count	N Value	Pocket Pen (tsf)	Water Level	Moisture Content %
0				ASPHALT - 2 inches						
				Aggregate base - 16 inches						
		CL/Fill		Fill - Silty CLAY, stiff, black, trace gravel, moist	1	2 3 3	5			
		CL/Fill		Fill - Silty Sandy CLAY, very stiff, light brown, with cobbles and pebbles, moist	2	3 7 10	5			
				E.O.B. @ 4'						
5										
10										

DRIESENGA & ASSOCIATES, INC.
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SB-10

Project: Bangor Township Schools
3175 Wilder Rd & 3281 & 3201 Kiesel Rd,
Bay City, Michigan

Project No. 2340694.3A

Client: Bangor Township Schools

Date Started	: September 5, 2023	Drilling Company	: Brax Drilling
Date Completed	: September 5, 2023	Field Sampling	: Al Rau
Hole Diameter	: 6-inches	Reviewed By	: A. Elsadek
Drilling Method	: Hollow-Stem Auger	GW Encountered	: N/A
Sampling Method	: Split-Spoon Sampler	GW Completed	: N/A

Water Levels
▼ During Drilling
▽ After Completion

Auto-Hammer Used for SPT

Depth in Feet	Elev.	USCS	GRAPHIC	DESCRIPTION	Samples	Blow Count	N Value	Pocket Pen (tsf)	Water Level	Moisture Content %
0				ASPHALT - 3 inches						
				Aggregate base - 9 inches						
		SW/Fill		Fill - SAND, loose, grey, medium to coarse grained, with crushed stones and gravel, moist	1	3 2 2	4			
		CL/Fill		Fill - Silty CLAY, medium stiff, brown, with cobbles and gravel, moist	2	2 2 3	5			
				E.O.B. @ 4'						
5										
10										

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SB-11

Project: Bangor Township Schools
3175 Wilder Rd & 3281 & 3201 Kiesel Rd,
Bay City, Michigan

Project No. 2340694.3A

Client: Bangor Township Schools

Date Started	: September 5, 2023	Drilling Company	: Brax Drilling
Date Completed	: September 5, 2023	Field Sampling	: Al Rau
Hole Diameter	: 6-inches	Reviewed By	: A. Elsadek
Drilling Method	: Hollow-Stem Auger	GW Encountered	: N/A
Sampling Method	: Split-Spoon Sampler	GW Completed	: N/A

Water Levels
▼ During Drilling
▽ After Completion

Auto-Hammer Used for SPT

Depth in Feet	Elev.	USCS	GRAPHIC	DESCRIPTION	Samples	Blow Count	N Value	Pocket Pen (tsf)	Water Level	Moisture Content %
0				ASPHALT - 5 inches						
				Aggregate base - 6 inches						
		SW/Fill		Fill - SAND, loose, brown, fine to medium grained, with silt, with gravel, moist	1	3 4 4	8			
		CL/Fill		Fill - Silty CLAY, stiff, brown and grey, with gravel, moist	2	3 4 3	7			
				E.O.B. @ 4'						
5										
10										

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SB-12

Project: Bangor Township Schools
3175 Wilder Rd & 3281 & 3201 Kiesel Rd,
Bay City, Michigan

Project No. 2340694.3A

Client: Bangor Township Schools

Date Started	: September 5, 2023	Drilling Company	: Brax Drilling
Date Completed	: September 5, 2023	Field Sampling	: Al Rau
Hole Diameter	: 6-inches	Reviewed By	: A. Elsadek
Drilling Method	: Hollow-Stem Auger	GW Encountered	: N/A
Sampling Method	: Split-Spoon Sampler	GW Completed	: N/A

Water Levels
▼ During Drilling
▽ After Completion

Auto-Hammer Used for SPT

Depth in Feet	Elev.	USCS	GRAPHIC	DESCRIPTION	Samples	Blow Count	N Value	Pocket Pen (tsf)	Water Level	Moisture Content %
0				ASPHALT - 3 inches						
				Aggregate base - 6 inches						
		SW/Fill		Fill - SAND, loose, brown, fine to medium grained, with silt, with gravel, moist						
		CL/Fill		Fill - Silty CLAY, medium stiff, brown and grey, with gravel, moist	1	2 2 3	5			
					2	2 3 4	7			
				E.O.B. @ 4'						
5										
10										

DRIESENGA & ASSOCIATES, INC.
Engineering · Surveying · Testing

SB-13

Project: Bangor Township Schools
3175 Wilder Rd & 3281 & 3201 Kiesel Rd,
Bay City, Michigan

Project No. 2340694.3A

Client: Bangor Township Schools

Date Started	: September 5, 2023	Drilling Company	: Brax Drilling
Date Completed	: September 5, 2023	Field Sampling	: Al Rau
Hole Diameter	: 6-inches	Reviewed By	: A. Elsadek
Drilling Method	: Hollow-Stem Auger	GW Encountered	: N/A
Sampling Method	: Split-Spoon Sampler	GW Completed	: N/A

Water Levels
▼ During Drilling
▽ After Completion

Auto-Hammer Used for SPT

Depth in Feet	Elev.	USCS	GRAPHIC	DESCRIPTION	Samples	Blow Count	N Value	Pocket Pen (tsf)	Water Level	Moisture Content %
0				ASPHALT - 5 inches						
				Aggregate base - 5 inches						
		SM/Fill		Fill - Silty SAND, medium dense, very light brown, fine grained, moist	1	3 5 5	10			
		CL		Silty CLAY, very stiff, grey, with gravel, moist	2	3 4 5	9	4.0		
				E.O.B. @ 4'						
5										
10										

DRIESENGA & ASSOCIATES, INC.
Engineering · Surveying · Testing

SB-14

Project: Bangor Township Schools
3175 Wilder Rd & 3281 & 3201 Kiesel Rd,
Bay City, Michigan

Project No. 2340694.3A

Client: Bangor Township Schools

Date Started	: September 5, 2023	Drilling Company	: Brax Drilling
Date Completed	: September 5, 2023	Field Sampling	: Al Rau
Hole Diameter	: 6-inches	Reviewed By	: A. Elsadek
Drilling Method	: Hollow-Stem Auger	GW Encountered	: N/A
Sampling Method	: Split-Spoon Sampler	GW Completed	: N/A

Water Levels
▼ During Drilling
▽ After Completion

Auto-Hammer Used for SPT

Depth in Feet	Elev.	USCS	GRAPHIC	DESCRIPTION	Samples	Blow Count	N Value	Pocket Pen (tsf)	Water Level	Moisture Content %
0				ASPHALT - 5 inches						
				Aggregate base - 6 inches						
		SM/Fill		Fill - Silty SAND, medium dense, very light brown, fine grained, moist	1	3 4 5	9			
		CL		Silty CLAY, very stiff, grey, trace gravel, moist	2	3 4 4	8	4.0		
				E.O.B. @ 4'						
5										
10										

DRIESENGA & ASSOCIATES, INC.
Engineering · Surveying · Testing

SB-15

Project: Bangor Township Schools
3175 Wilder Rd & 3281 & 3201 Kiesel Rd,
Bay City, Michigan

Project No. 2340694.3A

Client: Bangor Township Schools

Date Started	: September 5, 2023	Drilling Company	: Brax Drilling
Date Completed	: September 5, 2023	Field Sampling	: Al Rau
Hole Diameter	: 6-inches	Reviewed By	: A. Elsadek
Drilling Method	: Hollow-Stem Auger	GW Encountered	: N/A
Sampling Method	: Split-Spoon Sampler	GW Completed	: N/A

Water Levels
▼ During Drilling
▽ After Completion

Auto-Hammer Used for SPT

Depth in Feet	Elev.	USCS	GRAPHIC	DESCRIPTION	Samples	Blow Count	N Value	Pocket Pen (tsf)	Water Level	Moisture Content %
0				ASPHALT - 4 inches						
				Aggregate base - 5 inches						
		CL/Fill		Fill - Silty CLAY, stiff, black, trace gravel, moist	1	2 3 4	7			
		CL/Fill		Fill - Sandy CLAY, medium stiff, brown, with gravel, moist	2	3 4 4	8			
				E.O.B. @ 4'						
5										
10										

DRIESENGA & ASSOCIATES, INC.
Engineering · Surveying · Testing

SB-16

Project: Bangor Township Schools
3175 Wilder Rd & 3281 & 3201 Kiesel Rd,
Bay City, Michigan

Project No. 2340694.3A

Client: Bangor Township Schools

Date Started	: September 5, 2023	Drilling Company	: Brax Drilling
Date Completed	: September 5, 2023	Field Sampling	: Al Rau
Hole Diameter	: 6-inches	Reviewed By	: A. Elsadek
Drilling Method	: Hollow-Stem Auger	GW Encountered	: N/A
Sampling Method	: Split-Spoon Sampler	GW Completed	: N/A

Water Levels
▼ During Drilling
▽ After Completion

Auto-Hammer Used for SPT

Depth in Feet	Elev.	USCS	GRAPHIC	DESCRIPTION	Samples	Blow Count	N Value	Pocket Pen (tsf)	Water Level	Moisture Content %
0				ASPHALT - 4 inches						
				Aggregate base - 6 inches						
		CL/Fill		Fill - Silty CLAY, medium stiff, brown, with gravel, moist	1	2 3 3	6			
		CL/Fill		Fill - Silty Sandy CLAY, medium stiff, brown and grey, with gravel, moist	2	3 3 4	7			
				E.O.B. @ 4'						
5										
10										

DRIESENGA & ASSOCIATES, INC.
Engineering · Surveying · Testing

SB-17

Project: Bangor Township Schools
3175 Wilder Rd & 3281 & 3201 Kiesel Rd,
Bay City, Michigan

Project No. 2340694.3A

Client: Bangor Township Schools

Date Started	: September 5, 2023	Drilling Company	: Brax Drilling
Date Completed	: September 5, 2023	Field Sampling	: Al Rau
Hole Diameter	: 6-inches	Reviewed By	: A. Elsadek
Drilling Method	: Hollow-Stem Auger	GW Encountered	: N/A
Sampling Method	: Split-Spoon Sampler	GW Completed	: N/A

Water Levels
▼ During Drilling
▽ After Completion

Auto-Hammer Used for SPT

Depth in Feet	Elev.	USCS	GRAPHIC	DESCRIPTION	Samples	Blow Count	N Value	Pocket Pen (tsf)	Water Level	Moisture Content %
0				ASPHALT - 5 inches						
				Aggregate base - 5 inches						
		CL/Fill		Fill - Silty CLAY, stiff, brown, with gravel, moist	1	3 3 3	6			
		CL		Silty Sandy CLAY, brown, with pebbles, moist	2	2 3 4	7	1.5		
				E.O.B. @ 4'						
5										
10										

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SB-18

Project: Bangor Township Schools
3175 Wilder Rd & 3281 & 3201 Kiesel Rd,
Bay City, Michigan

Project No. 2340694.3A

Client: Bangor Township Schools

Date Started	: September 5, 2023	Drilling Company	: Brax Drilling
Date Completed	: September 5, 2023	Field Sampling	: Al Rau
Hole Diameter	: 6-inches	Reviewed By	: A. Elsadek
Drilling Method	: Hollow-Stem Auger	GW Encountered	: N/A
Sampling Method	: Split-Spoon Sampler	GW Completed	: N/A

Water Levels
▼ During Drilling
▽ After Completion

Auto-Hammer Used for SPT

Depth in Feet	Elev.	USCS	GRAPHIC	DESCRIPTION	Samples	Blow Count	N Value	Pocket Pen (tsf)	Water Level	Moisture Content %
0				ASPHALT - 5 inches						
				Aggregate base - 6 inches						
		SM/Fill		Fill - Silty SAND, loose, light brown, fine grained, with gravel, moist	1	3 4 4	8			
		CL		Silty CLAY, stiff, grey, with gravel, moist	2	3 4 3	7	2.0		
				E.O.B. @ 4'						
5										
10										

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SB-19

Project: Bangor Township Schools
3175 Wilder Rd & 3281 & 3201 Kiesel Rd,
Bay City, Michigan

Project No. 2340694.3A

Client: Bangor Township Schools

Date Started	: September 5, 2023	Drilling Company	: Brax Drilling
Date Completed	: September 5, 2023	Field Sampling	: Al Rau
Hole Diameter	: 6-inches	Reviewed By	: A. Elsadek
Drilling Method	: Hollow-Stem Auger	GW Encountered	: N/A
Sampling Method	: Split-Spoon Sampler	GW Completed	: N/A

Water Levels
▼ During Drilling
▽ After Completion

Auto-Hammer Used for SPT

Depth in Feet	Elev.	USCS	GRAPHIC	DESCRIPTION	Samples	Blow Count	N Value	Pocket Pen (tsf)	Water Level	Moisture Content %
0				ASPHALT - 6 inches						
				Aggregate base - 6 inches						
		SW/Fill		Fill - SAND, loose, brown, fine to medium grained, with clay, trace gravel, moist	1	2 3 3	6			
		CL/Fill		Fill - Silty Sandy CLAY, stiff, brown and grey, with cobbles and gravel, moist	2	2 2 1	3			
				E.O.B. @ 4'						
5										
10										

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SB-20

Project: Bangor Township Schools
3175 Wilder Rd & 3281 & 3201 Kiesel Rd,
Bay City, Michigan

Project No. 2340694.3A

Client: Bangor Township Schools

Date Started	: September 5, 2023	Drilling Company	: Brax Drilling
Date Completed	: September 5, 2023	Field Sampling	: Al Rau
Hole Diameter	: 6-inches	Reviewed By	: A. Elsadek
Drilling Method	: Hollow-Stem Auger	GW Encountered	: N/A
Sampling Method	: Split-Spoon Sampler	GW Completed	: N/A

Water Levels
▼ During Drilling
▽ After Completion

Auto-Hammer Used for SPT

Depth in Feet	Elev.	USCS	GRAPHIC	DESCRIPTION	Samples	Blow Count	N Value	Pocket Pen (tsf)	Water Level	Moisture Content %
0				ASPHALT - 6 inches						
				Aggregate base - 6 inches						
		SM/Fill		Fill - Silty SAND, loose, very light brown, fine grained, moist	1	3 3 4	7			
		CL/Fill		Fill - Silty CLAY,medium stiff, grey, with gravel, moist	2	4 4 5	9			
				E.O.B. @ 4'						
5										
10										

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SB-21

Project: Bangor Township Schools
3175 Wilder Rd & 3281 & 3201 Kiesel Rd,
Bay City, Michigan

Project No. 2340694.3A

Client: Bangor Township Schools

Date Started	: September 27, 2023	Drilling Company	: Brax Drilling
Date Completed	: September 27, 2023	Field Sampling	: Al Rau
Hole Diameter	: 6-inches	Reviewed By	: A. Elsadek
Drilling Method	: Hollow-Stem Auger	GW Encountered	: N/A
Sampling Method	: Split-Spoon Sampler	GW Completed	: N/A

Water Levels
▼ During Drilling
▽ After Completion

Auto-Hammer Used for SPT

Depth in Feet	Elev.	USCS	GRAPHIC	DESCRIPTION	Samples	Blow Count	N Value	Pocket Pen (tsf)	Water Level	Moisture Content %
0				ASPHALT - 4 inches						
				Aggregate base - 8 inches						
		CL/Fill		Fill - Silty Sandy CLAY, stiff to very stiff, brown and grey, with gravel, moist	1	4 5 5	10			
					2	2 4 5	9			
5										
		CL		Silty CLAY, very stiff to hard, brown, with pebbles, moist	3	3 7 10	17	4.0		
					4	5 10 14	24	4.5		
10										
		CL		Silty CLAY, hard, grey, with pebbles and gravel, moist	5	8 12 15	27	4.5		
15										
					6	4 7 10	17	4.5		
20				E.O.B. @ 20'						
25										

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SB-22

Project: Bangor Township Schools
3175 Wilder Rd & 3281 & 3201 Kiesel Rd,
Bay City, Michigan

Project No. 2340694.3A

Client: Bangor Township Schools

Date Started	: September 27, 2023	Drilling Company	: Brax Drilling
Date Completed	: September 27, 2023	Field Sampling	: Al Rau
Hole Diameter	: 6-inches	Reviewed By	: A. Elsadek
Drilling Method	: Hollow-Stem Auger	GW Encountered	: N/A
Sampling Method	: Split-Spoon Sampler	GW Completed	: N/A

Water Levels
▼ During Drilling
▽ After Completion

Auto-Hammer Used for SPT

Depth in Feet	Elev.	USCS	GRAPHIC	DESCRIPTION	Samples	Blow Count	N Value	Pocket Pen (tsf)	Water Level	Moisture Content %
0				ASPHALT - 4 inches						
				Aggregate base- 9 inches						
		CL/Fill		Fill - Silty Sandy CLAY, very stiff, brown and grey, with gravel, moist	1	5 5 6	11			
					2	1 3 4	7			
5		CL		Silty CLAY, very stiff, brown, trace gravel, moist	3	3 7 8	15	4.0		
		CL		Silty CLAY, hard, brown, with pebbles and gravel, moist	4	5 9 11	20	4.0		
10		CL		Silty CLAY, very stiff to hard, grey, with pebbles, moist	5	7 9 10	19	4.5		
15		CL			6	5 6 10	16	4.0		
20				E.O.B. @ 20'						
25										

DRIESENGA & ASSOCIATES, INC.
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SB-23

Project: Bangor Township Schools
3175 Wilder Rd & 3281 & 3201 Kiesel Rd,
Bay City, Michigan

Project No. 2340694.3A

Client: Bangor Township Schools

Date Started	: September 12, 2023	Drilling Company	: Brax Drilling
Date Completed	: September 12, 2023	Field Sampling	: Al Rau
Hole Diameter	: 6-inches	Reviewed By	: A. Elsadek
Drilling Method	: Hollow-Stem Auger	GW Encountered	: N/A
Sampling Method	: Split-Spoon Sampler	GW Completed	: N/A

Water Levels
▼ During Drilling
▽ After Completion

Auto-Hammer Used for SPT

Depth in Feet	Elev.	USCS	GRAPHIC	DESCRIPTION	Samples	Blow Count	N Value	Pocket Pen (tsf)	Water Level	Moisture Content %
0				TOPSOIL - 8 inches						
		CL/Fill		Fill - Silty CLAY, very stiff, black, with organics, trace gravel, moist	1	2 4 5	9			
		CL		Silty CLAY,very stiff, brown, with pebbles and gravel, moist	2	2 3 5	8	2.5		
5		CL		Silty CLAY, very stiff, brown, with gravel, moist	3	2 4 6	10	3.0		
		CL		Silty CLAY, hard, brown and grey, with pebbles and gravel, moist	4	5 14 25	39	>4.5		
10		CL		Silty CLAY, hard, grey, with pebbles and gravel, moist	5	7 10 14	24	4.5		
15		CL			6	5 7 8	15	>4.5		
20				E.O.B. @ 20'						
25										

DRIESENGA & ASSOCIATES, INC.
Engineering · Surveying · Testing

SB-24

Project: Bangor Township Schools
3175 Wilder Rd & 3281 & 3201 Kiesel Rd,
Bay City, Michigan

Project No. 2340694.3A

Client: Bangor Township Schools

Date Started	: September 12, 2023	Drilling Company	: Brax Drilling
Date Completed	: September 12, 2023	Field Sampling	: Al Rau
Hole Diameter	: 6-inches	Reviewed By	: A. Elsadek
Drilling Method	: Hollow-Stem Auger	GW Encountered	: N/A
Sampling Method	: Split-Spoon Sampler	GW Completed	: N/A

Water Levels
▼ During Drilling
▽ After Completion

Auto-Hammer Used for SPT

Depth in Feet	Elev.	USCS	GRAPHIC	DESCRIPTION	Samples	Blow Count	N Value	Pocket Pen (tsf)	Water Level	Moisture Content %
0				TOPSOIL - 12 inches						
		CL/Fill		Fill - Silty Sandy CLAY, very stiff, black, with organics, with gravel, moist	1	3 7 6	13			
		CL		Sandy CLAY, very stiff, brown and grey, with gravel, moist	2	4 5 6	11	4.0		
5		CL		Sandy CLAY, hard, brown, with gravel, moist	3	4 8 13	21	>4.5		
					4	4 7 9	16	>4.5		
10		CL		Silty CLAY, hard, grey, with pebbles and gravel, moist	5	6 9 12	21	>4.5		
15										
					6	5 8 10	18	>4.5		
20				E.O.B. @ 20'						
25										

DRIESENGA & ASSOCIATES, INC.
Engineering · Surveying · Testing

SB-25

Project: Bangor Township Schools
3175 Wilder Rd & 3281 & 3201 Kiesel Rd,
Bay City, Michigan

Project No. 2340694.3A

Client: Bangor Township Schools

Date Started	: September 12, 2023	Drilling Company	: Brax Drilling
Date Completed	: September 12, 2023	Field Sampling	: Al Rau
Hole Diameter	: 6-inches	Reviewed By	: A. Elsadek
Drilling Method	: Hollow-Stem Auger	GW Encountered	: N/A
Sampling Method	: Split-Spoon Sampler	GW Completed	: N/A

Water Levels
▼ During Drilling
▽ After Completion

Auto-Hammer Used for SPT

Depth in Feet	Elev.	USCS	GRAPHIC	DESCRIPTION	Samples	Blow Count	N Value	Pocket Pen (tsf)	Water Level	Moisture Content %
0				TOPSOIL - 10 inches						
		CL/Fill		Fill - Silty Sandy CLAY, very stiff, black, with organics and roots, moist	1	4 5 5	10			
5					2	2 2 2	4			
		CL		Silty CLAY, very stiff, brown and grey, with crushed stones and gravel, moist	3	2 3 5	8	3.5		
10		CL		Silty CLAY, very stiff, brown, with pebbles, moist	4	3 10 11	21	4.0		
15		CL		Silty CLAY, hard, grey, with gravel, moist	5	5 10 12	22	>4.5		
20					6	4 8 10	18	>4.5		
				E.O.B. @ 20'						
25										

DRIESENGA & ASSOCIATES, INC.
Engineering · Surveying · Testing

SB-26

Project: Bangor Township Schools
3175 Wilder Rd & 3281 & 3201 Kiesel Rd,
Bay City, Michigan

Project No. 2340694.3A

Client: Bangor Township Schools

Date Started	: September 12, 2023	Drilling Company	: Brax Drilling
Date Completed	: September 12, 2023	Field Sampling	: Al Rau
Hole Diameter	: 6-inches	Reviewed By	: A. Elsadek
Drilling Method	: Hollow-Stem Auger	GW Encountered	: N/A
Sampling Method	: Split-Spoon Sampler	GW Completed	: N/A

Water Levels
▼ During Drilling
▽ After Completion

Auto-Hammer Used for SPT

Depth in Feet	Elev.	USCS	GRAPHIC	DESCRIPTION	Samples	Blow Count	N Value	Pocket Pen (tsf)	Water Level	Moisture Content %
0				TOPSOIL - 12 inches						
		CL/Fill		Fill - Silty Sandy CLAY, very stiff, black, with organics, moist	1	2 3 4	7			
5		CL/Fill			2	3 3 4	7			
		CL		Silty CLAY, very stiff, brown and grey, with crushed stones and gravel, moist	3	3 4 6	10	3.5		
10		CL		Silty CLAY, very stiff, brown, with pebbles, moist	4	4 8 13	21	4.0		
		CL		Silty CLAY, hard, grey, with gravel, moist	5	6 9 11	20	>4.5		
15		CL			6	5 7 10	17	>4.5		
20				E.O.B. @ 20'						
25										

DRIESENGA & ASSOCIATES, INC.
Engineering · Surveying · Testing

SB-27

Project: Bangor Township Schools
3175 Wilder Rd & 3281 & 3201 Kiesel Rd,
Bay City, Michigan

Project No. 2340694.3A

Client: Bangor Township Schools

Date Started	: September 12, 2023	Drilling Company	: Brax Drilling
Date Completed	: September 12, 2023	Field Sampling	: Al Rau
Hole Diameter	: 6-inches	Reviewed By	: A. Elsadek
Drilling Method	: Hollow-Stem Auger	GW Encountered	: N/A
Sampling Method	: Split-Spoon Sampler	GW Completed	: N/A

Water Levels
▼ During Drilling
▽ After Completion

Auto-Hammer Used for SPT

Depth in Feet	Elev.	USCS	GRAPHIC	DESCRIPTION	Samples	Blow Count	N Value	Pocket Pen (tsf)	Water Level	Moisture Content %
0				TOPSOIL - 3 inches						
		CL/Fill		Fill - Silty Sandy CLAY, very stiff, black, with organics, moist	1	4 5 6	11			
		CL/Fill		Fill - Sandy CLAY, medium stiff, brown and grey, with gravel, moist	2	2 2 3	5			
5		CL		Silty CLAY, hard, brown, with pebbles, moist	3	4 8 13	21	>4.5		
					4	5 11 13	24	>4.5		
10										
		CL		Silty CLAY, very stiff to hard, grey, with gravel, moist	5	9 12 15	27	>4.5		
15										
					6	6 8 11	19	3.5		
20				E.O.B. @ 20'						
25										

DRIESENGA & ASSOCIATES, INC.
Engineering · Surveying · Testing

SB-28

Project: Bangor Township Schools
3175 Wilder Rd & 3281 & 3201 Kiesel Rd,
Bay City, Michigan

Project No. 2340694.3A

Client: Bangor Township Schools

Date Started	: September 5, 2023	Drilling Company	: Brax Drilling
Date Completed	: September 5, 2023	Field Sampling	: Al Rau
Hole Diameter	: 6-inches	Reviewed By	: A. Elsadek
Drilling Method	: Hollow-Stem Auger	GW Encountered	: N/A
Sampling Method	: Split-Spoon Sampler	GW Completed	: N/A

Water Levels
▼ During Drilling
▽ After Completion

Auto-Hammer Used for SPT

Depth in Feet	Elev.	USCS	GRAPHIC	DESCRIPTION	Samples	Blow Count	N Value	Pocket Pen (tsf)	Water Level	Moisture Content %
0				TOPSOIL- 3 inches						
		CL/Fill		Fill - Sandy CLAY, hard, black, with organics and roots, with sand seam, trace gravel, moist	1	3 7 7	14			
		CL/Fill		Sandy CLAY, stiff, brown and grey, with gravel, moist	2	3 2 3	5	2.0		
				E.O.B. @ 4'						
5										
10										

APPENDIX C

·FIELD AND LABORATORY PROCEDURES·

·LOCAL AGENCY PROPGRAMS HMA GUIDELINES·

FIELD PROCEDURES

The soil borings were performed using a truck-mounted drill rig equipped with an auto-hammer. Split-barrel samples were obtained in the soil below the bottom of the augers in general accordance with the Standard Method for Penetration and Split-Barrel Sampling of Soils. Samples were collected at 2.5 feet intervals to 10 feet below grade, and every 5 feet thereafter. After recovery, the samples were removed from the split-spoon sampler, visually reviewed and classified, placed in glass jars and transported to our laboratory for additional review.

Soil samples stored for extended periods are susceptible to moisture loss and are no longer indicative of the conditions originally encountered in the soil borings. Therefore, soil samples are usually stored in our laboratory for a period of 60 days, unless instructed otherwise.

Soil boring logs were prepared based on field notes and visual classification of the samples in the laboratory. Indicated on each soil boring log is the description of each stratum observed, the approximate depth and/or elevation of each stratum change observed, Standard Penetration Test resistance values, and the observed groundwater levels. The soil boring logs are presented in Appendix B.

LABORATORY PROCEDURES

The laboratory testing program included supplementary visual classification of the samples in general accordance with the Unified Soil Classification System. The following two pages describe the soils classification procedure.

CLASSIFICATION OF SOILS FOR ENGINEERING PURPOSES

Per ASTM D 2487—00
(Based on Unified Soil Classification System)

Soil Description: Secondary Soil Type BASIC SOIL TYPE, Consistency/Relative Density, Color, Supplemental Soil Type, Moisture, Miscellaneous comments.

Ex. Silty SAND, loose, brown, fine to medium, trace gravel, moist.

Secondary Soil Type – adjective for the BASIC SOIL TYPE describing material making up greater than 12% but less than 50% of the primary soil type by weight. For sands this also includes a description of grain size (fine, medium or coarse).

BASIC SOIL TYPE – primary constituent of sample; material making up greater than 50% of the sample by weight. Material is classified by grain size and material properties.

Consistency/Relative Density – a measurement of in-situ consistency or density of cohesive or cohesionless soils, respectively, based upon Standard Penetration Testing blow counts (N) per ASTM D 1586.

Color – visual inspection of soil appearance.

Supplementary Soil Type – a description of any other material that may be mixed with the BASIC SOIL TYPE. Qualifying terms are based on the percentage of the supplementary soil type in the sample by weight.

Moisture – description of the in-situ moisture content of the sample (dry, moist or wet).

Miscellaneous Comments – anything observed in the sample or in the field that does not fit into the above categories but should be noted (odor, etc.).

CALIBRATED AUTO HAMMER CONSISTENCY/RELATIVE DENSITY				
COHESIONLESS SOILS		COHESIVE SOILS		
SPT N-VALUES	IN-SITU RELATIVE DENSITY	SPT N-VALUES	SHEAR STRENGTH (PSF)	IN-SITU CONSISTENCY
0-3	VERY LOOSE	0-1	BELOW 250	VERY SOFT
4-8	LOOSE	2-3	250 - 500	SOFT
9-23	MEDIUM DENSE	4-6	500 - 1,000	MEDIUM STIFF
24-38	DENSE	7-12	1,000 - 2,000	STIFF
>38	VERY DENSE	13-25	2,000 - 4,000	VERY STIFF
		>26	OVER 4,000	HARD

STANDARD HAMMER CONSISTENCY/RELATIVE DENSITY				
COHESIONLESS SOILS		COHESIVE SOILS		
SPT N-VALUES	IN-SITU RELATIVE DENSITY	SPT N-VALUES	SHEAR STRENGTH (PSF)	IN-SITU CONSISTENCY
0-4	VERY LOOSE	0-2	BELOW 250	VERY SOFT
5-10	LOOSE	3-4	250 - 500	SOFT
11-30	MEDIUM DENSE	5-8	500 - 1,000	MEDIUM STIFF
31-50	DENSE	9-16	1,000 - 2,000	STIFF
>50	VERY DENSE	17-32	2,000 - 4,000	VERY STIFF
		>32	OVER 4,000	HARD

SUPPLEMENTAL TEXTURE QUALIFYING TERMS	
DESCRIPTOR	PERCENTAGE BY WEIGHT
TRACE	1-10%
LITTLE	10-20%
SOME	20-35%
AND	35-50%

SOIL CLASSIFICATION CHART (Per ASTM D2487)

Criteria for Assigning Symbols and Group Names Using Laboratory Tests[A]				Soil Classification	
				Group Symbol	Group Name
COHESIONLESS SOILS More than 50% retained on No. 200 sieve	Gravels More than 50% of coarse fraction retained on No. 4 Sieve	Clean Gravels Less than 5% fines[C]	Cu ≥ 4 and 1 ≤ Cc ≤ 3[E]	GW	Well-graded gravel[F]
			Cu < 4 and/or 1 > Cc > 3[E]	GP	Poorly graded gravel[F]
		Gravels with Fines More than 12% fines[C]	Fines classify as ML or MH	GM	Silty gravel[F,G,H]
			Fines classify as CL or CH	GC	Clayey gravel[F,G,H]
	Sands More than 50% of coarse fraction retained on No. 4 Sieve	Clean Sands Less than 5% fines[D]	Cu ≥ 6 and 1 ≤ Cc ≤ 3[E]	SW	Well-graded sand[F]
			Cu < 6 and/or 1 > Cc > 3[E]	SP	Poorly graded sand[F]
		Sands with Fines More than 12% fines[D]	Fines classify as ML or MH	SM	Silty sand[G,H,I]
			Fines classify as CL or CH	SC	Clayey sand[G,H,I]
COHESIVE SOILS 50% or more passes the No. 200 Sieve	Silts and Clays Liquid limit less than 50	Inorganic	PI ≥ 7 and plots on or above 'A' line[J]	CL	Lean clay[K,L,M]
			PI < 4 or plots below 'A' line[J]	ML	Silt[K,L,M]
		Organic	Liquid limit - oven dried < 0.75	OL	Organic clay[K,L,M,N]
			Liquid limit - not dried < 0.75		Organic silt[K,L,M,O]
	Silts and Clays Liquid limit 50 or more	Inorganic	PI plots on or above 'A' line	CH	Fat clay[K,L,M]
			PI plots below 'A' line	MH	Elastic Silt[K,L,M]
		Organic	Liquid limit - oven dried < 0.75	OH	Organic Clay[K,L,M,P]
			Liquid limit - not dried < 0.75		Organic silt[K,L,M,O]
HIGHLY ORGANIC SOILS	Primarily organic matter, dark in color, and organic odor			PT	Peat

A Based on the material passing the 3-in. sieve

B If field sample contained cobbles or builders, or both, add "with cobbles or boulders or both" to group name

C Gravels with 5 to 12% fines require dual symbols:
GW-GM well-graded gravel with silt
GW-GC well-graded gravel with clay
GP-GM poorly graded gravel with silt
GP-GC poorly graded gravel with clay

D Sands with 5 to 12% fines require dual symbols:
SW-SM well-graded sand with silt
SW-SC well-graded sand with clay
SP-SM poorly graded sand with silt
SP-SC poorly graded sand with clay

E $Cu = D_{60}/D_{10}$ $Cc = (D_{30})^2/(D_{10}*D_{60})$

F If soil contains ≥ 15% sand, add "with sand" to group name.

G If fines classify as CL-ML, use dual symbol GC-GM or SC-SM

H If fines are organic, add "with organic fines" to group name.

I If soil contains ≥ 15% gravel, add "with gravel" to group name.

J If Atterberg limits plot in hatched area, soil is a CL-ML, silty clay.

K If soil contains 15 to 29% plus No. 200, add "with sand" or "with gravel" whichever is predominant

L If soil contains ≥ 30% plus No. 200, predominantly sand, add "sandy" to group name.

M If soil contains ≥ 30% plus No. 200, predominantly gravel, add "gravelly" to group name

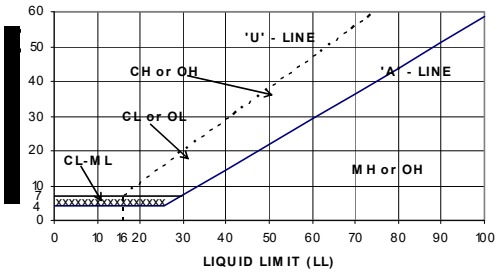
N PI ≥ 4 and plots on or above 'A' line.

O PI < 4 or plots below 'A' line.

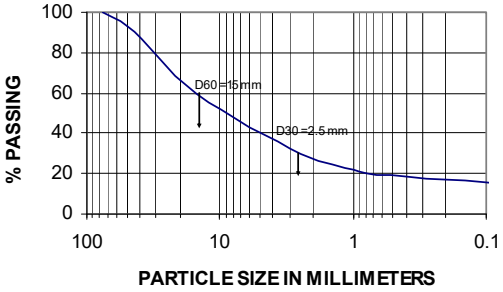
P PI plots on or above 'A' line.

Q PI plots below 'A' line.

For classification of fine-grained soils and fine-grained fraction of coarse-grained soils



SIEVE ANALYSIS



Local Agency Programs
Hot Mix Asphalt (HMA) Selection Guidelines
Revised: 11/01/2017
FHWA Approved: 12/26/2017

The following guidelines have been developed at the request of Local Agency Engineers for use on Local Agency projects. These guidelines have been reviewed and approved by the County Road Association of Michigan Engineering Committee. Previous experience and performance shall permit variations from these guidelines as per Sect D: Alternative Mixes**.**

A. HMA Mixture Type and Binder Selection

Selection is based on present day two-way commercial ADT. The commercial ADT ranges for each of the mixture types have taken into account an assumed future traffic growth rate.

Com. ADT.	Com. ADT 0-300	Com. ADT 301-700	Com. ADT 701-1000	Com. ADT 1001-3400	Com. ADT 3401- 9999
Mixture Type					
Top	LVSP or 13A, 36A	4C 5E1/4E1	5E3, or 4E3	5E10, or 4E10	5E30, or 5E10
Leveling	LVSP or 13A	3C 4E1	4E3	4E10	4E30
Base	13A / 3C	2C / 3C	3E3	3E10	3E30
Binder Grades by Region					
Superior	PG 58-34	PG 58-34	PG 58-34	PG 58-34	
Metro	PG 58-22	PG 64-22	PG 64-22	PG 64-22	PG 70-22P
All Other	PG 58-28	PG64-28	PG-64-28	PG64-28	PG70-28P

Note 1: If the designer wishes to reduce the target air voids on projects to 3.5%, a note needs to be added to the plans on the HMA Application Table stating that the air voids have been changed to 3.5% for that particular project for top and leveling courses. For mixtures meeting the definition of base course, field regress air void content to 3.0 percent with liquid asphalt cement unless specified otherwise on HMA application estimate.

Note 2: The mixture type in each traffic category listed in the above table is specifically designed to perform under their respective Commercial ADT. Selecting a mixture type that is specifically designed for a higher Comm. ADT than the project being designed may adversely affect performance.

Note 3: One course overlays on composite pavements where the prevention of cold temperature related thermal cracking is not as much of a concern, the cold temperature number of the PG binder may be decreased by one grade to help reduce costs.

Example: For a one course overlay in the Superior Region on a composite project, the recommended PG binder would be a PG58-28 instead of a PG58-34.

Note 4: To address traffic areas that are more susceptible to rutting early in pavements life such as signalized intersections and other areas of stop/start traffic use the pay item entitled **High Stress Hot Mix Asphalt Mixture**. The difference between the High Stress HMA Mixture and the typical HMA pay item is the Performance Graded binder. For High Stress Mixtures, increase the high temperature binder by one grade and add the polymer. The increase in the high temperature number results in an asphalt binder with improved high temperature stiffness or rutting resistance for both the leveling and top course.

Example: For a high stress application for a mixture type 5E3 placed in an intersection the recommended binder grade would be a PG70-28P instead of a PG64-28. Following are the recommend guides for the proper application of the Special Provision for High Stress Hot Mix Asphalt Mixture:

a. Use this pay item 1000 feet on either side of the center of signalized intersections and other areas where stop/start traffic occurs on the mainline (for quantity calculations use 1100 feet).

b. There are cases where the signalized intersections are spaced 1 mile or less over the entire length of the project. When this occurs, specify the High Stress HMA Mixture pay item for the entire length.

c. All HMA approaches that are adjacent to the High Stress HMA Mixture areas should be specified using this pay item.

d. Use of the Pay Item High Stress HMA (mix), should not be used unless it is to be distinguished from the same mix with a different PG grade.

B. Application Rates

HMA application rates shown in the table below are the required minimum and maximum rates for each of the specific mixtures. Pavement designs requiring a HMA greater than the recommended maximum will require multiple lifts of the leveling and/or base mixes.

Mixture Type	Marshall Mixture					**Superpave Mixture**				
	36A	13A	2C	3C	4C	LVSP	3E_	4E1	4E3+	5E_
Min. #/syd	110	165	350	220	165	165 Top or Leveling	330	165	220	165
Max. #/syd	165	275	500	330	275	220 Top 250 Leveling	410	330	275	220

Note 1: Application rate of 110 #/syd. per 1-inch thickness.

Note 2: When shoulders of 8 ft. or greater are being paved as a separate operation on a project, the following note should be added to the plans near the HMA Application Table; "For shoulders only, the mix design and/or JMF target value for Air Voids are to be adjusted to 2.5 percent." If it is not known whether the shoulders will be placed as a separate paving operation, the note should be added.

C: Aggregate Wear Index (All Projects)

Aggregate Wear Index (AWI) is required for all aggregates used in HMA top course mixtures. The following table identifies the required minimum AWI, based on the present average daily traffic (vehicular and commercial) per lane (ADT/Lane):

ADT/Lane	**Minimum AWI**
<100	None
100 - 2000	220
>2000	260

D: Alternative Mixes

These guidelines provide for the selection of Hot Mixed Asphalt (HMA) and application rates utilizing the Superpave mix design system along with the Marshall Mix design system. The substitution of another HMA mixture type other than the recommended mixture is acceptable if it has demonstrated to perform under similar traffic conditions. If a local agency desires to use an HMA mixture or grade of binder other than what is contained within this guide, they must submit the change in writing. The letter or email must include the alternate mix design, the justification/reason for the change, and a statement that they accept responsibility for the outcome of the performance of the mix design that is used in lieu of the recommended mixture.

E. Non-Motorized Path Mixes

When designing a Non-Motorized Path, recommended HMA Mixes that have historically worked well include:

Superpave mixes:

HMA, LVSP

HMA, 5E_

Shared Use Path, HMA Snowmobile Wearing Cse – Special (See: 12DS806(F355))

Marshall mixes:

HMA, 13A

HMA, 36A

No AWI is required on the top course, however, if the designer wishes, he or she can use the Aggregate Wear Index (AWI) of 220 minimum.

Use PG 58-28 for all mixes, except for HMA, 5E_, which should be PG 64/28.

Application rates should match the chart on the previous page (page 3 of 4).

F. Non-Motorized Path Alternative Mixes

If a local agency desires to use an HMA mixture or grade of binder other than what is contained within this guide, or if they propose another pavement treatment or type, they must submit the change request to the LAP Staff Engineer in writing. The letter or email must include the alternate mix design, or pavement treatment, the justification and/or reason for the change, and a statement that they accept responsibility for the outcome of the performance of the mix design that is used in lieu of the recommended mixture.