Beal City Public Schools

PROJECT MANUAL

Beal City Public Schools

Bid Pack No. 2

Athletic Complex Renovations,
Classroom Addition & Site Work

April 2, 2025

ARCHITECTS/ENGINEERS
Integrated Designs, Inc.
1021 West Baraga Avenue
Marquette, Michigan 49855
Telephone: (906) 228-4480
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

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Beal City Public Schools will receive sealed bid proposals for construction trade work from qualified contractors for the **Beal City Public Schools, Bid Pack No. 2 - Athletic Complex Renovations, Classroom Addition & Site Work** project**.** A pre-bid meeting and project walk-through will be conducted by the Construction Manager, Wolgast Corporation, and the Architect, **Integrated Designs, Inc.**, on **Wednesday, April 9, 2025,** at **1:00 PM** (local time) at **Wolgast Corporation On-Site Job Office Trailer** located at 3180 West Beal City Road, Mount Pleasant, Michigan 48858**.**

Proposals may be mailed or delivered in person to **Jason Lundin, Superintendent**, c/o **Beal City Public Schools, 3180 West Beal City Road, Mount Pleasant, Michigan 48858** or by **ELECTRONIC SEALED BIDDING via Building Connected**. Proposals must be received prior to **3:00 PM** (local time) on **Tuesday, April 22, 2025**, at the **Beal City Public Schools Administration Building or via Building Connected** (https://app.buildingconnected.com/login?retUrl=%2F). Proposals will be publicly opened and read aloud at **3:15 PM PM** in the **Beal City Public Schools Media Center** located at **3180 West Beal City Road, Mount Pleasant, Michigan 48858 and virtually utilizing 8x8 Online Meeting:** https://8x8.vc/wolgast/judy.rauch**.** All bids will be evaluated after the bid opening. All bids received after **3:00 PM** of the bid date will be returned to the Bidder unopened.

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 **May 5, 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 at No Cost. Plans may be obtained from Wolgast Corporation, attention **Judy Rauch** at **jrauch@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 **Craig Myers** at **cra.mye@wolgast.com** and **Judy Rauch** at **jrauch@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: **Beal City Public 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: **Beal City Public Schools: Bid Pack No. 2 - Athletic Complex Renovations, Classroom Addition & Site Work.**

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 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:

Craig Myers, Project Manager, at **cra.mye@wolgast.com and Judy Rauch,** Project Administrator**,** **jrauch@wolgast.com**.

D. For the purpose of clarity, the scope of work for each Bid Division may be divided into four categories: "GENERAL INCLUSIONS," "DIVISION INCLUSIONS", "PROJECT INCLUSIONS," AND "EXCLUDED."

1. Information provided under the heading "GENERAL INCLUSIONS" is the obvious and/or "conventional" work scope of each Bid Division.

2. Information provided under "DIVISION INCLUSIONS" or "PROJECT INCLUSIONS" points out items which may be considered less obvious or "unconventional," but which are included in the work scope of a particular Bid Division. (Information under these headings are not always necessary to delineate a Bid Division.)

3. Information provided under "EXCLUDED" is for the purpose of indicating beginning and termination points, and/or to provide an understanding of fringe involvement included in Bid Divisions. (Information under this heading is not always necessary to delineate a Bid Division.)

E. Bidders shall construe nothing contained in the Bidding Documents, including the Bid Division Descriptions, as an assignment of work to any construction industry trade. Each Bidder is responsible for their own work assignments when making their proposal.

1.03 INTERFACING BID DIVISIONS

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

1.04 PRE-BID CONFERENCE

A. Wolgast On-Site Job Office Trailer
3180 West Beal City Road
Mt Pleasant, Michigan 48858
Wednesday, April 9, 2025 at 1:00 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 the 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:

Beal City Public Schools, Jason Lundin, Superintendent,3180 West Beal City Road, Mt Pleasant, MI 48858 or Electronic Sealed Bidding via Building Connected

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

B. Proposals shall be submitted by **3:00 PM** on **Tuesday, April 22, 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 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.

B. Each Bidder is required to include a separate Bid for each Bid Division in order to be considered for 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 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:	**Beal City Public Schools** **Attn: Jason Lundin** **3180 West Beal City Road** **Mount Pleasant, MI 48858**
	SEALED BID FOR:
	Beal City Public Schools **Bid Pack No. 2** **Athletic Complex Renovations, Classroom Addition & Site Work**
	Bid Division No:_____

END OF SECTION 00300

Project: **Beal City Public Schools**
Bid Pack No. 2
Athletic Complex Renovations, Classroom Addition & Site Work

Submitted By: _____
(Bidder's Company Name)

Address: _____

City / State / Zip: _____

Phone: _____

Fax: _____

Contact Name: _____

Email: _____

Bid Proposal Deadline: **Prior to April 22, 2025 at 3:00 PM (local time) to:**

Beal City Public Schools
Jason Lundin, Superintendent
3180 West Beal City Road
Mount Pleasant, MI 48858

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 Beal City Public Schools – Bid Pack No. 2 (not including Labor Bond, Material Bond, and/or Performance Bond Costs):

_____ Dollars and 00/100ths

$_____

BOND COST for Beal City Public Schools – Bid Pack No. 2 (Cost to provide Labor Bond, Material Bond, and/or Performance Bonds on Base Bid):

_____ Dollars and 00/100ths

$_____

Base Bid:
Price Breakdown for BP No. 2

	BASE BID	BOND	TOTAL
Football Field / Parking Lot			
Classroom Addition			
Team Room			
TOTAL			

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 No. 1: Additional Parking Lot per Drawings C2.3A and C3.3A.

Alternate No. 1 Price: □ Add □ Deduct $ _____

Bond: □ Add □ Deduct $ _____

Alternate No. 1 Total $ _____

UNIT PRICE
Unit Price No. 1: MDOT Subgrade Undercutting, Type II – Measured by the CYD.

Per CYD: _____

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 **June 1, 2026.**

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

END OF SECTION 00307

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

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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.

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END OF SECTION 00307

Bid Division: 030100 – Concrete

Bid to Include:

Total Responsibility for Specification Sections:

Section 003121 – Site Survey Information
Section 003132 – Geotechnical Data
Section 024119 – Selective Demolition
Section 033000 – Cast In Place Concrete
Section 116833.43 – Track and Field Equipment
Section 321313 – Concrete Paving
Section 321374 – 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 and against foundation walls)
Section 312000 – Earth Moving (As it relates to fine grading, final compaction & footing excavation and backfill)

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

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

General Inclusions:

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

Bid Division: 030100 – Concrete

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

Division Inclusions:

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

Project Inclusions:

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

Bid Division: 030100 – Concrete

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

Excludes:

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

Consideration for award:

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

END OF BID DIVISION 030100

Package #	Package	Number	Spec #	Title	Type
030100 PA-001	Concrete - Start Ups	030100-01	030100-01	Signed Post Bid Interview Form	Start Ups
030100 PA-001	Concrete - Start Ups	030100-02	030100-02	Schedule of Values	Start Ups
030100 PA-001	Concrete - Start Ups	030100-03	030100-03	Signed Contracts Returned	Start Ups
030100 PA-001	Concrete - Start Ups	030100-04	030100-04	Payment/Performance Bonds	Start Ups
030100 PA-001	Concrete - Start Ups	030100-05	030100-05	Certificate of Insurance	Start Ups
030100 PA-001	Concrete - Start Ups	030100-06	030100-06	Employee List	Start Ups
030100 PA-001	Concrete - Start Ups	030100-07	030100-07	Safety Policy	Start Ups
030100 PA-001	Concrete - Start Ups	030100-08	030100-08	SDS Sheets	Start Ups
030100 PA-001	Concrete - Start Ups	030100-09	030100-09	Certificate of Subcontractor & Supplier	Start Ups
030100 PA-001	Concrete - Start Ups	030100-10	030100-10	AHERA Notification and Contractor Compliance Affidavit	Start Ups
030100 PACO-001	Concrete - Close Outs	030100-11	030100-11	Contractor (2) Year Guarantee	Close Outs
030100 PACO-001	Concrete - Close Outs	030100-12	030100-12	Consent of Surety	Close Outs
030100 PACO-001	Concrete - Close Outs	030100-13	030100-13	Certificate of Substantial Completion	Close Outs
030100 PACO-001	Concrete - Close Outs	030100-14	030100-14	Completed Punch List	Close Outs
030100 PACO-001	Concrete - Close Outs	030100-15	030100-15	As Built Drawings	Close Outs
030100 PACO-001	Concrete - Close Outs	030100-16	030100-16	All Processed Change Orders Returned	Close Outs
030100 PACO-001	Concrete - Close Outs	030100-17	030100-17	Current Certificate of Insurance	Close Outs
030100 PACO-001	Concrete - Close Outs	030100-18	030100-18	Signed Hazardous Materials Compliance Affidavit	Close Outs
030100 PACO-001	Concrete - Close Outs	030100-19	030100-19	Signed Asbestos Free Affidavit	Close Outs
030100 PACO-001	Concrete - Close Outs	030100-20	030100-20	All Other Warranties Required	Close Outs
030100 PACO-001	Concrete - Close Outs	030100-21	030100-21	Operations & Maintenance Manuals	Close Outs
030100 PACO-001	Concrete - Close Outs	030100-22	030100-22	Replacement Parts turned over to Owner	Close Outs
030100 PACO-001	Concrete - Close Outs	030100-23	030100-23	Inspections & Certificates	Close Outs
030100-001	Concrete - Submittals	030100-24	033000	Shop drawings on reinforcing steel regarding cast-in-place concrete.	Submittals
030100-001	Concrete - Submittals	030100-25	116833.43	Product data on track and field equipment.	Submittals
030100-001	Concrete - Submittals	030100-26	116833.43	Shop drawings on track and field equipment.	Submittals
030100-001	Concrete - Submittals	030100-27	321313	Concrete Mix Designs.	Submittals
030100-001	Concrete - Submittals	030100-28	321313	Certification of quality on the following: cementitious materials, admixtures and aggregates.	Submittals
030100-001	Concrete - Submittals	030100-29	321374	Product data and samples on concrete paving joint sealants.	Submittals

Bid Division: 040000 – Masonry

Bid to Include:

Total Responsibility for Specification Sections:

Section 024119 – Selective Demolition
Section 042200 – Concrete Unit Masonry
Section 072119 – Foamed-In-Place Insulation (As it relates to masonry work CMU/Brick)

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

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. Contractor is responsible for own dumpster(s) and all removal and disposal charges thereof. (Use of the Owner's dumpsters is strictly prohibited.)
7. All Contractors are required to inspect the existing project components and are to include all work necessary to complete the work to deliver a fully operational system in compliance with all governing codes.
8. This Contractor shall be responsible for performing all work in full compliance with all health and safety standards including Asbestos Awareness and Notification, Lead Paint Abatement, and all MIOSHA Standards. This Contractor shall also be responsible for satisfying all safety violations and/or fines resulting from the actions or lack of action by this Contractor at the sole expense of this Contractor.
9. Any contractor who compounds a mistake by installing their product on another Contractor's obvious faulty work will assume responsibility for repair of said work.
10. This contractor shall repair and restore any damaged area to an original or better condition with no detectable evidence that the area has been repaired. Repairs must be done by personnel qualified in the execution of the work skilled and licensed in that trade. Whenever possible, repairs to work shall be done by the original installer of the work.
11. Submittal of all insurance, unit pricing, schedule of values, required product data and shop drawings within (2) two weeks of Owner's Notice to commence work.

Bid Division: 040000 – Masonry

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

Division Inclusions:

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

Bid Division: 040000 – Masonry

Project Inclusions:

1. Review the milestone schedules. This bid division's work will be required to be completed at multiple locations and concurrently for some of the work. Prepare your bid proposal accordingly to allow for sufficient manpower and resources.
2. Furnish and install all required masonry materials.
3. Provide all interior and exterior masonry demolition as documented.
4. This bid division must provide their own dumpster for their work or remove the masonry debris by truck throughout the course of the masonry work.
5. Provide all required masonry patching, including all required cutting and toothing to existing at finished locations as documented. The masonry contractor is responsible to perform all cutting of mortar joints and removal of brick for installation of new and/or re-used existing brick. Bid divisions 021000, 222300 and 260000 will be responsible for cutting the initial opening, removal of materials from the initial opening and stockpiling salvaged brick where required. All toothing demo and new work is by the masonry contractor, including removal of all excess mortar from the salvaged brick prior to installation.
6. Provide all required masonry toothing and patching of CMU and brick.
7. Rub walls smooth.
8. Furnish and install bullnose CMU at locations as documented.
9. Furnish and install all required cavity wall insulation and rigid insulation against masonry construction, as documented.
10. Provide masonry locker bases per drawings.
11. Provide all required grouting of all hollow metal frames in masonry work.
12. Bid division 060000 will complete the initial installation and bracing of all hollow metal frames. The masonry contractor is responsible to maintain level and square door frames during the masonry installation. Any additional cost incurred by another bid division contractor, to correct a frame that is not plumb due to lack of proper installation, will be the responsibility of this contractor.
13. Provide all caulking of all exterior control joints. The first joint caulked must be approved by the Construction Manager to set the level of acceptance for all caulking. All unsatisfactory caulking will be required to be removed and re-installed. Confirm color of exterior caulking with the Architect prior to installation.
14. Furnish and install all required masonry for interior and exterior columns.
15. Construct a sample brick masonry wall for owner approval prior to any brick installation. Refer to specifications.
16. Must provide all submittals within 15 working days of contract award or sooner, unless specifically clarified with the construction manager prior to contract award.
17. Mandatory attendance at all required pre-installation meetings.
18. Completion of all punch list work within 5 working days or less upon receipt of punch list items, unless specific circumstances occur that are out of control of this bid division contractor dictate otherwise.

Excludes:

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

Consideration for award:

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

END OF BID DIVISION 040000

Package #	Package	Number	Spec #	Title	Type
040000 PA-001	Masonry - Start Ups	040000-01	040000-01	Signed Post Bid Interview Form	Start Ups
040000 PA-001	Masonry - Start Ups	040000-02	040000-02	Schedule of Values	Start Ups
040000 PA-001	Masonry - Start Ups	040000-03	040000-03	Signed Contracts Returned	Start Ups
040000 PA-001	Masonry - Start Ups	040000-04	040000-04	Payment/Performance Bonds	Start Ups
040000 PA-001	Masonry - Start Ups	040000-05	040000-05	Certificate of Insurance	Start Ups
040000 PA-001	Masonry - Start Ups	040000-06	040000-06	Employee List	Start Ups
040000 PA-001	Masonry - Start Ups	040000-07	040000-07	Safety Policy	Start Ups
040000 PA-001	Masonry - Start Ups	040000-08	040000-08	SDS Sheets	Start Ups
040000 PA-001	Masonry - Start Ups	040000-09	040000-09	Certificate of Subcontractor & Supplier	Start Ups
040000 PA-001	Masonry - Start Ups	040000-10	040000-10	AHERA Notification and Contractor Compliance Affidavit	Start Ups
040000 PACO-001	Masonry - Close Outs	040000-11	040000-11	Contractor (2) Year Guarantee	Close Outs
040000 PACO-001	Masonry - Close Outs	040000-12	040000-12	Consent of Surety	Close Outs
040000 PACO-001	Masonry - Close Outs	040000-13	040000-13	Certificate of Substantial Completion	Close Outs
040000 PACO-001	Masonry - Close Outs	040000-14	040000-14	Completed Punch List	Close Outs
040000 PACO-001	Masonry - Close Outs	040000-15	040000-15	As Built Drawings	Close Outs
040000 PACO-001	Masonry - Close Outs	040000-16	040000-16	All Processed Change Orders Returned	Close Outs
040000 PACO-001	Masonry - Close Outs	040000-17	040000-17	Current Certificate of Insurance	Close Outs
040000 PACO-001	Masonry - Close Outs	040000-18	040000-18	Signed Hazardous Materials Compliance Affidavit	Close Outs
040000 PACO-001	Masonry - Close Outs	040000-19	040000-19	Signed Asbestos Free Affidavit	Close Outs
040000 PACO-001	Masonry - Close Outs	040000-20	040000-20	All Other Warranties Required	Close Outs
040000 PACO-001	Masonry - Close Outs	040000-21	040000-21	Operations & Maintenance Manuals	Close Outs
040000 PACO-001	Masonry - Close Outs	040000-22	040000-22	Replacement Parts turned over to Owner	Close Outs
040000 PACO-001	Masonry - Close Outs	040000-23	040000-23	Inspections & Certificates	Close Outs
040000-001	Masonry - Submittals	040000-24	042200	Shop drawings on concrete unit masonry.	Submittals
040000-001	Masonry - Submittals	040000-25	042200	Samples on concrete unit masonry.	Submittals
040000-001	Masonry - Submittals	040000-26	072119	Product data and product test reports on concrete unit masonry.	Submittals
040000-001	Masonry - Submittals	040000-27	078413	Product data on penetration firestopping.	Submittals

Bid Division: 050000 – Metals

Bid to Include:

Total Responsibility for Specification Sections:

Section 051200 – Structural Steel Framing
Section 052100 – Steel Joist Framing (Robotics)
Section 053100 – Steel Decking (Robotics)
Section 054000 – Cold-Formed Metal Framing (Team Room)
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 042200 – Concrete Unit Masonry (Provide steel to be embedded in masonry)

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

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

General Inclusions:

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

Bid Division: 050000 – Metals

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

Division Inclusions:

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

Project Inclusions:

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

Bid Division: 050000 – Metals

16. Must provide all submittals within 15 working days of contract award or sooner, unless specifically clarified with the construction manager prior to contract award.
17. Mandatory attendance at all required pre-installation meetings.
18. Completion of all punch list work within 5 working days or less upon receipt of punch list items, unless specific circumstances occur that are out of control of this bid division contractor dictate otherwise.

Excludes:

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

Consideration for award:

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

END OF BID DIVISION 050000

Package #	Package	Number	Spec #	Title	Type
050000 PA-001	Metals - Start Ups	050000-01	050000-01	Signed Post Bid Interview Form	Start Ups
050000 PA-001	Metals - Start Ups	050000-02	050000-02	Schedule of Values	Start Ups
050000 PA-001	Metals - Start Ups	050000-03	050000-03	Signed Contracts Returned	Start Ups
050000 PA-001	Metals - Start Ups	050000-04	050000-04	Payment/Performance Bonds	Start Ups
050000 PA-001	Metals - Start Ups	050000-05	050000-05	Certificate of Insurance	Start Ups
050000 PA-001	Metals - Start Ups	050000-06	050000-06	Employee List	Start Ups
050000 PA-001	Metals - Start Ups	050000-07	050000-07	Safety Policy	Start Ups
050000 PA-001	Metals - Start Ups	050000-08	050000-08	SDS Sheets	Start Ups
050000 PA-001	Metals - Start Ups	050000-09	050000-09	Certificate of Subcontractor & Supplier	Start Ups
050000 PA-001	Metals - Start Ups	050000-10	050000-10	AHERA Notification and Contractor Compliance Affidavit	Start Ups
050000 PACO-001	Metals - Close Outs	050000-11	050000-11	Contractor (2) Year Guarantee	Close Outs
050000 PACO-001	Metals - Close Outs	050000-12	050000-12	Consent of Surety	Close Outs
050000 PACO-001	Metals - Close Outs	050000-13	050000-13	Certificate of Substantial Completion	Close Outs
050000 PACO-001	Metals - Close Outs	050000-14	050000-14	Completed Punch List	Close Outs
050000 PACO-001	Metals - Close Outs	050000-15	050000-15	As Built Drawings	Close Outs
050000 PACO-001	Metals - Close Outs	050000-16	050000-16	All Processed Change Orders Returned	Close Outs
050000 PACO-001	Metals - Close Outs	050000-17	050000-17	Current Certificate of Insurance	Close Outs
050000 PACO-001	Metals - Close Outs	050000-18	050000-18	Signed Hazardous Materials Compliance Affidavit	Close Outs
050000 PACO-001	Metals - Close Outs	050000-19	050000-19	Signed Asbestos Free Affidavit	Close Outs
050000 PACO-001	Metals - Close Outs	050000-20	050000-20	All Other Warranties Required	Close Outs
050000 PACO-001	Metals - Close Outs	050000-21	050000-21	Operations & Maintenance Manuals	Close Outs
050000 PACO-001	Metals - Close Outs	050000-22	050000-22	Replacement Parts turned over to Owner	Close Outs
050000 PACO-001	Metals - Close Outs	050000-23	050000-23	Inspections & Certificates	Close Outs
050000-001	Metals - Submittals	050000-24	051200	Shop drawings on structural steel framing.	Submittals
050000-001	Metals - Submittals	050000-25	051200	Welders certificates on structural steel framing.	Submittals
050000-001	Metals - Submittals	050000-26	052100	Shop drawings on steel joist framing.	Submittals
050000-001	Metals - Submittals	050000-27	053100	Shop drawings on steel decking.	Submittals
050000-001	Metals - Submittals	050000-28	054000	Shop drawings on cold-formed metal framing.	Submittals
050000-001	Metals - Submittals	050000-29	055000	Shop drawings on metal fabrications.	Submittals

Bid Division: 060000 – General Trades

Bid to Include:

Total Responsibility for Specification Sections:

Section 024119 – Selective Demolition
Section 061000 – Rough Carpentry
Section 061600 – Sheathing
Section 061753 – Shop-Fabricated Wood Trusses (Team Room)
Section 062023 – Interior Finish Carpentry
Section 064116 – Plastic-Laminate-Clad Architectural Cabinets (Robotics)
Section 081113 – Hollow Metal Doors and Frames
Section 083113 – Access Doors and Frames
Section 087100 – Door Hardware
Section 101100 – Visual Display Units
Section 102113.19 – Plastic Toilet Compartments
Section 102800 – Toilet Accessories
Section 104413 – Fire Protection Cabinets
Section 104416 – Fire Extinguishers
Section 105113 – Metal Lockers (Team Room)
Section 123623.13 – Plastic-Laminate-Clad Countertops

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

Section 078413 – Penetration Firestopping (As it relates to this bid division)
Section 079200 – Joint Sealants (As it relates to work in this Bid Division)

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

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

General Inclusions:

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

Bid Division: 060000 – General Trades

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

Division Inclusions:

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

Bid Division: 060000 – General Trades

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

Project Inclusions:

1. Review the milestone schedules. This bid division's work will be required to be completed at multiple locations and concurrently for some of the work. Prepare your bid proposal accordingly to allow for sufficient manpower and resources.
2. Furnish and install overhead door.
3. Furnish and install all bathroom accessories. Owner to provide toilet tissue, paper towel, and soap dispensers for installation by this contractor. This includes owner provided dispensers in Robotics.
4. Furnish and install toilet partitions.
5. Furnish and install all casework, per drawings.
6. Furnish and install Wood Trusses per drawings.
7. Furnish and install all blocking and sheathing as required, including fire-rated and treated as documented. This includes all roof Blocking / Nailers, as indicated in the wall details and specifications.
8. Furnish and install all hollow metal frames, doors, and finish hardware. This contractor will complete the initial installation and bracing of all hollow metal frames. The masonry contractor is responsible to maintain level and square door frames during the masonry installation. Any additional cost incurred by another bid division contractor, to correct a frame that is not plumb due to lack of proper installation during masonry installation, will be the responsibility of the masonry contractor.
9. When installing door frames, this contractor must consider floor thickness and install accordingly to ensure doors to not rub on floors.
10. Install owner provided room number signs.
11. Provide and install all marker boards and tack boards as indicated in the drawings and specifications.
12. Deliver all hollow metal frames to the siter prior to the installation of any masonry walls that have hollow metal frames installed in them. Provide manpower as needed to complete the initial installation of hollow metal frames.
13. Demolition as required.
14. All masonry demolition is by Bid Division 040000 Masonry.
15. Must provide all submittals within 15 working days of contract award or sooner, unless specifically clarified with the construction manager prior to contract award.
16. Mandatory attendance at all required pre-installation meetings.
17. Completion of all punch list work within 5 working days or less upon receipt of punch list items, unless specific circumstances occur that are out of control of this bid division contractor dictate otherwise.

Bid Division: 060000 – General Trades

18. **This contractor to include an allowance of 120 worker hours for cleaning, above required daily cleaning, of the work areas during the project and prior to turnover to the owner, in the base bid. This allowance is to be used at the discretion of and scheduled by the construction manager. Time and material invoices for this work shall be managed and approved daily by the field manager. This allowance must be included by line item in the schedule of values. Any remaining balance at the completion will be credited to the owner.**

Excludes:

1. All demolition of conduits, ducts, pipes, fixtures, etc. (demolition required for all mechanical, plumbing, and electrical work) is to be performed by the specific mechanical, pluming and electrical contractors.
2. Hardware for aluminum entries.
3. Aluminum frames
4. FRP Doors.
5. Dens-Glass is by bid division 091000.
6. Masonry demolition.

Consideration for award:

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

END OF BID DIVISION 060000

Package #	Package	Number	Spec #	Title	Type
060000 PA-001	General Trades - Start Ups	060000-01	060000-01	Signed Post Bid Interview Form	Start Ups
060000 PA-001	General Trades - Start Ups	060000-02	060000-02	Schedule of Values	Start Ups
060000 PA-001	General Trades - Start Ups	060000-03	060000-03	Signed Contracts Returned	Start Ups
060000 PA-001	General Trades - Start Ups	060000-04	060000-04	Payment/Performance Bonds	Start Ups
060000 PA-001	General Trades - Start Ups	060000-05	060000-05	Certificate of Insurance	Start Ups
060000 PA-001	General Trades - Start Ups	060000-06	060000-06	Employee List	Start Ups
060000 PA-001	General Trades - Start Ups	060000-07	060000-07	Safety Policy	Start Ups
060000 PA-001	General Trades - Start Ups	060000-08	060000-08	SDS Sheets	Start Ups
060000 PA-001	General Trades - Start Ups	060000-09	060000-09	Certificate of Subcontractor & Supplier	Start Ups
060000 PA-001	General Trades - Start Ups	060000-10	060000-10	AHERA Notification and Contractor Compliance Affidavit	Start Ups
060000 PACO-001	General Trades - Close Outs	060000-11	060000-11	Contractor (2) Year Guarantee	Close Outs
060000 PACO-001	General Trades - Close Outs	060000-12	060000-12	Consent of Surety	Close Outs
060000 PACO-001	General Trades - Close Outs	060000-13	060000-13	Certificate of Substantial Completion	Close Outs
060000 PACO-001	General Trades - Close Outs	060000-14	060000-14	Completed Punch List	Close Outs
060000 PACO-001	General Trades - Close Outs	060000-15	060000-15	As Built Drawings	Close Outs
060000 PACO-001	General Trades - Close Outs	060000-16	060000-16	All Processed Change Orders Returned	Close Outs
060000 PACO-001	General Trades - Close Outs	060000-17	060000-17	Current Certificate of Insurance	Close Outs
060000 PACO-001	General Trades - Close Outs	060000-18	060000-18	Signed Hazardous Materials Compliance Affidavit	Close Outs
060000 PACO-001	General Trades - Close Outs	060000-19	060000-19	Signed Asbestos Free Affidavit	Close Outs
060000 PACO-001	General Trades - Close Outs	060000-20	060000-20	All Other Warranties Required	Close Outs
060000 PACO-001	General Trades - Close Outs	060000-21	060000-21	Operations & Maintenance Manuals	Close Outs
060000 PACO-001	General Trades - Close Outs	060000-22	060000-22	Replacement Parts turned over to Owner	Close Outs
060000 PACO-001	General Trades - Close Outs	060000-23	060000-23	Inspections & Certificates	Close Outs
060000 PACO-001	General Trades - Close Outs	060000-24	081113	Record documents on hollow metal doors and frames. List of door numbers, room name and number to which door accesses.	Close Outs
060000 PACO-001	General Trades - Close Outs	060000-25	083113	Record documents on access doors and frames. List of applicable room name and number in which access door is located.	Close Outs
060000 PACO-001	General Trades - Close Outs	060000-26	087100	Operations and maintenance data on door hardware.	Close Outs
060000 PACO-001	General Trades - Close Outs	060000-27	087100	Warranties on door hardware.	Close Outs
060000 PACO-001	General Trades - Close Outs	060000-28	087100	Extra Materials: Furnish complete set of special tools required for maintenance and adjustment of hardware including changing of cylinders.	Close Outs
060000 PACO-001	General Trades - Close Outs	060000-29	101100	Manufacturer instructions on visual display units.	Close Outs
060000 PACO-001	General Trades - Close Outs	060000-30	101100	10 year warranty on writing surface warranty (visual display units).	Close Outs
060000 PACO-001	General Trades - Close Outs	060000-31	101100	Life of the Building warranty on markerboards.	Close Outs
060000 PACO-001	General Trades - Close Outs	060000-32	102113.19	Maintenance data on toilet compartments.	Close Outs
060000 PACO-001	General Trades - Close Outs	060000-33	102113.19	Extra materials on door hinges. Two hinge(s) with associated fasteners.	Close Outs
060000 PACO-001	General Trades - Close Outs	060000-34	102113.19	Extra materials on latch and keeper. Two latch(es) and keeper(s) with associated fasteners.	Close Outs
060000 PACO-001	General Trades - Close Outs	060000-35	102113.19	Extra materials on door bumper. Two bumper(s) with associated fasteners.	Close Outs
060000 PACO-001	General Trades - Close Outs	060000-36	102113.19	Extra materials on door pull. Two door pull(s) with associated fasteners.	Close Outs
060000 PACO-001	General Trades - Close Outs	060000-37	102113.19	Extra materials on fasteners. Ten fasteners of each size and type.	Close Outs
060000 PACO-001	General Trades - Close Outs	060000-38	102800	Manufacturers installation instructions on toilet accessories.	Close Outs
060000 PACO-001	General Trades - Close Outs	060000-39	104413	Maintenance data on fire protection cabinets.	Close Outs
060000 PACO-001	General Trades - Close Outs	060000-40	104416	Operation and maintenance data on fire extinguishers.	Close Outs
060000 PACO-001	General Trades - Close Outs	060000-41	105000	Extra Materials: Lock Combination Listings and Master Keys. Use only when combination locks are specified.	Close Outs

060000-001	General Trades - Submittals	060000-42	061000	Product data on rough carpentry.	Submittals
060000-001	General Trades - Submittals	060000-43	061600	Product data on sheathing.	Submittals
060000-001	General Trades - Submittals	060000-44	061753	Shop drawings and product data on shop-fabricated wood trusses.	Submittals
060000-001	General Trades - Submittals	060000-45	062023	Shop drawings on interior finish carpentry.	Submittals
060000-001	General Trades - Submittals	060000-46	062023	Samples on interior finish carpentry.	Submittals
060000-001	General Trades - Submittals	060000-47	064116	Product data on plastic-laminate-clad architectural cabinets.	Submittals
060000-001	General Trades - Submittals	060000-48	064116	Shop drawings on plastic-laminte-clad architectural cabinets.	Submittals
060000-001	General Trades - Submittals	060000-49	064116	Samples on plastic-laminate-clad architectural cabinets.	Submittals
060000-001	General Trades - Submittals	060000-50	079200	Product data and schedule on joint sealants.	Submittals
060000-001	General Trades - Submittals	060000-51	079200	Samples on joint sealants.	Submittals
060000-001	General Trades - Submittals	060000-52	081113	Product data and product schedule on hollow metal doors and frames.	Submittals
060000-001	General Trades - Submittals	060000-53	081113	Shop drawings on hollow metal doors and frames.	Submittals
060000-001	General Trades - Submittals	060000-54	083113	Product data and product schedule on access doors and frames.	Submittals
060000-001	General Trades - Submittals	060000-55	087100	Product data and riser and wiring diagrams on door hardware.	Submittals
060000-001	General Trades - Submittals	060000-56	087100	Samples on door hardware.	Submittals
060000-001	General Trades - Submittals	060000-57	087100	Door Hardware Schedule.	Submittals
060000-001	General Trades - Submittals	060000-58	087100	Key Schedule.	Submittals
060000-001	General Trades - Submittals	060000-59	101100	Product data and shop drawings on visual display units.	Submittals
060000-001	General Trades - Submittals	060000-60	101100	Samples and color charts on visual display units.	Submittals
060000-001	General Trades - Submittals	060000-61	102113.19	Product data, product schedule and shop drawings on plastic toilet compartments.	Submittals
060000-001	General Trades - Submittals	060000-62	102113.19	Samples on plastic toilet compartments.	Submittals
060000-001	General Trades - Submittals	060000-63	102800	Product data on toilet accessories.	Submittals
060000-001	General Trades - Submittals	060000-64	102800	Samples on toilet accessories.	Submittals
060000-001	General Trades - Submittals	060000-65	104413	Product data and shop drawings on fire protection cabinets.	Submittals
060000-001	General Trades - Submittals	060000-66	104416	Product data and product schedule on fire extinguishers.	Submittals
060000-001	General Trades - Submittals	060000-67	105000	Shop drawings on metal lockers.	Submittals
060000-001	General Trades - Submittals	060000-68	105000	Color charts on metal lockers.	Submittals
060000-001	General Trades - Submittals	060000-69	123623.13	Product data and product certificates on plastic-laminate-clad countertops.	Submittals
060000-001	General Trades - Submittals	060000-70	123623.13	Shop drawings on plastic-laminate-clad countertops.	Submittals
060000-001	General Trades - Submittals	060000-71	123623.13	Samples on plastic laminates (plastic-laminate-clad countertops).	Submittals

Bid Division: 074200 – Metal Panels

Bid to Include:

Total Responsibility for Specification Sections:

Section 072500 – Weather Barriers
Section 074113.16 – Standing-Seam Metal Roof (Team Room)
Section 074293 – Soffit Panels (Team Room)
Section 074619 – Steel Siding and Roofing (Team Room)
Section 077199 – Roof Specialties (Team Room)
Section 077253 – Snow Guards (Team Room)

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

Section 072100 – Thermal Insulation
Section 079200 – Joint Sealants

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

All required panels, trims, fasteners, sealants, flashing, etc., for a complete weather and water tight system.

General Inclusions:

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

Bid Division: 074200 – Metal Panels

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 15 working days of contract award or sooner, unless specifically clarified with the construction manager prior to contract award.
13. Provide all layout and measurements required to perform the work of this Bid Division.
14. The Owner reserves the right to salvage any materials removed from the site during the duration of the project.
15. Coordinate delivery of materials with Construction Manager (48 hours) in advance of the delivery, and provide proper personnel and equipment to perform the unloading.
16. Contractor shall submit to the field construction manager a complete written daily field report stating the work being done on site and the number of employees performing the work for each day the Contractor has representatives on site.
17. Contractor shall have a supervisor on site at all times when a crew is present on the job.
18. On Friday, or last workday of each week, the Contractor must update the Master Copy of As-Builts, as it applies to the work of their Bid Division.
19. **Wolgast uses a web-based construction 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. Maintain weather protection during entire installation.
2. Furnish and install all joint sealants as required for the work of this Bid Division.
3. Provide all accessories and hardware required for this Bid Division.
4. Furnish and install all required fasteners.
5. Coordinate all finishing connections with appropriate contractors.
6. Protect adjacent materials during the installation of the metal panels.
7. Completely clean all panels immediately prior to Owner occupancy.
8. Provide all required shop drawings and field verification of dimensions for a complete installation.

Project Inclusions:

1. Review the milestone schedules. This bid division's work will be required to be completed at multiple locations and concurrently for some of the work. Prepare your bid proposal accordingly to allow for sufficient manpower and resources.
2. All metal roof panels as required for a complete, warranted and weather tight system to include field measuring, timely shop drawings, roofing felt, ice and water guard, clips, shims, fasteners, final cleaning and touch-up as required.
3. Furnish and install new gutters and downspouts.
4. Furnish and install eave and rake trim.
5. Furnish and install snow guards.
6. Must provide all submittals within 15 working days of contract award or sooner, unless specifically clarified with the construction manager prior to contract award.
7. Mandatory attendance at all required pre-installation meetings.
8. Completion of all punch list work within 5 working days or less upon receipt of punch list items, unless specific circumstances occur that are out of control of this bid division contractor dictate otherwise.

Consideration for award:

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

END OF BID DIVISION 074200

Package #	Package	Number	Spec #	Title	Type
074200 PA-001	Metal Panels - Start Ups	074200-01	074200-01	Signed Post Bid Interview Form	Start Ups
074200 PA-001	Metal Panels - Start Ups	074200-02	074200-02	Schedule of Values	Start Ups
074200 PA-001	Metal Panels - Start Ups	074200-03	074200-03	Signed Contracts Returned	Start Ups
074200 PA-001	Metal Panels - Start Ups	074200-04	074200-04	Payment/Performance Bonds	Start Ups
074200 PA-001	Metal Panels - Start Ups	074200-05	074200-05	Certificate of Insurance	Start Ups
074200 PA-001	Metal Panels - Start Ups	074200-06	074200-06	Employee List	Start Ups
074200 PA-001	Metal Panels - Start Ups	074200-07	074200-07	Safety Policy	Start Ups
074200 PA-001	Metal Panels - Start Ups	074200-08	074200-08	SDS Sheets	Start Ups
074200 PA-001	Metal Panels - Start Ups	074200-09	074200-09	Certificate of Subcontractor & Supplier	Start Ups
074200 PA-001	Metal Panels - Start Ups	074200-10	074200-10	AHERA Notification and Contractor Compliance Affidavit	Start Ups
074200 PACO-001	Metal Panels - Close Outs	074200-11	074200-11	Contractor (2) Year Guarantee	Close Outs
074200 PACO-001	Metal Panels - Close Outs	074200-12	074200-12	Consent of Surety	Close Outs
074200 PACO-001	Metal Panels - Close Outs	074200-13	074200-13	Certificate of Substantial Completion	Close Outs
074200 PACO-001	Metal Panels - Close Outs	074200-14	074200-14	Completed Punch List	Close Outs
074200 PACO-001	Metal Panels - Close Outs	074200-15	074200-15	As Built Drawings	Close Outs
074200 PACO-001	Metal Panels - Close Outs	074200-16	074200-16	All Processed Change Orders Returned	Close Outs
074200 PACO-001	Metal Panels - Close Outs	074200-17	074200-17	Current Certificate of Insurance	Close Outs
074200 PACO-001	Metal Panels - Close Outs	074200-18	074200-18	Signed Hazardous Materials Compliance Affidavit	Close Outs
074200 PACO-001	Metal Panels - Close Outs	074200-19	074200-19	Signed Asbestos Free Affidavit	Close Outs
074200 PACO-001	Metal Panels - Close Outs	074200-20	074200-20	All Other Warranties Required	Close Outs
074200 PACO-001	Metal Panels - Close Outs	074200-21	074200-21	Operations & Maintenance Manuals	Close Outs
074200 PACO-001	Metal Panels - Close Outs	074200-22	074200-22	Replacement Parts turned over to Owner	Close Outs
074200 PACO-001	Metal Panels - Close Outs	074200-23	074200-23	Inspections & Certificates	Close Outs
074200 PACO-001	Metal Panels - Close Outs	074200-24	074113.16	Special 2 year warranty on components of metal panel system (standing-seam metal roof panels).	Close Outs
074200 PACO-001	Metal Panels - Close Outs	074200-25	074113.16	Special 20 year warranty on panel finishes (standing-seam metal roof panels).	Close Outs
074200 PACO-001	Metal Panels - Close Outs	074200-26	074113.16	Special 20 year weathertightness warranty on standing-seam metal roof panel assemblies.	Close Outs
074200 PACO-001	Metal Panels - Close Outs	074200-27	074113.16	Special 2 year warranty on components of metal panel system (soffit panels).	Close Outs
074200 PACO-001	Metal Panels - Close Outs	074200-28	074113.16	Special 20 year warranty on panel finishes (standing-seam metal roof panels).	Close Outs
074200 PACO-001	Metal Panels - Close Outs	074200-29	077100	Special 20 year warranty on painted finishes regarding roof specialties.	Close Outs
074200-001	Metal Panels - Submittals	074200-30	072500	Product data and shop drawings on weather barriers.	Close Outs
074200-001	Metal Panels - Submittals	074200-31	074113.16	Product data and shop drawings on standing-seam metal roof panels.	Submittals
074200-001	Metal Panels - Submittals	074200-32	074113.16	Samples on standing-seam metal roof panels.	Submittals
074200-001	Metal Panels - Submittals	074200-33	074293	Product data and shop drawings on soffit panels.	Submittals
074200-001	Metal Panels - Submittals	074200-34	074293	Samples on soffit panels.	Submittals
074200-001	Metal Panels - Submittals	074200-35	074619	Product data on steel siding and roofing.	Submittals
074200-001	Metal Panels - Submittals	074200-36	074619	Samples on steel siding and roofing.	Submittals
074200-001	Metal Panels - Submittals	074200-37	077100	Product data and shop drawings on roof specialties.	Submittals
074200-001	Metal Panels - Submittals	074200-38	077100	Samples on roof specialties.	Submittals
074200-001	Metal Panels - Submittals	074200-39	077253	Product data and shop drawings on snow guards.	Submittals
074200-001	Metal Panels - Submittals	074200-40	077253	Samples on snow guards.	Submittals

Bid Division: 075000 – Roofing

Bid to Include:

Total Responsibility for Specification Sections:

Section 072100 – Thermal Insulation
Section 075419.35 – Polyvinyl-Chloride (PVC) Roofing Mechanically Fastened
Section 076200 – Sheet Metal Flashing and Trim

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

Section 024119 – Selective Demolition (as it relates to tying into the existing building)
Section 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 & water-tight system.

General Inclusions:

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

Bid Division: 075000 – Roofing

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

Division Inclusions:

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

Project Inclusions:

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

Bid Division: 075000 – Roofing

7. Provide all required flashing work for a permanent, weather-tight condition at existing roofing for roof-mounted equipment as documented. Provide all required wood to extend mechanical curbs to achieve minimum height requirements per roof manufacturer's guidelines. Coordinate with mechanical and electrical contractors for removal and reinstallation of existing roof-mounted equipment and new equipment as required for the proper installation of the flashing. Provide all required termination bars and sealant for a permanent, weather-tight condition as documented.
8. Must provide all submittals within 15 working days of contract award or sooner, unless specifically clarified with the construction manager prior to contract award.
9. Mandatory attendance at all required pre-installation meetings.
10. Completion of all punch list work within 5 working days or less upon receipt of punch list items, unless specific circumstances occur that are out of control of this bid division contractor dictate otherwise.

Consideration for award:

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

END OF BID DIVISION 075000

Package #	Package	Number	Spec #	Spec	Title	Type
075000 PA-001	Roofing - Start Ups	075000-01	075000-01	Roofing - Start Ups	Signed Post Bid Interview Form	Start Ups
075000 PA-001	Roofing - Start Ups	075000-02	075000-02	Roofing - Start Ups	Schedule of Values	Start Ups
075000 PA-001	Roofing - Start Ups	075000-03	075000-03	Roofing - Start Ups	Signed Contracts Returned	Start Ups
075000 PA-001	Roofing - Start Ups	075000-04	075000-04	Roofing - Start Ups	Payment/Performance Bonds	Start Ups
075000 PA-001	Roofing - Start Ups	075000-05	075000-05	Roofing - Start Ups	Certificate of Insurance	Start Ups
075000 PA-001	Roofing - Start Ups	075000-06	075000-06	Roofing - Start Ups	Employee List	Start Ups
075000 PA-001	Roofing - Start Ups	075000-07	075000-07	Roofing - Start Ups	Safety Policy	Start Ups
075000 PA-001	Roofing - Start Ups	075000-08	075000-08	Roofing - Start Ups	SDS Sheets	Start Ups
075000 PA-001	Roofing - Start Ups	075000-09	075000-09	Roofing - Start Ups	Certificate of Subcontractor & Supplier	Start Ups
075000 PA-001	Roofing - Start Ups	075000-10	075000-10	Roofing - Start Ups	AHERA Notification and Contractor Compliance Affidavit	Start Ups
075000 PACO-001	Roofing - Close Outs	075000-11	075000-11	Roofing - Close Outs	Contractor (2) Year Guarantee	Close Outs
075000 PACO-001	Roofing - Close Outs	075000-12	075000-12	Roofing - Close Outs	Consent of Surety	Close Outs
075000 PACO-001	Roofing - Close Outs	075000-13	075000-13	Roofing - Close Outs	Certificate of Substantial Completion	Close Outs
075000 PACO-001	Roofing - Close Outs	075000-14	075000-14	Roofing - Close Outs	Completed Punch List	Close Outs
075000 PACO-001	Roofing - Close Outs	075000-15	075000-15	Roofing - Close Outs	As Built Drawings	Close Outs
075000 PACO-001	Roofing - Close Outs	075000-16	075000-16	Roofing - Close Outs	All Processed Change Orders Returned	Close Outs
075000 PACO-001	Roofing - Close Outs	075000-17	075000-17	Roofing - Close Outs	Current Certificate of Insurance	Close Outs
075000 PACO-001	Roofing - Close Outs	075000-18	075000-18	Roofing - Close Outs	Signed Hazardous Materials Compliance Affidavit	Close Outs
075000 PACO-001	Roofing - Close Outs	075000-19	075000-19	Roofing - Close Outs	Signed Asbestos Free Affidavit	Close Outs
075000 PACO-001	Roofing - Close Outs	075000-20	075000-20	Roofing - Close Outs	All Other Warranties Required	Close Outs
075000 PACO-001	Roofing - Close Outs	075000-21	075000-21	Roofing - Close Outs	Operations & Maintenance Manuals	Close Outs
075000 PACO-001	Roofing - Close Outs	075000-22	075000-22	Roofing - Close Outs	Replacement Parts turned over to Owner	Close Outs
075000 PACO-001	Roofing - Close Outs	075000-23	075000-23	Roofing - Close Outs	Roofing Inspection Report	Close Outs
075000 PACO-001	Roofing - Close Outs	075000-24	075419.35	Polyvinyl-Chloride (PVC) Roofing Mechanically Fastened	Maintenance data on PVC roofing.	Close Outs
075000 PACO-001	Roofing - Close Outs	075000-25	075419.35	Polyvinyl-Chloride (PVC) Roofing Mechanically Fastened	20 Year No Dollar Manufacturer Warranty on PVC Roofing.	Close Outs
075000-001	Roofing - Submittals	075000-26	072100	Thermal Insulation	Product data on thermal insulation.	Submittals
075000-001	Roofing - Submittals	075000-27	075419.35	Polyvinyl-Chloride (PVC) Roofing Mechanically Fastened	Product data and shop drawings on PVC roofing.	Submittals
075000-001	Roofing - Submittals	075000-28	076200	Sheet Metal Flashing and Trim	Product data and shop drawings on sheet metal flashing and trim.	Submittals
075000-001	Roofing - Submittals	075000-29	076200	Sheet Metal Flashing and Trim	Samples on sheet metal flashing and trim.	Submittals

Bid Division: 084000 – Glass & Glazing

Bid to Include:

Total Responsibility for Specification Sections:

Section 081743 – FRP/Aluminum Hybrid Doors
Section 085113 – Aluminum Windows (Robotics)
Section 087100 – Door Hardware (As it relates to this Bid Division)
Section 088000 – Glazing (Robotics)
Section 088700 – Window Film (Robotics)

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)

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

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

General Inclusions:

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

Bid Division: 084000 – Glass & Glazing

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

Division Inclusions:

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

Project Inclusions:

1. Review the milestone schedules. This bid division's work will be required to be completed at multiple locations and concurrently for some of the work. Prepare your bid proposal accordingly to allow for sufficient manpower and resources.
1. Must be able to furnish and install all doors, windows, framing, hardware, etc., per the milestone schedules.
2. Furnish and install all aluminum storefront, frames, windows, doors and all associated window and door hardware associated with FRP /Aluminum Hybrid doors and windows.
3. Provide pull ropes in door frames for access control wiring installation. Consult with construction manager and access control contractor prior to installation.
4. When installing door frames, this contractor must consider floor finish thickness such as ceramic tile and install accordingly to ensure doors do not rub on floors.
5. Review the milestone schedules. This bid division's work will be required to be completed at multiple locations and concurrently for some of the work. Prepare your bid proposal accordingly to allow for sufficient manpower and resources.
6. Must provide all submittals within 15 working days of contract award or sooner, unless specifically clarified with the construction manager prior to contract award.
7. Mandatory attendance at all required pre-installation meetings.
8. Completion of all punch list work within 5 working days or less upon receipt of punch list items, unless specific circumstances occur that are out of control of this bid division contractor dictate otherwise.

Bid Division: 084000 – Glass & Glazing

Consideration for award:

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

END OF BID DIVISION 084000

Package #	Package	Number	Spec #	Title	Type
084000 PA-001	Glass & Glazing - Start Ups	084000-01	084000-01	Signed Post Bid Interview Form	Start Ups
084000 PA-001	Glass & Glazing - Start Ups	084000-02	084000-02	Schedule of Values	Start Ups
084000 PA-001	Glass & Glazing - Start Ups	084000-03	084000-03	Signed Contracts Returned	Start Ups
084000 PA-001	Glass & Glazing - Start Ups	084000-04	084000-04	Payment/Performance Bonds	Start Ups
084000 PA-001	Glass & Glazing - Start Ups	084000-05	084000-05	Certificate of Insurance	Start Ups
084000 PA-001	Glass & Glazing - Start Ups	084000-06	084000-06	Employee List	Start Ups
084000 PA-001	Glass & Glazing - Start Ups	084000-07	084000-07	Safety Policy	Start Ups
084000 PA-001	Glass & Glazing - Start Ups	084000-08	084000-08	SDS Sheets	Start Ups
084000 PA-001	Glass & Glazing - Start Ups	084000-09	084000-09	Certificate of Subcontractor & Supplier	Start Ups
084000 PA-001	Glass & Glazing - Start Ups	084000-10	084000-10	AHERA Notification and Contractor Compliance Affidavit	Start Ups
084000 PACO-001	Glass & Glazing - Close Outs	084000-11	084000-11	Contractor (2) Year Guarantee	Close Outs
084000 PACO-001	Glass & Glazing - Close Outs	084000-12	084000-12	Consent of Surety	Close Outs
084000 PACO-001	Glass & Glazing - Close Outs	084000-13	084000-13	Certificate of Substantial Completion	Close Outs
084000 PACO-001	Glass & Glazing - Close Outs	084000-14	084000-14	Completed Punch List	Close Outs
084000 PACO-001	Glass & Glazing - Close Outs	084000-15	084000-15	As Built Drawings	Close Outs
084000 PACO-001	Glass & Glazing - Close Outs	084000-16	084000-16	All Processed Change Orders Returned	Close Outs
084000 PACO-001	Glass & Glazing - Close Outs	084000-17	084000-17	Current Certificate of Insurance	Close Outs
084000 PACO-001	Glass & Glazing - Close Outs	084000-18	084000-18	Signed Hazardous Materials Compliance Affidavit	Close Outs
084000 PACO-001	Glass & Glazing - Close Outs	084000-19	084000-19	Signed Asbestos Free Affidavit	Close Outs
084000 PACO-001	Glass & Glazing - Close Outs	084000-20	084000-20	All Other Warranties Required	Close Outs
084000 PACO-001	Glass & Glazing - Close Outs	084000-21	084000-21	Operations & Maintenance Manuals	Close Outs
084000 PACO-001	Glass & Glazing - Close Outs	084000-22	084000-22	Replacement Parts turned over to Owner	Close Outs
084000 PACO-001	Glass & Glazing - Close Outs	084000-23	084000-23	Inspections & Certificates	Close Outs
084000 PACO-001	Glass & Glazing - Close Outs	084000-24	081743	Operation and maintenance manual on FRP/aluminum hybrid doors.	Close Outs
084000 PACO-001	Glass & Glazing - Close Outs	084000-25	081743	Limited lifetime warranty on FRP/aluminum hybrid doors regarding corner joinery, core deterioration, and delamination or bubbling ofdoor skinand corrosion.	Close Outs
084000 PACO-001	Glass & Glazing - Close Outs	084000-26	081743	10 year warranty on finish regarding FRP/aluminum hybrid doors.	Close Outs
084000 PACO-001	Glass & Glazing - Close Outs	084000-27	085113	2 year manufacturer's warranty on aluminum windows.	Close Outs
084000 PACO-001	Glass & Glazing - Close Outs	084000-28	085113	5 year warranty on insulating glass (aluminum glass).	Close Outs
084000 PACO-001	Glass & Glazing - Close Outs	084000-29	087100	Operations and maintenance data on door hardware.	Close Outs
084000 PACO-001	Glass & Glazing - Close Outs	084000-30	087100	Warranties on door hardware.	Close Outs
084000 PACO-001	Glass & Glazing - Close Outs	084000-31	087100	Extra Materials: Furnish complete set of special tools required for maintenance and adjustment of hardware including changing of cylinders.	Close Outs
084000 PACO-001	Glass & Glazing - Close Outs	084000-32	088000	10 year manufacturer's special warranty for coated-glass projects glazing).	Close Outs
084000 PACO-001	Glass & Glazing - Close Outs	084000-33	088000	10 year manufacturer's special warranty for laminated glass (glazing).	Close Outs
084000 PACO-001	Glass & Glazing - Close Outs	084000-34	088000	10 year manufacturer's special warranty for insulating glass (glazing).	Close Outs
084000 PACO-001	Glass & Glazing - Close Outs	084000-35	088700	Warranty on window film.	Close Outs
084000-001	Glass & Glazing - Submittals	084000-36	079200	Product data on joint sealants.	Submittals
084000-001	Glass & Glazing - Submittals	084000-37	081743	Product data and shop drawings on FRP/aluminum hybrid doors.	Submittals
084000-001	Glass & Glazing - Submittals	084000-38	081743	Samples on FRP/aluminum hybrid doors.	Submittals
084000-001	Glass & Glazing - Submittals	084000-39	085113	Product data and product test reports on aluminum windows.	Submittals
084000-001	Glass & Glazing - Submittals	084000-40	085113	Shop drawings on aluminum windows.	Submittals
084000-001	Glass & Glazing - Submittals	084000-41	085113	Samples on aluminum windows.	Submittals
084000-001	Glass & Glazing - Submittals	084000-42	087100	Product data and riser and wiring diagrams on door hardware.	Submittals
084000-001	Glass & Glazing - Submittals	084000-43	087100	Samples on door hardware.	Submittals
084000-001	Glass & Glazing - Submittals	084000-44	087100	Door Hardware Schedule.	Submittals
084000-001	Glass & Glazing - Submittals	084000-45	087100	Key Schedule.	Submittals
084000-001	Glass & Glazing - Submittals	084000-46	088000	Product data and glazing schedule on glazing.	Submittals
084000-001	Glass & Glazing - Submittals	084000-47	088000	Glass samples regarding glazing.	Submittals
084000-001	Glass & Glazing - Submittals	084000-48	088700	Product data and test reports on window film.	Submittals
084000-001	Glass & Glazing - Submittals	084000-49	088700	Samples on window film.	Submittals

Bid Division: 091000 – Drywall, Insulation & Acoustical

Bid to Include:

Total Responsibility for Specification Sections:

Section 072119 – Foamed-in-Place Insulation (Team Room)
Section 092216 – Non-Structural Metal Framing
Section 092900 – Gypsum Board
Section 095100 – Acoustical Ceilings (Robotics)

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

Section 061000 – Rough Carpentry (As it relates to the Dens-Glass)
Section 078413 – Penetration Firestopping (As it relates to this scope of work)
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. Contractor is responsible for own dumpster(s) and all removal and disposal charges thereof. (Use of the Owner's dumpsters is strictly prohibited.)
7. All Contractors are required to inspect the existing project components and are to include all work necessary to complete the work to deliver a fully operational system in compliance with all governing codes.
8. This Contractor shall be responsible for performing all work in full compliance with all health and safety standards including Asbestos Awareness and Notification, Lead Paint Abatement, and all MIOSHA Standards. This Contractor shall also be responsible for satisfying all safety violations and/or fines resulting from the actions or lack of action by this Contractor at the sole expense of this Contractor.
9. Any contractor who compounds a mistake by installing their product on another Contractor's obvious faulty work will assume responsibility for repair of said work.
10. This contractor shall repair and restore any damaged area to an original or better condition with no detectable evidence that the area has been repaired. Repairs must be done by personnel qualified in the execution of the work skilled and licensed in that trade. Whenever possible, repairs to work shall be done by the original installer of the work.

Bid Division: 091000 – Drywall, Insulation & Acoustical

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

Divisions Inclusions:

1. All metal stud framing and drywall for bulkheads and light coves.
2. All building insulation except for that specifically defined in bid division 030100, 040000, and 075000.
3. Supply and install drywall and metal framing as design and specified.
4. Supply and install all gypsum board, studs and insulation as indicated.
5. Supply and install all bulkheads.
6. Coordination with mechanical and electrical trades on layout of ceiling grid.
7. Provide Owner with the amount specified of each type of ceiling tile, suspension system, and wall panels, upon completion.
8. Patch existing remodeled areas as required.
9. Supply and install fire rated gypsum board tight to roof deck as indicated.
10. Expansion and control joints as required by design or product manufacturer.
11. Prior to layout of ceilings, contractor to accept humidity and temperature levels in the building.
12. Provide all drywall and plaster on metal as well as wood as indicated.
13. The on-site foreman for this Bid Division must be able to communicate with all employees and the Construction Manager's staff.
14. Follow room finish schedule.
15. Provide all vapor barriers as required by design and product manufacturer.
16. Provide all nailers and underlayment.
17. Provide all trim as it relates to Acoustical Ceiling System.
18. Provide all fasteners.
19. Furnish and install all caulking required for the work of this Bid Division.
20. Replacement and/or repair of defective and/or misaligned material installed by this contractor.
21. To repair any adjacent material damaged in the execution of the above listed work.
22. Provide smooth transition from existing work to new work.
23. Install louvers and access panels furnished by each architectural, mechanical and electrical contractor in locations encased in this contractor's work.
24. Provide all caulking and sealants for plasterwork or drywall as required.
25. Provide all EIFS work per manufacturer recommendations.
26. All gypsum board walls, gypsum board wall systems, gypsum board ceilings and/or gypsum board ceiling systems must be constructed with expansion joints at a maximum spacing of 30'-0" on-center in both directions as manufactured by the gypsum board manufacturer regardless of the all other specification requirements.

Bid Division: 091000 – Drywall, Insulation & Acoustical

Project Inclusions:

1. Review the milestone schedules. This bid division's work will be required to be completed at multiple locations and concurrently for some of the work. Prepare your bid proposal accordingly to allow for sufficient manpower and resources.
2. Furnish and install all required light-gage metal framing material and drywall, glass mat sheathing, etc. at all walls, ceilings, bulkheads, parapets, etc.
3. Provide all metal framing, drywall and insulation at all walls, as documented.
4. Furnish and install all metal framing at.
5. Furnish and install all acoustical ceiling systems, as documented.
6. Furnish and install all materials for the bulkheads as documented.
7. Must provide all submittals within 15 working days of contract award or sooner, unless specifically clarified with the construction manager prior to contract award.
8. Mandatory attendance at all required pre-installation meetings.
9. Completion of all punch list work within 5 working days or less upon receipt of punch list items, unless specific circumstances occur that are out of control of this bid division contractor dictate otherwise.
10. Furnish and install all Exterior Insulation Finish System.

Consideration for award:

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

END OF BID DIVISION 091000

Package #	Package	Number	Spec #	Title	Type
091000 PA-001	Drywall, Insulation & Acoustical - Start Ups	091000-01	091000-01	Signed Post Bid Interview Form	Start Ups
091000 PA-001	Drywall, Insulation & Acoustical - Start Ups	091000-02	091000-02	Schedule of Values	Start Ups
091000 PA-001	Drywall, Insulation & Acoustical - Start Ups	091000-03	091000-03	Signed Contracts Returned	Start Ups
091000 PA-001	Drywall, Insulation & Acoustical - Start Ups	091000-04	091000-04	Payment/Performance Bonds	Start Ups
091000 PA-001	Drywall, Insulation & Acoustical - Start Ups	091000-05	091000-05	Certificate of Insurance	Start Ups
091000 PA-001	Drywall, Insulation & Acoustical - Start Ups	091000-06	091000-06	Employee List	Start Ups
091000 PA-001	Drywall, Insulation & Acoustical - Start Ups	091000-07	091000-07	Safety Policy	Start Ups
091000 PA-001	Drywall, Insulation & Acoustical - Start Ups	091000-08	091000-08	SDS Sheets	Start Ups
091000 PA-001	Drywall, Insulation & Acoustical - Start Ups	091000-09	091000-09	Certificate of Subcontractor & Supplier	Start Ups
091000 PA-001	Drywall, Insulation & Acoustical - Start Ups	091000-10	091000-10	AHERA Notification and Contractor Compliance Affidavit	Start Ups
091000 PACO-001	Drywall, Insulation & Acoustical - Close Outs	091000-11	091000-11	Contractor (2) Year Guarantee	Close Outs
091000 PACO-001	Drywall, Insulation & Acoustical - Close Outs	091000-12	091000-12	Consent of Surety	Close Outs
091000 PACO-001	Drywall, Insulation & Acoustical - Close Outs	091000-13	091000-13	Certificate of Substantial Completion	Close Outs
091000 PACO-001	Drywall, Insulation & Acoustical - Close Outs	091000-14	091000-14	Completed Punch List	Close Outs
091000 PACO-001	Drywall, Insulation & Acoustical - Close Outs	091000-15	091000-15	As Built Drawings	Close Outs
091000 PACO-001	Drywall, Insulation & Acoustical - Close Outs	091000-16	091000-16	All Processed Change Orders Returned	Close Outs
091000 PACO-001	Drywall, Insulation & Acoustical - Close Outs	091000-17	091000-17	Current Certificate of Insurance	Close Outs
091000 PACO-001	Drywall, Insulation & Acoustical - Close Outs	091000-18	091000-18	Signed Hazardous Materials Compliance Affidavit	Close Outs
091000 PACO-001	Drywall, Insulation & Acoustical - Close Outs	091000-19	091000-19	Signed Asbestos Free Affidavit	Close Outs
091000 PACO-001	Drywall, Insulation & Acoustical - Close Outs	091000-20	091000-20	All Other Warranties Required	Close Outs
091000 PACO-001	Drywall, Insulation & Acoustical - Close Outs	091000-21	091000-21	Operations & Maintenance Manuals	Close Outs
091000 PACO-001	Drywall, Insulation & Acoustical - Close Outs	091000-22	091000-22	Replacement Parts turned over to Owner	Close Outs
091000 PACO-001	Drywall, Insulation & Acoustical - Close Outs	091000-23	091000-23	Inspections & Certificates	Close Outs
091000 PACO-001	Drywall, Insulation & Acoustical - Close Outs	091000-24	095100	10 year warranty on acoustical panels.	Close Outs
091000 PACO-001	Drywall, Insulation & Acoustical - Close Outs	091000-25	095100	10 year warranty on suspension (acoustical ceilings).	Close Outs
091000 PACO-001	Drywall, Insulation & Acoustical - Close Outs	091000-26	095100	30 year warranty on ceiling system.	Close Outs
091000-001	Drywall, Insulation & Acoustical - Submittals	091000-27	072119	Product data and product test reports on foamed-in-place insulation.	Close Outs
091000-001	Drywall, Insulation & Acoustical - Submittals	091000-28	092900	Product data on gypsum board.	Close Outs
091000-001	Drywall, Insulation & Acoustical - Submittals	091000-29	095100	Product data and acoustical certifications on acoustical ceilings.	Close Outs
091000-001	Drywall, Insulation & Acoustical - Submittals	091000-30	095100	Shop drawings on acoustical ceilings.	Close Outs
091000-001	Drywall, Insulation & Acoustical - Submittals	091000-31	095100	Samples on acoustical ceilings.	Close Outs

Bid Division: 096500 – Flooring

Bid to Include:

Total Responsibility for Specification Sections:

Section 096519 – Resilient Tile Flooring

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)

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

All adhesives, base, sealants, etc.

General Inclusions:

1. There is no general contractor associated with this project; any and all reference to a "general contractor" related to the work of this bid division shall be understood to mean the contractor of this bid division.
2. The contractor for this bid division work is required to include but is not limited to all items, services, tasks, materials, personnel, equipment, etc. identified in this bid division description regardless of the presence of language in other bid division descriptions that is the same or is similar to that found in this contractor's bid division description.
3. Coordination of the work of this bid division with any and all work of other bid division contractors for the scheduling and integration of the work of this contractor.
4. All contractors are responsible for the entire set of plans and specifications; including tables, schedules, and notes.
5. Provide continuous housekeeping and clean-up, and proper legal off-site disposal of any debris generated by this Bid Division's work.
6. Contractor is responsible for own dumpster(s) and all removal and disposal charges thereof. (Use of the Owner's dumpsters is strictly prohibited.)
7. All Contractors are required to inspect the existing project components and are to include all work necessary to complete the work to deliver a fully operational system in compliance with all governing codes.
8. This Contractor shall be responsible for performing all work in full compliance with all health and safety standards including Asbestos Awareness and Notification, Lead Paint Abatement, and all MIOSHA Standards. This Contractor shall also be responsible for satisfying all safety violations and/or fines resulting from the actions or lack of action by this Contractor at the sole expense of this Contractor.
9. Any contractor who compounds a mistake by installing their product on another Contractor's obvious faulty work will assume responsibility for repair of said work.
10. This contractor shall repair and restore any damaged area to an original or better condition with no detectable evidence that the area has been repaired. Repairs must be done by personnel qualified in the execution of the work skilled and licensed in that trade. Whenever possible, repairs to work shall be done by the original installer of the work.
11. Submittal of all insurance, unit pricing, schedule of values, required product data and shop drawings within (2) two weeks of Owner's Notice to commence work.
12. Must provide all submittals within 15 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.

Bid Division: 096500 – Flooring

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

Division Inclusions:

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

Project Inclusions:

1. Review the milestone schedules. This bid division's work will be required to be completed at multiple locations and concurrently for some of the work. Prepare your bid proposal accordingly to allow for sufficient manpower and resources.
2. Clean and prepare floors to receive new flooring, including leveling and filling of voids prior to starting work, and in accordance with specifications and manufacturer's requirements. This contractor is responsible for furnishing and installing leveling materials to create a smooth finish flooring transition at dissimilar flooring materials or new to existing slabs.
3. Furnish and install resilient tile flooring and base.
4. Furnish and install all floor and base.
5. Furnish and install epoxy floor and base.
6. Furnish and install all required transition strips.
7. Mandatory attendance at all required pre-installation meetings.
8. Must provide all submittals within 15 working days of contract award or sooner, unless specifically clarified with the construction manager prior to contract award.
9. Completion of all punch list work within 5 working days or less upon receipt of punch list items, unless specific circumstances occur that are out of control of this bid division contractor dictate otherwise.

Bid Division: 096500 – 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 BID DIVISION 096500

Package #	Package	Number	Spec #	Title	Type
096500 PA-001	Flooring - Start Ups	096500-01	096500-01	Signed Post Bid Interview Form	Start Ups
096500 PA-001	Flooring - Start Ups	096500-02	096500-02	Schedule of Values	Start Ups
096500 PA-001	Flooring - Start Ups	096500-03	096500-03	Signed Contracts Returned	Start Ups
096500 PA-001	Flooring - Start Ups	096500-04	096500-04	Payment/Performance Bonds	Start Ups
096500 PA-001	Flooring - Start Ups	096500-05	096500-05	Certificate of Insurance	Start Ups
096500 PA-001	Flooring - Start Ups	096500-06	096500-06	Employee List	Start Ups
096500 PA-001	Flooring - Start Ups	096500-07	096500-07	Safety Policy	Start Ups
096500 PA-001	Flooring - Start Ups	096500-08	096500-08	SDS Sheets	Start Ups
096500 PA-001	Flooring - Start Ups	096500-09	096500-09	Certificate of Subcontractor & Supplier	Start Ups
096500 PA-001	Flooring - Start Ups	096500-10	096500-10	AHERA Notification and Contractor Compliance Affidavit	Start Ups
096500 PACO-001	Flooring - Close Outs	096500-11	096500-11	Contractor (2) Year Guarantee	Close Outs
096500 PACO-001	Flooring - Close Outs	096500-12	096500-12	Consent of Surety	Close Outs
096500 PACO-001	Flooring - Close Outs	096500-13	096500-13	Certificate of Substantial Completion	Close Outs
096500 PACO-001	Flooring - Close Outs	096500-14	096500-14	Completed Punch List	Close Outs
096500 PACO-001	Flooring - Close Outs	096500-15	096500-15	As Built Drawings	Close Outs
096500 PACO-001	Flooring - Close Outs	096500-16	096500-16	All Processed Change Orders Returned	Close Outs
096500 PACO-001	Flooring - Close Outs	096500-17	096500-17	Current Certificate of Insurance	Close Outs
096500 PACO-001	Flooring - Close Outs	096500-18	096500-18	Signed Hazardous Materials Compliance Affidavit	Close Outs
096500 PACO-001	Flooring - Close Outs	096500-19	096500-19	Signed Asbestos Free Affidavit	Close Outs
096500 PACO-001	Flooring - Close Outs	096500-20	096500-20	All Other Warranties Required	Close Outs
096500 PACO-001	Flooring - Close Outs	096500-21	096500-21	Operations & Maintenance Manuals	Close Outs
096500 PACO-001	Flooring - Close Outs	096500-22	096500-22	Replacement Parts turned over to Owner	Close Outs
096500 PACO-001	Flooring - Close Outs	096500-23	096500-23	Inspections & Certificates	Close Outs
096500 PACO-001	Flooring - Close Outs	096500-24	096519	Operation and maintenance data on resilient tile flooring.	Close Outs
096500 PACO-001	Flooring - Close Outs	096500-25	096519	20 limited warranty on resilient flooring.	Close Outs
096500 PACO-001	Flooring - Close Outs	096500-26	096519	Extra materials on resilient tile flooring. Furnish quantity of flooring units equal to 5% of amount installed but not less than (1) one carton of each color and style used.	Close Outs
096500-001	Flooring - Submittals	096500-27	079200	Product data on joint sealants.	Submittals
096500-001	Flooring - Submittals	096500-28	096519	Product data and shop drawings on resilient tile flooring.	Submittals

Bid Division: 099000 – Painting

Bid to Include:

Total Responsibility for Specification Sections:

Section 099113 – Exterior Painting
Section 099123 – Interior 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)

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

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

General Inclusions:

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

Bid Division: 099000 – Painting

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

Division Inclusions:

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

Project Inclusions:

1. Review the milestone schedules. This bid division's work will be required to be completed at multiple locations and concurrently for some of the work. Prepare your bid proposal accordingly to allow for sufficient manpower and resources.
2. All surfaces to be painted, including but not limited to drywall, steel and masonry are to be inspected and accepted by this contractor prior to application of paint. Surface imperfections not repaired prior to painting or submitted to the Construction Manager in writing as existing defects prior to painting, will be repaired by the painting contractor at no additional cost.
3. Paint all gas lines as documented.
4. Provide complete prep and painting of existing surfaces as documented.
5. Provide complete prep and painting of existing and new exposed steel materials as documented.
6. Prep and paint all exposed roof framing, duct work, conduits and any other materials as documented.

Bid Division: 099000 – Painting

7. Paint all exposed drywall and CMU as documented.
8. Paint all hollow metal frames and doors as documented.
9. Paint all bulkheads.
10. Paint Exterior Insulation Finish System.
11. This contractor to stencil paint or install signs / stickers indicating firewalls above ceilings per code. See fire safety plan for firewall locations and ratings.
12. Provide all caulking of interior control joints in masonry, drywall, and drywall to dissimilar materials and inside masonry corners.
13. Mandatory attendance at all required pre-installation meetings.
14. Must provide all submittals within 15 working days of contract award or sooner, unless specifically clarified with the construction manager prior to contract award.
15. Completion of all punch list work within 5 working days or less upon receipt of punch list items, unless specific circumstances occur that are out of control of this bid division contractor dictate otherwise.

Consideration for award:

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

END OF BID DIVISION 099000

Package #	Package	Number	Spec #	Title	Type
099000 PA-001	Painting - Start Ups	099000-01	099000-01	Signed Post Bid Interview Form	Start Ups
099000 PA-001	Painting - Start Ups	099000-02	099000-02	Schedule of Values	Start Ups
099000 PA-001	Painting - Start Ups	099000-03	099000-03	Signed Contracts Returned	Start Ups
099000 PA-001	Painting - Start Ups	099000-04	099000-04	Payment/Performance Bonds	Start Ups
099000 PA-001	Painting - Start Ups	099000-05	099000-05	Certificate of Insurance	Start Ups
099000 PA-001	Painting - Start Ups	099000-06	099000-06	Employee List	Start Ups
099000 PA-001	Painting - Start Ups	099000-07	099000-07	Safety Policy	Start Ups
099000 PA-001	Painting - Start Ups	099000-08	099000-08	SDS Sheets	Start Ups
099000 PA-001	Painting - Start Ups	099000-09	099000-09	Certificate of Subcontractor & Supplier	Start Ups
099000 PA-001	Painting - Start Ups	099000-10	099000-10	AHERA Notification and Contractor Compliance Affidavit	Start Ups
099000 PACO-001	Painting - Close Outs	099000-11	099000-11	Contractor (2) Year Guarantee	Close Outs
099000 PACO-001	Painting - Close Outs	099000-12	099000-12	Consent of Surety	Close Outs
099000 PACO-001	Painting - Close Outs	099000-13	099000-13	Certificate of Substantial Completion	Close Outs
099000 PACO-001	Painting - Close Outs	099000-14	099000-14	Completed Punch List	Close Outs
099000 PACO-001	Painting - Close Outs	099000-15	099000-15	As Built Drawings	Close Outs
099000 PACO-001	Painting - Close Outs	099000-16	099000-16	All Processed Change Orders Returned	Close Outs
099000 PACO-001	Painting - Close Outs	099000-17	099000-17	Current Certificate of Insurance	Close Outs
099000 PACO-001	Painting - Close Outs	099000-18	099000-18	Signed Hazardous Materials Compliance Affidavit	Close Outs
099000 PACO-001	Painting - Close Outs	099000-19	099000-19	Signed Asbestos Free Affidavit	Close Outs
099000 PACO-001	Painting - Close Outs	099000-20	099000-20	All Other Warranties Required	Close Outs
099000 PACO-001	Painting - Close Outs	099000-21	099000-21	Operations & Maintenance Manuals	Close Outs
099000 PACO-001	Painting - Close Outs	099000-22	099000-22	Replacement Parts turned over to Owner	Close Outs
099000 PACO-001	Painting - Close Outs	099000-23	099000-23	Inspections & Certificates	Close Outs
099000 PACO-001	Painting - Close Outs	099000-24	099123	Extra materials on paint. 5 percent, but not less than 1 gallon of each material and color applied.	Close Outs
099000-001	Painting - Submittals	099000-25	079200	Product data on joint sealants.	Submittals
099000-001	Painting - Submittals	099000-26	079200	Samples on joint sealants.	Submittals
099000-001	Painting - Submittals	099000-27	099123	Product data and product list on interior paint.	Submittals
099000-001	Painting - Submittals	099000-28	099123	Samples on interior paint.	Submittals

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 223400 – Fuel-Fired, Domestic-Water Heaters
Section 224213.13 – Commercial Water Closets
Section 224213.16 – Commercial Urinals
Section 224216.13 – Commercial Lavatories
Section 224216.16 – Commercial Sinks
Section 224500 – Emergency Plumbing Fixtures
Section 224716 – Pressure Water Coolers
Section 230100 – General Mechanical Provisions
Section 230500 – Common Work Results for HVAC
Section 230593 – Testing, Adjusting and Balancing for HVAC
Section 230713 – Duct Insulation
Section 230923 – Building Automation Systems for HVAC
Section 231123 – Facility Natural Gas Piping
Section 233113 – Metal Ducts
Section 233300 – Air Duct Accessories
Section 233346 – Flexible Ducts
Section 233423 – HVAC Power Ventilators
Section 233713.13 – Air Diffusers
Section 233723 – HVAC Gravity Ventilators
Section 235416.13 – Gas-Fired Furnaces
Section 235533.16 – Gas-Fired Unit Heaters
Section 237223.19 – Packaged, Indoor, Fixed Plate Energy Recovery Units
Section 237416 – Packaged Rooftop Air-Conditioning 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
Section 079200 – Joint Sealants

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

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

Bid Division: 222300 – Plumbing & HVAC Systems

General Inclusions:

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

Division Inclusions:

1. Concrete Patching for mechanical and electrical trades by Bid Division 15000 and 16000
2. Selective Demolition (concrete floors, etc.).
3. No concrete is to be installed until verification of acceptable density testing. Any concrete installed without density verification will become the sole responsibility of the Contractor and may be required to be replaced at the Contractor's expense.

Bid Division: 222300 – Plumbing & HVAC Systems

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

Bid Division: 222300 – Plumbing & HVAC Systems

Project Inclusions:

1. Review the milestone schedules. This bid division's work will be required to be completed at multiple locations and concurrently for some of the work. Prepare your bid proposal accordingly to allow for sufficient manpower and resources.
2. Include cost for all required permits in bid proposal and coordinate all required inspections.
3. Provide all required plumbing and HVAC demolition as documented.
4. Remove all existing concrete, masonry, etc. as required for the installation of new plumbing and HVAC work unless the demolition scope of work is specifically indicated in the documents to be completed by another bid division.
5. Provide all required concrete, masonry and drywall patching work associated with the installation of plumbing and HVAC work unless the patching scope of work is specifically indicated in the documents to be completed by another bid division.
6. All plumbing and HVAC installations to meet all required governing requirements.
7. Furnish and install all pre-fabricated curbs and/or wood material as required for mechanical equipment curbing.
8. Furnish all access panels as required for the installation of the bid division's work.
9. Furnish and install all required gas piping.
10. Furnish and install all required hydronic piping.
11. Furnish and install all required refrigerant lines.
12. Furnish and install all required waste, water supply and vent piping.
13. Furnish and install all roof sumps and all rainwater conductor lines.
14. Provide all required plumbing and HVAC insulation.
15. Provide and install emergency eyewash station.
16. Provide all required test and balance work.
17. Provide and complete all controls connections and programming.
18. Provide all firestopping required for penetrations associated with this bid divisions scope of work.
19. Mandatory attendance at all required pre-installation meetings.
20. Must provide all submittals within 15 working days of contract award or sooner, unless specifically clarified with the construction manager prior to contract award.
21. Completion of all punch list work within 5 working days or less upon receipt of punch list items, unless specific circumstances occur that are out of control of this bid division contractor dictate otherwise.

Consideration for award:

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

END OF BID DIVISION 222300

Package #	Package	Number	Spec #	Title	Type
222300 PA-001	Plumbing & HVAC Systems - Start Ups	222300-01	222300-01	Signed Post Bid Interview Form	Start Ups
222300 PA-001	Plumbing & HVAC Systems - Start Ups	222300-02	222300-02	Schedule of Values	Start Ups
222300 PA-001	Plumbing & HVAC Systems - Start Ups	222300-03	222300-03	Signed Contracts Returned	Start Ups
222300 PA-001	Plumbing & HVAC Systems - Start Ups	222300-04	222300-04	Payment/Performance Bonds	Start Ups
222300 PA-001	Plumbing & HVAC Systems - Start Ups	222300-05	222300-05	Certificate of Insurance	Start Ups
222300 PA-001	Plumbing & HVAC Systems - Start Ups	222300-06	222300-06	Employee List	Start Ups
222300 PA-001	Plumbing & HVAC Systems - Start Ups	222300-07	222300-07	Safety Policy	Start Ups
222300 PA-001	Plumbing & HVAC Systems - Start Ups	222300-08	222300-08	SDS Sheets	Start Ups
222300 PA-001	Plumbing & HVAC Systems - Start Ups	222300-09	222300-09	Certificate of Subcontractor & Supplier	Start Ups
222300 PA-001	Plumbing & HVAC Systems - Start Ups	222300-10	222300-10	AHERA Notification and Contractor Compliance Affidavit	Start Ups
222300 PA-001	Plumbing & HVAC Systems - Start Ups	222300-11	222300-11	Plumbing Permit	Start Ups
222300 PA-001	Plumbing & HVAC Systems - Start Ups	222300-12	222300-12	Mechanical Permit	Start Ups
222300 PACO-001	Plumbing & HVAC Systems - Close Outs	222300-13	222300-13	Contractor (2) Year Guarantee	Close Outs
222300 PACO-001	Plumbing & HVAC Systems - Close Outs	222300-14	222300-14	Consent of Surety	Close Outs
222300 PACO-001	Plumbing & HVAC Systems - Close Outs	222300-15	222300-15	Certificate of Substantial Completion	Close Outs
222300 PACO-001	Plumbing & HVAC Systems - Close Outs	222300-16	222300-16	Completed Punch List	Close Outs
222300 PACO-001	Plumbing & HVAC Systems - Close Outs	222300-17	222300-17	As Built Drawings	Close Outs
222300 PACO-001	Plumbing & HVAC Systems - Close Outs	222300-18	222300-18	All Processed Change Orders Returned	Close Outs
222300 PACO-001	Plumbing & HVAC Systems - Close Outs	222300-19	222300-19	Current Certificate of Insurance	Close Outs
222300 PACO-001	Plumbing & HVAC Systems - Close Outs	222300-20	222300-20	Signed Hazardous Materials Compliance Affidavit	Close Outs
222300 PACO-001	Plumbing & HVAC Systems - Close Outs	222300-21	222300-21	Signed Asbestos Free Affidavit	Close Outs
222300 PACO-001	Plumbing & HVAC Systems - Close Outs	222300-22	222300-22	All Other Warranties Required	Close Outs
222300 PACO-001	Plumbing & HVAC Systems - Close Outs	222300-23	222300-23	Operations & Maintenance Manuals	Close Outs
222300 PACO-001	Plumbing & HVAC Systems - Close Outs	222300-24	222300-24	Replacement Parts turned over to Owner	Close Outs
222300 PACO-001	Plumbing & HVAC Systems - Close Outs	222300-25	222300-25	Inspections & Certificates	Close Outs
222300 PACO-001	Plumbing & HVAC Systems - Close Outs	222300-26	222300-26	Plumbing Certificate of Acceptance	Close Outs
222300 PACO-001	Plumbing & HVAC Systems - Close Outs	222300-27	222300-27	Mechanical Certificate of Acceptance	Close Outs
222300 PACO-001	Plumbing & HVAC Systems - Close Outs	222300-28	221116	10 year warranty on domestic water piping.	Close Outs
222300 PACO-001	Plumbing & HVAC Systems - Close Outs	222300-29	221119	Operation and maintenance data on domestic water piping specialties.	Close Outs
222300 PACO-001	Plumbing & HVAC Systems - Close Outs	222300-30	221316	Warranty on sanitary waste and vent piping.	Close Outs
222300 PACO-001	Plumbing & HVAC Systems - Close Outs	222300-31	221319	Operation and maintenance data on sanitary waste piping specialties.	Close Outs
222300 PACO-001	Plumbing & HVAC Systems - Close Outs	222300-32	223400	Operation and maintenance data on fuel-fired, domestic-water heaters.	Close Outs
222300 PACO-001	Plumbing & HVAC Systems - Close Outs	222300-33	223400	3 year warranty on storage tank (commercial, gas-fired, storage, domestic-water heaters) and 1 year warranty on controls and other components.	Close Outs
222300 PACO-001	Plumbing & HVAC Systems - Close Outs	222300-34	223400	5 year warranty on heat exchanger (gas-fired, domestic-water heaters) and 3 year warranty on controls and other components.	Close Outs
222300 PACO-001	Plumbing & HVAC Systems - Close Outs	222300-35	224213.13	Operation and maintenance data on commercial water closets.	Close Outs
222300 PACO-001	Plumbing & HVAC Systems - Close Outs	222300-36	224213.13	Extra materials on flushometer-valve repair kits (commercial water closets). Equal to 10 percent of amount of each type installed, but no fewer than one of each type.	Close Outs
222300 PACO-001	Plumbing & HVAC Systems - Close Outs	222300-37	224213.16	Operation and maintenance data on commercial urinals.	Close Outs
222300 PACO-001	Plumbing & HVAC Systems - Close Outs	222300-38	224213.16	Extra materials on flushometer-valve repair kits (commercial urinals. Equal to 10 percent of each type installed, but no fewer than one of each type.	Close Outs
222300 PACO-001	Plumbing & HVAC Systems - Close Outs	222300-39	224216.13	Operation and maintenance data on commercial lavatories.	Close Outs
222300 PACO-001	Plumbing & HVAC Systems - Close Outs	222300-40	224216.13	Extra materials on faucet cartridges and O-rings. Equal to 5 percent of amount of each type and size installed.	Close Outs
222300 PACO-001	Plumbing & HVAC Systems - Close Outs	222300-41	224216.16	Maintenance data on commercial sinks.	Close Outs
222300 PACO-001	Plumbing & HVAC Systems - Close Outs	222300-42	224216.16	Extra materials on faucet washers and O-rings. Equal to 10 percent of each type and size installed.	Close Outs
222300 PACO-001	Plumbing & HVAC Systems - Close Outs	222300-43	224500	Operation and maintenance data on emergency plumbing fixtures.	Close Outs
222300 PACO-001	Plumbing & HVAC Systems - Close Outs	222300-44	224716	Maintenance data on pressure water coolers.	Close Outs
222300 PACO-001	Plumbing & HVAC Systems - Close Outs	222300-45	224716	Extra materials on filter cartridges. One per fixture.	Close Outs
222300 PACO-001	Plumbing & HVAC Systems - Close Outs	222300-46	230593	Certified TAB reports.	Close Outs
222300 PACO-001	Plumbing & HVAC Systems - Close Outs	222300-47	230923	Owner's Training on Building Automation System (BAS) for HVAC.	Close Outs
222300 PACO-001	Plumbing & HVAC Systems - Close Outs	222300-48	230923	Operation and maintenance manuals on building automation system (BAS) for HVAC.	Close Outs
222300 PACO-001	Plumbing & HVAC Systems - Close Outs	222300-49	230923	Warranty on building automation system (BAS) for HVAC.	Close Outs
222300 PACO-001	Plumbing & HVAC Systems - Close Outs	222300-50	231123	Operation and maintenane data on facility natural gas piping.	Close Outs
222300 PACO-001	Plumbing & HVAC Systems - Close Outs	222300-51	233300	Operation and maintenance data on air duct accessories.	Close Outs
222300 PACO-001	Plumbing & HVAC Systems - Close Outs	222300-52	233423	Operation and maintenance data on HVAC power ventilators.	Close Outs

222300 PACO-001	Plumbing & HVAC Systems - Close Outs	222300-53	235416.13	Operation and maintenane data on gas-fired furnaces.	Close Outs
222300 PACO-001	Plumbing & HVAC Systems - Close Outs	222300-54	235416.13	Extra materials on disposable air filters (gas-fired furnaces). Furnish two complete sets.	Close Outs
222300 PACO-001	Plumbing & HVAC Systems - Close Outs	222300-55	235416.13	10 year warranty on furnace heat exchanger.	Close Outs
222300 PACO-001	Plumbing & HVAC Systems - Close Outs	222300-56	235416.13	5 year warranty on integrated ignition and blower control circuit board.	Close Outs
222300 PACO-001	Plumbing & HVAC Systems - Close Outs	222300-57	235416.13	5 year warranty on draft-inducer motor.	Close Outs
222300 PACO-001	Plumbing & HVAC Systems - Close Outs	222300-58	235416.13	Owner's training on gas-fired furnaces.	Close Outs
222300 PACO-001	Plumbing & HVAC Systems - Close Outs	222300-59	235533.16	Operation and maintenance data on gas-fired unit heaters.	Close Outs
222300 PACO-001	Plumbing & HVAC Systems - Close Outs	222300-60	235533.16	Extra materials on fan belts (gas-fired unit heaters). One for each belt-driven fan size.	Close Outs
222300 PACO-001	Plumbing & HVAC Systems - Close Outs	222300-61	235533.16	1 year warranty on components (gas-fired unit heaters).	Close Outs
222300 PACO-001	Plumbing & HVAC Systems - Close Outs	222300-62	235533.16	5 year warranty on heat exchangers (gas-fired unit heaters).	Close Outs
222300 PACO-001	Plumbing & HVAC Systems - Close Outs	222300-63	235533.16	10 year warranty on burners (gas-fired unit heaters).	Close Outs
222300 PACO-001	Plumbing & HVAC Systems - Close Outs	222300-64	237223.19	Operation and maintenance data on packaged indoor fixed plate energy recovery units.	Close Outs
222300 PACO-001	Plumbing & HVAC Systems - Close Outs	222300-65	237223.19	Extra materials on filters (packaged indoor fixed plate energy recovery units). One set of each type of filter specified.	Close Outs
222300 PACO-001	Plumbing & HVAC Systems - Close Outs	222300-66	237223.19	2 year warranty on packaged energy-recovery units.	Close Outs
222300 PACO-001	Plumbing & HVAC Systems - Close Outs	222300-67	237223.19	10 year waranty on fixed-plate total heat exchangers.	Close Outs
222300 PACO-001	Plumbing & HVAC Systems - Close Outs	222300-68	237416	Operation and maintenance data on packaged rooftop air conditioning units.	Close Outs
222300 PACO-001	Plumbing & HVAC Systems - Close Outs	222300-69	237416	Extra materials on filters (rooftop air conditioning units). One set of filters for each unit.	Close Outs
222300 PACO-001	Plumbing & HVAC Systems - Close Outs	222300-70	237416	Extra materials on gaskets (rooftop air conditioning units). One set for each access door.	Close Outs
222300 PACO-001	Plumbing & HVAC Systems - Close Outs	222300-71	237416	5 year manufacturer warranty on heat exchangers (rooftop air conditioning units).	Close Outs
222300 PACO-001	Plumbing & HVAC Systems - Close Outs	222300-72	238239.13	Operation and maintenance data on cabinet unit heaters.	Close Outs
222300-001	Plumbing & HVAC Systems - Submittals	222300-73	078413	Product data on penetration firestopping.	Submittals
222300-001	Plumbing & HVAC Systems - Submittals	222300-74	220553	Product data, valve numbering scheme and valve schedules on identification for plumbing piping and equipment.	Submittals
222300-001	Plumbing & HVAC Systems - Submittals	222300-75	220719	Product data on plumbing piping insulation.	Submittals
222300-001	Plumbing & HVAC Systems - Submittals	222300-76	221116	Product data on domestic water piping.	Submittals
222300-001	Plumbing & HVAC Systems - Submittals	222300-77	221119	Product data on domestic water piping specialties.	Submittals
222300-001	Plumbing & HVAC Systems - Submittals	222300-78	221316	Product data on sanitary waste and vent piping.	Submittals
222300-001	Plumbing & HVAC Systems - Submittals	222300-79	221319	Product data on sanitary waste piping specialties.	Submittals
222300-001	Plumbing & HVAC Systems - Submittals	222300-80	221319.13	Product data on sanitary drains.	Submittals
222300-001	Plumbing & HVAC Systems - Submittals	222300-81	221413	Product data on facility storm drainage piping.	Submittals
222300-001	Plumbing & HVAC Systems - Submittals	222300-82	221423	Product data on storm drainage piping specialties.	Submittals
222300-001	Plumbing & HVAC Systems - Submittals	222300-83	223400	Product data on fuel-fired, domestic water heaters.	Submittals
222300-001	Plumbing & HVAC Systems - Submittals	222300-84	224213.13	Product data on commercial water closets.	Submittals
222300-001	Plumbing & HVAC Systems - Submittals	222300-85	224213.16	Product data on commercial urinals.	Submittals
222300-001	Plumbing & HVAC Systems - Submittals	222300-86	224216.13	Product data on commercial lavatories.	Submittals
222300-001	Plumbing & HVAC Systems - Submittals	222300-87	224216.16	Product data on commercial sinks.	Submittals
222300-001	Plumbing & HVAC Systems - Submittals	222300-88	224500	Product data on emergency plumbing fixtures.	Submittals
222300-001	Plumbing & HVAC Systems - Submittals	222300-89	224716	Product data on pressure water coolers.	Submittals
222300-001	Plumbing & HVAC Systems - Submittals	222300-90	230593	Preliminary TAB reports.	Submittals
222300-001	Plumbing & HVAC Systems - Submittals	222300-91	230713	Product data on duct insulation.	Submittals
222300-001	Plumbing & HVAC Systems - Submittals	222300-92	230923	Product data on building automation systems (BAS) for HVAC.	Submittals
222300-001	Plumbing & HVAC Systems - Submittals	222300-93	230923	Shop drawings on building automation systems (BAS) for HVAC.	Submittals
222300-001	Plumbing & HVAC Systems - Submittals	222300-94	231123	Product data on facility natural gas piping.	Submittals
222300-001	Plumbing & HVAC Systems - Submittals	222300-95	233113	Product data and shop drawings on metal ducts.	Submittals
222300-001	Plumbing & HVAC Systems - Submittals	222300-96	233300	Product data on air duct accessories.	Submittals
222300-001	Plumbing & HVAC Systems - Submittals	222300-97	233346	Product data on flexibile ducts.	Submittals
222300-001	Plumbing & HVAC Systems - Submittals	222300-98	233423	Product data on HVAC power ventilators.	Submittals
222300-001	Plumbing & HVAC Systems - Submittals	222300-99	233713.13	Product data on air diffusers.	Submittals
222300-001	Plumbing & HVAC Systems - Submittals	222300-100	233723	Product data and shop drawings on HVAC gravity ventilators.	Submittals
222300-001	Plumbing & HVAC Systems - Submittals	222300-101	235416.13	Product data and shop drawings on gas fired furnaces.	Submittals
222300-001	Plumbing & HVAC Systems - Submittals	222300-102	235533.16	Product data and shop drawings on gas fired unit heaters.	Submittals
222300-001	Plumbing & HVAC Systems - Submittals	222300-103	237223.19	Product data and shop drawings on packaged indoor fixed plate energy recovery units.	Submittals
222300-001	Plumbing & HVAC Systems - Submittals	222300-104	237416	Product data and shop drawings on packaged rooftop air conditioning units.	Submittals
222300-001	Plumbing & HVAC Systems - Submittals	222300-105	238239.13	Product data and shop drawings on cabinet unit heaters.	Submittals

Bid Division: 260000 – Electrical

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 262419 – Motor Control
Section 262726 – Wiring Devices
Section 262816 – Enclosed Switches and Circuit Breakers
Section 265100 – Interior Lighting
Section 265600 – Exterior Lighting
Section 271501 – Basic Cabling Requirements
Section 271513 – Network and Communication Cabling

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

Section 024119 – Selective Demolition (Demolition of electrical components)
Section 033000 – Cast In Place Concrete (Provide concrete for cut and patch areas; light pole bases)
Section 078413 – Penetration Firestopping
Section 079200 – Joint Sealants

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

All 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. 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.

Bid Division: 260000 – Electrical

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

Division Inclusions:

1. Contractor shall maintain existing electrical systems in fully functional order in all areas of the building during the duration of the project.
2. Contractor shall coordinate with utility company for purchase and installation of exterior transformers and associated work, if required.
3. Contractor shall coordinate with concrete contractor for locations of housekeeping pads and transformer pads. Concrete is by concrete contractor, layout and coordination is by electrical contractor.
4. Contractor shall furnish and install temporary insulated weather-tight closures of openings created as a result of the work in this scope in exterior surfaces to provide acceptable working conditions and protection for materials, to allow temporary heating, and building security.
5. Contractor is responsible for disconnecting, removing and legal and proper off site disposal of all indicated existing light fixtures including ballasts and bulbs. Ballasts shall be assumed to contain PCB's. Provide Owner with appropriate documentation of disposal.
6. Remove, clean and reinstall light fixtures where indicated.
7. Removal of electrical line power pole to old portable location.
8. Concrete Patching for mechanical and electrical trades by Bid Division 15000 and 16000.
9. Selective Demolition.
10. No concrete is to be installed until verification of acceptable density testing. Any concrete installed without density verification will become the sole responsibility of the Contractor and may be required to be replaced at the Contractor's expense.
11. Provide hook-up, final connection and interlocks for kitchen exhaust fan and kitchen make-up air units to hood controls.
12. Provide all permits required.

Bid Division: 260000 – Electrical

13. Supply and install exterior lights. (Including parking lot light bases.)
14. Remove spoils from site.
15. Provide all means necessary to provide temporary transformers to keep the school in operation before the final power turnover is complete.
16. Provide all cutting and patching required for existing tie-ins.
17. Maintain fire rating at all walls penetrated.
18. All excavation, backfill, compaction, and disposal of spoil for any electrical work placed below finish grade.
19. Coordinate with other trades for rough-in locations.
20. Provide temporary lighting and power distribution. A minimum of 100 watts of temporary lighting per 250 SF of floor area.
21. Provide all plywood or nailers required for mounting of electrical, audio, fire alarm or phone equipment.
22. Furnish any access hatches to mason and drywall contractors for installation required for electrical work.
23. Final hook-up of all equipment for other disciplines of work.
24. Patch all demolished areas affected by the electrical demolition to a condition ready to receive finish materials (finish materials by others, i.e. tile, carpet, etc.).
25. Perform all required demolition required for this trade as shown and specified.
26. Furnish and install all light and power fixtures in cabinetry.
27. Provide all final connection for kitchen equipment.
28. Supply and install a complete & operational fire protection alarm system.
29. Contractor is responsible for complete code compliance of Fire Alarm System.
30. Provide “As Built” Drawings for work.
31. Provide shop drawings to State Fire Marshal Plan Review or governing authority (allowing sufficient time for changes that may be made and must be completed prior to beneficial occupancy.)
32. Provide proper repair of all damaged ceilings, walls, floors, etc., when installing new fixtures.
33. Install pull box and chase conduit for temp control.
34. Provide Owner with training of new equipment.

Project Inclusions:

1. Review the milestone schedules. This bid division’s work will be required to be completed at multiple locations and concurrently for some of the work. Prepare your bid proposal accordingly to allow for sufficient manpower and resources.
2. Include costs for all required permits in bid proposal.
3. Provide all required electrical demolition work as documented and for the completion of the new work.
4. Provide all required temporary power and lighting.
5. Remove all existing concrete, drywall, masonry, etc. as required for the installation of new electrical work unless the demolition scope of work is specifically indicated in the documents to be performed by another bid division.
6. Provide all required patching work associated with the installation of electrical work unless the patching scope of work is specifically indicated in the documents to be performed by another bid division.
7. Furnish and install all required backer boards for electrical equipment, fire rated as documented.
8. Provide all required coordination with other Bid Division contractors for installation of all electrical materials and equipment prior to the work commencing.
9. Provide all required power disconnection at existing mechanical equipment and new power connections for new mechanical equipment.
10. Provide final electrical connection for all equipment.
11. Provide service and connections for electric water coolers.
12. Provide all required demolition of electrical items. Salvage as documented.
13. Provide all required fire alarm / detection items. Provide all required paperwork, payments, certification coordination with Office of Fire Safety and the State Fire Marshal.

Bid Division: 260000 – Electrical

14. Furnish and install intercom and clocks at the additions and renovated areas.
15. Provide power to card reader as required.
16. Furnish and install all lighting control systems and provide Owner training of systems.
17. Furnish and install all conduits for cabling and data outlets as documented.
18. Furnish and install all required raceways and wire mold as documented.
19. Provide power and connection to door hold opens and connect to fire alarm system.
20. Furnish and install all smoke detectors.
21. Furnish access doors as required for installation by other contractors.
22. Provide and install all low voltage wiring and connections. **Owners access control contractor to make final connections for access control.**
23. This contractor will be required to provide information pertaining to the energy incentive program of the utility company.
24. This bid division is responsible for all cabling work for this project and all final connections to devices and equipment.
25. Must provide all submittals within 15 working days of contract award or sooner, unless specifically clarified with the construction manager prior to contract award.
26. Mandatory attendance at all required pre-installation meetings.
27. Completion of all punch list work within 5 working days or less upon receipt of punch list items, unless specific circumstances occur that are out of control of this bid division contractor dictate otherwise.

Consideration for award:

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

END OF BID DIVISION 260000

Package #	Package	Number	Spec #	Title	Type
260000 PA-001	Electrical - Start Ups	260000-01	260000-01	Signed Post Bid Interview Form	Start Ups
260000 PA-001	Electrical - Start Ups	260000-02	260000-02	Schedule of Values	Start Ups
260000 PA-001	Electrical - Start Ups	260000-03	260000-03	Signed Contracts Returned	Start Ups
260000 PA-001	Electrical - Start Ups	260000-04	260000-04	Payment/Performance Bonds	Start Ups
260000 PA-001	Electrical - Start Ups	260000-05	260000-05	Certificate of Insurance	Start Ups
260000 PA-001	Electrical - Start Ups	260000-06	260000-06	Employee List	Start Ups
260000 PA-001	Electrical - Start Ups	260000-07	260000-07	Safety Policy	Start Ups
260000 PA-001	Electrical - Start Ups	260000-08	260000-08	SDS Sheets	Start Ups
260000 PA-001	Electrical - Start Ups	260000-09	260000-09	Certificate of Subcontractor & Supplier	Start Ups
260000 PA-001	Electrical - Start Ups	260000-10	260000-10	AHERA Notification and Contractor Compliance Affidavit	Start Ups
260000 PA-001	Electrical - Start Ups	260000-11	260000-11	Electrical Permit	Start Ups
260000 PACO-001	Electrical - Close Outs	260000-12	260000-12	Contractor (2) Year Guarantee	Close Outs
260000 PACO-001	Electrical - Close Outs	260000-13	260000-13	Consent of Surety	Close Outs
260000 PACO-001	Electrical - Close Outs	260000-14	260000-14	Certificate of Substantial Completion	Close Outs
260000 PACO-001	Electrical - Close Outs	260000-15	260000-15	Completed Punch List	Close Outs
260000 PACO-001	Electrical - Close Outs	260000-16	260000-16	As Built Drawings	Close Outs
260000 PACO-001	Electrical - Close Outs	260000-17	260000-17	All Processed Change Orders Returned	Close Outs
260000 PACO-001	Electrical - Close Outs	260000-18	260000-18	Current Certificate of Insurance	Close Outs
260000 PACO-001	Electrical - Close Outs	260000-19	260000-19	Signed Hazardous Materials Compliance Affidavit	Close Outs
260000 PACO-001	Electrical - Close Outs	260000-20	260000-20	Signed Asbestos Free Affidavit	Close Outs
260000 PACO-001	Electrical - Close Outs	260000-21	260000-21	All Other Warranties Required	Close Outs
260000 PACO-001	Electrical - Close Outs	260000-22	260000-22	Operations & Maintenance Manuals	Close Outs
260000 PACO-001	Electrical - Close Outs	260000-23	260000-23	Replacement Parts turned over to Owner	Close Outs
260000 PACO-001	Electrical - Close Outs	260000-24	260000-24	Inspections & Certificates	Close Outs
260000 PACO-001	Electrical - Close Outs	260000-25	260000-25	Electrical Certificate of Acceptance	Close Outs
260000 PACO-001	Electrical - Close Outs	260000-26	262416	Extra materials on keys (panelboards). Furnish 2 to each Owner.	Close Outs
260000 PACO-001	Electrical - Close Outs	260000-27	262419	Operation and maintenance data on motor control.	Close Outs
260000 PACO-001	Electrical - Close Outs	260000-28	262419	Extra materials on fuses (motor control). Furnish 3 of each type.	Close Outs
260000 PACO-001	Electrical - Close Outs	260000-29	265100	Manufacturer installation instructions on interior lighting.	Close Outs
260000 PACO-001	Electrical - Close Outs	260000-30	265600	Manufacturer installation instructions on exterior lighting.	Close Outs
260000 PACO-001	Electrical - Close Outs	260000-31	271513	Project record documents on network and communication cabling.	Close Outs
260000 PACO-001	Electrical - Close Outs	260000-32	271513	Project warranty on network and communication cabling.	Close Outs
260000-001	Electrical - Submittals	260000-33	260526	Product data and field test reports on grounding and bonding.	Submittals
260000-001	Electrical - Submittals	260000-34	262416	Shop drawings on panelboards.	Submittals
260000-001	Electrical - Submittals	260000-35	262419	Product data and shop drawings on motor control.	Submittals
260000-001	Electrical - Submittals	260000-36	262726	Product data on wiring devices.	Submittals
260000-001	Electrical - Submittals	260000-37	262816	Product data on enclosed switches and circuit breakers.	Submittals
260000-001	Electrical - Submittals	260000-38	265100	Product data on interior lighting.	Submittals
260000-001	Electrical - Submittals	260000-39	265600	Product data on exterior lighting.	Submittals
260000-001	Electrical - Submittals	260000-40	271501	Product data and shop drawings on basic cabling.	Submittals
260000-001	Electrical - Submittals	260000-41	271513	Product data and test reports on network and communication cabling.	Submittals

Bid Division: 310000 – Site Work

Bid to Include:

Total Responsibility for Specification Sections:

Total Responsibility for Specification Sections:

Section 003121 – Site Survey Information
Section 003132 – Geotechnical Data
Section 012200 – Unit Prices
Section 024200 – Selective Demolition
Section 311000 – Site Clearing
Section 312000 – Earth Moving
Section 312300 – Football Field Equipment
Section 312319 – Dewatering
Section 315000 – Excavation Support and Protection
Section 329200 – Turf Restoration
Section 331416 – Site Water Utility Distribution Piping
Section 333100 – Sanitary Sewers
Section 334200 – Storm Utility Drainage Piping

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

Section 078413 – Penetration Firestopping
Section 079200 – Joint Sealants

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

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

General Inclusions:

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

Bid Division: 310000 – Site Work

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

Division Inclusions:

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

Bid Division: 310000 – Site Work

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

Project Inclusions:

1. Review the milestone schedules. This bid division's work will be required to be completed at multiple locations and concurrently for some of the work. Prepare your bid proposal accordingly to allow for sufficient manpower and resources.
2. Provide all required permits. Soil Erosion permit will be provided by this contractor. This contractor is responsible for installation of all required soil erosion materials and all maintaining, monitoring and reporting required for the erosion and sedimentation control permit for the entire duration of the project. Provide inlet filters at all storm catch basins.
3. Remove storm lines and sanitary lines as documented.
4. Remove rock rip rap as indicated.
5. Install sediment control silt fence. Once the turf is established and final approvals have been received, remove.
6. Install sediment control, inlet protection, and filter drop at catch basins. Upon completion of the project, remove and clean all accumulated sediment at catch basins as documented.
7. All concrete stoops and walks to be removed by this Bid Division.
8. Provide all required saw-cutting and removal of asphalt and concrete material.
9. Provide all stripping of site materials as required for the installation of new work.
10. Provide all required proof rolling of existing soil.
11. Provide all required stone and sand fill and compaction as required.
12. Provide all required re-grading with fill and removal as necessary to achieve revised grades as documented.
13. Provide all required water, storm sewer and sanitary sewer work 5' outside building wall line unless noted otherwise.
14. Provide and install temporary traffic tracking pads at drives entrances.
15. Provide traffic control as needed.
16. Provide sand base for walks, drives, parking area, and building pad as documented.
17. Furnish and install new storm catch basins – with underdrains.
18. Furnish and install all storm and sanitary piping.
19. Tap and connect into exiting sanitary manhole as indicated.
20. Furnish and install flared end section with rip rap.

Bid Division: 310000 – Site Work

21. Furnish and install washed stone on fabric weed barrier as documented.
22. Install rip rap lined swales as indicated.
23. Furnish and install all rip rap stone material as documented.
24. Adjust storm catch basins to grade including installing concrete apron and under drainage as documented.
25. Furnish and install Football Field Equipment. Provide goal post sleeve to install in concrete footing by concrete contractor.
26. Furnish and install monument marker, complete, as documented.
27. Provide all required topsoil and fine grading as necessary for the installation of hydroseeding.
28. Patching of existing asphalt drive disturbed during construction if caused by this Bid Division.
29. Provide complete turf restoration including all removal and prep of existing surface and all required watering and fertilizing until the seed is established.
30. Must provide all submittals within 15 working days of contract award or sooner, unless specifically clarified with the construction manager prior to contract award.
31. Mandatory attendance at all required pre-installation meetings.
32. Completion of all punch list work within 5 working days or less upon receipt of punch list items, unless specific circumstances occur that are out of control of this bid division contractor dictate otherwise.

ALTERNATE PRICING FOR ADDITIONAL PARKING

Excludes:

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

Consideration for award:

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

END OF BID DIVISION 310000

Package #	Package	Number	Spec #	Title	Type
310000 PA-001	Site Work - Start Ups	310000-01	310000-01	Signed Post Bid Interview Form	Start Ups
310000 PA-001	Site Work - Start Ups	310000-02	310000-02	Schedule of Values	Start Ups
310000 PA-001	Site Work - Start Ups	310000-03	310000-03	Signed Contracts Returned	Start Ups
310000 PA-001	Site Work - Start Ups	310000-04	310000-04	Payment/Performance Bonds	Start Ups
310000 PA-001	Site Work - Start Ups	310000-05	310000-05	Certificate of Insurance	Start Ups
310000 PA-001	Site Work - Start Ups	310000-06	310000-06	Employee List	Start Ups
310000 PA-001	Site Work - Start Ups	310000-07	310000-07	Safety Policy	Start Ups
310000 PA-001	Site Work - Start Ups	310000-08	310000-08	SDS Sheets	Start Ups
310000 PA-001	Site Work - Start Ups	310000-09	310000-09	Certificate of Subcontractor & Supplier	Start Ups
310000 PA-001	Site Work - Start Ups	310000-10	310000-10	AHERA Notification and Contractor Compliance Affidavit	Start Ups
310000 PACO-001	Site Work - Close Outs	310000-11	310000-11	Contractor (2) Year Guarantee	Close Outs
310000 PACO-001	Site Work - Close Outs	310000-12	310000-12	Consent of Surety	Close Outs
310000 PACO-001	Site Work - Close Outs	310000-13	310000-13	Certificate of Substantial Completion	Close Outs
310000 PACO-001	Site Work - Close Outs	310000-14	310000-14	Completed Punch List	Close Outs
310000 PACO-001	Site Work - Close Outs	310000-15	310000-15	As Built Drawings	Close Outs
310000 PACO-001	Site Work - Close Outs	310000-16	310000-16	All Processed Change Orders Returned	Close Outs
310000 PACO-001	Site Work - Close Outs	310000-17	310000-17	Current Certificate of Insurance	Close Outs
310000 PACO-001	Site Work - Close Outs	310000-18	310000-18	Signed Hazardous Materials Compliance Affidavit	Close Outs
310000 PACO-001	Site Work - Close Outs	310000-19	310000-19	Signed Asbestos Free Affidavit	Close Outs
310000 PACO-001	Site Work - Close Outs	310000-20	310000-20	All Other Warranties Required	Close Outs
310000 PACO-001	Site Work - Close Outs	310000-21	310000-21	Operations & Maintenance Manuals	Close Outs
310000 PACO-001	Site Work - Close Outs	310000-22	310000-22	Replacement Parts turned over to Owner	Close Outs
310000 PACO-001	Site Work - Close Outs	310000-23	310000-23	Inspections & Certificates	Close Outs
310000 PACO-001	Site Work - Close Outs	310000-24	312300	Maintenance data on athletic equipment.	Close Outs
310000-001	Site Work - Submittals	310000-25	024119	Schedule of selective demolition activities.	Submittals
310000-001	Site Work - Submittals	310000-26	312000	Materials source on imported fill materials suppliers (earthmoving).	Submittals
310000-001	Site Work - Submittals	310000-27	312300	Product data and shop drawings on football field equipment.	Submittals
310000-001	Site Work - Submittals	310000-28	312319	Shop drawings on dewatering system.	Submittals
310000-001	Site Work - Submittals	310000-29	315000	Shop drawings on excavation support and protection.	Submittals
310000-001	Site Work - Submittals	310000-30	329200	Product data and certifications on topsoil, grass seed, mulch and fertilizer.	Submittals
310000-001	Site Work - Submittals	310000-31	331416	Product data on site water utility distribution piping.	Submittals
310000-001	Site Work - Submittals	310000-32	333100	Product data and shop drawing on sanitary sewers.	Submittals
310000-001	Site Work - Submittals	310000-33	334200	Product data and shop drawings on storm utility drainage piping.	Submittals

Bid Division: 321200 – Asphalt Paving

Bid to Include:

Section 321216 – Asphalt Paving
Section 321415 – Pavement Markings

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

Section 312000 – Earth Moving (As it related to fine grading)

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:

Fine grading of parking lot base, asphalt concrete paving, lot stripes and markings, final clean of parking lot prior to Owner occupancy.

General Inclusions:

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

Bid Division: 321200 – Asphalt Paving

15. Coordinate delivery of materials with Construction Manager (48 hours) in advance of the delivery, and provide proper personnel and equipment to perform the unloading.
16. Contractor shall submit to the field construction manager a complete written daily field report stating the work being done on site and the number of employees performing the work for each day the Contractor has representatives on site.
17. Contractor shall have a supervisor on site at all times when a crew is present on the job.
18. On Friday, or last workday of each week, the Contractor must update the Master Copy of As-Builts, as it applies to the work of their Bid Division.
19. **Wolgast uses a web-based construction 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. Include temporary barricades as required.
2. Placement of asphalt paving.
3. Pavement markings and striping.
4. Finish grading of gravel and preparation for all placement of asphalt paving.
5. Provide cleaning of base coat prior to application of finish coat.
6. Final cleaning of parking lot prior to Owner occupancy.
7. Final adjustment of all structures within the paved areas, prior to topcoat being applied.
8. Back dressing of areas affected by the placement of asphalt pavement.

Project Inclusions:

1. Review the milestone schedules. Prepare your bid proposal accordingly to allow for sufficient manpower and resources.
2. Provide all required barricades and traffic control during the performance of this bid division's work.
3. Provide all required fine grading prior to placement of asphalt material. Provide watering of stone base if necessary to achieve final compaction during fine grading immediately prior to placement of asphalt.
4. Provide all pavement markings and striping.
5. Must repair all concrete work damaged during the installation of the asphalt work.
6. Provide all cleaning of leveling course and asphalt binder between leveling and wearing courses, if the courses are placed at different times.
7. Repair and reseed all lawn areas damaged during the installation of the asphalt work.
8. Must provide all submittals within 15 working days of contract award or sooner, unless specifically clarified with the construction manager prior to contract award.
9. Mandatory attendance at all required pre-installation meetings.
10. Completion of all punch list work within 5 working days or less upon receipt of punch list items, unless specific circumstances occur that are out of control of this bid division contractor dictate otherwise.

ALTERNATE PRICING FOR ADDITIONAL PARKING

Excludes:

1. Asphalt Testing
2. Compaction Testing.

Bid Division: 321200 – Asphalt Paving

Consideration for award:

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

END OF BID DIVISION 321200

Package #	Package	Number	Spec #	Title	Type
321200 PA-001	Asphalt Paving - Start Ups	321200-01	321200-01	Signed Post Bid Interview Form	Start Ups
321200 PA-001	Asphalt Paving - Start Ups	321200-02	321200-02	Schedule of Values	Start Ups
321200 PA-001	Asphalt Paving - Start Ups	321200-03	321200-03	Signed Contracts Returned	Start Ups
321200 PA-001	Asphalt Paving - Start Ups	321200-04	321200-04	Payment/Performance Bonds	Start Ups
321200 PA-001	Asphalt Paving - Start Ups	321200-05	321200-05	Certificate of Insurance	Start Ups
321200 PA-001	Asphalt Paving - Start Ups	321200-06	321200-06	Employee List	Start Ups
321200 PA-001	Asphalt Paving - Start Ups	321200-07	321200-07	Safety Policy	Start Ups
321200 PA-001	Asphalt Paving - Start Ups	321200-08	321200-08	SDS Sheets	Start Ups
321200 PA-001	Asphalt Paving - Start Ups	321200-09	321200-09	Certificate of Subcontractor & Supplier	Start Ups
321200 PA-001	Asphalt Paving - Start Ups	321200-10	321200-10	AHERA Notification and Contractor Compliance Affidavit	Start Ups
321200 PACO-001	Asphalt Paving - Close Outs	321200-11	321200-11	Contractor (2) Year Guarantee	Close Outs
321200 PACO-001	Asphalt Paving - Close Outs	321200-12	321200-12	Consent of Surety	Close Outs
321200 PACO-001	Asphalt Paving - Close Outs	321200-13	321200-13	Certificate of Substantial Completion	Close Outs
321200 PACO-001	Asphalt Paving - Close Outs	321200-14	321200-14	Completed Punch List	Close Outs
321200 PACO-001	Asphalt Paving - Close Outs	321200-15	321200-15	As Built Drawings	Close Outs
321200 PACO-001	Asphalt Paving - Close Outs	321200-16	321200-16	All Processed Change Orders Returned	Close Outs
321200 PACO-001	Asphalt Paving - Close Outs	321200-17	321200-17	Current Certificate of Insurance	Close Outs
321200 PACO-001	Asphalt Paving - Close Outs	321200-18	321200-18	Signed Hazardous Materials Compliance Affidavit	Close Outs
321200 PACO-001	Asphalt Paving - Close Outs	321200-19	321200-19	Signed Asbestos Free Affidavit	Close Outs
321200 PACO-001	Asphalt Paving - Close Outs	321200-20	321200-20	All Other Warranties Required	Close Outs
321200 PACO-001	Asphalt Paving - Close Outs	321200-21	321200-21	Operations & Maintenance Manuals	Close Outs
321200 PACO-001	Asphalt Paving - Close Outs	321200-22	321200-22	Replacement Parts turned over to Owner	Close Outs
321200 PACO-001	Asphalt Paving - Close Outs	321200-23	321200-23	Inspections & Certificates	Close Outs
321200-001	Asphalt Paving - Submittals	321200-24	321216	Asphalt and concrete mix designs.	Submittals
321200-001	Asphalt Paving - Submittals	321200-25	321216	Certification of quality on aggregates, asphalt cement, pavement marking material, prime coat and bond coat.	Submittals
321200-001	Asphalt Paving - Submittals	321200-26	321415	Product data on pavement marking.	Submittals

Bid Division: 321800 – All Weather Synthetic Track Surface

Bid to Include:

Total Responsibility for Specification Sections

Section 003121 – Site Survey Information
Section 003132 – Geotechnical Data
Section 321220 – Track Surface and Marking

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:

Track surface installation with all markings.

General Inclusions:

1. There is no general contractor associated with this project; any and all reference to a "general contractor" related to the work of this bid division shall be understood to mean the contractor of this bid division.
2. The contractor for this bid division work is required to include but is not limited to all items, services, tasks, materials, personnel, equipment, etc. identified in this bid division description regardless of the presence of language in other bid division descriptions that is the same or is similar to that found in this contractor's bid division description.
3. Coordination of the work of this bid division with any and all work of other bid division contractors for the scheduling and integration of the work of this contractor.
4. All contractors are responsible for the entire set of plans and specifications; including tables, schedules, and notes.
5. Provide continuous housekeeping and clean-up, and proper legal off-site disposal of any debris generated by this Bid Division's work.
6. Contractor is responsible for own dumpster(s) and all removal and disposal charges thereof. (Use of the Owner's dumpsters is strictly prohibited.)
7. All Contractors are required to inspect the existing project components and are to include all work necessary to complete the work to deliver a fully operational system in compliance with all governing codes.
8. This Contractor shall be responsible for performing all work in full compliance with all health and safety standards including Asbestos Awareness and Notification, Lead Paint Abatement, and all MIOSHA Standards. This Contractor shall also be responsible for satisfying all safety violations and/or fines resulting from the actions or lack of action by this Contractor at the sole expense of this Contractor.
9. Any contractor who compounds a mistake by installing their product on another Contractor's obvious faulty work will assume responsibility for repair of said work.
10. This contractor shall repair and restore any damaged area to an original or better condition with no detectable evidence that the area has been repaired. Repairs must be done by personnel qualified in the execution of the work skilled and licensed in that trade. Whenever possible, repairs to work shall be done by the original installer of the work.
11. Submittal of all insurance, unit pricing, schedule of values, required product data and shop drawings within (2) two weeks of Owner's Notice to commence work.
12. Must provide all submittals within 15 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.

Bid Division: 321800 – All Weather Synthetic Track Surface

16. Contractor shall submit to the field construction manager a complete written daily field report stating the work being done on site and the number of employees performing the work for each day the Contractor has representatives on site.
17. Contractor shall have a supervisor on site at all times when a crew is present on the job.
18. On Friday, or last workday of each week, the Contractor must update the Master Copy of As-Builts, as it applies to the work of their Bid Division.
19. **Wolgast uses Web based construction 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. All markings and striping.
2. Field Events.
3. Provide engineered layout of all event markings.

Project Inclusions:

1. Review the milestone schedules. This bid division's work will be required to be completed at multiple locations and concurrently for some of the work. Prepare your bid proposal accordingly to allow for sufficient manpower and resources to meet the completion date. If overtime work is required to keep the project on schedule, this contractor shall include any overtime or premium rates in their bid proposal as necessary. Note that the timing of all tasks may change as required to stay on schedule and no contractor shall cause a delay in meeting their own or any other contractor's obligations as it pertains to the milestone schedule. The milestone schedule will be used as a template to create the construction schedule once input has been received from all awarded contractors, however the completion dates as listed in milestone schedule will need to be achieved.
2. This contractor must accept the asphalt surface in writing prior to installing the track surface.
3. Must provide all submittals within 15 working days of contract award or sooner, unless specifically clarified with the construction manager prior to contract award.
4. Mandatory attendance at all required pre-installation meetings.
5. Completion of all punch list work within 5 working days or less upon receipt of punch list items, unless specific circumstances occur that are out of control of this bid division contractor dictate otherwise.
6. **Provide required manpower along with required work hours (including weekends if required) to meet the indicated schedule. There will be no cost compensation to meet schedule, if this contractor is behind the published milestone schedule.**

Consideration for award:

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

END OF BID DIVISION 321800

Package #	Package	Number	Spec #	Title	Type
321800 PA-001	All Weather Synthetic Track Surface - Start Ups	321800-01	321800-01	Signed Post Bid Interview Form	Start Ups
321800 PA-001	All Weather Synthetic Track Surface - Start Ups	321800-02	321800-02	Schedule of Values	Start Ups
321800 PA-001	All Weather Synthetic Track Surface - Start Ups	321800-03	321800-03	Signed Contracts Returned	Start Ups
321800 PA-001	All Weather Synthetic Track Surface - Start Ups	321800-04	321800-04	Payment/Performance Bonds	Start Ups
321800 PA-001	All Weather Synthetic Track Surface - Start Ups	321800-05	321800-05	Certificate of Insurance	Start Ups
321800 PA-001	All Weather Synthetic Track Surface - Start Ups	321800-06	321800-06	Employee List	Start Ups
321800 PA-001	All Weather Synthetic Track Surface - Start Ups	321800-07	321800-07	Safety Policy	Start Ups
321800 PA-001	All Weather Synthetic Track Surface - Start Ups	321800-08	321800-08	SDS Sheets	Start Ups
321800 PA-001	All Weather Synthetic Track Surface - Start Ups	321800-09	321800-09	Certificate of Subcontractor & Supplier	Start Ups
321800 PA-001	All Weather Synthetic Track Surface - Start Ups	321800-10	321800-10	AHERA Notification and Contractor Compliance Affidavit	Start Ups
321800 PACO-001	All Weather Synthetic Track Surface - Close Outs	321800-11	321800-11	Contractor (2) Year Guarantee	Close Outs
321800 PACO-001	All Weather Synthetic Track Surface - Close Outs	321800-12	321800-12	Consent of Surety	Close Outs
321800 PACO-001	All Weather Synthetic Track Surface - Close Outs	321800-13	321800-13	Certificate of Substantial Completion	Close Outs
321800 PACO-001	All Weather Synthetic Track Surface - Close Outs	321800-14	321800-14	Completed Punch List	Close Outs
321800 PACO-001	All Weather Synthetic Track Surface - Close Outs	321800-15	321800-15	As Built Drawings	Close Outs
321800 PACO-001	All Weather Synthetic Track Surface - Close Outs	321800-16	321800-16	All Processed Change Orders Returned	Close Outs
321800 PACO-001	All Weather Synthetic Track Surface - Close Outs	321800-17	321800-17	Current Certificate of Insurance	Close Outs
321800 PACO-001	All Weather Synthetic Track Surface - Close Outs	321800-18	321800-18	Signed Hazardous Materials Compliance Affidavit	Close Outs
321800 PACO-001	All Weather Synthetic Track Surface - Close Outs	321800-19	321800-19	Signed Asbestos Free Affidavit	Close Outs
321800 PACO-001	All Weather Synthetic Track Surface - Close Outs	321800-20	321800-20	All Other Warranties Required	Close Outs
321800 PACO-001	All Weather Synthetic Track Surface - Close Outs	321800-21	321800-21	Operations & Maintenance Manuals	Close Outs
321800 PACO-001	All Weather Synthetic Track Surface - Close Outs	321800-22	321800-22	Replacement Parts turned over to Owner	Close Outs
321800 PACO-001	All Weather Synthetic Track Surface - Close Outs	321800-23	321800-23	Inspections & Certificates	Close Outs
321800 PACO-001	All Weather Synthetic Track Surface - Close Outs	321800-24	321220	5 year warranty on synthetic track surfacing system.	Close Outs
321800-001	All Weather Synthetic Track Surface - Submittals	321800-25	321220	Samples on track surface. Please see specifications for more details.	Submittals
321800-001	All Weather Synthetic Track Surface - Submittals	321800-26	321220	Affidavits and certifications on synthetic track and installer.	Submittals
321800-001	All Weather Synthetic Track Surface - Submittals	321800-27	321220	Shop drawings on track and markings.	Submittals

Bid Division: 323100 – Fencing

Bid to Include:

Total Responsibility for Specification Sections:

Section 003121 – Site Survey Information
Section 003132 – Geotechnical Data
Section 024119 – Selective Demolition
Section 323113 – Chain Link Fences and Gates

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

Section 033000 – Cast In Place Concrete (As it relates to the 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:

Metal fences and gates as complete units produced by a single manufacturer including necessary layout, erection accessories, fittings and fastenings for a complete operational system.

General Inclusions:

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

Bid Division: 323100 – Fencing

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

Division Inclusions:

1. Furnish and install fence as shown or indicated.
2. Furnish and install gates and latched as shown or indicated.
3. Furnish and install all necessary hardware, trim, fasteners, etc for a complete installation.
4. Excavate and remove from site the related fencing foundation spoil, as indicated.
5. All concrete bases for fence posts to be poured in "sona-tube" of size shown in plans and specifications.

Project Inclusions:

1. Review the milestone schedules. This bid division's work will be required to be completed at multiple locations and concurrently for some of the work. Prepare your bid proposal accordingly to allow for sufficient manpower and resources to meet the completion date. If overtime work is required to keep the project on schedule, this contractor shall include any overtime or premium rates in their bid proposal as necessary. Note that the timing of all tasks may change as required to stay on schedule and no contractor shall cause a delay in meeting their own or any other contractor's obligations as it pertains to the milestone schedule. The milestone schedule will be used as a template to create the construction schedule once input has been received from all awarded contractors, however the completion dates as listed in milestone schedule will need to be achieved.
2. This bid division responsible for fence demolition. Care to be taken with fencing that may be "re-installed" per drawings. Prior to disposal, insure owner's wishes for removed fencing, proper disposal of remaining fencing.
3. Insure proper installation and that all gates are working properly prior to owner turnover.
4. This contractor responsible for coring of asphalt for post installation. This contractor responsible for repair of damaged asphalt during installation of fencing.
5. Must provide all submittals within 15 working days of contract award or sooner, unless specifically clarified with the construction manager prior to contract award.
6. Mandatory attendance at all required pre-installation meetings.
7. Completion of all punch list work within 5 working days or less upon receipt of punch list items, unless specific circumstances occur that are out of control of this bid division contractor dictate otherwise.
8. **Provide required manpower along with required work hours (including weekends if required) to meet the indicated schedule. There will be no cost compensation to meet schedule, if this contractor is behind the published milestone schedule.**

Bid Division: 323100 - Fencing

Consideration for award:

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

END OF BID DIVISION 323100

Package #	Package	Number	Spec #	Title	Type
323100 PA-001	Fencing - Start Ups	323100-01	323100-01	Signed Post Bid Interview Form	Start Ups
323100 PA-001	Fencing - Start Ups	323100-02	323100-02	Schedule of Values	Start Ups
323100 PA-001	Fencing - Start Ups	323100-03	323100-03	Signed Contracts Returned	Start Ups
323100 PA-001	Fencing - Start Ups	323100-04	323100-04	Payment/Performance Bonds	Start Ups
323100 PA-001	Fencing - Start Ups	323100-05	323100-05	Certificate of Insurance	Start Ups
323100 PA-001	Fencing - Start Ups	323100-06	323100-06	Employee List	Start Ups
323100 PA-001	Fencing - Start Ups	323100-07	323100-07	Safety Policy	Start Ups
323100 PA-001	Fencing - Start Ups	323100-08	323100-08	SDS Sheets	Start Ups
323100 PA-001	Fencing - Start Ups	323100-09	323100-09	Certificate of Subcontractor & Supplier	Start Ups
323100 PA-001	Fencing - Start Ups	323100-10	323100-10	AHERA Notification and Contractor Compliance Affidavit	Start Ups
323100 PACO-001	Fencing - Close Outs	323100-11	323100-11	Contractor (2) Year Guarantee	Close Outs
323100 PACO-001	Fencing - Close Outs	323100-12	323100-12	Consent of Surety	Close Outs
323100 PACO-001	Fencing - Close Outs	323100-13	323100-13	Certificate of Substantial Completion	Close Outs
323100 PACO-001	Fencing - Close Outs	323100-14	323100-14	Completed Punch List	Close Outs
323100 PACO-001	Fencing - Close Outs	323100-15	323100-15	As Built Drawings	Close Outs
323100 PACO-001	Fencing - Close Outs	323100-16	323100-16	All Processed Change Orders Returned	Close Outs
323100 PACO-001	Fencing - Close Outs	323100-17	323100-17	Current Certificate of Insurance	Close Outs
323100 PACO-001	Fencing - Close Outs	323100-18	323100-18	Signed Hazardous Materials Compliance Affidavit	Close Outs
323100 PACO-001	Fencing - Close Outs	323100-19	323100-19	Signed Asbestos Free Affidavit	Close Outs
323100 PACO-001	Fencing - Close Outs	323100-20	323100-20	All Other Warranties Required	Close Outs
323100 PACO-001	Fencing - Close Outs	323100-21	323100-21	Operations & Maintenance Manuals	Close Outs
323100 PACO-001	Fencing - Close Outs	323100-22	323100-22	Replacement Parts turned over to Owner	Close Outs
323100 PACO-001	Fencing - Close Outs	323100-23	323100-23	Inspections & Certificates	Close Outs
323100-001	Fencing - Submittals	323100-24	323113	Product data and certificates on chain link fences and gates.	Close Outs
323100-001	Fencing - Submittals	323100-25	323113	Shop drawings on chain link fences and gates.	Close Outs

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.** Request 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
Craig Myers (cra.mye@wolgast.com) and **Judy Rauch (jrauch@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: **Bid Pack No. 2 – Athletic Complex Renovations, Classroom Addition & Site Work**

Site Location: **Beal City Public Schools**

ITEM(S) FOR CLARIFICATION OF BID: (Please use one form for each item)
Please review and respond to the following item(s) for clarification:

_____

_____

_____

_____

RESPONSE: ☐ **ITEM TO BE INCLUDED IN ADDENDUM**

_____

_____

_____

_____

Construction Manager:_____
Signature Date

Architect:_____
Signature Date

END OF SECTION 00310

PART 1 – GENERAL

1.01 BID SECURITY

A. Each Proposal shall be accompanied by Bid Security pledging that the Bidder will enter into a contract with the Owner on the terms stated in the Proposal, and will, if required, furnish bonds as described in Section 00600. Should the Bidder refuse to enter into such contract or fail to furnish such Bonds, the amount of the Bid Security shall be forfeited to the Owner as liquidated damages, not as a penalty.

B. Bid Security shall be in the amount of five percent (5%) of the Base Bid(s).

C. Bid Security for each Proposal containing Bids for multiple Bid Divisions shall be in the amount of five percent (5%) of the total Base Bids for the highest-priced combination of Bid Divisions included in the Proposal

D. Bid Security may take the form of a **Bid Bond, a Cashier's Check, or a Money Order made payable to the Owner.** When submitting a Cashier's Check or Money Order a separate check or money order must accompany each Bid Division.

E. Bid Security that is in the form of a Cashier's Check or Money Order will be returned to Bidders within a reasonable period after construction contracts have been executed, returned and approved by the Owner.

END OF SECTION 00410

PART 1 – GENERAL

1.01 OWNER/CONTRACTOR AGREEMENT

A. The Agreement between the Owner and the Contractor will be written on the Owner's standard Owner/Contractor Agreement Form. A sample of this Form appears as Section 00510.

B. The Owner/Contractor Agreement Form will be filled in by the Owner, as appropriate for each Contractor and will be sent to each Contractor.

C. The executed Owner/Contractor Agreement, the General Conditions and the other Contract Documents will be the entire, integrated Contract between the Owner and each Contractor.

D. Upon receipt of an Owner/Contractor Agreement, each successful Bidder shall review it for completeness and accuracy, execute it and return it to the Owner's Representative for delivery to the Owner.

E. Each successful Bidder shall submit all required post-bid documents, including Labor and Material Payment Bond and Performance Bond (Section 00600) unless waived by the Owner, Certificates of Insurance (Section 00650), Schedule of Values (Section 00670), Subcontractor and Supplier Listing (Section 00680), and Employee Listing (Section 00690) as a prerequisite to execution of the Owner/Contractor Agreement

F. The Owner will execute each Owner/Contractor Agreement after it has been properly executed by the Bidder and after all required post-bid documents have been submitted.

1.02 NOTICE TO PROCEED

A. The Owner may elect to issue Notices to Proceed prior to the execution of Owner/Contractor Agreements.

B. Upon receipt of Notice to Proceed, each Contractor shall commence work in accord with the conditions contained in the Notice to Proceed

C. Regardless of the provisions of any Notice to Proceed or of this Section, no Contractor shall commence work until all required insurance is in force and Certificates of Insurance (Section 00650) have been submitted to the Owner's Representative for delivery to the Owner.

D. Prior to commencement of work, Contractors shall submit evidence satisfactory to the Owner that required bonds will be furnished and shall deliver the Bonds by the date the Contractor executes the Owner/Contractor Agreement.

E. The Owner may include Notice to Proceed in Purchase Orders.

1.03 COMMENCEMENT OF WORK

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

END OF SECTION 00500

SAMPLE OWNER-CONTRACTOR CONTRACT ON FOLLOWING PAGE

END OF SECTION 00510

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)

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) 790-9063

The Architect is:
(Name, legal status, address and other information)
«Architect_Name»
«Architect_Address»
«Architect_CSZ»
Telephone:
Facsimile:

The Owner and Contractor agree as set forth below.

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

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

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

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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, bid specifications, Owner-accepted portions of bid responses and attachments, thereto, 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	Bid Opening dated:	«Bid_Opening»
§ 2.4	Post-Bid Interview dated:	«Post_Bid_Interview_Date»
§ 2.5	Pre-Construction Meeting Agenda and Meeting Minutes dated:	«Pre_Con_Date»
§ 2.6	Performance Bond and Labor and Material Payment Bond required:	«Bond_Required»
§ 2.7	Project Start Date:	«Project_Start_Date»

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§ 2.8 Completion Date: «Completion_Date»

§ 2.9 All submittals and shop drawings required by the specifications must be submitted by: «Submittals_Due_By»

§ 2.10 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.).

§ 2.11 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.

§ 2.12 Other Special provisions: Article 8.6

§ 2.13 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.

§ 2.14 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 Painting (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 visits, 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 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. 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 Standards, (Part 603 of the Michigan State Standards). All costs associated with regulatory compliance shall be borne by the Contractor.

§ 2.15 This Contractor is responsible for all safety issues for all work that he has effected until this 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.)

_____, 202__

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»

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§ 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:

(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. The Contract Sum includes Base Bid, PLM Bonds, and Alternates.

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 in writing following execution of this Agreement. Upon the Owner's written acceptance, the accepted alternate shall constitue 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)

To the extent this Agreement includes unit prices, those unit prices shall be fixed for the entire term of this Agreement through Final Completion. Any increase in any unit price or any price in labor or materials shall be borne by the Contractor and shall not be passed on to the Owner or submitted to the Owner as a Change Order or otherwise reimbursed by the Owner. No additional mark-ups shall apply to unit prices.

§ 4.3 Contract Sum

The Owner agrees to pay and the Contractor agrees to accept the sum set forth in the Contract Sum as full compensation for all labor, supervision, equipment, home office and field overhead, materials, administrative and incidental expense required in executing all of the Work contemplated in this Agreement as set forth in the plans and specifications, including all loss or damage arising out of the Work, as impacted by the elements or from any

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obstruction, delay or difficulties which may be encountered. It is further agreed that the Work may be modified only in accordance with the Contract Documents. No claims for extra compensation or adjustments in the Contract Sum will be made by or due to the Contractor on account of delay, costs incurred as a result of variations within the as-planned schedule, or the failure of others to complete any of the Work as scheduled.

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 Construction Manager 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 schedule of values, unless objected to by the Construction Manager, shall be used as a basis for reviewing the Contractor's Invoicing Form and Construction Manager 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, as modified, 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 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 Add that portion of Construction Change Directives that the Owner determines, after advice and consent from the Architect in the Architect's professional judgment, to be reasonably justified; and

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.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 Owner 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;

.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, refuse to certify in the Certificate for Payment, or nullify a Certificate of Payment in whole or in part, as provided in Article 9 of AIA Document A232-2019;

.5 Any amount for which the Owner withheld payment, and

.6 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.

§ 5.1.7.3 Except as set forth in this Section 5.1.7.3, when the Work of this Contract is finally complete, the Contractor may submit an Application for Payment that includes the retainage withheld from prior Application for Payment pursuant to this Section 5.1.7. The Application for Payment submitted when the Work of this Contract is finally complete shall not include retainage as follows:
(Insert any other conditions for release of retainage when the Work of this Contract is substantially complete, or upon Substantial Completion of the Work of all Contractors on the Project or portions thereof.)

Damages incurred by the Owner due to the Contractor's negligence or breach of this Agreement.

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§ 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, as modified, 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 Owner's receipt of the final executed Certificate for Payment or Project Certificate for Payment, or as follows:

If amounts are withheld from the final payment to cover any incomplete work, such withheld amounts are not considered retainage and shall not be paid to the Contractor until the work is actually completed and accepted. Such withholdings shall not be less than 150% of the estimated cost to complete the work.

§ 5.2.1.3 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 to 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, as modified.
(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, as modified, 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)*

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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 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, as modified.

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

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 modified by the Owner and as amended or supplemented therein, or as amended or supplemented by other provisions of the Contract Documents. All references to AIA Document A232-2019 refer to that document as modified by the Owner, which modified document is incorporated into this Agreement as modified. The Contractor may request a copy of that document from the Construction Manager.

§ 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»

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§ 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 AIA Document A132™-2019, and elsewhere in the Contract, as required by MCL 129.201, et seq.

§ 8.8 Other provisions:

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

§ 8.8.2 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.

§ 8.8.3 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. Nothing herein shall be interpreted to modify the independent contractor relationship between Owner and Contractor.

§ 8.8.4 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. 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.

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

§ 8.8.6 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.

§ 8.8.7 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.

§ 8.8.8 Claims or causes of action 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 or cause of action 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.

§ 8.8.9 The Agreement shall be governed by the laws of the State of Michigan.

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

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§ 8.8.11 Notwithstanding any provisions within the Contract Documents, nothing shall be deemed a waiver of any immunity granted to Owner by law or statue, including but not necessarily limited to, governmental immunity under MCL 691.3407. 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.

§ 8.8.12 The Contractor agrees that neither it nor its Subcontractors will discriminate against any employee or applicant for employment, to be employed in the performance of this Agreement, with respect to hire, tenure, conditions or privilege of employment, or any matter directly or indirectly related to employment, because of race, color, religion, national origin, age, sex, sexual orientation, gender identity or expression, height, weight, or marital status. Breach of this covenant may be regarded as a material breach of this Agreement.

§ 8.8.13 All Contractor employees assigned to work under this Agreement may, at Owner's discretion, be subject to a background check and clearance by the Owner. Failure to obtain such clearance from the Owner may result in mandatory dismissal from the Owner's property and/or termination of the Agreement.

§ 8.8.14 The Contractor shall indemnify and hold harmless the Owner and its board members, officers, administrators, employees, and agents ("Indemnified Parties") from and against all claims, damages, losses and expenses, including but not limited to attorneys' fees arising out of, or resulting from, this Agreement or Contractor's performance of the Work. The Contractor shall defend any and all suits brought against the Indemnified Parties by any party for damage to property and/or injury or death to persons claimed to have been caused by Contractor's performance of the Work. In the event of any such injury, death, loss, damage, or claim (or notice of any claim related to same). Contractor shall immediately give written notice to Owner regarding same.

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

§ 8.8.16 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, as modified.

.2

.3 AIA Document A232™-2019, General Conditions of the Contract for Construction, Construction Manager as Adviser Edition, as modified. See Section 8.1.

.4

.5 The Drawings are as follows, and are dated «Drawings_Dates» unless a different date is shown 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»	

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«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.)

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

In the event of any inconsistency or ambiguity within, between or among the various Contract Documents, the terms most beneficial to the Owner (as determined in the Owner's sole discretion) shall govern.

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)

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PART 1 – GENERAL

1.01 BID BONDS

A. Bid Security must be in the form of a Bid Bond or a certified-check made payable to the Owner.

B. When a Bid Bond is submitted, the Owner shall be listed as 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.**

1.02 LABOR & MATERIAL PAYMENT BONDS AND PERFORMANCE BONDS

A. The Owner reserves the right to require any successful Bidder to furnish both a Labor and Material Payment Bond, and a Performance Bond, each in the amount of one hundred percent (100%) of their contract amount.

B. **THE LABOR & MATERIAL PAYMENT BOND AND THE PERFORMANCE BOND MUST BE ISSUED BY A SURETY COMPANY LICENSED AS SUCH TO DO BUSINESS IN THE STATE OF 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.

1.03 SUPPLY BONDS

A. The Owner reserves the right to require any direct supplier to furnish a Supply Bond in the amount of one hundred percent (100%) of their contract amount.

B. Supply Bonds shall include all information required above (reference 1.02C above) for Labor and Material Payment Bonds and Performance Bonds.

C. **ALL SUPPLY BONDS SHALL BE LEGAL AND ENFORCEABLE IN THE STATE OF MICHIGAN.**

1.04 BOND COSTS IN BIDS

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

1.05 SUBMISSION OF BONDS

A. Bonds shall be submitted to the Construction Manager for delivery to the Owner within fifteen (15) days following the date of issue of the Contract.

B. Bonds must be submitted prior to contract execution and accepted by the Owner before work may begin on-site.

C. If the work is commenced prior to contract execution in response to a Notice to Proceed (reference Section 00500), the Contractor shall, prior to commencement of the work, submit evidence satisfactory to the Owner that required bonds will be furnished, and shall deliver the Bonds by the date the Bidder executes the Owner/Contractor Agreement (reference Section 00510).

END OF SECTION 00600

PART 1 – GENERAL

1.01 INSURANCE CERTIFICATES

A. Each Contractor shall provide, prior to 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: **Beal City Public Schools**
3180 West Beal City Road
Mount Pleasant, MI 48858

D. Certificates must show as 'additional insured' the Owner, **Beal City Public 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:

Beal City Public 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.

Letter of Compliance

Owner: _____

Contractor: _____

Project: _____

This letter is to acknowledge that I/We am/are the Insurance Agent(s) for the above named Contractor and furthermore, that we have reviewed the insurance coverage required under this Contract with the Owner:

Beal City Public Schools

We hereby certify that said Contractor is in compliance with all insurance coverage required under this Contract with the Owner referenced above.

We hereby certify that said Contractor is in compliance with all insurance requirements, whether or not so evidenced on the attached certificate of insurance.

Signed: _____

Agency: _____

Address: _____

Agent: _____

Witness: _____

Date: _____

Notary: _____

My Commission Expires: _____

For: _____

Contractor: _____

Address: _____

Bid Division: _____

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:	
	INSURER(S) AFFORDING COVERAGE	NAIC #
INSURED	INSURER A : (4)	
(3)	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)						EACH OCCURRENCE (5D)	$ 1,000,000.00
	CLAIMS-MADE OCCUR			(5B)	(5C)		DAMAGE TO RENTED PREMISES (Ea occurrence)	$ 100,000.00
							MED EXP (Any one person)	$ 5,000.00
							PERSONAL & ADV INJURY	$ 1,000,000.00
	GEN'L AGGREGATE LIMIT APPLIES PER:						GENERAL AGGREGATE	$ 1,000,000.00
	POLICY PRO-JECT LOC						PRODUCTS - COMP/OP AGG	$ 1,000,000.00
	OTHER:							$
	AUTOMOBILE LIABILITY (6A)						COMBINED SINGLE LIMIT (Ea accident) (6D)	$ 1,000,000.00
	X ANY AUTO						BODILY INJURY (Per person)	$
	OWNED AUTOS ONLY / SCHEDULED AUTOS			(6B)	(6C)		BODILY INJURY (Per accident)	$
	X HIRED AUTOS ONLY / X NON-OWNED AUTOS ONLY						PROPERTY DAMAGE (Per accident)	$
								$
	X UMBRELLA LIAB OCCUR (7A)						EACH OCCURRENCE (7D)	$ 2,000,000.00
	EXCESS LIAB CLAIMS-MADE			(7B)	(7C)		AGGREGATE	$ 2,000,000.00
	DED RETENTION $							$
	WORKERS COMPENSATION AND EMPLOYERS' LIABILITY (8A) Y / N						PER STATUTE / OTH-ER (8D)	
	ANYPROPRIETOR/PARTNER/EXECUTIVE OFFICER/MEMBER EXCLUDED? N / A (Mandatory in NH)			(8B)	(8C)		E.L. EACH ACCIDENT	$ 500,000.00
	If yes, describe under DESCRIPTION OF OPERATIONS below						E.L. DISEASE - EA EMPLOYEE	$ 500,000.00
							E.L. DISEASE - POLICY LIMIT	$ 500,000.00
	(9)							

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

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

CERTIFICATE HOLDER	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)

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POLICY NUMBER: **COMMERCIAL GENERAL LIABILITY**

THIS ENDORSEMENT CHANGES THE POLICY. PLEASE READ IT CAREFULLY.

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

This endorsement modifies insurance provided under the following:

COMMERCIAL GENERAL LIABILITY COVERAGE PART

SCHEDULE

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

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

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

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

However:

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

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

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

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

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

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

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

whichever is less.

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

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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:

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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 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 include in the Work shall be listed. Each items 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 award of 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 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)

Beal City Public Schools, 2023 School Bond Construction Program – including erecting, furnishing and equipping additions to school facilities; remodeling, furnishing, and refurnishing and equipping and re-equipping, school facilities; acquiring and installing instructional technology; erecting, equipping, preparing, developing, and improving athletic fields and facilities, playgrounds, sidewalks, parking areas, driveways, and 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 budge, 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)

Beal City Public Schools
3180 West Beal City Road
Mount Pleasant, Michigan 48858
Telephone: (989) 644-3901
Facsimile: (989) 644-5847

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

Integrated Designs, Inc.
1021 West Baraga Avenue
Marquette, Michigan 49855
Telephone: (906) 228-4480
Facsimile: (906) 228-7524

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ARTICLE 1 GENERAL PROVISIONS

§ 1.1 Basic Definitions

§ 1.1.1 The Contract Documents. The Contract Documents are enumerated in the Agreement between the Owner and Contractor (hereinafter the Agreement) and consist of the Agreement, Conditions of the Contract (General, Supplementary and other Conditions), Drawings, Specifications, Addenda issued prior to execution of the Contract, other documents listed in the Agreement, and Modifications issued after execution of the Contract. A Modification is (1) a written amendment to the Contract signed by both parties, (2) a Change Order, (3) a Construction Change Directive, or (4) a written order for a minor change in the Work issued by the Architect. Unless specifically enumerated in the Agreement, 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.

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§ 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.

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§ 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~~

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~~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.

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§ 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

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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

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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.

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§ 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

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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

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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

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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.

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§ 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

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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.

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§ 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.

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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.

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§ 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

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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,

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~~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.

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§ 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.~~

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§ 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.

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§ 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.

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§ 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.

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§ 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.

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§ 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.

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.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

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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.

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§ 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

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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

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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.

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§ 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

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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.

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§ 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~~

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~~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

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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.

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§ 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.

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~~§ 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

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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).

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§ 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.

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§ 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;

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.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.

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§ 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.

§ 15.1.2.1 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.

§ 15.1.3 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.

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§ 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,

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an initial ~~decision~~ interpretation shall be required as a condition precedent to mediation ~~of any Claim. If an initial decision~~ or litigation of any Claim brought by the Contractor against the Owner. If an initial interpretation has not been rendered within 30 days after the Claim has been referred to the Initial Decision Maker, the party asserting the Claim may demand mediation and binding dispute resolution without ~~a decision~~ an interpretation having been rendered. Unless the Initial Decision Maker and all affected parties agree, the Initial Decision Maker will not ~~decide~~ interpret disputes between the Contractor and persons or entities other than the Owner.

§ 15.2.2 The Initial Decision Maker will review Claims and within ten days of the receipt of a Claim take one or more of the following actions: (1) request additional supporting data from the claimant or a response with supporting data from the other party, (2) reject the Claim in whole or in part, (3) approve the Claim, (4) suggest a compromise, or (5) advise the parties that the Initial Decision Maker is unable to resolve the Claim if the Initial Decision Maker lacks sufficient information to evaluate the merits of the Claim or if the Initial Decision Maker concludes that, in the Initial Decision Maker's sole discretion, it would be inappropriate for the Initial Decision Maker to ~~resolve the Claim.~~ interpret the Claim. Within ten (10) days of a written request, the Contractor shall make available to the Owner or its representative all of its books, records, or other documents in its possession or to which it has access relating to a Claim and shall require its subcontractors, regardless of tier, and materialmen to do the same.

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

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

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

§ 15.2.6 ~~Either party may file for mediation of an initial decision at any time, subject to the terms of Section 15.2.6.1.~~ Regardless of any other time frames identified herein, claims and causes of action brought by the Owner shall be governed in accordance with the statute of limitations periods under Michigan law, except for such longer periods of time as may be permitted in Section 13.1 and Section 15.1.2.1.

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

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

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

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~~§ 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

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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.

Modified: 10/12/23; 1:56pm

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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)

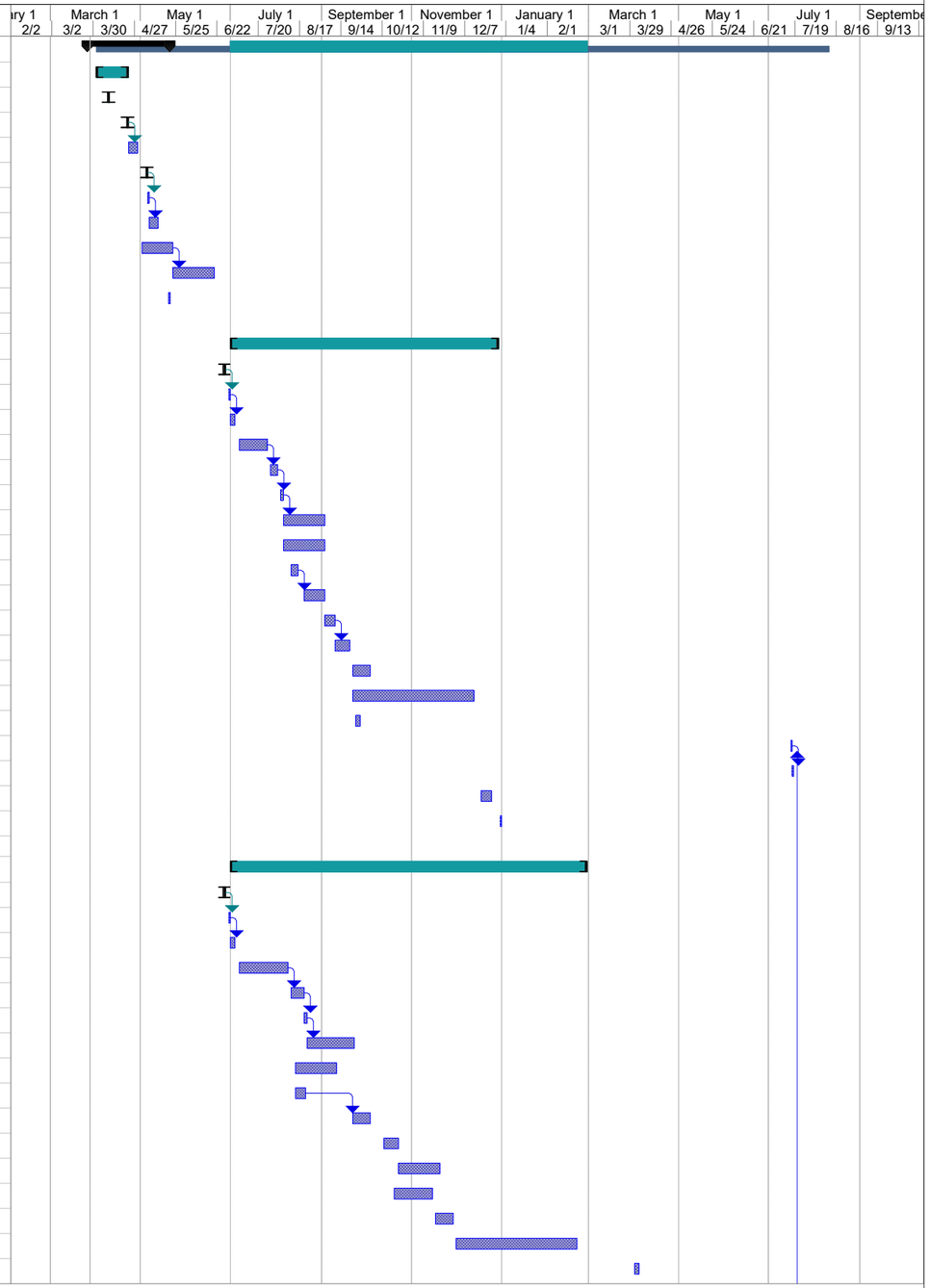
END OF SECTION 00999

Beal City Public Schools
Bid Pack #2
Athletic Complex
Additions & Site Work
Milestone Schedule 2025

Fri 3/28/25

Wolgast CORPORATION

ID	Task Name	Duration	Start	Finish	Predecessors
1	**Bidding**	**40 days**	**Wed 3/26/25**	**Tue 5/20/25**	
2	Bid Period	16 days	Tue 4/1/25	Tue 4/22/25	
3	Pre-Bid Meeting	1 day	Wed 4/9/25	Wed 4/9/25	
4	Bid Due Date	1 day	Tue 4/22/25	Tue 4/22/25	
5	Post Bid Interviews	4 days	Wed 4/23/25	Mon 4/28/25	4
6	Award Recommendation	1 day	Mon 5/5/25	Mon 5/5/25	
7	Owner Approval of Contracts	1 day	Tue 5/6/25	Tue 5/6/25	6
8	Prepare and Issue Contracts	4 days	Wed 5/7/25	Mon 5/12/25	7
9	Submittal Process	15 days	Fri 5/2/25	Thu 5/22/25	
10	Material Ordered	20 days	Fri 5/23/25	Thu 6/19/25	9
11	Pre-Construction Meeting (Tentative)	1 day	Tue 5/20/25	Tue 5/20/25	
12					
13	**Team Room**	**130 days**	**Tue 7/1/25**	**Mon 12/29/25**	
14	Site utility identification	2 days	Thu 6/26/25	Fri 6/27/25	
15	Mobilize	1 day	Mon 6/30/25	Mon 6/30/25	14
16	Site Work	3 days	Tue 7/1/25	Thu 7/3/25	15
17	Footings/Foundations	15 days	Mon 7/7/25	Fri 7/25/25	
18	Undergound MEP	5 days	Mon 7/28/25	Fri 8/1/25	17
19	Concrete Slab	2 days	Mon 8/4/25	Tue 8/5/25	18
20	CMU Walls	20 days	Wed 8/6/25	Tue 9/2/25	19
21	Electrical/Mechanical as needed	20 days	Wed 8/6/25	Tue 9/2/25	
22	Door Frames	5 days	Mon 8/11/25	Fri 8/15/25	
23	Exterior stud walls	10 days	Wed 8/20/25	Tue 9/2/25	22
24	Trusses	5 days	Wed 9/3/25	Tue 9/9/25	
25	Roofing	8 days	Wed 9/10/25	Fri 9/19/25	24
26	Metal Panels	10 days	Mon 9/22/25	Fri 10/3/25	
27	Interior Finishes	60 days	Mon 9/22/25	Fri 12/12/25	
28	Site Restoration	3 days	Wed 9/24/25	Fri 9/26/25	
29	Final Inspections	1 day	Thu 7/16/26	Thu 7/16/26	79
30	Punch list by Architect/Engineers	1 day	Fri 7/17/26	Fri 7/17/26	29
31	Punch List Work by All Contractors	5 days	Thu 12/18/25	Wed 12/24/25	
32	Turnover to Owner	1 day	Wed 12/31/25	Wed 12/31/25	
33					
34	**Robotics**	**174 days**	**Tue 7/1/25**	**Fri 2/27/26**	
35	Site utility identification	2 days	Thu 6/26/25	Fri 6/27/25	
36	Mobilize	1 day	Mon 6/30/25	Mon 6/30/25	35
37	Site Work	3 days	Tue 7/1/25	Thu 7/3/25	36
38	Footings/Foundations	25 days	Mon 7/7/25	Fri 8/8/25	
39	Undergound MEP	7 days	Mon 8/11/25	Tue 8/19/25	38
40	Concrete Slab	2 days	Wed 8/20/25	Thu 8/21/25	39
41	CMU Walls	22 days	Fri 8/22/25	Mon 9/22/25	40
42	Electrical/Mechanical as needed	20 days	Thu 8/14/25	Wed 9/10/25	
43	Door Frames	5 days	Thu 8/14/25	Wed 8/20/25	
44	Steel	10 days	Mon 9/22/25	Fri 10/3/25	43
45	Roofing	8 days	Mon 10/13/25	Wed 10/22/25	
46	Electrical/Mechanical Rough Ins	20 days	Thu 10/23/25	Wed 11/19/25	
47	Brick Veneer	20 days	Mon 10/20/25	Fri 11/14/25	
48	Windows/Exterior Doors	10 days	Mon 11/17/25	Fri 11/28/25	
49	Interior Finishes	60 days	Mon 12/1/25	Fri 2/20/26	
50	Site Restoration	3 days	Wed 4/1/26	Fri 4/3/26	



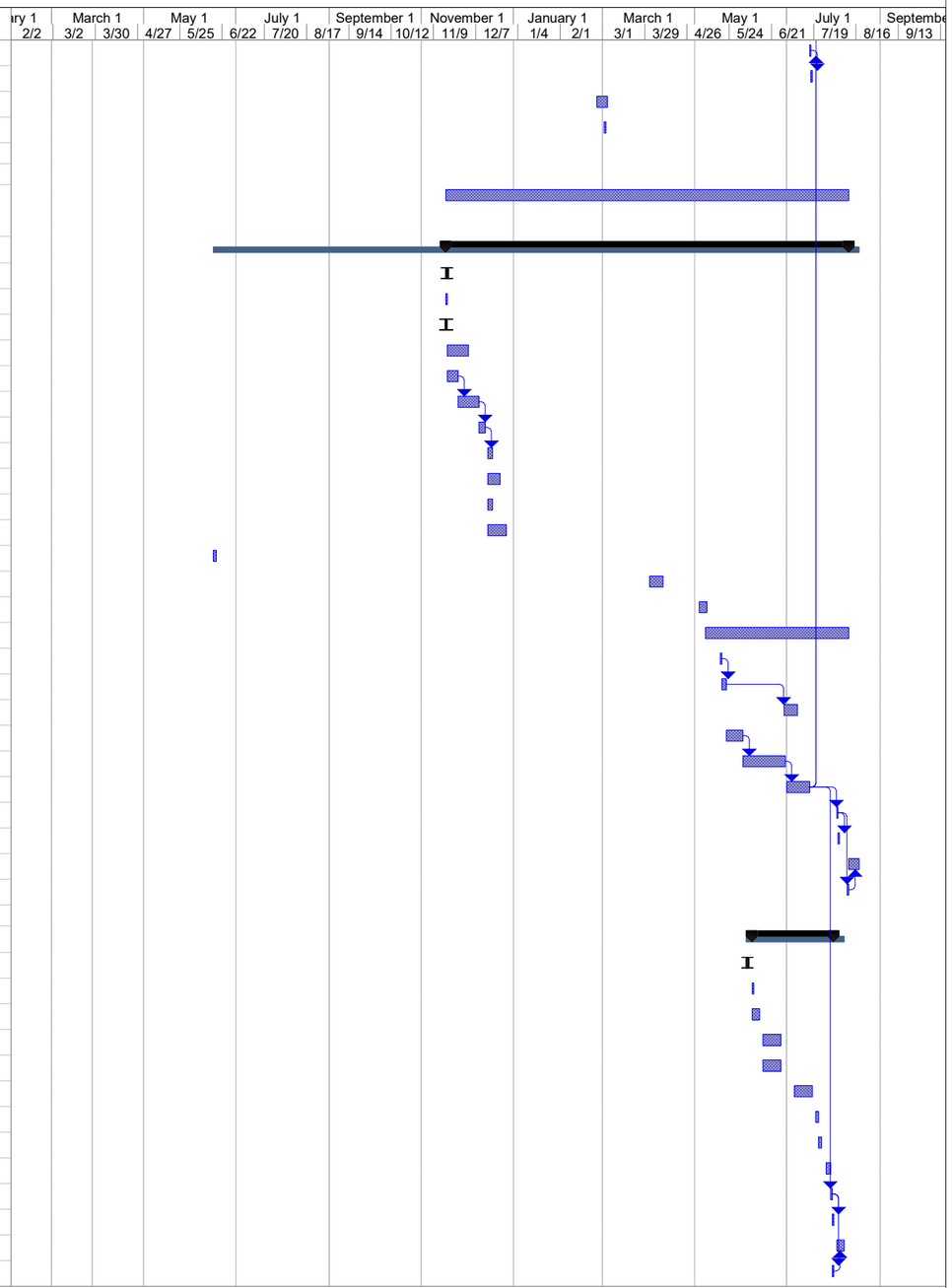
Wolgast Corporation reserves the right to make changes to this construction schedule as the project progress warrants.

Beal City Public Schools
Bid Pack #2
Athletic Complex
Additions & Site Work
Milestone Schedule 2025

Fri 3/28/25

Wolgast CORPORATION

ID	Task Name	Duration	Start	Finish	Predecessors
51	Final Inspections	1 day	Thu 7/16/26	Thu 7/16/26	79
52	Punch list by Architect/Engineers	1 day	Fri 7/17/26	Fri 7/17/26	51
53	Punch List Work by All Contractors	5 days	Wed 2/25/26	Tue 3/3/26	
54	Turnover to Owner	1 day	Mon 3/2/26	Mon 3/2/26	
55					
56					
57	**** THIS SCHEDULE TO ADJUST WITH WEATHER CONDITIONS ****	191 days	Mon 11/17/25	Mon 8/10/26	
58	**Football Field**	**191 days**	**Mon 11/17/25**	**Mon 8/10/26**	
59	Site utility identification	2 days	Mon 11/17/25	Tue 11/18/25	
60	Mobilize	1 day	Mon 11/17/25	Mon 11/17/25	
61	Temp Entrance	1 day	Mon 11/17/25	Mon 11/17/25	
62	Football Field Demo/Track Demo	10 days	Tue 11/18/25	Mon 12/1/25	
63	Fence Demo	5 days	Tue 11/18/25	Mon 11/24/25	
64	Install Catch Basins- drainage	10 days	Tue 11/25/25	Mon 12/8/25	63
65	Sand Infill/Grading	4 days	Tue 12/9/25	Fri 12/12/25	64
66	Electrical Work- pertaining to football field	3 days	Mon 12/15/25	Wed 12/17/25	65
67	Plumbing work- pertaining to football field	6 days	Mon 12/15/25	Mon 12/22/25	
68	Goal Post Bases	3 days	Mon 12/15/25	Wed 12/17/25	
69	Flat Drainage System	10 days	Mon 12/15/25	Fri 12/26/25	
70	Grading	2 days	Mon 6/16/25	Tue 6/17/25	
71	Irrigation	7 days	Wed 4/1/26	Thu 4/9/26	
72	Seeding	5 days	Mon 5/4/26	Fri 5/8/26	
73	Site Contractor Maintain Grass Growth	67 days	Fri 5/8/26	Mon 8/10/26	
74	Final Grading/prep for asphalt track	1 day	Mon 5/18/26	Mon 5/18/26	
75	Track Asphalt	3 days	Tue 5/19/26	Thu 5/21/26	74
76	Track Surface/Track Markings (28 day cure for asphalt)	7 days	Mon 6/29/26	Tue 7/7/26	75
77	Remaining Site Asphalt	7 days	Fri 5/22/26	Mon 6/1/26	
78	Concrete Sidewalks	20 days	Tue 6/2/26	Mon 6/29/26	77
79	Fencing	11 days	Wed 7/1/26	Wed 7/15/26	78
80	Final Inspections	1 day	Mon 8/3/26	Mon 8/3/26	79
81	Punch list by Architect/Engineers	1 day	Tue 8/4/26	Tue 8/4/26	80
82	Punch List Work by All Contractors	5 days	Tue 8/11/26	Mon 8/17/26	83
83	Turnover to Owner	1 day	Mon 8/10/26	Mon 8/10/26	80
84					
85	**Parking Lot**	**40 days**	**Mon 6/8/26**	**Fri 7/31/26**	
86	Site utility identification	2 days	Thu 6/4/26	Fri 6/5/26	
87	Mobilize	1 day	Mon 6/8/26	Mon 6/8/26	
88	Site Demo	5 days	Mon 6/8/26	Fri 6/12/26	
89	Site Prep	10 days	Mon 6/15/26	Fri 6/26/26	
90	Electrical	10 days	Mon 6/15/26	Fri 6/26/26	
91	Concrete Work	10 days	Mon 7/6/26	Fri 7/17/26	
92	Final Grading for asphalt track	2 days	Mon 7/20/26	Tue 7/21/26	
93	Asphalt	2 days	Wed 7/22/26	Thu 7/23/26	
94	Markings	3 days	Mon 7/27/26	Wed 7/29/26	
95	Final Inspections	1 day	Thu 7/30/26	Thu 7/30/26	79
96	Punch list by Architect/Engineers	1 day	Fri 7/31/26	Fri 7/31/26	95
97	Punch List Work by All Contractors	5 days	Mon 8/3/26	Fri 8/7/26	98
98	Turnover to Owner	1 day	Fri 7/31/26	Fri 7/31/26	95



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

PART 1 – GENERAL

1.01 PROJECT DESCRIPTION

A. Beal City Public Schools – Bid Pack No. 2 Athletic Complex Renovations, Classroom Addition & Site Work

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 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 **June 2, 2026.** 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 rae 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 slow down 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 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 on the basis of 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 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 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 **Beal City Public Schools – Bid Pack No. 2 - Athletic Complex Renovations, Classroom Addition & Site Work** to provide _____For the improvement of the property described as **Beal City Public Schools,** 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 **Beal City Public Schools – Bid Pack No. 2 - Athletic Complex Renovations, Classroom Addition & Site Work** to provide _____For the improvement of the property described as **Beal City Public Schools,** having been fully paid and satisfied, all my/our construction lien rights against such property and hereby waived and released.

_____
(Name of Lien Claimant)

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

Address: _____

_____

_____

Telephone: _____

END OF SECTION 01050

PART 1 – GENERAL

1.01 DESCRIPTION

A. The Change Event Form will be used to document any request for a change in the scope of the Work throughout the construction process, and establish owner and architect approval prior to preparing a change order or having work performed.

B. The Change Event Form will only be used when it IS NOT NECESSARY for work to be performed immediately.

1.02 PROCESSING OF CHANGE EVENT FORMS

A. The Owner, Architect, Engineer, Construction Manager or Contractor may initiate a request for change during the Project in the form of a bulletin/proposal request, construction change directive, request for information, or value engineering proposal. Requests for changes shall be submitted to the Construction Manager for preparation and distribution of the Change Event Form.

B. The Change Event will be accompanied by a copy of all related sketches, drawings, specifications, instructions, etc.

C. The Construction Manager will forward the Change Event to the Contractor for the purposes of obtaining an itemized quote (including labor, material, equipment, units, rates, and subtotals) for the changes requested.

D. The Contractor will complete and return the Change Event Form within five (5) days, or less, to the Construction Manager.

E. The Construction Manager will review all Change Events and itemized detail for accuracy and validity within 48 hours of receiving said information.

F. If the Construction Manager approves the costs or deductions submitted by the Contractor in the Change Event, the Construction Manager will:

1. Forward one (1) copy of the Change Event with itemized detail to the Architect for review and endorsement, 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 appoval 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 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.

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 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

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 be in attendance at 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	
_____ _____ _____ _____	_____ _____ _____ _____	DATE SUBMITTED: _____ DATE RECEIVED: _____ WOLGAST PROJECT NO. _____ NEW:_____RESUB. _____ SUB. NO. _____ RESUB. NO. _____

Pkg. NO.	Pkg. Name	CW 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

1.01 CONSTRUCTION SCHEDULES

A. A Milestone Schedule is provided as part of the bidding documents to indicate dates by which certain critical tasks and/or portions of the project must be completed. The Milestone schedule also indicates the date by which the Project must be 100% complete, receipt of final inspections, occupancy allowed by all governing authorities, and owner move-in.

B. Based on the Milestone Schedule each Contractor shall submit to the Construction Manager, at or prior to the Pre-Construction Meeting, two (2) copies of the proposed progress schedule for their Work identifying the critical tasks that they must complete to achieve the Milestone Schedule completion dates.

C. The Construction Manager will utilize the scheduling input from the Contractors for incorporation into the Project Construction Schedule. The Project Construction Schedule will be compiled and distributed to all contractors.

D. By signing the Owner-Contractor Agreement the Contractor agrees to cooperate with all of 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 to provide 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 to 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 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 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, identify 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 shall 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) agree to abide by the assignment of responsibility by the Architect and Construction Manager regarding such controls when required. The Contractor(s) shall be responsible to perform 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 accord 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 weeks 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 close out 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 close out 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, regulation, 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 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 persons 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 supplier, 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 **Beal City Public Schools** as they pertain to hazardous materials.

The SDS's are attached for all hazardous materials which will be brought to **Beal City Public Schools.**

There are _____ SDS's attached.

The Contractor's employees (including subcontractors) have received appropriate instructions pertaining to the use and handling of hazardous materials.

The Contractor has been informed of hazardous materials in the area of the specified work.

_____ 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 **Beal City Public Schools**.

1.02 DESCRIPTION

A. All thermal insulation such as pipe wrap, especially joints, should be assumed to contain asbestos. Contractors are cautioned not to attempt removal of these materials without first notifying the Owner.

AHERA Notification and
Contractor Compliance Affidavit

Project Name: **Beal City Public Schools**
Bid Pack No. 2 - Athletic Complex Renovations, Classroom Addition & Site Work
Project #: **A24901**
Owner: **Beal City Public Schools**
Address: **3180 West Beal City Road, Mt Pleasant, MI 48858**

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: Beal City Public 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 Beal City Public 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

NORTHERN
Analytical Services, LLC.
ENVIRONMENTAL CONSULTANTS

Three Year Asbestos Re-Inspection Report

For

Beal City Public Schools
3180 West Beal City Road
Mt. Pleasant, Michigan 48858

Prepared By:

Northern Analytical Services, LLC.
PO Box 1604
Big Rapids, Michigan 49307

Project No.: 240198
Report Date: October 14, 2024

14870 225th Ave., Big Rapids, Michigan 49307
Phone : 231-268-0004 Fax : 866-214-4739 Web : www.northernas.com

Beal City Public Schools
3 Year Re-Inspection Report
Project No.: 240198
Report Date: October 14, 2024

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Introduction

The following Three-Year Asbestos Re-Inspection Report was completed by Northern Analytical Services, LLC. (NAS) for Beal City Public Schools located at 3180 West Beal City Road, Mt. Pleasant, Michigan 48858. Re-inspection activities were limited to the known or assumed asbestos containing materials identified in the previous re-inspection report.

In accordance with the US EPA under the National Emissions Standard for Hazardous Air Pollutants (NESHAPs), building owners and their contractors are responsible for having building materials tested for asbestos content prior to disturbance. This re-inspection is not intended to satisfy NESHAP requirements; Additional inspection and testing services will be necessary before performing renovations or other activities that will otherwise disturb building materials.

In accordance with the Asbestos Hazard Emergency Response Act (AHERA), all buildings owned and/or operated by K-12 school districts are required to be incorporated in the district's management plan. These regulations allow for buildings, or portions of buildings, constructed after 1988 to either be inspected for the presence of asbestos containing materials (ACM) or be accompanied by a statement from the architect/construction manager that no ACM was installed during construction activities. It is recommended that acceptable statements be obtained and attached to this report for any future renovation/construction activities.

Notable buildings/structures observed during this re-inspection but are not a part of the district's management plan include Press Box, Concessions Building, Baseball and Softball Dugouts, Bus Garage and Storage Buildings. NAS recommends these buildings be inspected for the presence of ACM and added to the district's management plan.

Beal City Public Schools
3 Year Re-Inspection Report
Project No.: 240198
Report Date: October 14, 2024

This re-inspection included the following buildings:

School Building Number	Building	Address	Re-Inspection Date
1	Beal City Public Schools	3180 West Beal City Road, Mt. Pleasant, Michigan 48858	10/2/2024

Company Statement

This Re-inspection Report and Management Plan update was prepared by NAS to assist Beal City Public Schools in meeting the 3 Year Re-Inspection requirements set forth by AHERA.

In preparation of this document, every attempt has been made to recommend the least burdensome response actions consistent with protecting human health and the environment as specified by AHERA.

AHERA states that the management plan is the responsibility of the owner/operator of the facility, also called the Local Education Agency (LEA); in this case the LEA is Beal City Public Schools. It is the responsibility of the LEA to read and understand the response actions, their obligations, timetables, and to determine if these actions are reasonable actions prior to signing the owner/operator statement. Any changes or additions to this document without written authorization from NAS will automatically void the inspection and management plan statements.

If the LEA decides to make changes to this report without authorization from NAS or decides to make changes which conflict with the advice and/or professional judgment of NAS, a separate statement shall accompany the management plan and should specify which recommended actions the owner/operator has decided to change, the actual changes and rationale for the changes. NAS will not accept any responsibility for changes to any response actions that weren't stated previously by NAS.

Asbestos Background

Asbestos is a naturally occurring mineral. It is distinguished from other minerals by the fact that its crystals form long, thin fibers. Deposits of asbestos are found throughout the world. The primary sites of commercial production are Canada, China, Brazil, Zimbabwe, and South Africa. Asbestos is also mined commercially in limited quantities in the United States, in California and Vermont.

Asbestos has been used in thousands of products. Collectively, these are referred to as asbestos-containing material (ACM). Asbestos gained wide-spread use because it was plentiful, readily available and low in cost. Because of its unique properties – fire resistance, high tensile strength, poor heat and electrical conductivity and being generally impervious to chemicals attacks – asbestos proved well-suited for many uses in the construction trades.

Asbestos-related diseases are chronic diseases and symptoms usually do not appear for 15 to 40 years after initial exposures to airborne asbestos fibers. In nearly all cases, many years of exposure to high levels of airborne ACM is necessary for personnel to contract asbestos-related diseases.

The primary exposure route is inhalation. Inhaled fibers may become embedded in the bronchial tubes or alveoli, or they may pass through to the pleura – the lining of the chest cavity. Asbestos-related diseases include asbestosis, lung cancer, mesothelioma and gastrointestinal cancers.

Survey Procedures

Survey procedures were conducted by a State of Michigan accredited Asbestos Building Inspector in accordance with AHERA requirements.

To complete this survey, the inspector(s) reviewed the most recent re-inspection report and performed an inspection of the materials identified in that report as either known or assumed to be asbestos containing. During the inspection, the inspector visually inspected materials for damage or the potential for damage.

NAS did not conduct a thorough inspection of the building(s) to determine the presence, location, or quantity of materials suspected to contain asbestos. NAS only inspected the materials identified in the previous re-inspection. Prior to performing any renovation work NAS strongly recommends a thorough building inspection be performed.

Unknown Suspect Materials

It is likely that there are suspect asbestos containing materials present that have not been identified in this re-inspection or in previous AHERA inspections. Keep in mind

that in 1988 when AHERA was enacted many inspectors were new and likely missed some of the suspect materials. Additionally, new building materials have likely been added since the original AHERA inspection. It is a common misconception that asbestos has been banned, it is still legal to sell many types of building materials yet today that contain asbestos.

In addition to unknown/untested materials, many known asbestos containing materials have been removed over the years through renovation or maintenance activities. It is possible that the conditions at the time work was completed would not allow for complete removal and some portion of the ACM remain. The following are examples of this:

- Cabinets and unit vent heaters cover old floor tile.
- Floor tile was removed but the asbestos containing mastic remains and was covered with new flooring.
- Pipe insulation was abated where exposed but the asbestos insulation extends into a wall cavity.
- Spray applied acoustical ceilings were scrapped but the non-asbestos plaster substrate remains along with asbestos containing overspray above it.
- Spray applied fire proofing was removed but residual overspray remains in wall cavities and other hidden areas.

To help ensure suspect ACMs are not unknowingly disturbed it is crucial that the NESHAP regulations are closely followed and every space be thoroughly inspected and every building material be tested prior to disturbance. This report does not cover unknown or hidden suspect materials.

Facility Recommendations

Based on the findings of the Inspector, the following general site recommendations have been made:

Careful review of the included Response Action Report should be conducted by the Districts Designated Person. The reports titled Material Report will provide a detailed description of the suspect ACM found, asbestos content, friability, type of asbestos present, and the total quantity found in each building. Reports titled Response Action Report will provide a description of what ACMs were found in each room, comments on the specific location and damage if any was observed and response actions to be taken for each of the known or assumed ACM.

For materials that have been identified as damaged, it is recommended that a licensed abatement contractor be contacted to make any repairs or to conduct any removal activities needed.

In accordance with CFR 1910.1200, it is recommended that each ACM be properly labeled as asbestos containing. Warning labels should contain the following information:

Danger
Contains Asbestos Fibers
Avoid Creating Dust
Cancer and Lung Disease Hazard

Labels should be placed in various locations on each material in a manner to avoid accidental disturbance.

Prior to any renovation or maintenance activity, review the Management Plan to ensure materials being impacted by the renovation/activity do not contain asbestos. Should materials likely to be disturbed not be accurately described in the inspection reports, contact a licensed Asbestos Building Inspector to collect samples. Do not disturb materials not described in the Management Plan or materials identified as asbestos containing or assumed to contain asbestos.

If a disturbance occurs, either accidental or planned (abatement project), area air monitoring should be conducted to establish the airborne concentration of asbestos fibers present. Both State and Federal Agency strictly govern disturbance activities and exposure to employees and building occupants. Proper air sampling can determine if area contamination has occurred as well as help assure employees and building occupants in adjacent areas are not being exposed. In addition to area monitoring, AHERA requires third party area air clearance testing whenever a disturbance occurs.

Records of future renovation activities should be kept. These records should include what materials where disturbed and to what extent. Also, information on replacement materials is vital in keeping this survey up to date. Often Architects or Design Engineers can provide legal statements indicating that replacement materials do not contain asbestos. Other documentation of this sort would be material or product safety data sheets. If proper documentation is not available for suspect ACM’s located in building constructed prior to 1986, sample collection and analysis is required by State and Federal Regulations.

Both CFR 1910.110 and CFR 1926.110 require that employers provide awareness training to all employees that are expected to come in contact with or required to work in the general vicinity of ACM. In accordance with regulatory requirements, it is recommended that all housekeeping and maintenance employees receive, at a minimum, 2-hour asbestos awareness training. In addition, employees that are required to conduct minor cleanup projects shall be provided additional training.

Management Planner's Recommendations

All of the ACM or suspect ACM identified in this report was noted by the inspector as being in good condition unless specifically mentioned below under each building name. Continue the facility's operations and maintenance program and conduct periodic assessments (at least every 6 months) of all known or assumed asbestos containing materials.

The following recommendations (not all inclusive, see Response Actions for additional recommendations) are based on the inspector's findings, laboratory results and the management planner's opinion. Please note that all work described below must be completed either by in house properly trained 16-hour asbestos operations and maintenance personnel or a licensed asbestos abatement contractor. Third-party air clearance testing should be conducted following any repair/removal actions described below:

School Building Number 1 - Beal City Public Schools

1. All known friable ACM observed during this re-inspection was found to be in good condition with the following exceptions:

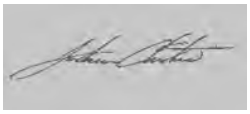
   A) 102 (Stage South Hall) – 1 damaged mudded pipe fitting needs repaired/abated.

   B) 244 (Girls LR) – 3 damaged mudded pipe fittings need abated.

Signature Page

Inspection Statement

The person(s) listed below hereby attest(s) that he/she/they did inspect, assess and perform sampling of suspect asbestos containing building materials (ACBM) at the buildings/portions of buildings listed in this report in accordance with AHERA regulations set forth in 40 CFR Section 763.85(a):

Name	Accreditation Number	Signature	Date
Joshua Christie	A60272		10/14/2024

Management Plan Statement

The person(s) listed below hereby attest(s) that he/she/they did review the asbestos re-inspection data collected by the asbestos building inspector for this re-inspection. Any recommendations are based on the above referenced inspection in accordance with AHERA regulations set forth in 40 CFR Section 763.93 (12), (ii).

Name	Accreditation Number	Signature	Date
John Rehkopf	A16809		10/14/2024

Local Education Information
Local Education Agency (LEA): Beal City Public Schools
LEA Address: 3180 West Beal City Road, Mt. Pleasant, Michigan 48858
Designated Person: Jason McDonald
Designated Person Address: 3180 West Beal City Road, Mt. Pleasant, Michigan 48858
Designated Person Telephone: 989-644-3901

Training Certification
The Designated Person(s) listed above attests that he/she/they received adequate training covering the Local Education Agency's (LEA) responsibilities for Designated Person in accordance with 763.93 (e)(4). This training included:

- The health effects of asbestos exposure
- Detection, identification and assessment of ACBM
- Options for controlling ACBM
- Asbestos management programs
- Relevant State and Federal regulations regarding asbestos
- The LEA/Designated Person responsibilities.

Training was provided by: _____

Under the course titled: Asbestos Designated Person Training

on: _____ and was _____ hours in length.

Designated Person Signature: _____ _____
Jason McDonald Date

LEA Responsibility Certification

The Designated Person listed above certifies that the general LEA responsibilities as required by 763.84 have been or will be satisfied. This includes the following actions:

1. Anyone who conducts any inspections, re-inspections or abatement projects; develops or updates management plans; or performs operations and maintenance that will disturb ACM are licensed asbestos professionals.
2. All custodial and maintenance staff have received two-hour asbestos awareness training and 14 hours of operations and maintenance training (along with annual refreshers) as described in AHERA.
3. The parents, teachers and employee organizations are notified on an annual basis of all inspections, response actions and periodic surveillance that are planned or in progress in regard to asbestos in each school building.
4. Short-term workers (e.g., telephone repair workers, utility workers or exterminators) are informed of the locations of ACBM in school buildings.
5. Warning signs are posted immediately adjacent to ACM in routine maintenance areas that state:

   Danger. Asbestos. Hazardous.
   Do Not Disturb
   Without Proper Training and Equipment

6. Parents, teachers and employee organizations are notified in writing on an annual basis of the availability of the school's asbestos management plan.
7. The management plans are available for inspection in each school and the district office.
8. Records are properly maintained.
9. Each management plan contains a statement, signed by the designated person that certifies the LEA's responsibilities have been or will be met. The statement needs to be amended for each new designated person chosen by the LEA.
10. Re-inspections are conducted at least once every three years after a management plan is in effect.

As the Designated Person for Beal City Public Schools, I will ensure that the above items are completed in accordance with AHERA.

_____	_____	_____
Signature of Designated Person	Jason McDonald	Date

Annual Notification

Annual AHERA Notifications to Employees, Students, and Parents.

The Asbestos Hazard Emergency Response Act (AHERA) requires schools to "ensure that workers and building occupants, or their legal guardians, are informed at least once each school year about inspections, response actions, and post-response action activities, including periodic reinspection and surveillance activities that are planned or in progress (763.84(c)). Such notification must be done in writing and a copy placed in the management plan. Suggested notification methods may be through the publication of an article in a school district newsletter or through a separate written notice distributed to staff and sent home to a student's parent or legal guardian.

In addition, schools "shall make management plans available for inspection to representatives of EPA and the State, the public, including parents, teachers, and other school personnel within 5 working days after receiving a request for inspection (763.93(g)(3)). Furthermore, "the local education agency shall notify in writing parent, teacher, and employee organizations of the availability of management plans and shall include in the management plan a description of steps to notify such organizations, and a dated copy of the notification. In the absence of any such organizations for parents, teachers, or employees, the local education agency shall provide written notice to that relevant group of the availability of management plans and shall include in the management plan a description of the steps taken to notify such groups and a dated copy of the notification" (763.93(g)(4).

The LEA asbestos designated person for the school district is to ensure that these AHERA required notifications occur each school year. The school may determine when to do AHERA notification, as long as it occurs at least once each school year.

A copy of the annual notification can be found in Appendix A.

Appendix A
Notifications & Forms

Annual AHERA Notification

Beal City Public Schools has an Asbestos Management Plan in place in accordance with the Asbestos Hazard Emergency Response Act (AHERA). The plan is available for review in the main office. Please call Mr. Jason McDonald at (989-644-3901) to view during normal operational hours, 8AM to 4PM Monday through Friday with the exception of holidays.

In accordance with AHERA requirements, Beal City Public Schools has contracted Northern Analytical Services, LLC. (NAS) to perform all re-inspections of known asbestos containing materials present, to prepare written project designs for all response actions and to perform all post response action testing. As part of this plan, NAS performed the most recent 3-year re-inspection on 10/2/2024.

Over the past 12 months, the following materials were removed from our buildings:

In the next 12 months we are planning to remove the following materials from our buildings:

Prior to conducting any work that disturbs asbestos, Beal City Public Schools will notify all parents and building staff in advance.

Sincerely,

Jason McDonald
Beal City Public Schools

Asbestos Removal Notification

In an effort to provide our students with the best learning environment possible, Beal City Public Schools is planning a building improvement project that will require the disturbance of asbestos containing materials. We have retained the services of a State of Michigan accredited Asbestos Project Designer to prepare written specifications to help ensure the work is completed in the safest manner possible. All removal work will be performed by a State of Michigan licensed asbestos abatement contractor and overseen by a qualified third-party air quality testing firm.

Third party air clearance testing will be performed before the areas affected by the asbestos removal are returned to normal use.

Asbestos Removal is scheduled to be removed from the following buildings:

Building Name	Start Date	Completion Date

Please contact our District's Designated Person, Mr. Jason McDonald at 989-644-3901 with any questions.

Asbestos Acknowledgement

Asbestos containing materials (ACM)'s are located in various areas of Beal City Public Schools. All short-term workers (anyone performing work that may disturb any building materials) must first have received asbestos awareness training within the past 12 months and be made aware of the types, locations, and quantities of ACM present in our District. Training shall be in accordance with Part 602 Asbestos Standards for Construction-1926.1101, be at least 2 hours in length, and include the contents of our District's asbestos building survey.

A copy of the asbestos survey reports can be obtained by contacting the Asbestos Designated Person for Beal City Public Schools, Mr. Jason McDonald at 989-644-3901.

All short-term workers must return a signed copy of this form to Mr. McDonald before disturbing any building materials.

By signing this form _____ of _____ acknowledges there is asbestos present in various areas of Beal City Public Schools and accepts all liability associated with repairing, cleaning, and testing should any representative of our company, or our sub-contractor(s) improperly disturb any asbestos containing material. In addition, I attest that all of our employees, sub-contractors and their employees who perform services at Beal City Public Schools that causes the disturbance of building materials have been provided asbestos awareness training within the past 12 months that specifically included information regarding the presence, location, and quantity of ACM at Beal City Public Schools.

Company Representative Legally Authorized to Sign this form:

_____	_____	_____
Signature	Title	Date

By signing below, you are attesting that you have received asbestos awareness training within the past 12 months that included information regarding the presence, location, and quantity of ACM at Beal City Public Schools.

Individual's name	Signature	Date of Training

Local Education Agency (LEA) Name

Beal City Public Schools

School Building Number/Name

1-Beal City Public Schools

Periodic Surveillance

1. Name of Person Performing the Surveillance:

Last	First	M.I.

2. Date of the Surveillance:

3. Description of any Changes in the Condition of the Materials:

Appendix B
Inspection Data

Beal City Public Schools

Material Report

Northern Analytical Services
14870 225th Avenue, Big Rapids, MI 49307 - (231) 268-0004 - Fax (866) 214-4739

Customer: Beal City Public School
Building: Beal City Public School
Address: 3180 West Beal City Road
Mt. Pleasant, MI 48858
Printed: October 14, 2024

Material Report

Material Number	*Homogeneous Material Description*	*Category*	*Friability**	*RACM***	*Asbestos Detected*	*Percent Asbestos*	*Asbestos Type*	*Quantity*	*Units*
1	Pipe Insulation - Roof Drains and Cones	Thermal	Yes	Yes	Yes	---	Assumed	20	Ln.Ft.
2	Pipe Insulation-Mudded Pipe Fitting -	Thermal	Yes	Yes	Yes	3%	Chrysotile	92	Ln.Ft.
3	Floor Tile - & Black Mastic	Misc.	Category I Non-Friable	No	Yes	T-5% M-5%	Chrysotile	1685	Sq.Ft.
4	Pipe Insulation -	Thermal	Yes	Yes	Yes	---	Assumed	940	Ln.Ft.
5	Fire Rated Door -	Misc.	Category II Non-Friable	No	Yes	---	Assumed	10	Each
6	Cove Base - 4 inch, Brown	Misc.	No	No	No	---	None Detected	Not Quantified	Sq.Ft.
7	Floor Tile - & Black Mastic, East Wing	Misc.	No	No	No	---	None Detected	Not Quantified	Sq.Ft.
8	Mastic - Black	Misc.	Category I Non-Friable	No	Yes	5%	Chrysotile	14125	Sq.Ft.
9	Vinyl Sheet Flooring - Room 117	Misc.	No	No	No	---	None Detected	Not Quantified	Sq.Ft.
10	Glue - Behind Marker Board, Room 311, Brown	Misc.	No	No	No	---	None Detected	Not Quantified	Sq.Ft.

** Non-Friable materials may become friable when damaged.*
*** May become regulated asbestos containing material (RACM) when damaged.*

Misc. = miscelleaneous material
Surfacing = surfacing material
Thermal = thermal system insulation
RACM = regulated asbestos containing material

Response Action Report

Northern Analytical Services

14870 225th Avenue, Big Rapids, MI 49307 - (231) 268-0004 - Fax (866) 214-4739

LEA: Beal City Public School
Building: Beal City Public School
Building No.: 1
Address: 3180 West Beal City Road
Mt. Pleasant, MI 48858

Response Action Report

Printed: October 14, 2024

Room Number	*Material Number*	*Homogeneous Material Description*	*Quantity*	*Units*	*Comments*	*Response Action (AHERA Ranking)*
101 (Gym)	1	Pipe Insulation - Roof Drains and Cones	20	Ln.Ft.		maintain with O&M plan. (7)
101 (Gym)	2	Pipe Insulation-Mudded Pipe Fitting -	30	Ln.Ft.		maintain with O&M plan. (7)
102 (Stage South Hall)	2	Pipe Insulation-Mudded Pipe Fitting -	10	Ln.Ft.	1 Damaged	remove or repair damage ASAP. (4)
102 (Stage South Hall)	4	Pipe Insulation -	30	Ln.Ft.		maintain with O&M plan. (7)
102 (Stage)	4	Pipe Insulation -	120	Ln.Ft.	Under Stage	maintain with O&M plan. (7)
104 (Boys LR)	2	Pipe Insulation-Mudded Pipe Fitting -	22	Ln.Ft.		maintain with O&M plan. (7)
104 (Boys LR)	4	Pipe Insulation -	90	Ln.Ft.		maintain with O&M plan. (7)
117	1	Pipe Insulation - Roof Drains and Cones	0	Ln.Ft.	Removed Prior To Re-Inspection	maintain with O&M plan. (7)
204	8	Mastic - Black	825	Sq.Ft.	Under Surface Layer	maintain with O&M plan. (7)
205	8	Mastic - Black	140	Sq.Ft.	Under Surface Layer	maintain with O&M plan. (7)
206	8	Mastic - Black	160	Sq.Ft.	Under Surface Layer	maintain with O&M plan. (7)
207	8	Mastic - Black	145	Sq.Ft.	Under Surface Layer	maintain with O&M plan. (7)
208	8	Mastic - Black	145	Sq.Ft.	Under Surface Layer	maintain with O&M plan. (7)
209	8	Mastic - Black	145	Sq.Ft.	Under Surface Layer	maintain with O&M plan. (7)
213	8	Mastic - Black	825	Sq.Ft.	Under Surface Layer	maintain with O&M plan. (7)
214	8	Mastic - Black	825	Sq.Ft.	Under Surface Layer	maintain with O&M plan. (7)

Northern Analytical Services

14870 225th Avenue, Big Rapids, MI 49307 - (231) 268-0004 - Fax (866) 214-4739

LEA: Beal City Public School
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Address: 3180 West Beal City Road
Mt. Pleasant, MI 48858

Response Action Report

Printed: October 14, 2024

Room Number	*Material Number*	*Homogeneous Material Description*	*Quantity*	*Units*	*Comments*	*Response Action (AHERA Ranking)*
231	8	Mastic - Black	500	Sq.Ft.	Under Surface Layer	maintain with O&M plan. (7)
232	8	Mastic - Black	90	Sq.Ft.	Under Surface Layer	maintain with O&M plan. (7)
233	8	Mastic - Black	1000	Sq.Ft.	Under Surface Layer	maintain with O&M plan. (7)
234	8	Mastic - Black	830	Sq.Ft.	Under Surface Layer	maintain with O&M plan. (7)
244 (Girls LR)	2	Pipe Insulation-Mudded Pipe Fitting -	20	Ln.Ft.	3 Damaged - One At Lockers Two In Toilet Area	remove or repair damage ASAP. (4)
244 (Girls LR)	3	Floor Tile - & Black Mastic	150	Sq.Ft.		maintain with O&M plan. (7)
244 (Girls LR)	4	Pipe Insulation -	60	Ln.Ft.		maintain with O&M plan. (7)
249	2	Pipe Insulation-Mudded Pipe Fitting -	10	Ln.Ft.		maintain with O&M plan. (7)
249	3	Floor Tile - & Black Mastic	200	Sq.Ft.	5 sq.ft. Exposed Mastic	maintain with O&M plan. (7)
249	4	Pipe Insulation -	100	Ln.Ft.		maintain with O&M plan. (7)
304	8	Mastic - Black	700	Sq.Ft.	Under Surface Layer	maintain with O&M plan. (7)
306	8	Mastic - Black	80	Sq.Ft.	Under Surface Layer	maintain with O&M plan. (7)
307	8	Mastic - Black	150	Sq.Ft.	Under Surface Layer	maintain with O&M plan. (7)
308	8	Mastic - Black	250	Sq.Ft.	Under Surface Layer	maintain with O&M plan. (7)
309	8	Mastic - Black	520	Sq.Ft.	Under Surface Layer	maintain with O&M plan. (7)
310	8	Mastic - Black	630	Sq.Ft.	Under Surface Layer	maintain with O&M plan. (7)

Northern Analytical Services

14870 225th Avenue, Big Rapids, MI 49307 - (231) 268-0004 - Fax (866) 214-4739

LEA: Beal City Public School
Building: Beal City Public School
Building No.: 1
Address: 3180 West Beal City Road
Mt. Pleasant, MI 48858

Response Action Report

Printed: October 14, 2024

Room Number	*Material Number*	*Homogeneous Material Description*	*Quantity*	*Units*	*Comments*	*Response Action (AHERA Ranking)*
311	8	Mastic - Black	320	Sq.Ft.	Under Surface Layer	maintain with O&M plan. (7)
313	8	Mastic - Black	1000	Sq.Ft.	Under Surface Layer	maintain with O&M plan. (7)
314	8	Mastic - Black	145	Sq.Ft.	Under Surface Layer	maintain with O&M plan. (7)
315	8	Mastic - Black	700	Sq.Ft.	Under Surface Layer	maintain with O&M plan. (7)
316	8	Mastic - Black	430	Sq.Ft.	Under Surface Layer	maintain with O&M plan. (7)
328	3	Floor Tile - & Black Mastic	510	Sq.Ft.		maintain with O&M plan. (7)
333	8	Mastic - Black	165	Sq.Ft.	Under Surface Layer	maintain with O&M plan. (7)
334	8	Mastic - Black	165	Sq.Ft.	Under Surface Layer	maintain with O&M plan. (7)
336	8	Mastic - Black	100	Sq.Ft.	Under Surface Layer	maintain with O&M plan. (7)
337	8	Mastic - Black	325	Sq.Ft.	Under Surface Layer	maintain with O&M plan. (7)
362	8	Mastic - Black	825	Sq.Ft.	Under Surface Layer	maintain with O&M plan. (7)
365	8	Mastic - Black	825	Sq.Ft.	Under Surface Layer	maintain with O&M plan. (7)
369	3	Floor Tile - & Black Mastic	825	Sq.Ft.		maintain with O&M plan. (7)
370	8	Mastic - Black	620	Sq.Ft.	Under Surface Layer	maintain with O&M plan. (7)
371	8	Mastic - Black	175	Sq.Ft.	Under Surface Layer	maintain with O&M plan. (7)
372	8	Mastic - Black	150	Sq.Ft.	Under Surface Layer	maintain with O&M plan. (7)

Northern Analytical Services

14870 225th Avenue, Big Rapids, MI 49307 - (231) 268-0004 - Fax (866) 214-4739

LEA: Beal City Public School
Building: Beal City Public School
Building No.: 1
Address: 3180 West Beal City Road
Mt. Pleasant, MI 48858

Response Action Report

Printed: October 14, 2024

Room Number	*Material Number*	*Homogeneous Material Description*	*Quantity*	*Units*	*Comments*	*Response Action (AHERA Ranking)*
374	8	Mastic - Black	100	Sq.Ft.	Under Surface Layer	maintain with O&M plan. (7)
375	8	Mastic - Black	120	Sq.Ft.	Under Surface Layer	maintain with O&M plan. (7)
Building Wide	5	Fire Rated Door -	10	Each		maintain with O&M plan. (7)
Tunnel	4	Pipe Insulation -	540	Ln.Ft.	No Access to Tunnel	maintain with O&M plan. (7)

Sample Location Report

Northern Analytical Services

14870 225th Avenue, Big Rapids, MI 49307 - (231) 268-0004 - Fax (866) 214-4739

Customer: Beal City Public School
Building: Beal City Public School
Address: 3180 West Beal City Road
Mt. Pleasant, MI 48858
Printed: October 14, 2024

Sample Location Report

Sample Number	*Material Number*	*Homogeneous Material Description*	*Room Number*	*Sample Location*
201	2	Pipe Insulation-Mudded Pipe Fitting -	244 (Girls LR)	At Locker Area Damage
202	2	Pipe Insulation-Mudded Pipe Fitting -	244 (Girls LR)	Above Sink
203	2	Pipe Insulation-Mudded Pipe Fitting -	102 (Stage)	At Damaged Fitting

Lab Report

SanAir Technologies Laboratory

The Identification Specialists

Analysis Report
prepared for
Northern Analytical Services, LLC

Report Date: 10/3/2024

Project Name: Beal City Elementary

Project #: 240198

SanAir ID#: 24056537

NVLAP TESTING

NVLAP LAB CODE 600227-0

11709 Chesterdale Road | Cincinnati, Ohio 45246
888.895.1177 | 513.438.6006 | IAQ@SanAir.com | SanAir.com

SanAir ID Number
24056537
FINAL REPORT
10/3/2024 4:53:47 PM

Name: Northern Analytical Services, LLC
Address: 14870 225th Avenue
Big Rapids, MI 49307
Phone: 231-679-0005

Project Number: 240198
P.O. Number:
Project Name: Beal City Elementary
Collected Date: 10/2/2024
Received Date: 10/3/2024 10:15:00 AM

Dear Kevin Delancey,

We at SanAir would like to thank you for the work you recently submitted. The 3 sample(s) were received on Thursday, October 03, 2024 via UPS. The final report(s) is enclosed for the following sample(s): 201, 202, 203.

These results only pertain to this job and should not be used in the interpretation of any other job. This report is only complete in its entirety. Refer to the listing below of the pages included in a complete final report.

Sincerely,

Maureen Y. Haley
Asbestos Laboratory Manager
SanAir Technologies Laboratory

Final Report Includes:
- Cover Letter
- Analysis Pages
- Disclaimers and Additional Information

Sample conditions:
- 3 samples in Good condition.

SanAir ID Number
24056537
FINAL REPORT
10/3/2024 4:53:47 PM

Name: Northern Analytical Services, LLC
Address: 14870 225th Avenue
Big Rapids, MI 49307
Phone: 231-679-0005

Project Number: 240198
P.O. Number:
Project Name: Beal City Elementary
Collected Date: 10/2/2024
Received Date: 10/3/2024 10:15:00 AM

Analyst: Pinkerton, Sid

Asbestos Bulk PLM EPA 600/R-93/116

	Stereoscopic	Components		
SanAir ID / Description	Appearance	% Fibrous	% Non-fibrous	Asbestos Fibers
201 / 24056537-001 Mudded Pipe Fitting	Grey Non-Fibrous Homogeneous	5% Min. Wool	92% Other	3% Chrysotile
202 / 24056537-002 Mudded Pipe Fitting				Not Analyzed
203 / 24056537-003 Mudded Pipe Fitting				Not Analyzed

Analyst: Sidney Pinkerton
Analysis Date: 10/3/2024

Approved Signatory: Johnathan Wilson
Date: 10/3/2024

Disclaimer and Additional Information

This report is the sole property of the client named on the SanAir Technologies Laboratory, Inc. (SanAir) chain-of-custody (COC). Results in the report are confidential information intended only for the use by the client named on the COC. Neither results nor reports will be discussed with or released to any third party without our client's written permission to maintain client confidentiality. The final report cannot be reproduced, except in full, without written authorization from SanAir to assure that parts of the report are not taken out of context. This report and any information contained within shall not be edited, altered, or modified in any way by any persons or agencies receiving, viewing, distributing, or otherwise possessing a copy of this final report. The laboratory reserves the right to perform amendments to any finalized report, of which shall supersede and make obsolete any previous editions. Such changes, modifications, additions, or deletions shall be effective immediately upon notice thereof, which may be given by means including, but not limited to, posting on the SanAir client portal website, electronic or conventional mail, or by any other means. The information provided in this report applies only to the samples submitted in the condition they were received at the laboratory and is relevant only for the date, time, and location of sampling. Samples were received in good condition unless otherwise noted on the report. The accuracy of the results is dependent upon the client's sampling procedure and information provided to the laboratory by the client on the COC, which includes the project name, project number, P.O. number, sample collection dates, special instructions, samples collected by, sample numbers, sample identifications/location, sample type, selected analysis type, and total area or volume that may affect the validity of the results. SanAir assumes no responsibility for the sampling procedure and will provide evaluation reports based solely on the sample and information provided by the client. SanAir assumes no responsibility or liability for the manner in which results are used or interpreted. This report does not constitute and shall not be used to claim product, process, system, or person certification, approval, or endorsement by NVLAP, NIST, NELAC, AIHA LAP, LLC or any other agency of the U.S. government; all or some tests contained in this report may not be accredited by every local, state, and federal regulatory agency. Refer to the SanAir website at www.sanair.com for copies of current certificates and scopes of various accreditations, certifications, and licenses or contact the laboratory at iaq@sanair.com for inquiries regarding the status or scope of an accreditation or certification.

Fibers smaller than 5-microns cannot be seen with this method due to scope limitations. Polarized- light microscopy is not consistently reliable in detecting asbestos in floor covering and similar non-friable organically bound materials. Quantitative transmission electron microscopy is currently the only method that can be used to determine if this material can be considered or treated as non-asbestos containing. Samples are held for a period of 60 days.

Asbestos Accreditations, Certifications, and Licenses
National Voluntary Laboratory Accreditation Program (NVLAP) Lab Code 600227-0
State of Connecticut Department of Public Health Registration Number: PH-0817
State of Rhode Island Department of Health, Certification Number: PLM00144, TEM00144
State of West Virginia Bureau for Public Health, Analytical Laboratory Number: LT000637
Texas Department of State Health Services License Number: 300510

SanAir Technologies Laboratory
10501 Trade Ct., Suite 100
N. Chesterfield, VA 23236
804.897.1177 / 888.895.1177
Fax 804.897.0070
sanair.com

Asbestos Chain of Custody

Form 140, Rev 7, 10/20/2022

SanAir ID Number: 24056537

Company: Northern Analytical Services, LLC	Project #: 240198	Collected by: Joshua Christie
Address: 14870 225th Ave.	Project Name: Beal City Elementary	Phone #: (231) 679-0005
City, St., Zip: Big Rapids, MI, 49307	Date Collected: 10/2/2024	Fax #: 866-214-4739
State of Collection: MI Account#: 2409	P.O. Number:	Email: john@northernas.com/kevindelancey@northernas

Bulk

ABB	PLM EPA 600/R-93/116	X
	Positive Stop	X
ABEPA	PLM EPA 400 Point Count	
ABB1K	PLM EPA 1000 Point Count	
ABBEN	PLM EPA NOB**	
ABBCH	TEM Chatfield**	
ABBTM	TEM EPA NOB**	
ABQ	PLM Qualitative	

** Available on 24-hr. to 5-day TAT

Air

ABA	PCM NIOSH 7400	
ABA-2	OSHA w/ TWA*	
ABTEM	TEM AHERA	
ABATN	TEM NIOSH 7402	
ABT2	TEM Level II	
Other:		

New York ELAP

ABEPA2	NY ELAP 198.1	
ABENY	NY ELAP 198.6 PLM NOB	
ABBNY	NY ELAP 198.4 TEM NOB	
	Positive Stop	

Soil

ABSE	PLM EPA 600/R-93/116 (Qual.)	

Vermiculite

ABB	PLM EPA 600/R-93/116	
ABEPA3	PLM EPA 400 Point Count	
ABCM	Cincinnati Method	

Dust

ABWA	TEM Wipe ASTM D-6480	
ABDMV	TEM Microvac ASTM D-5755	

Water

ABHE	EPA 100.2	

Other

Matrix		

Turn Around Times				
	3 HR (4 HR TEM) ☐	6 HR (8HR TEM) ☐	12 HR ☐	1 Day ☒
	☐ 2 Days	☐ 3 Days	☐ 4 Days	☐ 5 Days

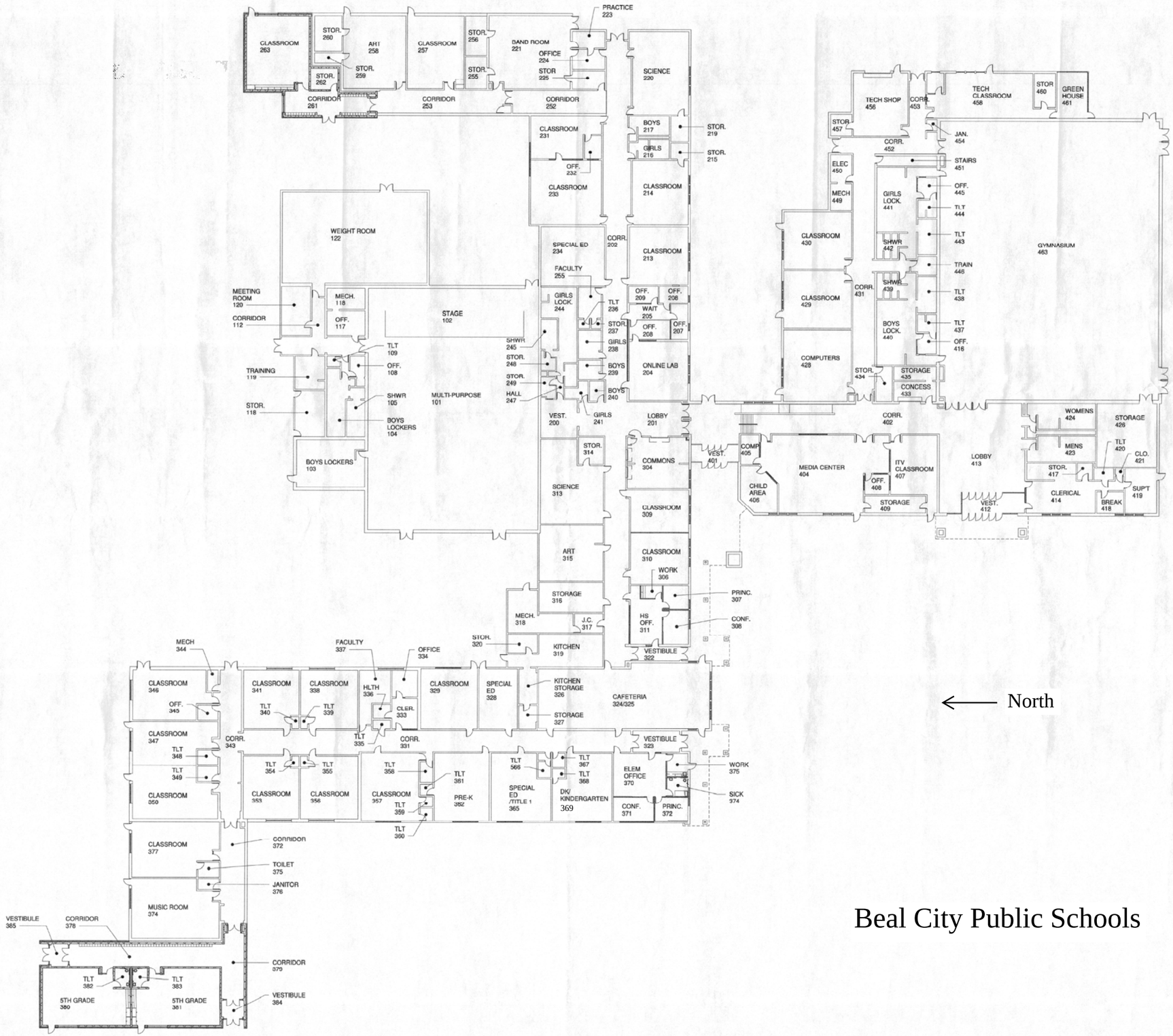
Special Instructions: POINT COUNT IF < 1%

Sample #	Sample Identification/Location	Volume or Area	Sample Date	Flow Rate*	Start – Stop Time*	
201	Molded Pipe Fitting					
202	"					
203	"					

Relinquished by	Date	Time	Received by	Date	Time
Joshua Christie	1630	10/2/2024	RMB	OCT 03 2024	10:15am

If no technician is provided, then the primary contact for your account will be selected. Unless scheduled, the turnaround time for all samples received after 3 pm EST will be logged in the next business day. Weekend or holiday work must be scheduled ahead of time and is charged at 150% of the 3hr TAT or a minimum charge of $150. A courier charge will be applied for same day and one-day turnaround times for offsite work. SanAir covers Ground and Next Day Air shipping. Shipments billed to SanAir with a faster shipping rate will result in additional charges.

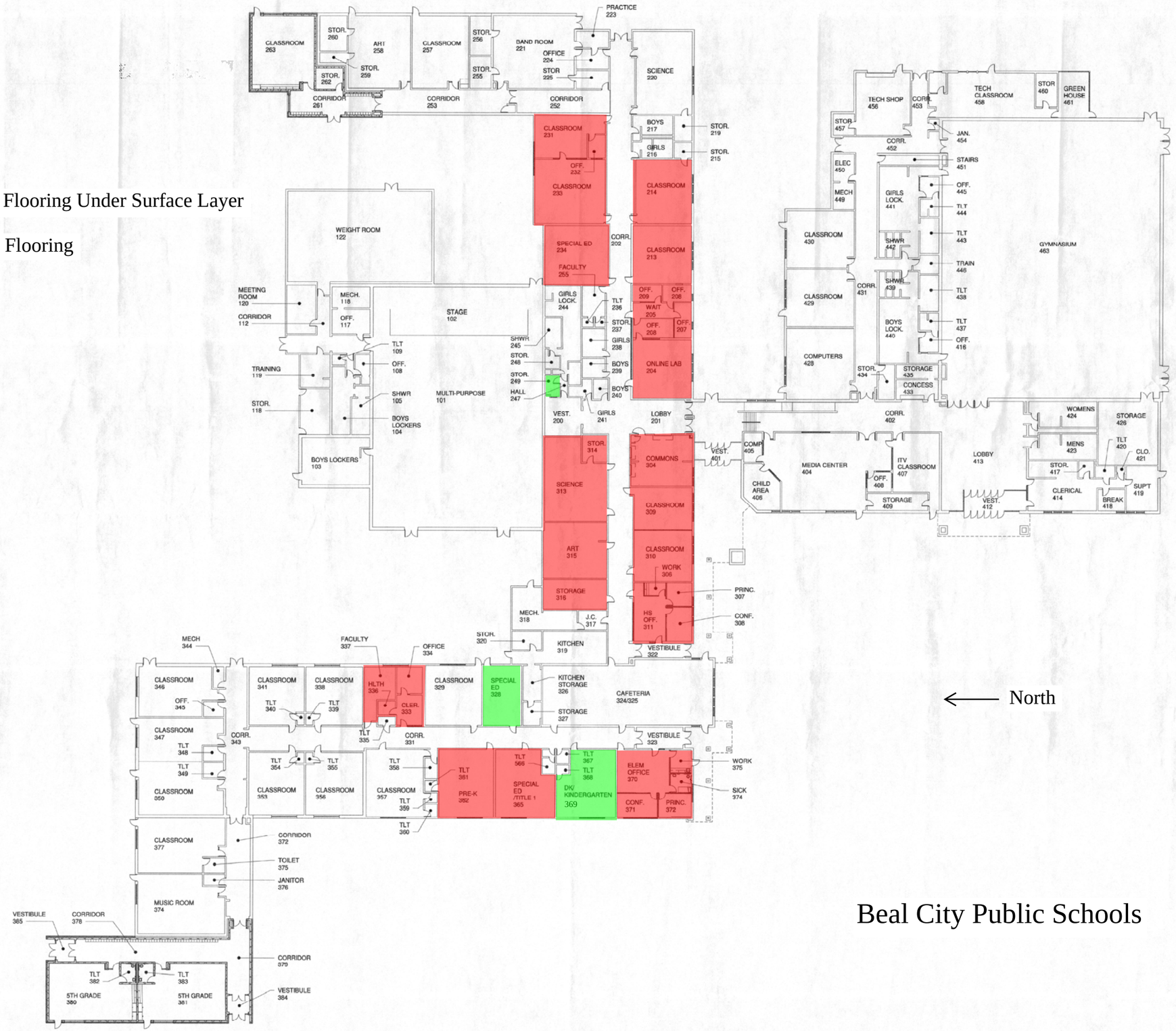
Floor Plan



Beal City Public Schools

= Known ACM Flooring Under Surface Layer

= Known ACM Flooring



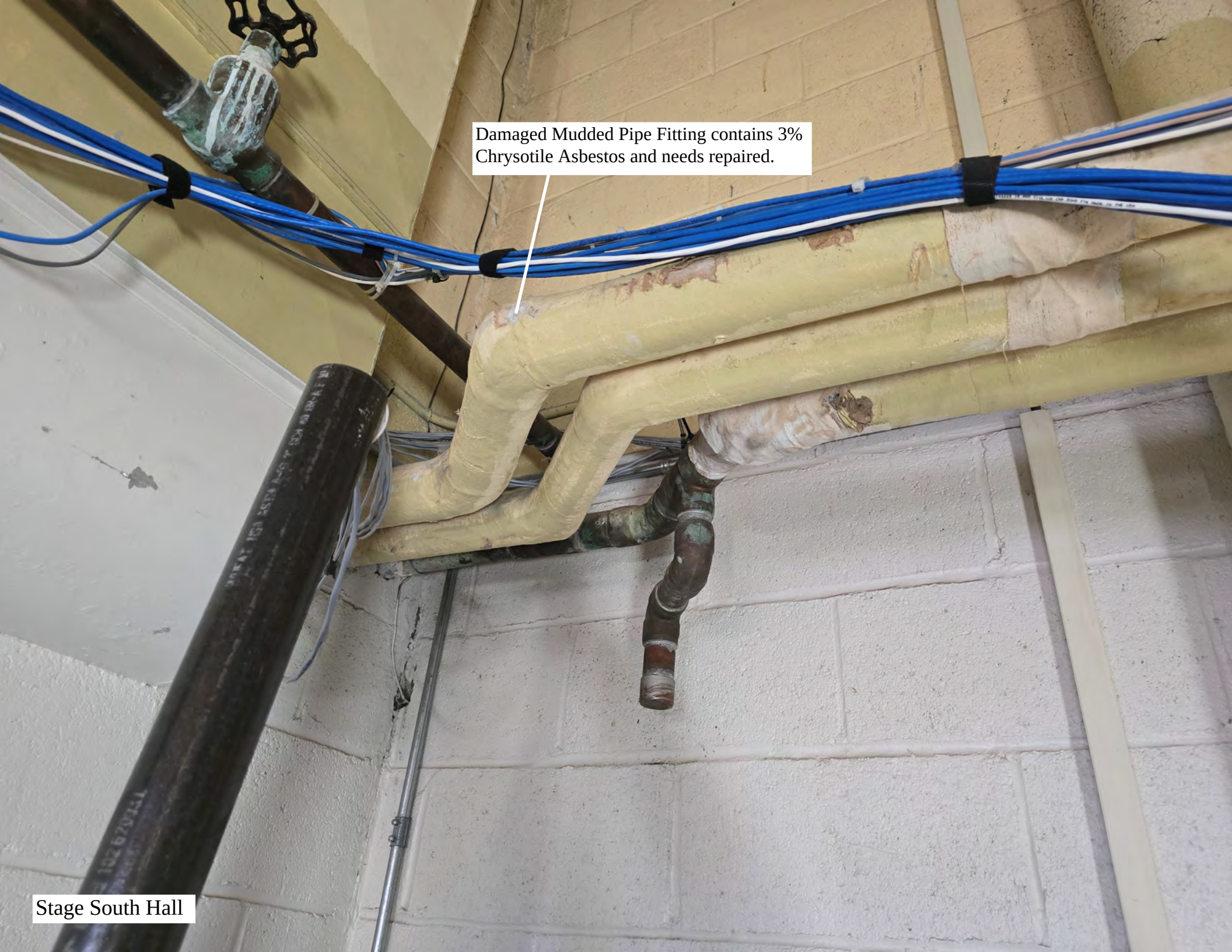
← North

Beal City Public Schools

Photos

Damaged Mudded Pipe Fitting contains 3% Chrysotile Asbestos and needs repaired/abated.
Girls Locker Room

Damaged Mudded Pipe Fitting contains 3% Chrysotile Asbestos and needs repaired/abated.
Girls Locker Room


Damaged Mudded Pipe Fitting contains 3% Chrysotile Asbestos and needs repaired.
Stage South Hall

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. 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

Beal City Schools
Beal City 2025 Bond Projects

FOR CONSTRUCTION

Owner

Beal City School District
1380 W. Beal City Road
Beal City, MI 48858

Date: March 27, 2025

IDI integrated designs inc. ARCHITECTURE ENGINEERING CONSULTING

Project Number

22-037

DIVISION 1 - GENERAL REQUIREMENTS

003121 Site Survey Information
003132 Geotechnical Data
012200 Unit Prices

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 (Robotics)
053100 Steel Decking (Robotics)
054000 Cold-Formed Metal Framing (Team Room)
055000 Metal Fabrications

DIVISION 6 – WOOD, PLASTICS AND COMPOSITES

061000 Rough Carpentry
061600 Sheathing
061753 Shop-Fabricated Wood Trusses (Team Room)
062023 Interior Finish Carpentry
064116 Plastic-Laminate-Clad Architectural Cabinets (Robotics)

DIVISION 7 – THERMAL AND MOISTURE PROTECTION

072100 Thermal Insulation
072119 Foamed-in-place Insulation
072500 Weather Barriers
074113.16 Standing-Seam Metal Roof (Team Room)
074293 Soffit Panels (Team Room)
074619 Steel Siding and Roofing (Team Room)
075419.35 Polyvinyl-Chloride (PVC) Roofing Mechanically Fastened (Robotics)
076200 Sheet Metal Flashing and Trim
077199 Roof Specialties (Team Room)
077253 Snow Guards (Team Room)
078413 Penetration Firestopping
079200 Joint Sealants

DIVISION 8 – OPENINGS

081113 Hollow Metal Doors and Frames
081743 FRP/Aluminum Hybrid Doors
083113 Access Doors and Frames
085113 Aluminum Windows (Robotics)
087100 Door Hardware
088000 Glazing (Robotics)
088700 Window Film (Robotics)

DIVISION 9 – FINISHES

092216 Non-Structural Metal Framing
092900 Gypsum Board
095100 Acoustical Ceilings (Robotics)
096519 Resilient Tile Flooring (Robotics)
099113 Exterior Painting
099123 Interior Painting

DIVISION 10 – SPECIALTIES

101100 Visual Display Units
102113.19 Plastic Toilet Compartments (Team Room)
102800 Toilet Accessories (Team Room)
104413 Fire Protection Cabinets
104416 Fire Extinguishers
105113 Metal Lockers (Team Room)

DIVISION 11 – EQUIPMENT

116833.43 Track and Field Equipment

DIVISION 12 – FURNISHINGS

123623.13 Plastic-Laminate-Clad Countertops

DIVISION 13 (NOT USED)

DIVISION 14 – (NOT USED)

DIVISION 15-20 (NOT USED)

DIVISION 21 – FIRE SUPPRESSION (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
223400 Fuel-Fired, Domestic-Water Heaters
224213.13 Commercial Water Closets
224213.16 Commercial Urinals
224216.13 Commercial Lavatories
224216.16 Commercial Sinks
224500 Emergency Plumbing Fixtures
224716 Pressure Water Coolers

DIVISION 23 – HEATING, VENTILATING AND AIR CONDITIONING

230100 General Mechanical Provisions
230500 Common Work Results for HVAC
230593 Testing, Adjusting, and Balancing for HVAC
230713 Duct Insulation
230923 Building Automation Systems for HVAC
231123 Facility Natural Gas Piping
233113 Metal Ducts
233300 Air Duct Accessories
233346 Flexible Ducts
233423 HVAC Power Ventilators
233713.13 Air Diffusers
233723 HVAC Gravity Ventilators
235416.13 Gas-Fired Furnaces
235533.16 Gas-Fired Unit Heaters
237223.19 Packaged, Indoor, Fixed Plate Energy Recovery Units
237416 Packaged Rooftop Air-Conditioning 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 (Robotics)
262419 Motor Control
262726 Wiring Devices
262816 Enclosed Switches and Circuit Breakers
265100 Interior Lighting
265600 Exterior Lighting

DIVISION 27 – COMMUNICATIONS

271501 Basic Cabling Requirements
271513 Network and Communication Cabling

DIVISION 28 – ELECTRONIC SAFETY AND SECURITY (NOT USED)

DIVISION 31 – EARTHWORK

311000 Site Clearing
312000 Earth Moving
312300 Football Field Equipment
312319 Dewatering
315000 Excavation Support and Protection

DIVISION 32 – EXTERIOR IMPROVEMENTS

321216 Asphalt Paving
321220 Track Surfacing and Marking
321313 Concrete Paving
321374 Concrete Paving Joint Sealants
321415 Pavement Markings
323113 Chain Link Fences and Gates
329200 Turf Restoration

DIVISION 33 - EXTERIOR IMPROVEMENTS

331416 Site Water Utility Distribution Piping
333100 Sanitary Sewers
334200 Storm Utility Drainage Piping

DIVISION 34 (NOT USED)

APPENDIX

Geotechnical Report

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 Rowe Professional Services Company dated, October 30, 2023, was used for the bases of design and, is available as an appendix to this Document.

END OF SECTION

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 G2 Consulting Group and included in the Geotechnical Report dated December 30, 2020, 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

SECTION 012200
UNIT PRICES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes administrative and procedural requirements for unit prices.
   1. Material Cost.
   2. Labor.
   3. Taxes.

B. Related Sections include, but not limited to the following:
   1. Division 01 4000 Section "Quality Requirements" for general testing and inspecting requirements.

1.2 DEFINITIONS

A. Unit price is an amount proposed by bidders, stated on the Bid Form, as a price per unit of measurement for materials or services added to or deducted from the Contract Sum by appropriate modification, if estimated quantities of Work required by the Contract Documents are increased or decreased.

1.3 PROCEDURES

A. Unit prices include all necessary material, plus cost for delivery, installation, insurance, applicable taxes, overhead, and profit.

B. Measurement and Payment: Refer to individual Specification Sections for work that requires establishment of unit prices. Methods of measurement and payment for unit prices are specified in those Sections.

C. Owner reserves the right to reject Contractor's measurement of work-in-place that involves use of established unit prices and to have this work measured, at Owner's expense, by an independent surveyor acceptable to Contractor.

D. List of Unit Prices: A list of unit prices is included in Part 3. Specification Sections referenced in the schedule contain requirements for materials described under each unit price.

PART 2 - EXECUTION

2.1 LIST OF UNIT PRICES

A. MDOT Subgrade Undercutting, Type II – Measured by the CYD.

END OF SECTION 012200

SECTION 024119 - SELECTIVE DEMOLITION

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. 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.

1.3 DEFINITIONS

A. Remove: Detach items from existing construction and dispose of them off-site unless indicated to be salvaged or reinstalled.

B. Remove and Salvage: Detach items from existing construction, in a manner to prevent damage, and deliver to Owner ready for reuse.

C. Remove and Reinstall: Detach items from existing construction, in a manner to prevent damage, prepare for reuse, and reinstall where indicated.

D. Existing to Remain: Leave existing items that are not to be removed and that are not otherwise indicated to be salvaged or reinstalled.

E. Dismantle: To remove by disassembling or detaching an item from a surface, using gentle methods and equipment to prevent damage to the item and surfaces; disposing of items unless indicated to be salvaged or reinstalled.

1.4 MATERIALS OWNERSHIP

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

B. Historic items, relics, antiques, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, and other items of interest or value to Owner that may be uncovered during demolition remain the property of Owner.

1. Carefully salvage in a manner to prevent damage and promptly return to Owner.

1.5 PREINSTALLATION MEETINGS

A. Pre-demolition Conference: Conduct conference at Project site.

1. Inspect and discuss condition of construction to be selectively demolished.

2. Review structural load limitations of existing structure.
3. Review and finalize selective demolition schedule and verify availability of materials, demolition personnel, equipment, and facilities needed to make progress and avoid delays.
4. Review requirements of work performed by other trades that rely on substrates exposed by selective demolition operations.
5. Review areas where existing construction is to remain and requires protection.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For refrigerant recovery technician.

B. Engineering Survey: Submit engineering survey of condition of building.

C. Proposed Protection Measures: Submit report, including Drawings, that indicates the measures proposed for protecting individuals and property, and for dust control. Indicate proposed locations and construction of barriers.

D. Schedule of Selective Demolition Activities: Indicate the following:

1. Detailed sequence of selective demolition and removal work, with starting and ending dates for each activity.
2. Interruption of utility services. Indicate how long utility services will be interrupted.
3. Coordination for shutoff, capping, and continuation of utility services.
4. Coordination of Owner's continuing occupancy of portions of existing building and of Owner's partial occupancy of completed Work.

E. Statement of Refrigerant Recovery: Signed by refrigerant recovery technician responsible for recovering refrigerant, stating that all refrigerant that was present was recovered and that recovery was performed according to EPA regulations. Include name and address of technician and date refrigerant was recovered.

F. Warranties: Documentation indicating that existing warranties are still in effect after completion of selective demolition.

1.7 CLOSEOUT SUBMITTALS

A. Inventory: Submit a list of items that have been removed and salvaged.

1.8 QUALITY ASSURANCE

A. Refrigerant Recovery Technician Qualifications: Certified by an EPA-approved certification program.

1.9 FIELD CONDITIONS

A. Owner will occupy portions of building 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.

1. Before selective demolition, Owner will remove the following items:

    a. Loose furnishings and teaching equipment.

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

D. Hazardous Materials: It is not expected that hazardous materials will be encountered in the Work.

1. Hazardous materials will be removed by Owner before start of the Work.
2. If suspected hazardous materials are encountered, do not disturb; immediately notify Architect and Owner. Hazardous materials will be removed by Owner under a separate contract.

E. Hazardous Materials: Present in buildings and structures to be selectively demolished. A report on the presence of hazardous materials is on file for review and use. Examine report to become aware of locations where hazardous materials are present.

1. Hazardous material remediation is specified elsewhere in the Contract Documents.
2. Do not disturb hazardous materials or items suspected of containing hazardous materials except under procedures specified elsewhere in the Contract Documents.
3. Owner will provide material safety data sheets for suspected hazardous materials that are known to be present in buildings and structures to be selectively demolished because of building operations or processes performed there.

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

G. 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. Indicate to Owner when down-time may occur.

1.10 COORDINATION

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

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.

B. Standards: Comply with ASSE A10.6 and NFPA 241.

PART 3 - EXECUTION

3.1 EXAMINATION

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

B. Review Project Record Documents of existing construction or other existing condition and hazardous material information provided by Owner. Owner does not guarantee that existing conditions are same as those indicated in Project Record Documents.

C. Perform an engineering survey of condition of building to determine whether removing any element might result in structural deficiency or unplanned collapse of any portion of structure or adjacent structures during selective building demolition operations.

1. Perform surveys as the Work progresses to detect hazards resulting from selective demolition activities.

D. Verify that hazardous materials have been remediated before proceeding with building demolition operations.

E. Survey of Existing Conditions: Record existing conditions by use of preconstruction photographs or video.
1. Inventory and record the condition of items to be removed and salvaged. Provide photographs or video of conditions that might be misconstrued as damage caused by salvage operations.
2. Before selective demolition or removal of existing building elements that will be reproduced or duplicated in final Work, make permanent record of measurements, materials, and construction details required to make exact reproduction.

3.2 PREPARATION

A. Refrigerant: Before starting demolition, remove refrigerant from mechanical equipment according to 40 CFR 82 and regulations of authorities having jurisdiction.

3.3 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. Arrange to shut off utilities with utility companies.
3. 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.
4. 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. Piping to Be Abandoned in Place: Drain piping and cap or plug piping with same or compatible piping material and leave in place.
c. Equipment to Be Removed: Disconnect and cap services and remove equipment.
d. Equipment to Be Removed and Reinstalled: Disconnect and cap services and remove, clean, and store equipment; when appropriate, reinstall, reconnect, and make equipment operational.
e. Equipment to Be Removed and Salvaged: Disconnect and cap services and remove equipment and deliver to Owner.
f. Ducts to Be Removed: Remove portion of ducts indicated to be removed and plug remaining ducts with same or compatible ductwork material.
g. Ducts to Be Abandoned in Place: Cap or plug ducts with same or compatible ductwork material and leave in place.

3.4 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.

1. Provide protection to ensure safe passage of people around selective demolition area and to and from occupied portions of building.
2. Provide temporary weather protection, during interval between selective demolition of existing construction on exterior surfaces and new construction, to prevent water leakage and damage to structure and interior areas.
3. Protect walls, ceilings, floors, and other existing finish work that are to remain or that are exposed during selective demolition operations.
4. Cover and protect furniture, furnishings, and equipment that have not been removed.
5. Comply with requirements for temporary enclosures, dust control, heating, and cooling specified in Section 015000 "Temporary Facilities and Controls."

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.

1. Strengthen or add new supports when required during progress of selective demolition.

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

3.5 SELECTIVE DEMOLITION, GENERAL

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. Proceed with selective demolition systematically, from higher to lower level. Complete selective demolition operations above each floor or tier before disturbing supporting members on the next lower level.
2. 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.

3. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
4. 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.
5. Maintain fire watch during and for at least <**Insert number**> hours after flame-cutting operations.
6. Maintain adequate ventilation when using cutting torches.
7. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.
8. Remove structural framing members and lower to ground by method suitable to avoid free fall and to prevent ground impact or dust generation.
9. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
10. Dispose of demolished items and materials promptly.

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 on-site designated by Owner.
5. Protect items from damage during transport and storage.

D. Removed and Reinstalled Items:

1. Notify the Construction Manager immediately if those items scheduled to be removed and reinstalled are found to be damage or in non-working order. Owner/Architect shall review a make final determination for their removal and re-use.
2. Clean and repair items to functional condition adequate for intended reuse.
3. Pack or crate items after cleaning and repairing. Identify contents of containers.
4. Protect items from damage during transport and storage.
5. 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, cleaned and reinstalled in their original locations after selective demolition operations are complete.

3.6 SELECTIVE DEMOLITION PROCEDURES FOR SPECIFIC MATERIALS

A. Concrete: Demolish in small sections. Using power-driven saw, cut concrete to a depth of at least 3/4 inch at junctures with construction to remain. Dislodge concrete from reinforcement at perimeter of areas being demolished, cut reinforcement, and then remove remainder of concrete. Neatly trim openings to dimensions indicated.

B. Concrete: Demolish in sections. Cut concrete full depth at junctures with construction to remain and at regular intervals using power-driven saw, and then remove concrete between saw cuts.

C. Masonry: Demolish in small sections. Cut masonry at junctures with construction to remain, using power-driven saw, and then remove masonry between saw cuts.

D. Concrete Slabs-on-Grade: Saw-cut perimeter of area to be demolished, and then break up and remove.

E. Resilient Floor Coverings: Remove floor coverings and adhesive according to recommendations in RFCI's "Recommended Work Practices for the Removal of Resilient Floor Coverings.

F. Roofing: Remove no more existing roofing than what can be covered in one day by new roofing and so that building interior remains watertight and weathertight.

1. Remove existing roof membrane, flashings, copings, and roof accessories.
2. Remove existing roofing system down to substrate, or insulation where indicated in drawings.

3.7 DISPOSAL OF DEMOLISHED MATERIALS

A. Remove demolition waste materials from Project site.

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.

B. Burning: Do not burn demolished materials.

3.8 CLEANING

A. 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

SECTION 033000
CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Cast-in-place concrete, including concrete materials, mixture design, placement procedures, and finishes.

B. Related Requirements:

1. Section 312000 "Earth Moving" for drainage fill under slabs-on-ground.

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 061000- Rough Carpentry: anchor bolts, embedded in foundations.

D. Section 076200- Sheet Metal Flashing and Trim: Flashing reglets attached to formwork.

1.4 DEFINITIONS

A. Cementitious Materials: Portland cement alone or in combination with one or more of the following: blended hydraulic cement, fly ash, slag cement, and other pozzolans materials subject to compliance with requirements.

B. Water/Cement Ratio (w/cm): The ratio by weight of water to cementitious materials.

1.5 ACTION SUBMITTALS

A. Shop Drawings:

1. Construction Joint Layout: Indicate proposed construction joints required to construct the structure.

a. Location of construction joints is subject to approval of the Architect.

2. Submit shop drawings of reinforcing steel to Architect for approval prior to fabrication. Submit under provisions of Section 013300.

3. Indicate reinforcement sizes, spacings, locations and quantities of reinforcing steel, bending and cutting schedules, and splices.

1.6 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.

1.7 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.

1.8 DELIVERY, STORAGE, AND HANDLING

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

1.9 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.

C. Fiber Reinforcing: synthetic polypropylene fibers engineered & designed for use in concrete slabs, complying with ASTM C1116, Type III, ½" to 1-1/2" long.

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. Polished concrete floors: ASTM C33/C33M, Class 3M fine aggregate or better, graded. Provide aggregates from a single source.

D. 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.

6. 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, 10 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 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. Class J: Normal-weight concrete used for exterior retaining walls.

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

G. 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.

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 6 feet long by 4 feet 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 efflorescence 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 CONCRETE SPLIT FACE UNITS

A. Split face Masonry Units shall comply with the recommendations of the National Concrete Masonry Association, and conform to ASTM C90, for hollow and solid load bearing units.

B. Split face Masonry Units shall be normal weight block, withstanding compression test loads of at least 3,000 psi for individual units, or 3,500 psi for an average of five units; basing load figures on the average net area of the blocks.

C. Units shall meet or exceed requirements for ASTM C55-96e1.

D. Split face Masonry Unit samples shall be submitted for establishing an approved color and texture. Provide color integral in mixture.

E. Integral Water Repellent: Provide units made with integral water repellent

F. Color:

1. As selected by Owner/Architect

2.4 BRICK VENEER

A. Grade SW, Type FBS.

B. Initial Rate of Absorption: Less than 6 grams per minute when tested according to ASTM C67.

C. Surface Coating: Brick with colors or textures produced by application of coatings shall withstand 50 cycles of freezing and thawing according to ASTM C67 with no observable difference in the applied finish when viewed from 10 feet.

D. Size: 2-1/4" high x 7-5/8" long x 3-5/8" wide (Modular Size)

E. Color and Texture:

1. Match brick color and texture of existing building.

2.5 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.

2.6 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.

2.7 REINFORCEMENT

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.

2.8 TIES AND ANCHORS

A. Materials: Provide ties and anchors specified in this article that are made from materials that comply with the following unless otherwise indicated:

1. Hot-Dip Galvanized, Carbon-Steel Wire: ASTM A82/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.

B. 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.
C. 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.

2.9 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.

2.10 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. Control Joints: Form with preformed rubber or PVC joint devices.
E. Cavity Wall Drainage: "Mortar Net" drain material or equal.
F. Cellular Plastic Weep/Vent: One-piece, flexible extrusion made from UV-resistant polypropylene copolymer, full height and width of head joint and depth 1/8 inch less than depth of outer wythe, in color selected from manufacturer's standard.

2.11 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: As selected by architect from manufacturers standard colors.

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: Headed stud shear connectors for composite construction; support framing for small openings in floor and roof deck.

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. Specifications for Vulcraft Super Longspan Steel Joists SLH Series.
F. SJI – Standard Specifications for Joist Girders.
G. SJI – Recommended Code of Standard Practice for Steel Joists and Joist Girders.
H. 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 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.

2.2 PRIMERS

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

2.3 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.

2.4 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. Galvanized-Steel Sheet: ASTM A653/A653M, Structural Steel (SS), Grade 33 zinc coating.
3. Galvanized and Shop-Primed Steel Sheet: ASTM A 653/A 653M, Structural Steel (SS), Grade 33, G60 zinc coating; cleaned, pretreated, and primed with manufacturer's standard baked-on, rust-inhibitive primer.
4. Deck Profile: As indicated.
5. Profile Depth: 1-1/2 inches.
6. Design Uncoated-Steel Thickness: 22 guage

2.3 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. Comply with AWS requirements and procedures for manual shielded metal arc welding, appearance and quality of welds, and methods used for correcting welding work.

F. Mechanical fasteners may be used in lieu of welding to fasten deck. Locate mechanical fasteners and install according to deck manufacturer's written instructions.

G. Miscellaneous Roof-Deck Accessories: Install ridge and valley plates, finish strips, end closures, and reinforcing channels according to deck manufacturer's written instructions. mechanically fasten to substrate to provide a complete deck installation.

1. Weld 12 gauge sheet steel cover plates at changes in direction of roof-deck panels unless otherwise indicated.

H. Pour Stops and Girder Fillers: Weld steel sheet pour stops and girder fillers to supporting structure according to SDI recommendations unless otherwise indicated.

I. 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 053100

SECTION 054000
COLD-FORMED METAL FRAMING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Load-bearing wall framing.
2. Exterior non-load-bearing wall framing.
3. Interior non-load-bearing wall framing exceeding height limitations of standard, nonstructural metal framing.

1.2 RELATED SECTIONS

A. Section 052100 – Structural Steel Framing: Cold Formed Metal Framing supported by structural steel.
B. Section 061000 – Rough Carpentry.
C. Section

1.3 REFERENCES

A. AISI (American Iron and Steel Institute) - Cold-Formed Steel Design Manual.
B. AISI (American Iron and Steel Institute) - Residential Steel Framing Manual.
C. ASTM A123 - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
D. ASTM A570/A570M - Standard Specification for Steel, Sheet and Strip, Carbon, Hot-Rolled, Structural Quality.
E. ASTM A611 - Standard Specification for Steel, Sheet, Carbon, Cold-Rolled, Structural Quality.
F. ASTM A645/A645M - Standard Specification for Pressure Vessel Plates, Five Percent Nickel Alloy Steel, Specially Heat Treated.
G. ASTM A653, Standard Specification for Steel Sheet, Zinc Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvanized) by the Hot-Dip Process.
H. ASTM C955 - Standard Specification for Load-Bearing (Transverse and Axial) Steel Studs, Runners (Tracks), and Bracing or Bridging, for Screw Application of Gypsum Board and Metal Plaster Bases.
I. AWS D1.1 (American Welding Society) - Structural Welding Code - Steel.
J. AWS D1.3 (American Welding Society) - Structural Welding Code - Sheet Steel.
K. ML/SFA 540 - (Metal Lath/Steel Framing Association, Division of National Association of Architectural Metal Manufacturers; NAAMM) - Lightweight Steel Framing Systems Manual.
L. SSPC-Paint 15 (Steel Structures Painting Council) - Steel Joist Shop Paint.
M. SSPC-Paint 20 (Steel Structures Painting Council) - Zinc Rich Primers.

1.4 SYSTEM DESCRIPTION

A. Size components to withstand design loads as indicated on Design Drawings.
B. Maximum Allowable Deflection: 1:360
C. Wall System:

1. Design to AISI – Cold-Formed Steel Design Manual.

2. Design to provide for movement of components without damage, failure of joint seals, undue stress on fasteners, or other detrimental effects when subject to seasonal or cyclic day/night temperature ranges.
3. Design system to accommodate construction tolerances, deflection of building structural members, and clearances of intended openings.
4. Seismic Loads: Design and size components to withstand seismic loads and sway displacement as calculated in accordance with 2015 Michigan Building code.

1.5 ACTION SUBMITTALS

A. Shop Drawings:

1. Include layout, spacings, sizes, thicknesses, and types of cold-formed steel framing; fabrication; and fastening and anchorage details, including mechanical fasteners.
2. Indicate reinforcing channels, opening framing, supplemental framing, strapping, bracing, bridging, splices, accessories, connection details, and attachment to adjoining work.
3. Submit product information and calculations as designed per the Michigan building Code requirements under the direct supervision of a Professional Engineer licensed in the State of Michigan. Shop Drawings shall bear the seal of a licensed Michigan Engineer.

1.6 INFORMATIONAL SUBMITTALS

A. Welding certificates.
B. Product certificates.
C. Evaluation Reports: For post-installed anchors and power-actuated fasteners, from ICC-ES or other qualified testing agency acceptable to authorities having jurisdiction.

1.7 QUALITY ASSURANCE

A. Calculate structural properties of framing members in accordance with AISI Specification for Design of Cold-Formed Steel Structural Members.

1.8 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years documented experience.
B. Installer: company specializing in performing work of this section with three years documented experience and approved by manufacturer.
C. Design structural elements under direct supervision of Professional Engineer experienced in design of this work and licensed in the State of Michigan.
D. Form, fabricate, provide, and connect components in accordance with ML/SFA 540 – Lightweight Steel Framing Systems Manual.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. ClarkDietrich
B. Cemco
C. Approved Equal.

2.2 COLD-FORMED STEEL FRAMING MATERIALS

A. Studs: sheet steel, formed to channel shape, punched web.
B. Joists: sheet steel, formed to channel shape, punched web.
C. Track: Formed sheet steel; channel shaped; same width as studs, tight fit; solid web.
D. Headers and Posts: built up shapes to meet performance criteria of “System Description”.
E. Framing Materials: Roll from new sheet steel; cold reduction steels not being acceptable.

2.3 ACCESSORIES

A. Bracing, Furring, Bridging: Formed sheet steel, thickness determined by performance requirements specified.
B. Plates, Gussets, Clips: Formed sheet steel, thickness determined by performance requirements specified.
C. Touch-Up Primer for Galvanized Surfaces: SSPC Paint 20 zinc rich.

2.4 ANCHORS, CLIPS, AND FASTENERS

A. Self-drilling, Self-tapping Screws, Bolts, Nuts, and Washers: Steel, hot dip galvanized to ASTM A123 1.25 oz/sq ft.
B. Anchorage Devices: Power actuated, and/ or screws with sleeves.
C. Welding: In conformance with AWS D1.1 and AWS D1.3.

2.5 MISCELLANEOUS MATERIALS

A. Galvanizing Repair Paint: SSPC-Paint 20.
B. Nonmetallic, Nonshrink Grout: Factory-packaged, nonmetallic, noncorrosive, nonstaining grout, complying with ASTM C 1107/C 1107M, and with a fluid consistency and 30-minute working time.
C. Shims: Load-bearing, high-density, multimonomer, nonleaching plastic; or cold-formed steel of same grade and metallic coating as framing members supported by shims.
D. Sealer Gaskets: Closed-cell neoprene foam, 1/4 inch thick, selected from manufacturer's standard widths to match width of bottom track or rim track members as required.

2.6 FABRICATION

A. Fabricate assemblies of formed sections of sizes and profiles required.
B. Fit, reinforce, and brace framing members to suit design requirements.
C. Fit and assemble in larges practical sections for delivery to site, ready for installation.

2.7 FINISHES

A. Studs: Galvanize to G60 coating class
B. Tracks and Headers: Galvanize to G60 coating class.
C. Joists: Galvanize to G60 coating class.
D. Bracing Furring, and Bridging: Same finish as framing members.
E. Plates, Gussets, and Clips: Same finish as framing members.

PART 3 - EXECUTION

3.1 PREPARATION

A. Verify substrate surfaces and building framing components are ready to receive Work.
B. Verify rough-in utilities are in proper location.

C. Install load-bearing shims or grout between the underside of load-bearing wall bottom track and the top of foundation wall or slab at locations with a gap larger than 1/4 inch to ensure a uniform bearing surface on supporting concrete or masonry construction.
D. Install sealer gaskets at the underside of wall bottom track or rim track and at the top of foundation wall or slab at stud or joist locations.

3.2 ERECTION OF STUDS

A. Align floor and ceiling tracks; locate to wall layout. Secure in place with fasteners or by welding at maximum 16 inches oc. Place studs at 16 inches oc; not more than 2 inches from abutting walls and at each side of openings. Connect studs to tracks using method suitable for performance criteria.
B. Construct corners using minimum three studs. Double stud wall openings, door jambs, and window jambs.
C. Erect load bearing studs one piece full length. Splicing of studs is not permitted.
D. Erect load bearing studs, brace, and reinforce to develop full strength, to achieve design requirements.
E. Fully seat axial loaded studs in receiving tracks (maximum 1/16 inch gap between stud and track web).
F. Coordinate placement of insulation in multiple stud spaces after erection.
G. Install intermediate studs above and below openings to align with wall stud spacing.
H. Install studs with deflection allowance in stud track, directly below horizontal building framing at non-load bearing framing.
I. Attach cross studs to studs for attachment of fixtures anchored to walls.
J. Install framing between studs for attachment of mechanical and electrical items, and to prevent stud rotation.
K. Touch-up field welds and damaged galvanized surfaces with primer.

3.3 ERECTION OF JOISTS

A. Install framing components.
B. Make provisions for erection stresses. Install temporary bracing to maintain alignment, until permanent bracing and attachments are installed.
C. Place joists at 16 inches oc; not more than 2 inches from abutting walls. Connect joists to supports using method suitable for performance criteria.
D. Set floor and roof joists parallel and level, with lateral bracing and bridging.
E. Locate joist end bearing directly over load bearing studs or install load distributing member to top of stud track.
F. Install web stiffeners at reaction points and other concentrated load points.
G. Touch-up field welds and damaged galvanized surfaces with primer.

3.4 ERECTION TOLERANCES

A. Install cold-formed steel framing level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet and as follows:

1. Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.

3.5 FIELD QUALITY CONTROL

A. Reference structural drawings for additional Special Inspection requirements as designated per Chapter 17 of the Michigan Building Code.
B. Testing: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.

C. Field and shop welds will be subject to testing and inspecting.
D. Testing agency will report test results promptly and in writing to Contractor and Architect.
E. Cold-formed steel framing will be considered defective if it does not pass tests and inspections.
F. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.6 REPAIRS AND PROTECTION

A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on fabricated and installed cold-formed steel framing with galvanized repair paint according to ASTM A 780/A 780M and manufacturer's written instructions.

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.
5. Steel weld plates and angles for casting into concrete.

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. Guard rails: As detailed, prime paint finish.

C. Bollards: Steel pipe, concrete filled, crowned cap, as detailed; prime paint finish.

D. Lintels: As detailed, prime paint finish.

E. Door frames for Overhead Door openings and Wall openings: Channel and Angle sections, galvanized finish.

END OF SECTION

SECTION 061000 - ROUGH CARPENTRY

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. Framing with dimension lumber.
2. Rooftop bases and support curbs.
3. Wood blocking, cants, and nailers.
4. Wood furring.
5. Plywood backing panels.

1.3 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. Exposed Framing: Framing not concealed by other construction.

D. OSB: Oriented strand board.

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

1.4 ACTION SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.

1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used and net amount of preservative retained.
2. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Include physical properties of treated materials based on testing by a qualified independent testing agency.
3. For fire-retardant treatments, include physical properties of treated lumber both before and after exposure to elevated temperatures, based on testing by a qualified independent testing agency according to ASTM D5664.
4. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.

B. Fastener Patterns: Full-size templates for fasteners in exposed framing.

1.5 INFORMATIONAL SUBMITTALS

A. Material Certificates: For dimension lumber specified to comply with minimum allowable unit stresses. Indicate species and grade selected for each use and design values approved by the ALSC Board of Review.

1.6 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: 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. For exposed lumber indicated to receive a stained or natural finish, omit grade stamp and provide certificates of grade compliance issued by grading agency.
3. Dress lumber, S4S, unless otherwise indicated.

B. Maximum Moisture Content of 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 FIRE-RETARDANT-TREATED MATERIALS

A. General: Where fire-retardant-treated materials are indicated, materials shall comply with requirements in this article, that are acceptable to authorities having jurisdiction, and with fire-test-response characteristics specified as determined by testing identical products per test method indicated by a qualified testing agency.

B. Fire-Retardant-Treated Lumber and Plywood by Pressure Process: Products with a flame-spread index of 25 or less when tested according to ASTM E84, and with no evidence of significant progressive combustion when the test is extended an additional 20 minutes, and with the flame front not extending more than 10.5 feet beyond the centerline of the burners at any time during the test.

1. Treatment shall not promote corrosion of metal fasteners.
2. Exterior Type: Treated materials shall comply with requirements specified above for fire-retardant-treated lumber and plywood by pressure process after being subjected to accelerated weathering according to ASTM D2898. Use for exterior locations and where indicated.
3. Interior Type A: Treated materials shall have a moisture content of 28 percent or less when tested according to ASTM D3201 at 92 percent relative humidity. Use where exterior type is not indicated.

4. Design Value Adjustment Factors: Treated lumber shall be tested according to ASTM D5664 and design value adjustment factors shall be calculated according to ASTM D6841.

C. Kiln-dry lumber after treatment to maximum moisture content of 19 percent.

D. Identify fire-retardant-treated wood with appropriate classification marking of qualified testing agency.

1. For exposed lumber indicated to receive a stained or natural finish, omit marking and provide certificates of treatment compliance issued by testing agency.

E. For exposed items indicated to receive a stained or natural finish, chemical formulations shall not bleed through, contain colorants, or otherwise adversely affect finishes.

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

1. Concealed blocking.
2. Roof construction.
3. Plywood backing panels.

2.3 DIMENSION LUMBER FRAMING

A. Joists, Rafters, and Other Framing Not Listed Above: Construction or No. 2 grade.

1. Species:
   a. Hem-fir (north); NLGA.
   b. Douglas fir-larch; WCLIB or WWPA.

B. Joists, Rafters, and Other Framing Not Listed Above: Any species of machine stress-rated dimension lumber with a grade of not less than 2400f-2.0E.

C. Joists, Rafters, and Other Framing Not Listed Above: Any species and grade with a modulus of elasticity of at least 900,000 psi and an extreme fiber stress in bending of at least 600 psi for 2-inch nominal thickness and 12-inch nominal width for single-member use.

D. Exposed Framing Indicated to Receive a Stained or Natural Finish: Hand-select material for uniformity of appearance and freedom from characteristics, on exposed surfaces and edges, that would impair finish appearance, including decay, honeycomb, knot-holes, shake, splits, torn grain, and wane.

1. Species and Grade: As indicated above for load-bearing construction of same type.

2.4 MISCELLANEOUS LUMBER

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

1. Blocking.
2. Rooftop equipment bases and support curbs.
3. Cants.

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

C. Concealed Boards: 19 percent maximum moisture content and any of the following species and grades:

1. Hem-fir or hem-fir (north); Construction or No. 2 Common grade; 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.

2.5 PLYWOOD BACKING PANELS

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

2.6 FASTENERS

A. General: Fasteners shall be of size and type indicated and shall comply with requirements specified in this article for material and manufacture.

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.

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.

2.7 METAL FRAMING ANCHORS

A. Manufacturers: Subject to compliance with requirements, undefined:

1. Cleveland Steel Specialty Co.
2. KC Metals Products, Inc.
3. Simpson Strong-Tie Co., Inc.
4. USP Structural Connectors.

B. Allowable design loads, as published by manufacturer, shall meet or exceed those of products of manufacturers listed. 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.

C. Galvanized-Steel Sheet: Hot-dip, zinc-coated steel sheet complying with ASTM A653/A653M, G60 coating designation. Use for interior locations unless otherwise indicated.

D. Hot-Dip, Heavy-Galvanized Steel Sheet: ASTM A653/A653M; structural steel (SS), high-strength low-alloy steel Type A (HSLAS Type A), or high-strength low-alloy steel Type B (HSLAS Type B);

G185 coating designation; and not less than 0.036 inch thick. Use for wood-preservative-treated lumber and where indicated.

E. Joist Hangers: U-shaped joist hangers with 2-inch- long seat and 1-1/4-inch- wide nailing flanges at least 85 percent of joist depth.

1. Thickness: 0.050 inch.

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 rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit rough carpentry accurately to other construction. Locate 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. Do not splice structural members between supports unless otherwise indicated.

G. 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.

H. 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.

I. 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.

J. 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.

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

L. 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. Table R602.3(1), "Fastener Schedule for Structural Members," and Table R602.3(2), "Alternate Attachments," in ICC's International Residential Code for One- and Two-Family Dwellings.
3. ICC-ES evaluation report for fastener.

M. 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.

N. For exposed work, arrange fasteners in straight rows parallel with edges of members, with fasteners evenly spaced, and with adjacent rows staggered.

1. Comply with approved fastener patterns where applicable.
2. Use finishing nails unless otherwise indicated. Countersink nail heads and fill holes with wood filler.
3. Use common nails unless otherwise indicated. Drive nails snug but do not countersink nail heads.

3.2 PROTECTION

A. Protect wood that has been treated with inorganic boron (SBX) from weather. If, despite protection, inorganic boron-treated wood becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

B. Protect rough carpentry from weather. If, despite protection, rough carpentry becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

END OF SECTION

SECTION 061600 -
SHEATHING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Wall sheathing.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product.

1.3 INFORMATIONAL SUBMITTALS

A. Evaluation Reports: For the following, from ICC-ES:

1. Wood-preservative-treated plywood.
2. Fire-retardant-treated plywood.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Resistance Ratings: As tested according to ASTM E119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Fire-Resistance Ratings: Indicated by design designations from UL's "Fire Resistance Directory" or from the listings of another qualified testing agency.

2.2 FIRE-RETARDANT-TREATED PLYWOOD

A. General: Where fire-retardant-treated materials are indicated on drawings or required by building code, use materials complying with requirements in this article that are acceptable to authorities having jurisdiction and with fire-test-response characteristics specified as determined by testing identical products per test method indicated by a qualified testing agency.

B. Fire-Retardant-Treated Plywood by Pressure Process: Products with a flame-spread index of 25 or less when tested according to ASTM E84, and with no evidence of significant progressive combustion when the test is extended an additional 20 minutes, and with the flame front not extending more than 10.5 feet beyond the centerline of the burners at any time during the test.

1. Exterior Type: Treated materials shall comply with requirements specified above for fire-retardant-treated plywood by pressure process after being subjected to accelerated weathering according to ASTM D2898. Use for exterior locations and where indicated.
2. Interior Type A: Treated materials shall have a moisture content of 28 percent or less when tested according to ASTM D3201/D3201M at 92 percent relative humidity. Use where exterior type is not indicated.

3. Design Value Adjustment Factors: Treated lumber plywood shall be tested according to ASTM D5516 and design value adjustment factors shall be calculated according to ASTM D6305. Span ratings after treatment shall be not less than span ratings specified.

C. Kiln-dry material after treatment to a maximum moisture content of 15 percent.

D. Identify fire-retardant-treated plywood with appropriate classification marking of qualified testing agency.

E. Application: Treat all plywood unless otherwise indicated.

2.3 WALL SHEATHING

A. Plywood Sheathing: Exposure 1, Structural I sheathing, 5/8 inch thick.

B. Glass-Mat Gypsum Sheathing: ASTM C1177/C1177M.

1. Type and Thickness: Type X, 5/8 inch thick.

2.4 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.

1. For wall sheathing, provide fasteners with hot-dip zinc coating complying with ASTM A153/A153M.
2. For wall sheathing, provide fasteners with organic-polymer or other corrosion-protective coating having a salt-spray resistance of more than 800 hours according to ASTM B117.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Do not use materials with defects that impair quality of sheathing or pieces that are too small to use with minimum number of joints or optimum joint arrangement. Arrange joints so that pieces do not span between fewer than three support members.

B. Cut panels at penetrations, edges, and other obstructions of work; fit tightly against abutting construction unless otherwise indicated.

C. Securely attach to substrate by fastening as indicated, complying with the following:

1. Table 2304.9.1, "Fastening Schedule," in the ICC's International Building Code.
2. Table R602.3(1), "Fastener Schedule for Structural Members," and Table R602.3(2), "Alternate Attachments," in the ICC's International Residential Code for One- and Two-Family Dwellings.
3. ICC-ES evaluation report for fastener.

D. Coordinate wall sheathing installation with flashing and joint-sealant installation so these materials are installed in sequence and manner that prevent exterior moisture from passing through completed assembly.

E. Do not bridge building expansion joints; cut and space edges of panels to match spacing of structural support elements.

3.2 WOOD STRUCTURAL PANEL INSTALLATION

A. General: Comply with applicable recommendations in APA Form No. E30, "Engineered Wood Construction Guide," for types of structural-use panels and applications indicated.

B. Fastening Methods: Fasten panels as indicated below:

1. Wall Sheathing:
    a. Screw to cold-formed metal framing.
    b. Space panels 1/8 inch apart at edges and ends.

END OF SECTION

SECTION 061753
SHOP-FABRICATED WOOD TRUSSES

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Prefabricated wood roof trusses.
B. Bridging, bracing, hangers and anchorage.

1.2 RELATED WORK

A. Section 061000 – Rough Carpentry.

1.3 REFERENCES

A. AFPA-American Forest & Paper Association.
B. ALSC American Lumber Standards Committee: Softwood Lumber Standards.
C. ASTM A167 Stainless and Heat Resisting Chromium Nickel Steel Plate, Sheet and Strip.
D. ANSI/ASTM A446 Sheet Steel, Zinc Coated (Galvanized) by the Hot Dip Process, Physical (Structural) Quality.
E. AWPA American Wood Preserver's Association.
F. FS TT W 571 Wood Preservation: Treating Practices.
G. RIS Redwood Inspection Service: Standard Specifications and Grades for California Redwood Lumber.
H. SEI/ASCE 7-02: Structural Engineer’s Institute/American Society of Civil Engineers-Minimum Design Loads for Buildings and Other Structures.
I. SFPA Southern Forest Products Association
J. TPI Truss Plate Institute.
K. UL Underwriter's Laboratories, Inc.
L. WCLIB West Coast Lumber Inspection Bureau: Standard Grading Rules for West Coast Lumber.
M. WWPA Western Wood Products Association.

1.4 SYSTEM DESCRIPTION

A. Manufacturer: Company specializing in manufacture of prefabricated wood trusses with three years minimum experience.
B. Design trusses and truss-to-truss connections under direct supervision of a Professional Engineer experienced in wood truss design and licensed in the State of Michigan/Wisconsin. Truss-to-truss connections shall be designed by the truss supplier and clearly shown on the erection plans.
C. Where piggyback trusses are used to achieve full roof height, or to frame hips and valleys, etc., the primary load carrying trusses below shall have their top chords fully sheathed as part of the roof diaphragm.
D. Lumber Grading Agency: Certified by ALSC.
E. Truss plates: In accordance with Truss Plate Institute.

1.5 REGULATORY REQUIREMENTS

A. Conform to 2015 Michigan Building Code (2015 International Building Code, as modified by latest DILHR revisions) and SEI/ASCE 7-10 for loads, seismic zoning, and other governing load criteria.
B. Refer to the design drawings for floor live loads, floor and rood dead loads, as well as uniform snow loads, unbalanced snow loads, drift loads and wind loads for the roof.

C. Where unbalanced snow loads, sliding snow loads or drift loads create larger reactions for the primary roof trusses, including connection hardware, shall be designed based upon the larger reactions.

1.6 SUBMITTALS

A. Submit shop drawings and product data under provisions of section 013000.

1. Shop drawings shall bear the seal of a Michigan/Wisconsin licensed Engineer.
2. Erection plans which call out truss-to-truss connections and hardware shall bear the seal of truss-to-truss connection hardware indicating dimensions and load capacities.
3. Submit cut sheets of truss-to-truss connections hardware indicating dimensions and load capacities.

B. Indicate Framing system, sizes and spacing, loads and cambers, bearing and anchor details, bridging and bracing, and framed openings. Submit design calculations.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site under provisions of Section 16000.
B. Store and protect products under provisions of Section 016000.
C. Transport and store trusses in vertical position, resting on bearing ends.
D. Protect trusses from moisture, warpage, and distortion during transit and when stored.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Lumber Grading Rules: As specified by the manufacturer.
B. Steel Connectors: ANSI/ASTM A446 steel, Grade A: galvanized; die stamped with integral teeth.
C. Fasteners: Galvanized for exterior, high humidity and treated wood locations; plain finish elsewhere; size and type to suit location.

2.2 FABRICATION

A. Verify dimensions and site conditions prior to fabrication.
B. Cut members accurately to length to achieve tight joint connections.
C. Jig trusses during fabrication to assure accurate configuration. Press connectors into lumber, both sides of joint simultaneously.
D. Build camber into truss, as required by design.

PART 3 - EXECUTION

3.1 INSPECTION

A. Verify that supports and openings are ready to receive trusses.
B. Verify sufficient end bearing area.
C. Beginning of installation means acceptance of existing conditions.
D. Provide permanent bracing in accordance with truss manufacturer's requirements.

3.2 PREPARATION

A. Coordinate placement of bearing items.

3.3 INSTALLATION

A. Install trusses in accordance with manufacturer's instructions, at spacing shown on drawings.
B. Place trusses true to line and level.
C. Provide temporary bracing to hold trusses in place until permanently secured.
D. Place permanent bridging, bracing, and anchors to maintain trusses in correct position before inducing loads.
E. Do not field cut trusses.
F. Place headers and supports to frame openings required.
G. Frame openings between trusses with lumber in accordance with Section 06001.
H. Coordinate placement of sheathing with work of this Section.
I. Specifier-delete I unless the truss configuration and lack of bottom chord sheathing/bracing tends to make the truss unstable
J. Where piggyback trusses are used to achieve full roof height, or to frame hips and valleys, etc., the primary load carrying trusses below shall have their top chords fully sheathed as part of the roof diaphragm.

3.4 TOLERANCES

A. Framing Members: 1/2” maximum from true position.

END OF SECTION

SECTION 062023 - INTERIOR FINISH CARPENTRY

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. Finish carpentry items, other than new shop prefabricated manufactured casework.

B. Related Requirements:

1. Section 061000 "Rough Carpentry" for furring, blocking, and other carpentry work not exposed to view and for framing exposed to view.
2. Section 099300 "Staining and Transparent Finish" for interior finish carpentry.

1.3 ACTION SUBMITTALS

A. Submit Shop Drawings indicating materials, component profiles, fastening methods, jointing details, finishes, and accessories to a minimum scale of 1-1/2 inch to one foot.
B. Submit two samples 6 inches X 6 inches in size illustrating wood grain and/or plastic laminate pattern, color, and specified finish.
C. Submit instructions for use of adhesives, attachment hardware, and finish hardware.

1.4 QUALITY ASSURANCE

A. All millwork shall be provided by an AWI member.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Stack lumber, plywood, and other panels flat with spacers between each bundle to provide air circulation.

1. Protect materials from weather by covering with waterproof sheeting, securely anchored.
2. Provide for air circulation around stacks and under coverings.

B. Deliver interior finish carpentry materials only when environmental conditions comply with requirements specified for installation areas. If interior finish carpentry materials must be stored in other than installation areas, store only where environmental conditions comply with requirements specified for installation areas.

1.6 FIELD CONDITIONS

A. Environmental Limitations: Do not deliver or install interior finish carpentry materials until building is enclosed and weatherproof, wet-work in space is completed and nominally dry, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.

B. Do not install finish carpentry materials that are wet, moisture damaged, or mold damaged.

1. Indications that materials are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
2. Indications that materials are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

A. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, comply with applicable rules of any rules-writing agency certified by the American Lumber Standard Committee's (ALSC) Board of Review. Grade lumber by an agency certified by the ALSC's 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. For exposed lumber, mark grade stamp on end or back of each piece, or omit grade stamp and provide certificates of grade compliance issued by grading agency.

B. Hardwood Lumber: FS MM-L-736; Premium grade in accordance with AWI; maximum moisture content of 6 percent; Maple species, with vertical grain, of quality capable of transparent finish.

C. Softwood Plywood: DOC PS 1.

D. Hardboard: ANSI A135.4.

E. MDF: ANSI A208.2, Grade 130.

F. Particleboard: ANSI A208.1, Grade M-2.

2.2 MISCELLANEOUS MATERIALS

A. Fasteners for Interior Finish Carpentry: Nails, screws, and other anchoring devices of type, size, material, and finish required for application indicated to provide secure attachment, concealed where possible.

B. Low-Emitting Materials: Adhesives shall comply with testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

C. Glue: Aliphatic-resin, polyurethane, or resorcinol wood glue recommended by manufacturer for general carpentry use.

D. Installation Adhesive for Foam-Plastic Moldings: Product recommended for indicated use by foam-plastic molding manufacturer.

E. Multipurpose Construction Adhesive: Formulation, complying with ASTM D 3498, that is recommended for indicated use by adhesive manufacturer.

F. Lumber for Shimming and Blocking: Softwood lumber, Southern Pine.

G. Wood Filler: Solvent or Oil base, tinted to match surface finish color.

2.3 FABRICATION

A. Back out or kerf backs of the following members, except those with ends exposed in finished work:

1. Interior standing and running trim, except shoe and crown molds.

B. Ease edges of lumber less than 1 inch in nominal thickness to 1/16-inch radius and edges of lumber 1 inch or more in nominal thickness to 1/8-inch radius.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine finish carpentry materials before installation. Reject materials that are wet, moisture damaged, and mold damaged.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean substrates of projections and substances detrimental to application.

B. Before installing interior finish carpentry, condition materials to average prevailing humidity in installation areas for a minimum of 24 hours.

3.3 INSTALLATION, GENERAL

A. Do not use materials that are unsound; warped; improperly treated or finished; inadequately seasoned; too small to fabricate with proper jointing arrangements; or with defective surfaces, sizes, or patterns.

B. Install interior finish carpentry level, plumb, true, and aligned with adjacent materials.

1. Use concealed shims where necessary for alignment.
2. Scribe and cut interior finish carpentry to fit adjoining work. Refinish and seal cuts as recommended by manufacturer.

3. Where face fastening is unavoidable, countersink fasteners, fill surface flush, and sand unless otherwise indicated.
4. Install to tolerance of 1/8 inch in 96 inches for level and plumb. Install adjoining interior finish carpentry with 1/32-inch maximum offset for flush installation and 1/16-inch maximum offset for reveal installation.
5. Coordinate interior finish carpentry with materials and systems in or adjacent to it. Provide cutouts for mechanical and electrical items that penetrate interior finish carpentry.

3.4 ADJUSTING

A. Replace interior finish carpentry that is damaged or does not comply with requirements.

1. Interior finish carpentry may be repaired or refinished if work complies with requirements and shows no evidence of repair or refinishing.

B. Adjust joinery for uniform appearance.

3.5 CLEANING

A. Clean interior finish carpentry on exposed and semi-exposed surfaces.

B. Restore damaged or soiled areas and touch up factory-applied finishes if any.

3.6 PROTECTION

A. Protect installed products from damage from weather and other causes during construction.

B. Remove and replace finish carpentry materials that are wet, moisture damaged, and mold damaged.

1. Indications that materials are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
2. Indications that materials are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

3.7 TOLERANCES

A. Maximum Variation from True Position: 1/16 inch.
1. Maximum Offset from True Alignment with Abutting Materials: 1/32 inch.

END OF SECTION

SECTION 064116 - PLASTIC-LAMINATE-CLAD ARCHITECTURAL CABINETS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Plastic-laminate-faced architectural plywood cabinets.
2. Cabinet hardware and accessories.

B. Section Excludes:

1. Wood lab casework in Science Classrooms.

C. Related Requirements:

1. Section 061000 "Rough Carpentry" for wood furring, blocking, shims, and hanging strips required for installing cabinets and concealed within other construction before cabinet installation.
2. Section 123623.13 "Plastic-Laminate-Clad Countertops."

1.2 REFERENCES

A. ANSI A 208.1: Particleboard.

B. ANSI A 208.2: Medium Density Fiberboard (MDF) For Interior Applications

C. ASTM C 1036: Standard Specification for Flat Glass.

D. ASTM E 84: Standard Test Method for Surface Burning Characteristics of Building Materials.

E. AWI: Architectural Woodwork Institute.

F. AWS: Architectural Woodwork Standards.

G. BHMA A156.9: Cabinet Hardware.

H. BHMA A156.11: Cabinet Locks.

I. BHMA A156.18: Materials and Finishes.

J. DOC PS 1: Voluntary Product Standard for Structural Plywood.

K. HPVA HP-1: American National Standard for Hardwood and Decorative Plywood.

L. ICC: International Code Council.

M. ICC-ES: ICC Evaluation Service.

N. ISO 9001: Quality Management Systems.

O. NEMA LD 3: High Pressure Decorative Laminates.

P. WI: Woodwork Institute.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product, including; panel products, high-pressure decorative laminate, and cabinet hardware and accessories.

B. Shop Drawings: Show location of each item, dimensioned plans and elevations, large-scale details, attachment devices, and other components.

1. Show locations and sizes of furring, blocking, and hanging strips, including concealed blocking and reinforcement specified in other Sections.
2. Show locations and sizes of cutouts and holes for other items installed in architectural plastic-laminate cabinets.

C. Samples for Verification:

1. Plastic laminates, 8 by 10 inches for each type, color, pattern, and surface finish.
2. Exposed cabinet hardware and accessories, one unit for each type and finish.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For fabricator.

B. Product Certificates: For the following:

1. Composite wood products.
2. High-pressure decorative laminate.
3. Adhesives.

C. Woodwork Quality Standard Compliance Certificates: AWI Quality Certification Program certificates.

D. Safety Data Sheets (SDS).

1.5 QUALITY ASSURANCE

A. Fabricator Qualifications: Shop that employs skilled workers who custom fabricate products similar to those required for this Project and whose products have a record of successful in-service performance. Shop is a certified participant in AWI's Quality Certification Program.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Do not deliver cabinets until painting and similar operations that could damage woodwork have been completed in installation areas. If cabinets must be stored in other than installation areas, store only in areas where environmental conditions comply with requirements specified in "Field Conditions" Article.

1.7 FIELD CONDITIONS

A. Environmental Limitations: Do not deliver or install cabinets until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature between 60 and 90 deg

F and relative humidity between 25 and 55 range percent 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, and indicate measurements on Shop Drawings.

C. Established Dimensions: Where cabinets are indicated to fit to other construction, establish dimensions for areas where cabinets are to fit. Provide allowance for trimming at site, and coordinate construction to ensure that actual dimensions correspond to established dimensions.

1.8 COORDINATION

A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to ensure that cabinets can be supported and installed as indicated.

PART 2 - PRODUCTS

2.1 PLASTIC-LAMINATE-FACED ARCHITECTURAL CABINETS

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

B. Grade: Premium.

C. Type of Construction: Frameless.

D. Cabinet, Door, and Drawer Front Interface Style: Flush overlay.

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

1. Basis-of-Design Product: Subject to compliance with requirements, provide Wilsonart LLC; Decorative Plastic Laminates or a comparable product by one of the following:

a. Formica Corporation.
b. Lamin-Art, Inc.
c. Pionite; a Panolam Industries International, Inc. brand.

F. Laminate Cladding for Exposed Surfaces:

1. Horizontal Surfaces: Grade HGS
2. Vertical Surfaces: Grade VGS.
3. Edges: ABS/PVC extruded fabrication.
4. Pattern Direction: Vertically for drawer fronts, doors, and fixed panels

G. Materials for Semi-exposed Surfaces:

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

    a. Edges of Plastic-Laminate Shelves: ABS/PVC extruded fabrication.
    b. For semi-exposed backs of panels with exposed plastic-laminate surfaces, provide surface of high-pressure decorative laminate, NEMA LD 3, NEMA LD 3, Grade VGL thermoset decorative panels
2. Drawer Sides and Backs: Solid-hardwood lumber.
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. Drawer Construction: Fabricate with exposed fronts fastened to subfront with mounting screws from interior of body.

1. Join subfronts, backs, and sides with glued dovetail joints.

J. Colors, Patterns, and Finishes: Provide materials and products that result in colors and textures of exposed laminate surfaces refer to the contract document drawings.

2.2 WOOD MATERIALS

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

C. Bottoms, tops, and ends of cabinets (and all structural components) shall be ¾” thick plywood. Fixed interior components such as fixed shelves, dividers, and cubicle components shall be ¾” thick and attached with concealed interlocking mechanical fasteners. Base cabinets shall have a solid ¾” thick plywood sub-top.

1. Drawer boxes shall be constructed with a ½” thick core, plywood non-racking.

2. Doors shall be constructed with a ¾” thick core, plywood non-racking.

3. Shelves under 36” shall be constructed with a ¾” thick core, plywood non-racking. Shelves 36” and over shall be constructed with a 1” thick core, plywood non-racking. Shelves in special use cabinets shall be 1” unless noted otherwise in drawings.

D. Sink cabinets with a split removable back panel shall have a formed metal front brace and steel corner gussets shall be utilized to support and securely fasten top in all four corners. Front brace shall be powder coated black.

E. All wall cabinet exterior bottoms shall match cabinet sides.

2.3 CABINET HARDWARE AND ACCESSORIES

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

B. Butt Hinges: 2-3/4-inch, five-knuckle steel hinges made from 0.095-inch- thick metal, and as follows:

1. Semi-concealed Hinges for Overlay Doors: BHMA A156.9, B01521.

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

D. Catches:

1. Magnetic Catch, (not used with self-closing hinges) shall have: white plastic housing with two 32mm spaced, elongated holes for screw-attachment

2. Chain Pulls shall be zinc plated, spring loaded door catch used to hold door securely shut.

3. Chain Stops shall be zinc plated, looped chain used to limit door swing as specified, mounting plate at each end of chain shall use (4) #7 x 5/8" screws to secure to cabinet door and end panel. They shall be on cabinets at adjoining walls and where casework and countertops can interfere with the door swing of the tall cabinet.

4. Elbow Catch shall be chrome plated, spring loaded, used to hold non-locking door securely shut.

5. Roller Catch, (not used with self-closing hinges) shall have: heavy-duty, springloaded roller, with molded plastic bumper mounted at door top to keep door securely shut.

6. Catches shall be: Magnetic at Base and Wall, 1 Roller at Tall.

E. Tote Tray shall be white, high impact resistant polystyrene, with label holder permanently attached to face of tray. Supported by individual polycarbonate channels mounted to cabinet ends and partitions with two integral 5mm diameter pins and secured with one euro style screw. Height adjustable on 32mm (1-1/4") centers.

1. Countertop Supports: Powder coated, formed metal supports. Must provide attachment points between countertop and wall.

A. Adjustable Shelf Standards and Supports: BHMA A156.9, B04071; with shelf rests, B04081.

B. Shelf Rests: BHMA A156.9, B04013; metal, two-pin type with shelf hold-down clip.

C. Drawer Slides: BHMA A156.9.

1. Grade 1 and Grade 2: Side mounted full-extension type; zinc-plated steel with polymer rollers.
2. Grade 1HD-100 and Grade 1HD-200: Side mounted; type; zinc-plated-steel ball-bearing slides.
3. For drawers not more than 3 inches high and not more than 24 inches wide, provide Grade 2.
4. For drawers more than 3 inches high but not more than 6 inches high and not more than 24 inches wide, provide Grade 1HD-100.

5. For drawers more than 6 inches high or more than 24 inches wide, provide Grade 1HD-100.

D. Door and Drawer Silencers: BHMA A156.16, L03011.

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

1. Satin Stainless Steel: BHMA 630.

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

G. Coat hooks shall be Zinc plated, double prong. Each wardrope cabinet with “closet” side shall have 2 on cabinet back.

H. Closet rods shall be zinc plated rod, 1” diameter with captice sockets. Each wardrope cabinet with “closet” side shall have 1 closet rod.

I. Locks (where shown or noted only):

A. Lock Type: Standard Lock - National: Five-disc tumbler cam locks, chrome plated steel faceplate. All locks keyed alike or keyed differently by room and master keyed. Shall permit a minimum of 50 keying options. Lock core is removable permitting owner to easily change lock arrangements. Inactive door of base and wall cabinets shall be: secured by using an elbow catch, or a chain pull for tall cabinets.

1.2 MISCELLANEOUS MATERIALS

A. Adhesives: Do not use adhesives that contain urea formaldehyde.

B. Adhesive for Bonding Plastic Laminate: Unpigmented contact cement.

1. Adhesive for Bonding Edges: Hot-melt adhesive or adhesive specified above for faces.

1.3 FABRICATION

A. Fabricate 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.

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. For decorative plastic laminates, comply with manufacturer's written fabrication instructions.

PART 2 - EXECUTION

2.1 PREPARATION

A. Before installation, condition cabinets to average prevailing humidity conditions in installation areas.

B. Before installing cabinets, examine shop-fabricated work for completion and complete work as required.

2.2 INSTALLATION

A. Grade: Install cabinets to comply with same grade as item to be installed.

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

C. Install cabinets level, plumb, true, and straight. Shim as required with concealed shims. Install level and plumb to a tolerance of 1/8 inch in 96 inches .

D. Scribe and cut cabinets to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.

E. Anchor cabinets to anchors or blocking built in or directly attached to substrates. Secure with countersunk, concealed fasteners and blind nailing. Use fine finishing nails or finishing screws for exposed fastening, countersunk and filled flush with woodwork.

1. Use filler matching finish of items being installed.

F. Cabinets: Install without distortion so doors and drawers fit openings properly 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.

1. Install cabinets with no more than 1/8 inch in 96-inch sag, bow, or other variation from a straight line.

G. Caulk all cabinets to adjacent wall, color to match. Confirm color selection with Architect.

2.3 ADJUSTING AND CLEANING

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

B. Clean, lubricate, and adjust hardware.

C. Clean cabinets on exposed and semi exposed surfaces. Clean decorative plastic laminate surfaces according to manufacturer's written care and maintenance instructions.

D. Protect completed work from damage for duration of construction period.

END OF SECTION

SECTION 072100 - THERMAL INSULATION

PART 1 - GENERAL

1.1 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 092116 "Gypsum Board Assemblies" for sound attenuation blanket used as acoustic insulation.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.3 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

2.4 ACCESSORIES

A. 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

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. Closed-cell spray polyurethane foam.

B. Related Requirements:

1. Section 072100 "Thermal Insulation" for foam-plastic board insulation.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.4 INFORMATIONAL SUBMITTALS

A. Product Test Reports: For each product, for tests performed by a qualified testing agency.

1.5 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

A. Closed-Cell Spray Polyurethane Foam: ASTM C 1029, 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. Provide 3” overall depth within masonry cavity wall construction and as otherwise indicated on drawings.

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. BASF Corporation, WALLTITE
   b. CertainTeed Corporation.
   c. RPS Industries
   d. Johns Manville; a Berkshire Hathaway company.
   e. NCFI Polyurethanes; a division of Barnhardt Manufacturing Company.

2. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
   a. Flame-Spread Index: 25 or less.
   b. Smoke-Developed Index: 450 or less.

PART 3 - EXECUTION

3.1 PREPARATION

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

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.

3.3 PROTECTION

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

END OF SECTION

SECTION 072500 - WEATHER BARRIERS

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. Building wrap.
2. Flexible flashing.

B. Locations: Install flashing at locations indicated, where building systems require and per code requires.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. For building wrap, include data on air and water-vapor permeance based on testing according to referenced standards.

B. Shop Drawings: Show details of building at terminations, openings, and penetrations. Show details of flexible flashing applications.

PART 2 - PRODUCTS

2.1 WATER-RESISTIVE BARRIER

A. Building Wrap: ASTM E 1677, Type I air barrier; with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, when tested according to ASTM E 84; UV stabilized; and acceptable to authorities having jurisdiction.

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

a. Dow Chemical Company (The).
b. DuPont Safety and Construction.
c. Kingspan Insulation Limited.
d. Raven Industries, Inc.

2. Water-Vapor Permeance: Not less than 20 perms per ASTM E 96/E 96M, Desiccant Method (Procedure A).
3. Allowable UV Exposure Time: Not less than three months.

B. Building-Wrap Tape: Pressure-sensitive plastic tape recommended by building-wrap manufacturer for sealing joints and penetrations in building wrap.

2.2 FLEXIBLE FLASHING

A. Butyl Rubber Flashing: Composite, self-adhesive, flashing product consisting of a pliable, butyl rubber compound, bonded to a high-density polyethylene film, aluminum foil, or spunbonded polyolefin to produce an overall thickness of not less than 0.040 inch.

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

a. DuPont Safety and Construction.
b. Raven Industries, Inc.
c. TYPAR.

B. Primer for Flexible Flashing: Product recommended in writing by flexible flashing manufacturer for substrate.

C. Nails and Staples: Product recommended in writing by flexible flashing manufacturer and complying with ASTM F 1667.

PART 3 - EXECUTION

3.1 WATER-RESISTIVE BARRIER INSTALLATION

A. Cover exposed exterior surface of sheathing with water-resistive barrier securely fastened to framing immediately after sheathing is installed.

B. Cover sheathing with water-resistive barrier as follows:

1. Cut back barrier 1/2 inch on each side of the break in supporting members at expansion- or control-joint locations.
2. Apply barrier to cover vertical flashing with a minimum 4-inch overlap unless otherwise indicated.

C. Building Wrap: Comply with manufacturer's written instructions and warranty requirements.

1. Seal seams, edges, fasteners, and penetrations with tape.
2. Extend into jambs of openings and seal corners with tape.

3.2 FLEXIBLE FLASHING INSTALLATION

A. Apply flexible flashing at locations indicated and where building systems or code requires to comply with manufacturer's written instructions.

1. Prime substrates as recommended by flashing manufacturer.
2. Lap seams and junctures with other materials at least 4 inches except that at flashing flanges of other construction, laps need not exceed flange width.
3. Lap flashing over water-resistive barrier at bottom and sides of openings.
4. Lap water-resistive barrier over flashing at heads of openings.
5. After flashing has been applied, roll surfaces with a hard rubber or metal roller to ensure that flashing is completely adhered to substrates.

END OF SECTION

SECTION 074113.16 - STANDING-SEAM METAL ROOF PANELS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Standing-seam metal roof panels.

B. Related Requirements:

1. Section 074293 "Soffit Panels" for metal panels used in horizontal soffit applications.
2. Section 077253 "Snow Guards" for prefabricated devices designed to hold snow on the roof surface, allowing it to melt and drain off slowly.

1.2 ACTION SUBMITTALS

A. Product Data: For standing-seam metal roof panels. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of panel and accessory.

B. Shop Drawings:

1. Include fabrication and installation layouts of metal panels; details of edge conditions, joints, panel profiles, corners, anchorages, attachment system, trim, flashings, closures, and accessories; and special details.
2. Accessories: Include details of the flashing, trim, and anchorage systems, at a scale of not less than 1-1/2 inches per 12 inches.

C. Samples for Initial Selection: For each type of metal panel indicated with factory-applied color finishes.

1. Include similar Samples of trim and accessories involving color selection.

1.3 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Deliver components, metal panels, and other manufactured items so as not to be damaged or deformed. Package metal panels for protection during transportation and handling.

B. Unload, store, and erect metal panels in a manner to prevent bending, warping, twisting, and surface damage.

C. Stack metal panels horizontally on platforms or pallets, covered with suitable weathertight and ventilated covering. Store metal panels to ensure dryness, with positive slope for drainage of water. Do not store metal panels in contact with other materials that might cause staining, denting, or other surface damage.

D. Retain strippable protective covering on metal panels during installation.

1.5 FIELD CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit assembly of metal panels to be performed according to manufacturers' written instructions and warranty requirements.

1.6 COORDINATION

A. Coordinate metal panel installation with rain drainage work, flashing, trim, construction of soffits, and other adjoining work to provide a leakproof, secure, and noncorrosive installation.

1.7 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of metal panel systems that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:
    a. Structural failures including rupturing, cracking, or puncturing.
    b. Deterioration of metals and other materials beyond normal weathering.
2. Warranty Period: Two years from date of Substantial Completion.

B. Special Warranty on Panel Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace metal panels that show 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 according to ASTM D2244.
    b. Chalking in excess of a No. 8 rating when tested according to 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.

C. Special Weathertightness Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace standing-seam metal roof panel assemblies that fail to remain weathertight, including leaks, within specified warranty period.

1. Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Water Penetration under Static Pressure: No water penetration when tested according to ASTM E1646 or ASTM E331 at the following test-pressure difference:

1. Test-Pressure Difference: 6.24 lbf/sq. ft..

B. Wind-Uplift Resistance: Provide metal roof panel assemblies that comply with UL 580 for wind-uplift-resistance class indicated.

1. Uplift Rating: UL 90.

C. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change (Range): 120 deg F , ambient; 180 deg F , material surfaces .

2.2 STANDING-SEAM METAL ROOF PANELS

A. Provide factory-formed metal roof panels designed to be installed by lapping and interconnecting raised side edges of adjacent panels with joint type indicated and mechanically attaching panels to supports using concealed clips in side laps. Include clips, cleats, pressure plates, and accessories required for weathertight installation.

1. Steel Panel Systems: Unless more stringent requirements are indicated, comply with ASTM E1514.

B. Vertical-Rib, Seamed-Joint, Standing-Seam Metal Roof Panels : Formed with vertical ribs at panel edges and intermediate stiffening ribs symmetrically spaced between ribs; designed for sequential installation by mechanically attaching panels to supports using concealed clips located under one side of panels, engaging opposite edge of adjacent panels, and mechanically seaming panels together.

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. AEP Span a brand of ASC Profiles LLC, a part of BlueScope.
   b. Berridge Manufacturing Company.
   c. Fabral; a brand of Flack Global Metals.
   d. PAC-CLAD; Petersen Aluminum Corporation; a Carlisle company.
2. Metallic-Coated Steel Sheet: Zinc-coated (galvanized) steel sheet complying with ASTM A653/A653M, G90 coating designation, or aluminum-zinc alloy-coated steel sheet complying with ASTM A792/A792M, Class AZ50 coating designation; structural quality. Prepainted by the coil-coating process to comply with ASTM A755/A755M.

a. Nominal Thickness: 0.022 inch .
b. Exterior Finish: Three-coat fluoropolymer .
c. Color: As selected by Architect from manufacturer's full range .

3. Clips: One-piece fixed to accommodate thermal movement.
   a. 0.064-inch- nominal thickness, zinc-coated (galvanized) or aluminum-zinc alloy-coated steel sheet.
   b. 0.0625-inch- thick, stainless steel sheet.
4. Joint Type: As standard with manufacturer.
5. Panel Coverage: 16 inches .
6. Panel Height: 2.0 inches .

2.3 UNDERLAYMENT MATERIALS

A. Self-Adhering, High-Temperature Underlayment: Provide self-adhering, cold-applied, sheet underlayment, a minimum of 30 mils thick, consisting of slip-resistant, polyethylene-film top surface laminated to a layer of butyl or SBS-modified asphalt adhesive, with release-paper backing. Provide primer when recommended by underlayment manufacturer.

1. Thermal Stability: Stable after testing at 240 deg F; ASTM D1970.
2. Low-Temperature Flexibility: Passes after testing at minus 20 deg F; ASTM D1970.
3. 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 WIP Products; a brand of Carlisle Construction Materials.
   b. Henry Company; a Carlisle company.
   c. Owens Corning.

B. Slip Sheet: Manufacturer's recommended slip sheet, of type required for application.

2.4 MISCELLANEOUS MATERIALS

A. Miscellaneous Metal Subframing and Furring: ASTM C645; cold-formed, metallic-coated steel sheet, ASTM A653/A653M, G90 hot-dip galvanized coating designation or ASTM A792/A792M, Class AZ50 coating designation unless otherwise indicated. Provide manufacturer's standard sections as required for support and alignment of metal panel system.

B. Panel Accessories: Provide components required for a complete, weathertight panel system including trim, copings, fasciae, mullions, sills, corner units, clips, flashings, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal panels unless otherwise indicated.

1. Closures: Provide closures at eaves and ridges, fabricated of same metal as metal panels.
2. Backing Plates: Provide metal backing plates at panel end splices, fabricated from material recommended by manufacturer.
3. Closure Strips: Closed-cell, expanded, cellular, rubber or crosslinked, polyolefin-foam or closed-cell laminated polyethylene; minimum 1-inch- thick, flexible closure strips; cut or premolded to match metal panel profile. Provide closure strips where indicated or necessary to ensure weathertight construction.

C. Flashing and Trim: Provide flashing and trim formed from same material as metal panels as required to seal against weather and to provide finished appearance. Locations include, but are not limited to, eaves, rakes, corners, bases, framed openings, ridges, fasciae, and fillers. Finish flashing and trim with same finish system as adjacent metal panels.

D. Panel Fasteners: Self-tapping screws designed to withstand design loads.

2.5 FABRICATION

A. Fabricate and finish metal panels and accessories at the factory, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements demonstrated by laboratory testing. Comply with indicated profiles and with dimensional and structural requirements.

B. On-Site Fabrication: Subject to compliance with requirements of this Section, metal panels may be fabricated on-site using UL-certified, portable roll-forming equipment if panels are of same profile and warranted by manufacturer to be equal to factory-formed panels. Fabricate according to equipment manufacturer's written instructions and to comply with details shown.

C. Provide panel profile, including major ribs and intermediate stiffening ribs, if any, for full length of panel.

D. Sheet Metal Flashing and Trim: Fabricate flashing and trim to comply with manufacturer's recommendations and 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: Fabricate nonmoving seams in accessories with flat-lock seams. Tin edges to be seamed, form seams, and solder.
3. Sealed Joints: Form nonexpansion, but movable, joints in metal to accommodate sealant and to comply with SMACNA standards.
4. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces of accessories exposed to view.
5. 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 panel manufacturer for application, but not less than thickness of metal being secured.

2.6 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 are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in same piece are unacceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

C. Steel Panels and Accessories:

1. Three-Coat Fluoropolymer: AAMA 621. Fluoropolymer finish containing not less than 70 percent polyvinylidene fluoride (PVDF) resin by weight in both color coat and clear topcoat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, metal panel supports, and other conditions affecting performance of the Work.

1. Examine solid roof sheathing to verify that sheathing joints are supported by framing or blocking and that installation is within flatness tolerances required by metal roof 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. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Miscellaneous Supports: Install subframing, furring, and other miscellaneous panel support members and anchorages according to ASTM C754 and metal panel manufacturer's written recommendations.

3.3 INSTALLATION OF UNDERLAYMENT

A. Self-Adhering Sheet Underlayment: Apply primer if required by manufacturer. Comply with temperature restrictions of underlayment manufacturer for installation. Apply , wrinkle free, in shingle fashion to shed water, and with end laps of not less than 6 inches staggered 24 inches between courses. Overlap side edges not less than 3-1/2 inches. Roll laps with roller. Cover underlayment within 14 days.

1. Apply over the entire roof surface.
2. Apply over the roof area indicated below:
    a. Roof perimeter for a distance up from eaves of 36 inches beyond interior wall line.

b. Valleys, from lowest point to highest point, for a distance on each side of 18 inches . Overlap ends of sheets not less than 6 inches.
c. Rake edges for a distance of 18 inches .
d. Hips and ridges for a distance on each side of 12 inches .
e. Roof-to-wall intersections for a distance from wall of 18 inches .

B. Slip Sheet: Apply slip sheet over underlayment before installing metal roof panels.

C. Flashings: Install flashings to cover underlayment to comply with requirements specified in Section 076200 "Sheet Metal Flashing and Trim."

3.4 INSTALLATION OF STANDING-SEAM METAL ROOF PANELS

A. Install metal panels according to manufacturer's written instructions in orientation, sizes, and locations indicated. Install panels perpendicular to supports unless otherwise indicated. Anchor metal panels and other components of the Work securely in place, with provisions for thermal and structural movement.

1. Shim or otherwise plumb substrates receiving metal panels.
2. Flash and seal metal 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 metal 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 metal 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 metal panels and fasten with blind rivets, bolts, or self-tapping screws. Fasten flashings and trim around openings and similar elements with self-tapping screws.

B. Fasteners:

1. Steel Panels: Use stainless steel fasteners for surfaces exposed to the exterior; use galvanized-steel fasteners for surfaces exposed to the interior.

C. Anchor Clips: Anchor metal roof panels and other components of the Work securely in place, using manufacturer's approved fasteners according to manufacturers' written instructions.

D. Metal Protection: Where dissimilar metals contact each other or corrosive substrates, protect against galvanic action as recommended in writing by metal panel manufacturer.

E. Standing-Seam Metal Roof Panel Installation: Fasten metal roof panels to supports with concealed clips at each standing-seam joint at location, spacing, and with fasteners recommended in writing by manufacturer.

1. Install clips to supports with self-tapping fasteners.
2. Install pressure plates at locations indicated in manufacturer's written installation instructions.

3. Seamed Joint: Crimp standing seams with manufacturer-approved, motorized seamer tool so clip, metal roof panel, and factory-applied sealant are completely engaged.
4. Watertight Installation:
    a. Apply a continuous ribbon of sealant or tape to seal joints of metal panels, using sealant or tape as recommend in writing by manufacturer as needed to make panels watertight.
    b. At panel splices, nest panels with minimum 6-inch end lap, sealed with sealant and fastened together by interlocking clamping plates.

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 metal panel system including trim, copings, corners, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items. Provide types indicated by metal roof panel manufacturers; or, if not indicated, types recommended by metal roof panel manufacturer.

G. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints, and seams that will be permanently watertight and weather resistant.

1. Install exposed flashing and trim that is without 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 achieve waterproof and weather-resistant performance.
2. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet with no joints allowed within 24 inches of corner or intersection. Where lapped expansion provisions cannot be used or would not be sufficiently weather resistant and waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with mastic sealant (concealed within joints).

3.5 CLEANING AND PROTECTION

A. Remove temporary protective coverings and strippable films, if any, as metal panels are installed, unless otherwise indicated in manufacturer's written installation instructions. On completion of metal panel installation, clean finished surfaces as recommended by metal panel manufacturer. Maintain in a clean condition during construction.

B. Replace metal panels that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 074113.16

SECTION 074293 - SOFFIT PANELS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Metal soffit panels.

B. Related Requirements:

1. Section 074113.16 "Standing-seam Metal Roof Panels" for lap-seam metal roof panels.
2. Section 074619 “Steel Siding and Roofing” for lap-seam metal siding and roof panels.

1.2 ACTION SUBMITTALS

A. Product Data:

1. Metal soffit panels.

B. Shop Drawings:

1. Include fabrication and installation layouts of metal panels; details of edge conditions, joints, panel profiles, corners, anchorages, attachment system, trim, flashings, closures, and accessories; and special details.
2. Accessories: Include details of flashing, trim, and anchorage systems, at a scale of not less than 1-1/2 inches per 12 inches.

C. Samples for Initial Selection: For each type of metal panel indicated with factory-applied color finishes.

1. Include similar Samples of trim and accessories involving color selection.

1.3 DELIVERY, STORAGE, AND HANDLING

A. Deliver components, metal panels, and other manufactured items so as not to be damaged or deformed. Package metal panels for protection during transportation and handling.

B. Unload, store, and erect metal panels in a manner to prevent bending, warping, twisting, and surface damage.

C. Stack metal panels horizontally on platforms or pallets, covered with suitable weathertight and ventilated covering. Store metal panels to ensure dryness, with positive slope for drainage of water. Do not store metal panels in contact with other materials that might cause staining, denting, or other surface damage.

D. Retain strippable protective covering on metal panels during installation.

1.4 FIELD CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit assembly of metal panels to be performed according to manufacturers' written instructions and warranty requirements.

1.5 COORDINATION

A. Coordinate metal panel installation with rain drainage work, flashing, trim, construction of walls, and other adjoining work to provide a leakproof, secure, and noncorrosive installation.

1.6 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of metal panel systems that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:
    a. Structural failures including rupturing, cracking, or puncturing.
    b. Deterioration of metals and other materials beyond normal weathering.
2. Warranty Period: Two years from date of Substantial Completion.

B. Special Warranty on Panel Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace metal panels that show 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 according to ASTM D2244.
    b. Chalking in excess of a No. 8 rating when tested according to 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. Air Infiltration: Air leakage of not more than 0.06 cfm/sq. ft. when tested according to ASTM E283 at the following test-pressure difference:

1. Test-Pressure Difference: 6.24 lbf/sq. ft..

B. Water Penetration under Static Pressure: No water penetration when tested according to ASTM E331 at the following test-pressure difference:

1. Test-Pressure Difference: 6.24 lbf/sq. ft..

C. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change (Range): 120 deg F , ambient; 180 deg F , material surfaces .

2.2 METAL SOFFIT PANELS

A. Provide metal soffit panels designed to be installed by lapping and interconnecting side edges of adjacent panels and mechanically attaching through panel to supports using concealed fasteners in side laps. Include accessories required for weathertight installation.

B. V-Groove-Profile Metal Soffit Panels : Perforated panels formed with vertical panel edges and intermediate stiffening ribs symmetrically spaced between panel edges; with a V-groove joint between panels.

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. Berridge Manufacturing Company.
   b. Fabral; a brand of Flack Global Metals.
   c. McElroy Metal, Inc.
   d. PAC-CLAD; Petersen Aluminum Corporation; a Carlisle company.
2. Metallic-Coated Steel Sheet: Zinc-coated (galvanized) steel sheet complying with ASTM A653/A653M, G90 coating designation, or aluminum-zinc alloy-coated steel sheet complying with ASTM A792/A792M, Class AZ50 coating designation; structural quality. Prepainted by the coil-coating process to comply with ASTM A755/A755M.
   a. Nominal Thickness: 0.022 inch .
   b. Exterior Finish: Three-coat fluoropolymer .
   c. Color: As selected by Architect from manufacturer's full range .
3. Panel Coverage: 6 inches .
4. Panel Height: 0.50 inch .

2.3 MISCELLANEOUS MATERIALS

A. Miscellaneous Metal Subframing and Furring: ASTM C645, cold-formed, metallic-coated steel sheet, ASTM A653/A653M, G90 hot-dip galvanized coating designation or ASTM A792/A792M, Class AZ50 aluminum-zinc-alloy coating designation unless otherwise indicated. Provide manufacturer's standard sections as required for support and alignment of metal panel system.

B. Panel Accessories: Provide components required for a complete, weathertight panel system including trim, clips, flashings, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal panels unless otherwise indicated.

1. Closure Strips: Closed-cell, expanded, cellular, rubber or crosslinked, polyolefin-foam or closed-cell laminated polyethylene; minimum 1-inch- thick, flexible closure strips; cut or

premolded to match metal panel profile. Provide closure strips where indicated or necessary to ensure weathertight construction.

C. Flashing and Trim: Provide flashing and trim formed from same material as metal panels as required to seal against weather and to provide finished appearance. Finish flashing and trim with same finish system as adjacent metal panels.

D. Panel Fasteners: Self-tapping screws designed to withstand design loads. Provide exposed fasteners with heads matching color of metal panels by means of plastic caps or factory-applied coating. Provide EPDM or PVC sealing washers for exposed fasteners.

E. Panel Sealants: Provide sealant types recommended by manufacturer that are compatible with panel materials, are nonstaining, and do not damage panel finish.

1. Sealant Tape: Pressure-sensitive, 100 percent solids, gray polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/2 inch wide and 1/8 inch thick.
2. Joint Sealant: ASTM C920; elastomeric polyurethane or silicone sealant; of type, grade, class, and use classifications required to seal joints in metal panels and remain weathertight; and as recommended in writing by metal panel manufacturer.
3. Butyl-Rubber-Based, Solvent-Release Sealant: ASTM C1311.

2.4 FABRICATION

A. Fabricate and finish metal panels and accessories at the factory, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements demonstrated by laboratory testing. Comply with indicated profiles and with dimensional and structural requirements.

B. Provide panel profile, including major ribs and intermediate stiffening ribs, if any, for full length of panel.

C. Sheet Metal Flashing and Trim: Fabricate flashing and trim to comply with manufacturer's recommendations and 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: Fabricate nonmoving seams in accessories with flat-lock seams. Tin edges to be seamed, form seams, and solder.
3. Sealed Joints: Form nonexpansion, but movable, joints in metal to accommodate sealant and to comply with SMACNA standards.
4. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces of accessories exposed to view.
5. 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 soffit 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 are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

C. Steel Panels and Accessories:

1. Three-Coat Fluoropolymer: AAMA 621. Fluoropolymer finish containing not less than 70 percent polyvinylidene fluoride (PVDF) resin by weight in both color coat and clear topcoat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, metal panel supports, and other conditions affecting performance of the Work.

1. Examine framing to verify that girts, angles, channels, studs, and other structural panel support members and anchorage have been installed within alignment tolerances required by metal panel manufacturer.

B. Examine roughing-in for components and systems penetrating metal panels to verify actual locations of penetrations relative to seam locations of metal panels before installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Miscellaneous Supports: Install subframing, furring, and other miscellaneous panel support members and anchorages according to ASTM C754 and metal panel manufacturer's written recommendations.

1. Soffit Framing: Wire tie or clip furring channels to supports , as required to comply with requirements for assemblies indicated.

3.3 INSTALLATION OF METAL SOFFIT PANELS

A. Install metal panels according to manufacturer's written instructions in orientation, sizes, and locations indicated. Install panels perpendicular to supports unless otherwise indicated. Anchor metal panels and other components of the Work securely in place, with provisions for thermal and structural movement.

1. Shim or otherwise plumb substrates receiving metal panels.
2. Flash and seal metal 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 metal 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 metal 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.

B. Fasteners:

1. Steel Panels: Use stainless steel fasteners for surfaces exposed to the exterior; use 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 metal panel manufacturer.

D. Lap-Seam Metal Panels: Fasten metal panels to supports with fasteners at each lapped joint at location and spacing recommended by manufacturer.

1. Apply panels and associated items true to line for neat and weathertight enclosure.
2. Provide metal-backed washers under heads of exposed fasteners bearing on weather side of metal panels.
3. Locate and space exposed fasteners in uniform vertical and horizontal alignment. Use proper tools to obtain controlled uniform compression for positive seal without rupture of washer.
4. Install screw fasteners with power tools having controlled torque adjusted to compress washer tightly without damage to washer, screw threads, or panels. Install screws in predrilled holes.

E. 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 metal panel system including trim, corners, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items. Provide types indicated by metal panel manufacturer; or, if not indicated, provide types recommended by metal panel manufacturer.

F. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints, and seams that 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 achieve waterproof performance.
2. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet with no joints allowed within 24 inches of corner or intersection. Where lapped expansion provisions cannot be used or would not be waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with mastic sealant (concealed within joints).

3.4 CLEANING AND PROTECTION

A. Remove temporary protective coverings and strippable films, if any, as metal panels are installed unless otherwise indicated in manufacturer's written installation instructions. On completion of metal panel installation, clean finished surfaces as recommended by metal panel manufacturer. Maintain in a clean condition during construction.

B. After metal panel installation, clear weep holes and drainage channels of obstructions, dirt, and sealant.

C. Replace metal panels that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 074293

SECTION 074619 - STEEL SIDING AND ROOFING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Steel siding and roofing.

B. Related Requirements:

1. Section 061000 "Rough Carpentry" for wood furring, grounds, nailers, and blocking.
2. Section 072500 "Weather Barriers" for weather-resistive barriers.

1.2 COORDINATION

A. Coordinate siding installation with flashings and other adjoining construction to ensure proper sequencing.

1.3 ACTION SUBMITTALS

A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

1. Steel siding & roofing.

B. Samples for Initial Selection: For steel siding including related accessories.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store packaged materials in original containers with labels intact until time of use.

B. Store materials on elevated platforms, under cover, and in a dry location.

PART 2 - PRODUCTS

2.1 STEEL SIDING & ROOFING

A. Steel Siding: Formed product , in continuous lengths without end joints, made from galvanized steel complying with ASTM A653/A653M, G90 coating.

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. EDCO Products Inc.
   b. Gentek Building Products, Inc.
   c. United States Seamless Inc.

B. Vertical Pattern: 24-inch width or Maunfacturer standard.

C. Texture: Smooth .

D. Nominal Thickness: 29 ga. .

E. Finish: Manufacturer's standard primer and heat-fused PVC .

1. Colors: As selected by Architect from manufacturer's full range of colors.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates for compliance with requirements for installation tolerances and other conditions affecting performance of steel siding and related accessories.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean substrates of projections and substances detrimental to application.

3.3 INSTALLATION OF STEEL SIDING AND ROOFING

A. General: Comply with manufacturer's written installation instructions applicable to products and applications indicated unless more stringent requirements apply.

1. Center nails in elongated nailing slots without binding siding to allow for thermal movement.

B. Install joint sealants as specified in Section 079200 "Joint Sealants" and to produce a weathertight installation.

C. Where steel siding contacts dissimilar metals, protect against galvanic action by painting contact surfaces with primer or by applying sealant or tape or installing nonconductive spacers as recommended by manufacturer for this purpose.

3.4 ADJUSTING AND CLEANING

A. Remove damaged, improperly installed, or otherwise defective materials and replace with new materials complying with specified requirements.

B. Clean finished surfaces according to manufacturer's written instructions and maintain in a clean condition during construction.

END OF SECTION 074619

SECTION 075419.35 - POLYVINYL-CHLORIDE (PVC) ROOFING
MECHANICALLY FASTENED

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. PVC thermoplastic membrane attached with mechanical fasteners.
2. Polyisocyanurate (tapered), attached with mechanical fasteners.
3. Polyisocyanurate (flat), attached with mechanical fasteners.
4. Prefabricated flashings, corners, parapets, stacks, vents, and related details.
5. Fasteners, adhesives, and other accessories required for a complete roofing installation.
6. Traffic Protection.
7. Tapered Insulation

B. Section includes installation of sound-absorbing insulation strips in ribs of roof deck. Sound-absorbing insulation strips are furnished under Section 053100 "Steel Decking."

1.2 DEFINITIONS

A. Roofing Terminology: Definitions in ASTM D1079 and glossary in NRCA's "The NRCA Roofing Manual: Membrane Roof Systems" apply to work of this Section.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. For insulation and roof system component fasteners.

B. Shop Drawings: Include roof plans, sections, details, and attachments to other work, including the following:

1. Layout and thickness of insulation.
2. Base flashings and membrane terminations.
3. Flashing details at penetrations.
4. Tapered insulation thickness and slopes.
5. Roof plan showing orientation of steel roof deck and orientation of roof membrane, fastening spacings, and patterns for mechanically fastened roofing system.
6. Insulation fastening patterns for corner, perimeter, and field-of-roof locations.
7. Tie-in with air barrier.

C. Wind Uplift Resistance Submittal: For roofing system, indicating compliance with wind uplift performance requirements.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer and manufacturer.

B. Manufacturer Certificates:

1. Performance Requirement Certificate: Signed by roof membrane manufacturer, certifying that roofing system complies with requirements specified in "Performance Requirements" Article.

    a. Submit evidence of compliance with performance requirements.
2. Special Warranty Certificate: Signed by roof membrane manufacturer, certifying that all materials supplied under this Section are acceptable for special warranty.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For roofing system to include in maintenance manuals.

B. Certified statement from existing roof membrane manufacturer stating that existing roof warranty has not been affected by Work performed under this Section.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: A qualified manufacturer that is UL listed for roofing system identical to that used for this Project.

B. Installer Qualifications: A qualified firm that is approved, authorized, or licensed by roofing system manufacturer to install manufacturer's product and that is eligible to receive manufacturer's special warranty.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver roofing materials to Project site in original containers with seals unbroken and labeled with manufacturer's name, product brand name and type, date of manufacture, approval or listing agency markings, and directions for storing and mixing with other components.

B. Store liquid materials in their original undamaged containers in a clean, dry, protected location and within the temperature range required by roofing system manufacturer. Protect stored liquid material from direct sunlight.

    1. Discard and legally dispose of liquid material that cannot be applied within its stated shelf life.

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

D. Handle and store roofing materials, and place equipment in a manner to avoid permanent deflection of deck.

1.8 FIELD CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit roofing system to be installed according to manufacturer's written instructions and warranty requirements.

1.9 WARRANTY

A. Contractor's Warranty: The contractor shall warrant the roof application with respect to workmanship and proper application for two (2) years from the effective date of the warranty issued by the manufacturer.
B. Manufacturer's Warranty: Must be no-dollar limit type and provide for completion of repairs, replacement of membrane or total replacement of the roofing system at the then-current material and labor prices throughout the life of the warranty. In addition, the warranty must meet the following criteria:
   1. Warranty Period: 20 years from date issued by the manufacturer.
   2. No exclusion for damage caused by ponding water.
   3. No exclusion for damage caused by biological growth.
   4. Issued direct from and serviced by the roof membrane manufacturer.
   5. Transferable for the full term of the warranty.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. General Performance: Installed roofing and base flashings shall withstand specified uplift pressures, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Roof system and flashings shall remain watertight.

   1. Accelerated Weathering: Roof membrane shall withstand 2000 hours of exposure when tested according to ASTM G152, ASTM G154, or ASTM G155.
   2. Impact Resistance: Roof membrane shall resist impact damage when tested according to ASTM D3746, ASTM D4272/D4272M.

B. Material Compatibility: Roofing materials shall be compatible with one another and adjacent materials under conditions of service and application required, as demonstrated by roof membrane manufacturer based on testing and field experience.

C. Wind Uplift Resistance: Design roofing system to resist the following wind uplift pressures when tested according to UL 580, or UL 1897:

   1. Zone 1 (Roof Area Field):
   2. Zone 2 (Roof Area Perimeter):
      a. Location: From roof edge to inside roof edge.
   3. Zone 3 (Roof Area Corners):
      a. Location: in each direction from building corner.

D. SPRI's Directory of Roof Assemblies Listing: Roof membrane, base flashings, and component materials be listed in SPRI's Directory of Roof Assemblies for roof assembly identical for that specified for this Project.

   1. Wind Uplift Load Capacity: 1. Roofing System Design: Provide a roofing system designed to resist uplift pressures calculated according to the current edition of the ASCE-7 Specification Minimum Design Loads for Buildings And Other Structures.

2.2 POLYVINYL CHLORIDE (PVC) ROOFING

A. PVC Sheet: ASTM D4434/D4434M, Type III, fabric reinforced.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Duro-Last Roofing, Inc.
   b. Carlisle SynTec Incorporated.
   c. GAF EverGuard, 900 S. Frontage Road - Suite 350 Woodridge, IL 60517
   d. Versico Roofing Systems.
2. Thickness: 60 mils.
3. Exposed Face Color: White.

B. Source Limitations: Obtain components for roofing system from roof membrane manufacturer or manufacturers approved by roof membrane manufacturer.

2.3 AUXILIARY ROOFING MATERIALS

A. General: Auxiliary materials recommended by roofing system manufacturer for intended use and compatible with other roofing components.

1. Adhesives and Sealants: Comply with VOC limits of authorities having jurisdiction.

B. Sheet Flashing: Manufacturer's standard sheet flashing of same material, type, reinforcement, thickness, and color as PVC sheet.

C. Prefabricated Pipe Flashings: As recommended by roof membrane manufacturer.

D. Roof Vents: As recommended by roof membrane manufacturer.

1. Size: Not less than 4-inch diameter.

E. Bonding Adhesive: Manufacturer's standard, water based.

F. Water-Based, Fabric-Backed Membrane Adhesive: Roofing system manufacturer's standard water-based, cold-applied adhesive formulated for compatibility and use with fabric-backed membrane roofing.

G. Slip Sheet: Manufacturer's standard, of thickness required for application.

H. Metal Termination Bars: Manufacturer's standard, predrilled stainless steel or aluminum bars, approximately 1 by 1/8 inch thick; with anchors.

I. Miscellaneous Accessories: Provide pourable sealers, preformed cone and vent sheet flashings, preformed inside and outside corner sheet flashings, T-joint covers, lap sealants, termination reglets, and other accessories.

2.4 ROOF INSULATION

A. General: Preformed roof insulation boards manufactured or approved by PVC roof membrane manufacturer.

B. Polyisocyanurate Board Insulation: ASTM C1289, Type II, Class 1, Grade 2, felt or glass-fiber mat facer on both major surfaces.

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

a. Atlas Roofing Corporation.
b. Carlisle SynTec Incorporated.
c. GAF.
d. Insulfoam; Carlisle Construction Materials Company.
e. Johns Manville; a Berkshire Hathaway company.

2. Compressive Strength: 24 psi.
3. Size: 48 by 96 inches.
4. Thickness Minimum Thickness: 5.2 inch or R30

C. Tapered Insulation: Provide factory-tapered insulation boards.
1. Material: Match roof insulation.
2. Minimum Thickness: 1/4 inch.
3. Slope:

a. Roof Field: 1/4 inch per foot unless otherwise indicated on Drawings.
b. Saddles and Crickets: 1/2 inch per foot unless otherwise indicated on Drawings.

2.5 INSULATION ACCESSORIES

A. General: Roof insulation accessories recommended by insulation manufacturer for intended use and compatibility with other roofing system components.

B. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions, designed for fastening roof insulation and cover boards to substrate, and acceptable to roofing system manufacturer.

C. Insulation Adhesive: Insulation manufacturer's recommended adhesive formulated to attach roof insulation to substrate or to another insulation layer as follows:

D. Protection Mat: Woven or nonwoven polypropylene, polyolefin, or polyester fabric, water permeable and resistant to UV degradation, type and weight as recommended by roofing system manufacturer for application.

2.6 WALKWAYS

A. Flexible Walkways: Factory-formed, nonporous, heavy-duty, slip-resisting, surface-textured walkway pads, approximately 3/16 inch thick and acceptable to roofing system manufacturer.

1. Size: Approximately 36 by 60 inches.
2. Color: Contrasting with roof membrane.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance of the Work.

1. Verify that roof openings and penetrations are in place, curbs are set and braced, and roof-drain bodies are securely clamped in place.
2. Verify that wood blocking, curbs, and nailers are securely anchored to roof deck at penetrations and terminations and that nailers match thicknesses of insulation.
3. Verify that surface plane flatness and fastening of steel roof deck complies with requirements in Section 053100 "Steel Decking."
4. Verify that minimum concrete drying period recommended by roofing system manufacturer has passed.
5. Verify that concrete substrate is visibly dry and free of moisture, and that minimum concrete internal relative humidity is not more than 75 percent, or as recommended by roofing system manufacturer, when tested according to ASTM F2170.

    a. Test Frequency: One test probe per each 1000 sq. ft., or portion thereof, of roof deck, with no fewer than three test probes.
    b. Submit test reports within 24 hours of performing tests.
6. Verify that concrete-curing compounds that will impair adhesion of roofing components to roof deck have been removed.
7. Verify that joints in precast concrete roof decks have been grouted flush with top of concrete.
8. Verify that minimum curing period recommended by roofing system manufacturer for lightweight insulating concrete roof decks has passed.
9. Verify that any damaged sections of cementitious wood-fiber decks have been repaired or replaced.
10. Verify that adjacent cementitious wood-fiber panels are vertically aligned to within 1/8 inch at top surface.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean substrate of dust, debris, moisture, and other substances detrimental to roofing system installation according to roofing system manufacturer's written instructions. Remove sharp projections.

B. Prevent materials from entering and clogging roof drains and conductors and from spilling or migrating onto surfaces of other construction. Remove roof-drain plugs when no work is taking place or when rain is forecast.

C. Perform fastener-pullout tests according to roof system manufacturer's written instructions.

1. Submit test result within 24 hours of performing tests.

    a. Include manufacturer's requirements for any revision to previously submitted fastener patterns required to achieve specified wind uplift requirements.

D. Install sound-absorbing insulation strips according to acoustical roof deck manufacturer's written instructions.

3.3 INSTALLATION OF ROOFING, GENERAL

A. Install roofing system according to roofing system manufacturer's written instructions.

B. Complete terminations and base flashings and provide temporary seals to prevent water from entering completed sections of roofing system at end of workday or when rain is forecast. Remove and discard temporary seals before beginning work on adjoining roofing.

C. Install roof membrane and auxiliary materials to tie in to existing roofing to maintain weathertightness of transition.

D. Coordinate installation and transition of roofing system component serving as an air barrier with air barrier specified under

3.4 INSTALLATION OF INSULATION

A. Coordinate installing roofing system components so insulation is not exposed to precipitation or left exposed at end of workday.

B. Comply with roofing system and insulation manufacturer's written instructions for installing roof insulation.

C. Installation Over Metal Decking:

1. Install base layer of insulation with joints staggered not less than 24 inches in adjacent rows and with long joints continuous at right angle to flutes of decking.
    a. Locate end joints over crests of decking.
    b. Where installing composite and noncomposite insulation in two or more layers, install noncomposite board insulation for bottom layer and intermediate layers, if applicable, and install composite board insulation for top layer.
    c. Trim insulation neatly to fit around penetrations and projections, and to fit tight to intersecting sloping roof decks.
    d. Make joints between adjacent insulation boards not more than 1/4 inch in width.
    e. At internal roof drains, slope insulation to create a square drain sump with each side equal to the diameter of the drain bowl plus 24 inches.
        1) Trim insulation so that water flow is unrestricted.
    f. Fill gaps exceeding 1/4 inch with insulation.
    g. Cut and fit insulation within 1/4 inch of nailers, projections, and penetrations.
    h. Loosely lay base layer of insulation units over substrate.
    i. Mechanically attach base layer of insulation and substrate board using mechanical fasteners specifically designed and sized for fastening specified board-type roof insulation to metal decks.
        1) Fasten insulation according to manufacturers requirements.
        2) Fasten insulation to resist specified uplift pressure at corners, perimeter, and field of roof.
2. Install upper layers of insulation and tapered insulation with joints of each layer offset not less than 12 inches from previous layer of insulation.
    a. Staggered end joints within each layer not less than 24 inches in adjacent rows.

b. Install with long joints continuous and with end joints staggered not less than 12 inches in adjacent rows.
c. Trim insulation neatly to fit around penetrations and projections, and to fit tight to intersecting sloping roof decks.
d. Make joints between adjacent insulation boards not more than 1/4 inch in width.
e. At internal roof drains, slope insulation to create a square drain sump with each side equal to the diameter of the drain bowl plus 24 inches.
f. Trim insulation so that water flow is unrestricted.
g. Fill gaps exceeding 1/4 inch with insulation.
h. Cut and fit insulation within 1/4 inch of nailers, projections, and penetrations.
i. Loosely lay each layer of insulation units over substrate.
j. Adhere each layer of insulation to substrate using adhesive according to listed roof assembly requirements for specified Windstorm Resistance Classification, as follows:
    1) Set each layer of insulation in a solid mopping of hot roofing asphalt, applied within plus or minus 25 deg F of equiviscous temperature.
    2) Set each layer of insulation in ribbons of bead-applied insulation adhesive, firmly pressing and maintaining insulation in place.
    3) Set each layer of insulation in a uniform coverage of full-spread insulation adhesive, firmly pressing and maintaining insulation in place.

3.5 INSTALLATION OF MECHANICALLY FASTENED ROOF MEMBRANE

A. Mechanically fasten roof membrane over area to receive roofing according to roofing system manufacturer's written instructions.

B. Unroll roof membrane and allow to relax before installing.

C. For in-splice attachment, install roof membrane with long dimension perpendicular to steel roof deck flutes.

D. Start installation of roofing in presence of roofing system manufacturer's technical personnel.

E. Accurately align roof membrane, and maintain uniform side and end laps of minimum dimensions required by manufacturer. Stagger end laps.

F. Mechanically fasten or adhere roof membrane securely at terminations, penetrations, and perimeter of roofing.

G. Apply roof membrane with side laps shingled with slope of roof deck where possible.

H. Seams: Clean seam areas, overlap roof membrane, and hot-air weld side and end laps of roof membrane and sheet flashings to ensure a watertight seam installation.

1. Test lap edges with probe to verify seam weld continuity. Apply lap sealant to seal cut edges of roof membrane and sheet flashings.
2. Verify field strength of seams a minimum of twice daily, and repair seam sample areas.
3. Repair tears, voids, and lapped seams in roof membrane that do not comply with requirements.

I. Spread sealant bed over deck-drain flange at roof drains, and securely seal roof membrane in place with clamping ring.

3.6 INSTALLATION OF BASE FLASHING

A. Install sheet flashings and preformed flashing accessories, and adhere to substrates according to roofing system manufacturer's written instructions.

B. Apply bonding adhesive to substrate and underside of sheet flashing at required rate, and allow to partially dry. Do not apply to seam area of flashing.

C. Flash penetrations and field-formed inside and outside corners with cured or uncured sheet flashing.

D. Clean seam areas, overlap, and firmly roll sheet flashings into the adhesive. Hot-air weld side and end laps to ensure a watertight seam installation.

E. Terminate and seal top of sheet flashings and mechanically anchor to substrate through termination bars.

3.7 INSTALLATION OF WALKWAYS

A. Flexible Walkways: Install walkway products according to manufacturer's written instructions.

1. Install flexible walkways at the following locations:
    a. Perimeter of each rooftop unit.
    b. Between each rooftop unit location, creating a continuous path connecting rooftop unit locations.
    c. Between each roof hatch and each rooftop unit location or path connecting rooftop unit locations.
    d. Top and bottom of each roof access ladder.
    e. Between each roof access ladder and each rooftop unit location or path connecting rooftop unit locations.
    f. Locations indicated on Drawings.
    g. As required by roof membrane manufacturer's warranty requirements.
2. Provide 6-inch clearance between adjoining pads.
3. Heat weld to substrate or adhere walkway products to substrate with compatible adhesive according to roofing system manufacturer's written instructions.

3.8 PROTECTING AND CLEANING

A. Protect roofing system from damage and wear during remainder of construction period. When remaining construction does not affect or endanger roofing, inspect roofing system for deterioration and damage, describing its nature and extent in a written report, with copies to Architect and Owner.

B. Correct deficiencies in or remove roofing system that does not comply with requirements, repair substrates, and repair or reinstall roofing system to a condition free of damage and deterioration at time of Substantial Completion and according to warranty requirements.

C. Clean overspray and spillage from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

END OF SECTION

SECTION 076200
SHEET METAL FLASHING AND TRIM

PART 1 GENERAL

1.1 SUMMARY

A. This Section includes the following:
   1. Miscellaneous flashing and trim

1.2 SUBMITTALS

A. Product Data: For each product indicated.
B. Shop Drawings: Show layouts, profiles, shapes, seams, dimensions, and details for fastening, joining, supporting, and anchoring sheet metal flashing and trim.
C. Samples: For each type of sheet metal flashing and trim.

1.3 QUALITY ASSURANCE

A. Sheet Metal Flashing and Trim Standard: Comply with SMACNA's "Architectural Sheet Metal Manual." Conform to dimensions and profiles shown unless more stringent requirements are indicated.

PART 2 PRODUCTS

2.1 SHEET METALS

A. Aluminum Sheet: ASTM B 209 (ASTM B 209M), Alloy 3003, 3004, 3105, or 5005, Temper suitable for forming and structural performance required, but not less than H14, finished as follows:

   1. Termination and Edge Details at roof: Per drawings and in conformance with roofing manufacturer.
   2. Termination at soffit, per exterior finish system manufacturer’s recommendation and in conformance with roofing manufacturer.
   3. Finish: Kynar 500® PVDF prefinished 24-gauge Galvalume steel.
   4. Color: as selected from manufacturers standard

2.2 MISCELLANEOUS MATERIALS

A. General: Provide materials and types of fasteners, solder, welding rods, protective coatings, separators, sealants, and other miscellaneous items as required for complete sheet metal flashing and trim installation.
B. Felt Underlayment: ASTM D 226, Type II (No. 30), asphalt-saturated organic felt, nonperforated.

   1. Slip Sheet: Rosin-sized paper, minimum 3 lb/100 sq. ft. (0.16 kg/sq. m).

C. Fasteners: Wood screws, annular threaded nails, self-tapping screws, self-locking rivets and bolts, and other suitable fasteners designed to withstand design loads.

   1. Fasteners for Flashing and Trim: Blind fasteners or self-drilling screws, gasketed, with hex washer head.
   2. Blind Fasteners: High-strength aluminum or stainless-steel rivets.

D. Sealing Tape: Pressure-sensitive, 100 percent solids, polyisobutylene compound sealing tape with release-paper backing. Provide permanently elastic, non-sag, nontoxic, non-staining tape.

2.3 FABRICATION, GENERAL

A. General: Custom fabricate sheet metal flashing and trim to comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of item indicated. Shop fabricate items where practicable. Obtain field measurements for accurate fit before shop fabrication.
B. Fabricate sheet metal flashing and trim without excessive oil canning, buckling, and tool marks and true to line and levels indicated, with exposed edges folded back to form hems.

1. Seams for Aluminum: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with epoxy seam sealer. Rivet joints for additional strength.
2. Seams for Other Than Aluminum: Fabricate nonmoving seams in accessories with flat-lock seams. Tin edges to be seamed, form seams, and solder.

C. Sealed Joints: Form non-expansion but movable joints in metal to accommodate elastomeric sealant to comply with SMACNA recommendations.
D. Expansion Provisions: Where lapped or bayonet-type expansion provisions in the Work cannot be used, form expansion joints of intermeshing hooked flanges, not less than 1 inch (25 mm) deep, filled with sealant concealed within joints.
E. Conceal fasteners and expansion provisions where possible on exposed-to-view sheet metal flashing and trim, unless otherwise indicated.
F. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal, and in thickness not less than that of metal being secured.

2.4 WALL SHEET METAL FABRICATIONS

A. Openings Flashing in Frame Construction: Fabricate head, sill, jamb, and similar flashings to extend beyond wall openings. Form head and sill flashing with 2-inch- (50-mm-) high end dams. Fabricate from the following material:

1. Aluminum: 0.0320 inch thick.

PART 3 EXECUTION

3.1 INSTALLATION, GENERAL

A. General: Anchor sheet metal flashing and trim and other components of the Work securely in place, with provisions for thermal and structural movement. Use fasteners, solder, welding rods, protective coatings, separators, sealants, and other miscellaneous items as required to complete sheet metal flashing and trim system.

1. Torch cutting of sheet metal flashing and trim is not permitted.

B. Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with bituminous coating or by other permanent separation as recommended by fabricator or manufacturers of dissimilar metals.
C. Install exposed sheet metal flashing and trim without excessive oil canning, buckling, and tool marks.
D. Install sheet metal flashing and trim true to line and levels indicated. Provide uniform, neat seams with minimum exposure of solder, welds, and sealant.

E. Install sheet metal flashing and trim to fit substrates and to result in watertight performance. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.

1. Space cleats not more than 12 inches (300 mm) apart. Anchor each cleat with two fasteners. Bend tabs over fasteners.

F. 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 (600 mm) of corner or intersection. Where lapped or bayonet-type expansion provisions cannot be used or would not be sufficiently watertight, form expansion joints of intermeshing hooked flanges, not less than 1 inch (25 mm) deep, filled with sealant concealed within joints.

G. Fasteners: Use fasteners of sizes that will penetrate substrate not less than 1-1/4 inches (32 mm) for nails and not less than 3/4 inch (19 mm) for wood screws.

1. Galvanized or Pre-painted, Metallic-Coated Steel: Use stainless-steel fasteners.
2. Aluminum: Use aluminum or stainless-steel fasteners.
3. Copper: Use copper, hardware bronze, or stainless-steel fasteners.
4. Stainless Steel: Use stainless-steel fasteners.

H. Seal joints with [elastomeric] [butyl] sealant as required for watertight construction.

I. Soldered Joints: Clean surfaces to be soldered, removing oils and foreign matter. Pre-finish edges of sheets to be soldered to a width of 1-1/2 inches (38 mm) except where pre-tinned surface would show in finished Work.

3.2 WALL FLASHING INSTALLATION

A. General: Install sheet metal wall flashing to intercept and exclude penetrating moisture according to SMACNA recommendations and as indicated. Coordinate installation of wall flashing with installation of wall-opening components such as windows, doors, and louvers.

B. Openings Flashing in Frame Construction: Install continuous head, sill, jamb, and similar flashings to extend beyond wall openings.

END OF SECTION

SECTION 077100 - ROOF SPECIALTIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Roof-edge specialties.

B. Related Requirements:

1. Section 061000 "Rough Carpentry" for wood nailers, curbs, and blocking.
2. Section 074113.16 "Standing-Seam Metal Roof Panels" for roof-edge drainage-system components provided by metal-roof-panel manufacturer.
3. Section 076200 "Sheet Metal Flashing and Trim" for custom- and site-fabricated sheet metal flashing and trim.
4. Section 077253 "Snow Guards" for manufactured snow guard devices.
5. Section 079200 "Joint Sealants" for field-applied sealants between roof specialties and adjacent materials.

1.2 ACTION SUBMITTALS

A. Product Data:

1. Roof-edge specialties.

B. Shop Drawings: For roof specialties.

1. Include plans, elevations, expansion-joint locations, keyed details, and attachments to other work. Distinguish between plant- and field-assembled work.
2. Include details for expansion and contraction; locations of expansion joints, including direction of expansion and contraction.
3. Indicate profile and pattern of seams and layout of fasteners, cleats, clips, and other attachments.
4. Detail termination points and assemblies, including fixed points.
5. Include details of special conditions.

C. Samples for Initial Selection: For each type of roof specialty indicated with factory-applied color finishes.

1.3 DELIVERY, STORAGE, AND HANDLING

A. Do not store roof specialties in contact with other materials that might cause staining, denting, or other surface damage. Store roof specialties away from uncured concrete and masonry.

B. Protect strippable protective covering on roof specialties from exposure to sunlight and high humidity, except to extent necessary for the period of roof-specialty installation.

1.4 FIELD CONDITIONS

A. Field Measurements: Verify profiles and tolerances of roof-specialty substrates by field measurements before fabrication, and indicate measurements on Shop Drawings.

B. Coordination: Coordinate roof specialties with flashing, trim, and construction of parapets, roof deck, roof and wall panels, and other adjoining work to provide a leakproof, secure, and noncorrosive installation.

1.5 WARRANTY

A. Special Warranty on Painted Finishes: Manufacturer agrees to repair finish or replace roof specialties that show evidence of deterioration of factory-applied finishes within specified warranty period.

1. Fluoropolymer 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**] 10 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. General Performance: Roof specialties to withstand exposure to weather and resist thermally induced movement without failure, rattling, leaking, or fastener disengagement due to defective manufacture, fabrication, installation, or other defects in construction.

2.2 ROOF-EDGE SPECIALTIES

A. Roof-Edge Fascia: Manufactured, two-piece, roof-edge fascia consisting of snap-on metal fascia cover in section lengths not exceeding 12 feet and a continuous metal receiver with integral drip-edge cleat to engage fascia cover . Provide matching corner units.

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. Drexel Metals.
   b. Metal-Era, Inc.
   c. SAF Perimeter Systems Division.

2. Formed Aluminum Sheet Fascia Covers: Aluminum sheet, thickness as required to meet performance requirements .
   a. Surface: Smooth, flat finish.
   b. Finish: Two-coat fluoropolymer .
   c. Color: As selected by Architect from manufacturer's full range .
3. Corners: Factory mitered and soldered .
4. Splice Plates: Concealed , of same material, finish, and shape as fascia cover.
5. Receiver: Manufacturer's standard material and thickness.
6. Fascia Accessories: Wall cap Soffit trim .

2.3 MATERIALS

A. Zinc-Coated (Galvanized) Steel Sheet: ASTM A653/A653M, G90 coating designation.

B. Aluminum Sheet: ASTM B209, alloy as standard with manufacturer for finish required, with temper to suit forming operations and performance required.

C. Aluminum Extrusions: ASTM B221, alloy and temper recommended by manufacturer for type of use and finish indicated, finished as follows:

2.4 UNDERLAYMENT MATERIALS

A. Self-Adhering, High-Temperature Sheet: Minimum 30 to 40 mils thick, consisting of slip-resisting polyethylene-film top surface laminated to layer of butyl or SBS-modified asphalt adhesive, with release-paper backing; cold applied. Provide primer when recommended by underlayment manufacturer.

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 WIP Products; a brand of Carlisle Construction Materials.
   b. Henry Company; a Carlisle company.
   c. Protecto Wrap Company.
2. Thermal Stability: ASTM D1970/D1970M; stable after testing at 240 deg F.
3. Low-Temperature Flexibility: ASTM D1970/D1970M; passes after testing at minus 20 deg F.

2.5 MISCELLANEOUS MATERIALS

A. Fasteners: Manufacturer's recommended fasteners, suitable for application and designed to meet performance requirements. Furnish the following unless otherwise indicated:

1. Exposed Penetrating Fasteners: Gasketed screws with hex washer heads matching color of sheet metal.
2. Fasteners for Aluminum: Aluminum or Series 300 stainless steel.
3. Fasteners for Zinc-Coated (Galvanized) Steel Sheet: Series 300 stainless steel or hot-dip zinc-coated steel in accordance with ASTM A153/A153M or ASTM F2329.

B. Butyl Sealant: ASTM C1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for hooked-type joints with limited movement.

2.6 FINISHES

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Appearance of Finished Work: Noticeable variations in same piece are unacceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

D. Aluminum Extrusion Finishes:

1. High-Performance Organic Finish: Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
   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.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, to verify actual locations, dimensions, and other conditions affecting performance of the Work.

B. Examine walls, roof edges, and parapets for suitable conditions for roof specialties.

C. Verify that substrate is sound, dry, smooth, clean, sloped for drainage where applicable, and securely anchored.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION OF UNDERLAYMENT

A. Self-Adhering Sheet Underlayment: Apply primer if required by manufacturer. Comply with temperature restrictions of underlayment manufacturer for installation. Apply wrinkle free, in shingle fashion to shed water, and with end laps of not less than 6 inches staggered 24 inches between courses. Overlap side edges not less than 3-1/2 inches. Roll laps with roller. Cover underlayment within 14 days.

1. Apply continuously under roof-edge specialties .

2. Coordinate application of self-adhering sheet underlayment under roof specialties with requirements for continuity with adjacent air barrier materials.

3.3 INSTALLATION, GENERAL

A. Install roof specialties in accordance with manufacturer's written instructions. Anchor roof specialties securely in place, with provisions for thermal and structural movement. Use fasteners, solder, protective coatings, separators, underlayments, sealants, and other miscellaneous items as required to complete roof-specialty systems.

1. Install roof specialties level, plumb, true to line and elevation; with limited oil-canning and without warping, jogs in alignment, buckling, or tool marks.
2. Provide uniform, neat seams with minimum exposure of solder and sealant.
3. Install roof specialties to fit substrates and to result in weathertight performance. Verify shapes and dimensions of surfaces to be covered before manufacture.
4. Torch cutting of roof specialties is not permitted.
5. Do not use graphite pencils to mark metal surfaces.

B. Metal Protection: Protect metals against galvanic action by separating dissimilar metals from contact with each other or with corrosive substrates by painting contact surfaces with bituminous coating or by other permanent separation as recommended by manufacturer.

1. Coat concealed side of uncoated aluminum roof specialties with bituminous coating where in contact with wood, ferrous metal, or cementitious construction.
2. Bed flanges in thick coat of asphalt roofing cement where required by manufacturers of roof specialties for waterproof performance.

C. Expansion Provisions: Allow for thermal expansion of exposed roof specialties.

1. Space movement joints at a maximum of 12 feet with no joints within 18 inches of corners or intersections unless otherwise indicated on Drawings.
2. When ambient temperature at time of installation is between 40 and 70 deg F, set joint members for 50 percent movement each way. Adjust setting proportionately for installation at higher ambient temperatures.

D. Fastener Sizes: Use fasteners of sizes that penetrate substrate not less than recommended by fastener manufacturer to achieve maximum pull-out resistance .

E. Seal concealed joints with butyl sealant as required by roofing-specialty manufacturer.

F. Seal joints as required for weathertight construction. Place sealant to be completely concealed in joint. Do not install sealants at temperatures below 40 deg F.

3.4 INSTALLATION OF ROOF-EDGE SPECIALITIES

A. Install cleats, cants, and other anchoring and attachment accessories and devices with concealed fasteners.

B. Anchor roof edgings with manufacturer's required devices, fasteners, and fastener spacing to meet performance requirements.

3.5 CLEANING AND PROTECTION

A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.

B. Clean and neutralize flux materials. Clean off excess solder and sealants.

C. Remove temporary protective coverings and strippable films as roof specialties are installed. On completion of installation, clean finished surfaces, including removing unused fasteners, metal filings, pop rivet stems, and pieces of flashing. Maintain roof specialties in a clean condition during construction.

D. Replace roof specialties that have been damaged or that cannot be successfully repaired by finish touchup or similar minor repair procedures.

END OF SECTION 077100

SECTION 077253 - SNOW GUARDS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Rail-type, seam-mounted snow guards.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: Include roof plans showing layouts and attachment details of snow guards.

1. Include details of rail-type snow guards.

C. Samples:

1. Rail-Type Snow Guards: Bracket, 12-inch- long rail, and installation hardware.
   a. For units with factory-applied finishes, submit manufacturer's standard color selections .

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Performance Requirements: Provide snow guards that withstand exposure to weather and resist thermally induced movement without failure, rattling, or fastener disengagement due to defective manufacture, fabrication, installation, or other defects in construction.

2.2 RAIL-TYPE SNOW GUARDS

A. Rail-Type, Seam-Mounted Snow Guards:

1. Basis-of-Design Product: Subject to compliance with requirements, provide Exceptional Metals 2" iClad Snow Retention System or comparable product by one of the following:
   a. TRA Snow and Sun, Inc. .
   b. Berger Building Products, Inc.
   c. S-5! Attachment Solutions
2. Description: Snow guard rails fabricated from metal pipes, bars, or extrusions, anchored to brackets and equipped with one rail with integral track to accept color-matching inserts of material and finish used for metal roof .
3. Brackets and Baseplates: ASTM B209 aluminum, clear anodized .

4. Bars: ASTM B221 aluminum, clear anodized.
   a. Profile: with integral track to accept color-matching inserts of material and finish used for metal roof.
5. Seam clamps: ASTM B221 aluminum extrusion or ASTM B85/B85M aluminum casting with stainless steel set screws incorporating round nonpenetrating point; designed for use with applicable roofing system to which clamp is attached.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install snow guards according to manufacturer's written instructions.

1. Space rows as recommended by manufacturer.

B. Attachment for Standing-Seam Metal Roofing:

1. Do not use fasteners that will penetrate metal roofing or fastening methods that void metal roofing finish warranty.
2. Rail-Type, Seam-Mounted Snow Guards:
   a. Install brackets to vertical ribs in straight rows.
   b. Secure with stainless steel set screws, incorporating round nonpenetrating point, on same side of standing seam.
   c. Torque set screw according to manufacturer's instructions.
   d. Install cross members to brackets.

END OF SECTION 077253

SECTION 078413 - PENETRATION FIRESTOPPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification Section, apply to work specified in this section.

1.2 DEFINITIONS

A. Firestopping: Material or combination of materials used to retain integrity of fire-rated construction by maintaining an effective barrier against the spread of flame, smoke, and hot gases through penetrations in fire rated wall and floor assemblies.

1.3 GENERAL DESCRIPTION OF THE WORK OF THIS SECTION

A. Only tested firestop systems shall be used in specific locations as follows:

B. Penetrations for the passage of duct, cable, cable tray, conduit, piping, electrical busways and raceways through fire-rated vertical barriers (walls and partitions), horizontal barriers (floor/ceiling assemblies), and vertical service shaft walls and partitions.

C. Blank openings through fire-rated vertical barriers (walls and partitions), horizontal barriers (floor/ceiling assemblies), and vertical service shaft walls and partitions.

D. Openings and penetrations in fire-rated partitions or walls containing fire doors.

E. Openings around structural members which penetrate floors or walls.

1.4 RELATED WORK OF OTHER SECTIONS

A. A. Coordinate work of this section with work of other sections as required to properly execute the work and as necessary to maintain satisfactory progress of the work of other sections, including:

1. Section 033000 - Cast-In-Place Concrete
2. Section 042000 - Unit Masonry
3. Section 092900 - Gypsum Board Assemblies
4. Section 210000 - Fire Suppression
5. Section 220000 - Plumbing
6. Section 230000 - Heating, Ventilating, and Air Conditioning
7. Section 260000 - Electrical

1.5 REFERENCES

A. Test Requirements: ASTM E 814, "Standard Method of Fire Tests of Through Penetration Fire Stops"

B. Test Requirements: UL 1479, “Fire Tests of Through-Penetration Firestops”

C. Underwriters Laboratories (UL) of Northbrook, IL publishes tested systems in their "FIRE RESISTANCE DIRECTORY" that is updated annually.

1. UL Fire Resistance Directory:

a. Firestop Devices (XHJI)
b. Fire Resistance Ratings (BXRH)
c. Through-Penetration Firestop Systems (XHEZ)
d. Fill, Voids, or Cavity Material (XHHW)
e. Forming Materials (XHKU)

D. International Firestop Council Guidelines for Evaluating Firestop Systems Engineering Judgments

E. ASTM E 84, Standard Test Method for Surface Burning Characteristics of Building Materials.

F. Inspection Requirements: ASTM E 2174, “Standard Practice for On-site Inspection of Installed Fire Stops.”

G. 2015 Michigan Building Code

H. NFPA 101 - Life Safety Code

I. NFPA 70 - National Electric Code

1.6 QUALITY ASSURANCE

A. Fire-Test-Response Characteristics: Provide through-penetration fire stop systems that comply with specified requirements of tested systems.

B. Firestop System installation must meet requirements of ASTM E 814, UL 1479 or UL 2079 tested assemblies that provide a fire rating equal to that of construction being penetrated.

C. Proposed firestop materials and methods shall conform to applicable governing codes having local jurisdiction.

D. Firestop Systems do not reestablish the structural integrity of load bearing partitions/assemblies, or support live loads and traffic. Installer shall consult the structural engineer prior to penetrating any load bearing assembly.

E. For those firestop applications that exist for which no qualified tested system is available through a manufacturer, an engineering judgment derived from similar qualified tested system designs or other tests will be submitted to local authorities having jurisdiction for their review and approval prior to installation. Engineering judgment documents must follow requirements set forth by the International Firestop Council.

1.7 SUBMITTALS

A. Submit Product Data: Manufacturer's specifications and technical data for each material including the composition and limitations, documentation of qualified firestop systems to be used and manufacturer's installation instructions to comply with Section 01 30 00.

B. Manufacturer's engineering judgment identification number and drawing details when no qualified tested system is available for an application. Engineering judgment must include both project name and contractor’s name who will install firestop system as described in document.

C. Submit material safety data sheets provided with product delivered to job-site.

1.8 INSTALLER QUALIFICATIONS

A. Engage an experienced Installer who is certified, licensed, or otherwise qualified by the firestopping manufacturer as having been provided the necessary training to install manufacturer’s products per specified requirements. A supplier’s willingness to sell its firestopping products to the Contractor or to an Installer engaged by the Contractor does not in itself confer qualification on the buyer.

B. Installation Responsibility: assign installation of through-penetration fire stop systems and fire-resistive joint systems in Project to a single sole source firestop specialty contractor.

C. The work is to be installed by a contractor with at least one of the following qualifications:

1. FM 4991 Approved Contractor
2. UL Approved Contractor

D. Firm with not less than 3 years experience with fire stop installation.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials undamaged in manufacturer's clearly labeled, unopened containers, identified with brand, type, and UL label where applicable.

B. Coordinate delivery of materials with scheduled installation date to allow minimum storage time at job-site.

C. Store materials under cover and protect from weather and damage in compliance with manufacturer's requirements, including temperature restrictions.

D. Comply with recommended procedures, precautions or remedies described in material safety data sheets as applicable.

E. Do not use damaged or expired materials.

1.10 PROJECT CONDITIONS

A. Do not use materials that contain flammable solvents.

B. Schedule installation of firestopping after completion of penetrating item installation but prior to covering or concealing of openings.

C. Verify existing conditions and substrates before starting work. Correct unsatisfactory conditions before proceeding.

D. Weather conditions: Do not proceed with installation of firestop materials when temperatures exceed the manufacturer's recommended limitations for installation printed on product label and product data sheet.

E. During installation, provide masking and drop cloths to prevent firestopping materials from contaminating any adjacent surfaces.

PART 2 - PRODUCTS

2.1 FIRESTOPPING - GENERAL

A. Provide firestopping composed of components that are compatible with each other, the substrates forming openings, and the items, if any, penetrating the firestopping under conditions of service and application, as demonstrated by the firestopping manufacturer based on testing and field experience.

B. Provide components for each firestopping system that are needed to install fill material. Use only components specified by the firestopping manufacturer and approved by the qualified testing agency for the designated fire-resistance-rated systems.

C. Penetrations in Fire Resistance Rated Walls: Provide firestopping with ratings determined in accordance with UL 1479 or ASTM E 814.

D. F-Rating: Not less than the fire-resistance rating of the wall construction being penetrated.

E. Penetrations in Horizontal Assemblies: Provide firestopping with ratings determined in accordance with UL 1479 or ASTM E 814.

F. F-Rating: Minimum of 1-hour rating, but not less than the fire-resistance rating of the floor construction being penetrated.

G. T-Rating: when penetrant is located outside of a wall cavity, minimum of 1-hour rating, but not less than the fire-resistance rating of the floor construction being penetrated.

H. W-Rating: Class 1 rating in accordance with water leakage test per UL 1479.

I. Penetrations in Smoke Barriers: Provide firestopping with ratings determined in accordance with UL 1479 or ASTM E 814.

J. L-Rating: Not exceeding 5.0 cfm/sq. ft. of penetration opening at both ambient and elevated temperatures.

K. Mold Resistance: Provide penetration firestoppping with mold and mildew resistance rating of 0 as determined by ASTM G21.

L. Firestopping Materials are either “cast-in-place” (integral with concrete placement) or “post installed.” Provide cast-in-place firestop devices prior to concrete placement.

2.2 ACCEPTABLE MANUFACTURERS

A. A. Subject to compliance with through penetration firestop systems (XHEZ) listed in Volume II of the UL Fire Resistance Directory, provide products of the following manufacturer as identified below:

1. Hilti, Inc., Tulsa, Oklahoma
2. 3M Products
3. Tremco Sealants

2.3 MATERIALS

A. Use only firestop products that have been UL 1479 or ASTM E 814 tested for specific fire-rated construction conditions conforming to construction assembly type, penetrating item type, annular space requirements, and fire-rating involved for each separate instance.

B. Pre-installed firestop devices for use with noncombustible and combustible pipes (closed and open systems), conduit, and/or cable bundles penetrating concrete floors and/or gypsum walls, the following products (basis of design) are acceptable:

1. Hilti Cast-In Place Firestop Device (CP 680-P)
2. Add Aerator Adaptor when used in conjunction with aerator system.
3. Hilti Tub Box Kit (CP 681) for use with tub installations.
4. Hilti Cast-In Place Firestop Device (CP 680-M) for use with noncombustible penetrants.
5. Hilti Speed Sleeve (CP 653) for use with cable penetrations.
6. Hilti Firestop Drop-In Device (CFS-DID) for use with noncombustible and combustible penetrants.
7. Hilti Firestop Block (CFS-BL)

C. Sealants, caulking materials, or foams for use with non-combustible items including steel pipe, copper pipe, rigid steel conduit and electrical metallic tubing (EMT), the following products are acceptable:

1. Hilti Intumescent Firestop Sealant (FS-ONE)
2. Hilti Self-leveling Firestop Sealant (CP 604)
3. Hilti Fire Foam (CP 620)
4. Hilti Flexible Firestop Sealant (CP 606)
5. Hilti Elastomeric Firestop Sealant (CP 601S)

D. Sealants or caulking materials for use with sheet metal ducts, the following products are acceptable:

1. Hilti Elastomeric Firestop Sealant (CP 601S)
2. Hilti Flexible Firestop Sealant (CP 606)
3. Hilti Intumescent Firestop Sealant (FS-ONE)

E. Intumescent sealants, caulking materials for use with combustible items (penetrants consumed by high heat and flame) including insulated metal pipe, PVC jacketed, flexible cable or cable bundles and plastic pipe, the following products are acceptable:

1. Hilti Intumescent Firestop Sealant (FS-ONE)

F. Foams, intumescent sealants, or caulking materials for use with flexible cable or cable bundles, the following products are acceptable:

1. Hilti Intumescent Firestop Sealant (FS-ONE)

G. Hilti Fire Foam (CP 620)

1. Hilti Elastomeric Firestop Sealant (CP 601S)
2. Hilti Flexible Firestop Sealant (CP 606)

H. Non-curing, re-penetrable, intumescent putty or foam materials for use with flexible cable or cable bundles, the following products are acceptable:

1. Hilti Firestop Putty Stick (CP 618)
2. Hilti Firestop Plug (CFS-PL)

I. Wall opening protective materials for use with U.L. listed metallic and specified nonmetallic outlet boxes, the following products are acceptable:

1. Hilti Firestop Putty Pad (CP 617)
2. Hilti Firestop Box Insert

J. Firestop collar or wrap devices attached to assembly around combustible plastic pipe (closed and open piping systems), the following products are acceptable:

1. Hilti Firestop Collar (CP 643N)
2. Hilti Firestop Collar (CP 644)
3. Hilti Wrap Strips (CP 648E/648S)

K. J. Materials used for large openings and complex penetrations made to accommodate cable trays and bundles, multiple steel and copper pipes, electrical busways in raceways, the following products are acceptable:

1. Hilti Firestop Mortar (CP 637)
2. Hilti Firestop Block (CFS-BL)
3. Hilti Fire Foam (CP 620)
4. Hilti Firestop Board (CP 675T)

L. Non curing, re-penetrable materials used for large openings and complex penetrations made to accommodate cable trays and bundles, multiple steel and copper pipes, electrical busways in raceways, the following products are acceptable:

1. Hilti Firestop Block (CFS-BL)
2. Hilti Firestop Board (CP 675T)

M. Re-penetrable, round cable management devices for use with new or existing cable bundles penetrating gypsum or masonry walls, the following products are acceptable:

1. 1. Hilti Speed Sleeve (CP 653) with integrated smoke seal fabric membrane.
2. 2. Hilti Firestop Sleeve (CFS-SL SK)
3. 3. Hilti Retrofit Sleeve (CFS-SL RK) for use with existing cable bundles.
4. 4. Hilti Gangplate (CFS-SL GP) for use with multiple cable management devices.
5. 5. Hilti Gangplate Cap (CFS-SL GP CAP) for use at blank openings in gangplate for future penetrations.

N. For blank openings made in fire-rated wall or floor assemblies, where future penetration of pipes, conduits, or cables is expected, the following products are acceptable:

1. Hilti Firestop Block (CFS-BL)
2. Hilti Firestop Plug (CFS-PL)

O. Provide a firestop system with a "F" Rating as determined by UL 1479 or ASTM E 814 which is equal to the time rating of construction being penetrated.

PART 3 - EXECUTION

3.1 PREPARATION

A. Verification of Conditions: Examine areas and conditions under which work is to be performed and identify conditions detrimental to proper or timely completion.

1. Verify penetrations are properly sized and in suitable condition for application of materials.
2. Surfaces to which firestop materials will be applied shall be free of dirt, grease, oil, rust, laitance, release agents, water repellents, and any other substances that may affect proper adhesion.
3. Provide masking and temporary covering to prevent soiling of adjacent surfaces by firestopping materials.
4. Comply with manufacturer's recommendations for temperature and humidity conditions before, during and after installation of firestopping.
5. Do not proceed until unsatisfactory conditions have been corrected.

3.2 COORDINATION

A. Coordinate construction of openings, penetrations and construction joints to ensure that the fire stop systems are installed according to specified requirements.

B. Coordinate sizing of sleeves, openings, core-drilled holes, or cut openings to accommodate through-penetration fire stop systems. Coordinate construction and sizing of joints to ensure that fire-resistive joint systems are installed according to specified requirements.

C. Coordinate fire stopping with other trades so that obstructions are not placed in the way prior to the installation of the fire stop systems.

D. Do not cover up through-penetration fire stop and joint system installations that will become concealed behind other construction until each installation has been examined by the building inspector..

3.3 INSTALLATION

A. Regulatory Requirements: Install firestop materials in accordance with UL Fire Resistance Directory.

B. Manufacturer's Instructions: Comply with manufacturer's instructions for installation of through-penetration materials.

1. Seal all holes or voids made by penetrations to ensure an air and water resistant seal.
2. Consult with mechanical engineer, project manager, and damper manufacturer prior to installation of UL firestop systems that might hamper the performance of fire dampers as it pertains to duct work.

3. Protect materials from damage on surfaces subjected to traffic.

3.4 FIELD QUALITY CONTROL

A. Examine sealed penetration areas to ensure proper installation before concealing or enclosing areas.

3.5 Keep areas of work accessible until inspection by applicable code authorities.

A. Perform under this section patching and repairing of firestopping caused by cutting or penetrating of existing firestop systems already installed by other trades.

B. Manufacturer’s Field Services: During Installation, provide periodic destructive testing inspections to assure proper installation/application. After installation is complete, submit findings in writing indicating whether or not the installation of the tested system identified was installed correctly.

3.6 ADJUSTING AND CLEANING

A. Remove equipment, materials and debris, leaving area in undamaged, clean condition.

B. Clean all surfaces adjacent to sealed holes and joints to be free of excess firestop materials and soiling as work progresses.

3.7 LABOR USE TO INSTALL FIRESTOP SYSTEMS

A. To ensure complete harmony on the project site, the installation of each scope of work is to be performed jurisdictionally correct per existing trade agreements.

END OF SECTION

SECTION 079200 - JOINT SEALANTS

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. Silicone joint sealants.
2. Non-staining silicone joint sealants.
3. Mildew-resistant joint sealants.
4. Butyl joint sealants.
5. Latex joint sealants.

1.3 ACTION SUBMITTALS

A. Product Data: For each joint-sealant product.

B. Samples for Initial Selection: Manufacturer's color charts consisting of strips of cured sealants showing the full range of colors available for each product exposed to view.

C. Joint-Sealant Schedule: Include the following information:

1. Joint-sealant application, joint location, and designation.
2. Joint-sealant manufacturer and product name.
3. Joint-sealant formulation.
4. Joint-sealant color.

1.4 INFORMATIONAL SUBMITTALS

A. Product Test Reports: For each kind of joint sealant, for tests performed by manufacturer and witnessed by a qualified testing agency.

1.5 QUALITY ASSURANCE

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

B. Product Testing: Test joint sealants using a qualified testing agency.

1. Testing Agency Qualifications: Qualified according to ASTM C 1021 to conduct the testing indicated.

C. Mockups: Install sealant in mockups of assemblies specified in other Sections that are indicated to receive joint sealants specified in this Section. Use materials and installation methods specified in this Section.

1.6 FIELD CONDITIONS

A. Do not proceed with installation of joint sealants under the following conditions:

1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer.
2. When joint substrates are wet.
3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
4. Where contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

1.7 WARRANTY

A. 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.

B. 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, non-sag, plus 100 percent and minus 50 percent movement capability, traffic- and non-traffic-use, neutral-curing silicone joint sealant; ASTM C 920, Type S, Grade NS, Class 100/50, Uses T and NT.

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

a. Dow Corning Corporation.
b. May National Associates, Inc.; a subsidiary of Sika Corporation.

c. Pecora Corporation.
d. Sika Corporation; Joint Sealants.

B. Silicone, S, NS, 50, T, NT: Single-component, non-sag, plus 50 percent and minus 50 percent movement capability, traffic- and non-traffic-use, neutral-curing silicone joint sealant; ASTM C 920, Type S, Grade NS, Class 50, Uses T and NT.

1. Manufacturers: Subject to compliance with requirements, undefined:

a. Dow Corning Corporation.
b. Soudal USA.

C. Silicone, S, NS, 25, T, NT: Single-component, non-sag, plus 25 percent and minus 25 percent movement capability, traffic- and non-traffic-use, neutral-curing silicone joint sealant; ASTM C 920, Type S, Grade NS, Class 25, Uses T and NT.

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

a. May National Associates, Inc.; a subsidiary of Sika Corporation.
b. Pecora Corporation.
c. Sika Corporation; Joint Sealants.

2.3 NONSTAINING SILICONE JOINT SEALANTS

A. Non-staining Joint Sealants: No staining of substrates when tested according to ASTM C 1248.

B. Silicone, Non-staining, S, NS, 50, NT: Non-staining, single-component, non-sag, plus 50 percent and minus 50 percent movement capability, non-traffic-use, neutral-curing silicone joint sealant; ASTM C 920, Type S, Grade NS, Class 50, Use NT.

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

a. Dow Corning Corporation.
b. GE Construction Sealants; Momentive Performance Materials Inc.
c. May National Associates, Inc.; a subsidiary of Sika Corporation.
d. Pecora Corporation.
e. Sika Corporation; Joint Sealants.
f. Tremco Incorporated.

C. Silicone, Non-staining, S, NS, 100/50, T, NT: Non-staining, single-component, non-sag, plus 100 percent and minus 50 percent movement capability, traffic- and non-traffic-use, neutral-curing silicone joint sealant; ASTM C 920, Type S, Grade NS, Class 100/50, Uses T and NT.

1. Manufacturers: Subject to compliance with requirements, undefined:

a. Dow Corning Corporation.

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, non-sag, plus 25 percent and minus 25 percent movement capability, non-traffic-use, acid-curing silicone joint sealant; ASTM C 920, Type S, Grade NS, Class 25, Use NT.

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

a. Dow Corning Corporation.
b. GE Construction Sealants; Momentive Performance Materials Inc.
c. May National Associates, Inc.; a subsidiary of Sika Corporation.
d. Pecora Corporation.
e. Tremco Incorporated.

C. STPE, Mildew Resistant, S, NS, 50, NT: Mildew-resistant, single-component, non-sag, plus 50 percent and minus 50 percent movement capability, non-traffic-use, silyl-terminated polyether joint sealant; ASTM C 920, Type S, Grade NS, Class 50, Use NT.

1. Manufacturers: Subject to compliance with requirements, undefined:

a. BASF Corporation.

2.5 BUTYL JOINT SEALANTS

A. Butyl-Rubber-Based Joint Sealants: ASTM C 1311.

1. Manufacturers: Subject to compliance with requirements, undefined:

a. Bostik, Inc.
b. Pecora Corporation.

2.6 LATEX JOINT SEALANTS

A. Acrylic Latex: Acrylic latex or siliconized acrylic latex, ASTM C 834, Type OP, Grade NF.

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

a. May National Associates, Inc.; a subsidiary of Sika Corporation.
b. Pecora Corporation.
c. Sherwin-Williams Company (The).
d. Tremco Incorporated.

2.7 JOINT-SEALANT BACKING

A. Sealant Backing Material, General: Non-staining; 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.

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

a. Adfast.

b. Alcot Plastics Ltd.
c. BASF Corporation.
d. Construction Foam Products; a division of Nomaco, Inc.

B. Cylindrical Sealant Backings: ASTM C 1330, 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.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 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.

3.3 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 C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.

C. Install sealant backings of kind 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 Non-sag 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 per Figure 8A in ASTM C 1193 unless otherwise indicated.
4. Provide flush joint profile at locations indicated on Drawings according to Figure 8B in ASTM C 1193.
5. Provide recessed joint configuration of recess depth and at locations indicated on Drawings according to Figure 8C in ASTM C 1193.

    a. Use masking tape to protect surfaces adjacent to recessed tooled joints.

3.4 FIELD QUALITY CONTROL

3.5 CLEANING

A. 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.

3.6 PROTECTION

A. 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.

3.7 JOINT-SEALANT SCHEDULE

A. Joint-Sealant Application: Exterior joints in vertical surfaces and horizontal non-traffic surfaces.

1. Joint Locations:

    a. Construction joints in cast-in-place concrete.
    b. Control and expansion joints in unit masonry.
    c. Joints between metal panels.
    d. Joints between different materials listed above.
    e. Perimeter joints between materials listed above and frames of doors windows and louvers.
    f. Control and expansion joints in ceilings and other overhead surfaces.

2. Joint Sealant: Silicone, non-staining, S, NS, 50, NT.
3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

B. Joint-Sealant Application: Interior joints in horizontal traffic surfaces.

1. Joint Locations:

    a. Isolation joints in cast-in-place concrete slabs.
    b. Control and expansion joints in tile flooring.

2. Joint Sealant: Urethane, S, P, 25, T, NT.
3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

C. Joint-Sealant Application: Interior joints in vertical surfaces and horizontal non-traffic surfaces.

1. Joint Locations:

    a. Control and expansion joints on exposed interior surfaces of exterior walls.
    b. Tile control and expansion joints.
    c. Vertical joints on exposed surfaces of unit masonry and concrete **[and]** .

2. Joint Sealant: Urethane, S, NS, 25, NT.

3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

D. Joint-Sealant Application: Interior joints in vertical surfaces and horizontal non-traffic 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: As selected by Architect from manufacturer's full range of colors.

E. Joint-Sealant Application: Mildew-resistant interior joints in vertical surfaces and horizontal non-traffic 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: As selected by Architect from manufacturer's full range of colors.

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.

1.2 DEFINITIONS

A. Minimum Thickness: Minimum thickness of base metal without coatings according to 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, 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.

C. Product Schedule: For hollow-metal doors and frames, prepared by or under the supervision of supplier, using same reference numbers for details and openings as those on Drawings. Coordinate with final door hardware schedule.

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 MANUFACTURERS

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

1. Ceco Door; ASSA ABLOY.
2. Curries Company; ASSA ABLOY.
3. Mesker Door Inc.
4. Pioneer Industries.
5. Republic Doors and Frames.
6. Steelcraft; an Allegion brand.

2.2 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 indicated on Drawings, based on testing at positive pressure according to 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 according to 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:, 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.

B. Fire-Rated, Borrowed-Lite Assemblies: Assemblies complying with NFPA 80 and listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated, based on testing according to NFPA 257 or UL 9.

2.3 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 0.040 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 doors.
2. Frames:

    a. Materials: Uncoated steel sheet, minimum thickness of 0.051 inch.
    b. Sidelite Frames: Fabricated from same thickness material as adjacent door frame.
    c. Construction: Full profile welded.
3. Exposed Finish: Prime.

2.4 BORROWED LITES

A. Fabricate of uncoated steel sheet, minimum thickness of 0.051 inch.

B. Construction: Full profile welded.

C. Fabricate in one piece except where handling and shipping limitations require multiple sections. Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of metal of same or greater thickness as metal as frames.

D. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.

2.5 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 according to ASTM A153/A153M, Class B.

2.6 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 according to 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."

2.7 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. Sidelite Frames: Provide closed tubular members with no visible face seams or joints, fabricated from same material as door frame. Fasten members at crossings and to jambs by welding, or by rigid mechanical anchors.
2. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.
3. 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.

4. Terminated Stops (Hospital Stops): Terminate stops 6 inches above finish floor with a 45-degree angle cut, and close open end of stop with steel sheet closure. Cover opening in extension of frame with welded-steel filler plate, with welds ground smooth and flush with frame.

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 according to 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 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.

2.8 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.

B. Factory Finish: Clean, pretreat, and apply manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat, complying with ANSI/SDI A250.3.

1. Color and Gloss: Match Architect's sample.

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 according to 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 according to NFPA 80.
3. Smoke-Control Doors: Install doors according to 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

SECTION 081743
FRP/ ALUMINUM HYBRID DOORS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. SL-17 Pebble Grain FRP/ Aluminum Hybrid Door installed in Thermally Broken Aluminum Framing.

1.2 REFRENCES

A. AAMA 1304 – Voluntary Specification for Forced Entry Resistance of Side-Hinged Door Systems.
B. ASTM-B209 – Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
C. ASTM-B221 – Standard Specification for Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
D. ASTM-C518 – Standard test Method for Steady-State Thermal Transmission Properties by Means of Heat Flow Meter Apparatus.
E. ASTM-D256 – Standard Test Methods for Determining the Pendulum Impact Resistance of Plastics.
F. ASTM-D570 – Standard Test Method for Water Absorption of Plastics.
G. ASTM-D638 – Standard Test Method for Tensile Properties of Plastics.
H. ASTM-D790 – Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials.
I. ASTM-D1621 – Standard Test Method for Compressive Properties of Rigid Cellular Plastics.
J. ASTM-D1622 – Standard Test Method for Apparent Density of Rigid Cellular Plastics.
K. ASTM-D1623 – Standard Test Method for Tensile and Tensile Adhesion Properties of Rigid Cellular Plastics.
L. ASTM-D2126 – Standard Test Method for Response of Rigid Cellular Plastics to Thermal and Humid Aging.
M. ASTM-D2583 – Standard Test Method for Indentation Hardness of Rigid Plastics by Means of a Barcol Impressor.
N. 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).
O. ASTM-D5116 - Standard Guide for Small-Scale Environmental Chamber Determinations of Organic Emissions from Indoor Materials/ Products.
P. ASTM-D6670 – Standard Practice for Full-Scale Chamber Determination of Volatile Organic Emissions from Indoor Materials/ Products.
Q. ASTM-E84 – Standard Test Method for Surface Burning Characteristics of Building Materials.
R. 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.
S. ASTM-E330 – Standard Test Method for Structural Performance of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference.
T. NFRC 100 – Procedure for Determining Fenestration Products U-Factors.
U. NFRC 400 – Procedure for Determining Fenestration Products Air Leakage.
V. TAS 201 – Impact Test Procedures.
W. TAS 202 – Criteria for Testing Impact & Nonimpact Resistant Building Envelope Components Using Uniform Static Air Pressure.
X. TAS 203 – Criteria for Testing Products Subject to Cyclic Wind Pressure Loading.

1.3 SUBMITTALS

A. 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 contained in these specifications.

5. Manufacturer Reports.

a. Manufacturer's Project References.
b. Submit list of successfully completed projects including project name, location, name of architect, type, and quantity of doors manufactured.

B. 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.

1.4 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.

1.5 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.

1.6 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. Anodized, aluminum 10 years.

PART 2 - PRODUCTS

2.1 FRP/ALUMINUM HYBRID DOORS

A. Manufacturer.

1. Special-Lite, Inc., Basis of Design
2. Chem-Pruf Door Company
3. Commercial Door Systems
4. Corrim Company
5. Tiger Door, by Overly Door Company

2.2 DESCRIPTION

A. Model.

1. Basis of Design: SL-17 Pebble Grain FRP/ Aluminum Hybrid Door.

B. Construction.

1. Door Thickness: 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.
    d. Foam plastic shall be separated from the interior of a building by an approved thermal barrier.
    e. Approved thermal barrier must meet the acceptance criteria of the Temperature Transmission Fire Test and Integrity Fire Test as stated in NFPA 275.
    f. 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.
    g. 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 integral surfaseal film FRP sheet.
        2. Class C standard.

    B. Interior

        1. 0.120” thick, pebble texture, through color with integral surfaseal film FRP sheet.
        2. 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.

C. Hardware.

1. Pre-machine doors in accordance with templates from specified hardware manufacturers.
2. Surface mounted closures will be reinforced for but not prepped or installed at factory.
3. Factory install door hardware

D. Reinforcements.

1. Aluminum extrusions made from 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.

2.3 FRAMING

A. Thermally Broken Aluminum Framing.

1. Specialite Model. SL-600TB, basis of design
2. Perimeter Frame Members, thermally broken, factory fabricated.
3. Thermal Strut: Fiber reinforced plastic.

4. Applied Door Stops.

a. 5/8” x 1-1/4”, 0.125” wall thickness, with screws and weather-stripping.
b. Provide solid ½” aluminum bar behind door stop for closer shoe attachment.
c. Pressure gasketing for weathering seal.
d. Counterpunch fastener holes in door stop to preserve full-metal thickness under fastener head.
e. Minimum ½” aluminum bar reinforcement under doorstop for required hardware attachments, aluminum to meet ASTM-B221.

5. Caulking.

a. Caulk joints before assembling frame members.

6. Frame Member to Member Connections.

a. Secure joints with fasteners.
b. Provide hairline butt joint appearance.
c. Shear block construction only, no screw spline allowed.

7. Hardware

a. Pre-machine and reinforce frame members for hardware in accordance with manufacturer's standards and door hardware schedule.
b. Surface mounted closures will be reinforced for but not prepped or installed at factory.
c. Factory install door hardware.

8. Anchors:

a. Anchors appropriate for wall conditions to anchor framing to wall materials.
b. Door Jamb and Header Mounting Holes: Maximum of 24-inch centers.
c. Secure head and sill members of transom, side lites, and similar conditions.

2.4 PERFORMANCE

A. Face Sheet: Standard Interior and Exterior Class C 0.120” thick, Sandstone texture, through color FRP sheet.

B. Interior Face Only Class A 0.120” thick, Sandstone texture, through color FRP sheet.

C. Door Core: Density, ASTM-D1622: ≤ 5.0 pcf. Compressive Properties, ASTM-D1621: Compressive Strength ≥ 60 psi, Compressive Modulus ≥ 1948 psi.

D. Door and Thermally Broken Aluminum Frame Assembly.

1. Thermal Transmittance, NFRC 100.

a. Opaque Swinging Door (< than 50% glass)
1) U-Factor = 0.33 Btu/hr·ft²·°F.

2. Air Leakage, NFRC 400, ASTM-E283.

a. Opaque Swinging Door (< than 50% glass)
1) 0.02 cfm/sqft @ 1.57 psf.
2) 0.02 cfm/sqft @ 6.24 psf.

E. Sound Transmission, ASTM-E90: STC = 30, OITC = 30.

2.5 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. 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.

2.6 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. Maintain continuity of line and accurate relation of planes and angles.
6. Secure attachments and support at mechanical joints with hairline fit at contact surfaces.

B. Shop Fabrication: All shop fabrication to be completed in accordance with manufactures process work instructions.

2.7 FINISHES

A. Door: FRP Face Sheets

1. Through color to be selected from manufacturer's standard.

B. Frame: Aluminum.

1. Paint: KYNAR®.
   a. Topcoat.
      1) 70% KYNAR® or HYLAR® 5000 Coating, meets or exceeds all AAMA 2605 specifications, 2.5 to 4.0 wet mils, 1.00 to 1.20 dry mils.
   b. Color as selected from manufacturer's standard.

2.8 ACCESSORIES

A. Hardware.

1. Pre-machine doors in accordance with templates from specified hardware manufactures and hardware schedule.
2. Factory install hardware.
3. Hardware Schedule as specified in Section 087100 and as follows:
   a. Concealed adjustable bottom brush.
      1) SL-301.
   b. Integral Door Pull. SL-86
   c. Aluminum threshold by Special-Lite.

PART 3 - EXECUTION

3.1 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.

3.2 PREPARATION

A. Ensure openings to receive frames are plumb, level, square, and in tolerance.

3.3 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.

3.4 FIELD QUALITY CONTROL

A. Manufacture's Field Services.
   1. Manufacturer's representative shall provide technical assistance and guidance for installation of doors.

3.5 ADJUSTING

A. Adjust doors, hinges, and locksets for smooth operation without binding.

3.6 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.

3.7 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 083113 - ACCESS DOORS AND FRAMES

PART 1 - GENERAL.

1.1 SUMMARY

A. Section includes access doors and frames for walls and ceilings.

1.2 ALLOWANCES

A. Access doors and frames are part of an access door and frame allowance.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, fire ratings, material descriptions, dimensions of individual components and profiles, and finishes.

B. Product Schedule: For access doors and frames.

1.4 CLOSEOUT SUBMITTALS

A. Record Documents: For fire-rated doors, list of applicable room name and number in which access door is located.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Rated Access Doors and Frames: Assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, according to NFPA 252 or UL 10B.

2.2 ACCESS DOORS AND FRAMES

A. Flush Access Doors with Concealed Flanges :

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

a. Acudor Products, Inc.
b. Babcock-Davis.
c. JL Industries, Inc.; a division of the Activar Construction Products Group.
d. Karp Associates, Inc.
e. Larsens Manufacturing Company.
f. MIFAB, Inc.
g. Milcor; Commercial Products Group of Hart & Cooley, Inc.

h. Nystrom, Inc.

2. Description: Face of door flush with frame; with concealed flange for gypsum board installation and concealed hinge.
3. Locations: Wall and ceiling.
4. Door Size: Provide door in adequate size and location to access mechanical and plumbing components.
5. Metallic-Coated Steel Sheet for Door: Nominal 0.064 inch, 16 gage factory primed.
6. Frame Material: Same material and thickness as door.
7. Latch and Lock: Cam latch, screwdriver operated with interior release.

2.3 FIRE-RATED ACCESS DOORS AND FRAMES

A. Fire-Rated, Flush Access Doors with Concealed Flanges :

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

   a. Acudor Products, Inc.
   b. Babcock-Davis.
   c. JL Industries, Inc.; a division of the Activar Construction Products Group.
   d. Karp Associates, Inc.
   e. MIFAB, Inc.
   f. Nystrom, Inc.

2. Description: Door face flush with frame, uninsulated; with concealed flange for gypsum board installation, self-closing door, and concealed hinge.
3. Locations: Wall and ceiling.
4. Door Size: Provide door in adequate size and location to access mechanical and plumbing components.
5. Fire-Resistance Rating: Not less than that of adjacent construction.
6. Temperature-Rise Rating: 250 deg F at the end of 30 minutes.
7. Metallic-Coated Steel Sheet for Door: Nominal 0.040 inch, 20 gage, factory primed.
8. Frame Material: Same material, thickness, and finish as door.
9. Latch and Lock: Self-closing, self-latching door hardware, operated by knurled-knob, with interior release.

2.4 MATERIALS

A. Steel Plates, Shapes, and Bars: ASTM A36/A36M.

B. Steel Sheet: Uncoated or electrolytic zinc coated, ASTM A879/A879M, with cold-rolled steel sheet substrate complying with ASTM A1008/A1008M, Commercial Steel (CS), exposed.

C. Metallic-Coated Steel Sheet: ASTM A653/A653M, Commercial Steel (CS), Type B; with minimum G60 or A60 metallic coating.

D. Aluminum Extrusions: ASTM B221, Alloy 6063.

E. Aluminum Sheet: ASTM B209, alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated.

F. Frame Anchors: Same material as door face.

G. Inserts, Bolts, and Anchor Fasteners: Hot-dip galvanized steel according to ASTM A153/A153M or ASTM F2329.

2.5 FABRICATION

A. General: Provide access door and frame assemblies manufactured as integral units ready for installation.

B. Metal Surfaces: For metal surfaces exposed to view in the completed Work, provide materials with smooth, flat surfaces without blemishes. Do not use materials with exposed pitting, seam marks, roller marks, rolled trade names, or roughness.

C. Doors and Frames: Grind exposed welds smooth and flush with adjacent surfaces. Furnish mounting holes, attachment devices and fasteners of type required to secure access doors to types of supports indicated.

1. For concealed flanges with drywall bead, provide edge trim for gypsum panels securely attached to perimeter of frames.
2. For concealed flanges with plaster bead for full-bed plaster applications, provide zinc-coated expanded-metal lath and exposed casing bead welded to perimeter of frames.

D. Recessed Access Doors: Form face of panel to provide recess for application of applied finish. Reinforce panel as required to prevent buckling. Provide access sleeves for each latch operator and install in holes cut through finish.

1. For recessed doors with plaster infill, provide self-furring expanded-metal lath attached to door panel.

E. Latch and Lock Hardware:

1. Quantity: Furnish number of latches and locks required to hold doors tightly closed.
2. Keys: Furnish two keys per lock and key all locks alike.
3. Mortise Cylinder Preparation: Where indicated, prepare door panel to accept cylinder specified in Section 087100 "Door Hardware."

F. Aluminum: After fabrication, apply manufacturer's standard protective coating on aluminum that will come in contact with concrete.

2.6 FINISHES

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

D. Painted Finishes: Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.

1. Factory Primed: Apply manufacturer's standard, lead- and chromate-free, universal primer immediately after surface preparation and pretreatment.
2. Factory Finished: Apply manufacturer's standard baked-enamel or powder-coat finish immediately after cleaning and pretreating, with minimum dry-film thickness of 1 mil for topcoat.

    a. Color: As selected by Architect from full range of industry colors. Typical to match adjacent wall surfaces unless otherwise noted.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates 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

A. Comply with manufacturer's written instructions for installing access doors and frames.

3.3 ADJUSTING

A. Adjust doors and hardware, after installation, for proper operation.

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 Kawneer Architectural Aluminum Windows including perimeter trims, stools, accessories, shims and anchors, and perimeter sealing of window units.
   1. Types of aluminum windows include:
      a. Kawneer Series 8400TL Thermal Windows
      b. Model 8470TL Horizontal Sliding Window
      c. 4" (101.6) frame depth
      d. HS-AW40 (OXO)

1.3 Definitions

A. Definitions: For fenestration industry standard terminology and definitions refer to American Architectural Manufactures Association (AAMA) – AAMA Glossary (AAMA AG).

1.4 Performance Requirements

A. General Performance: Aluminum-framed window system shall withstand the effects of the following performance requirements without failure due to defective manufacture, fabrication, installation, or other defects in construction.

B. Window Performance Requirements:

   1. Performance Requirements: Provide aluminum windows of performance indicated that comply with AAMA/WDMA/CSA 101/I.S.2/A440 (NAFS)
      a. Performance Class and Grade: HS-AW40 - (OXO), refer to drawings for size.

   2. Air Leakage: The test specimen shall be tested in accordance with ASTM E 283. The air leakage rate shall not exceed 0.30 cfm/ft^2 (1.5 L/s·m^2) at a static air pressure differential of 6.2 psf (300 PA).

   3. Water Resistance: The test specimen shall be tested in accordance with ASTM E 331 and ASTM E 547. There shall be no leakage as defined in the test method at a static air pressure differential of 10 psf (479 Pa).

   4. Uniform Load Deflection: A minimum static air pressure difference of 70 psf (3352 Pa) shall be applied in the positive and negative direction in accordance with ASTM E 330. There shall be no deflection in excess of L/175 of the span of any framing member.

   5. Uniform Load Structural Test: A minimum static air pressure difference of 105 psf (5027 Pa) shall be applied in the positive and negative direction in accordance with ASTM E 330. The unit shall be evaluated after each load.

   6. Component Testing: Window components shall be tested in accordance with procedures described in AAMA/WDMA/CSA 101/I.S.2/A440 (NAFS).

   7. Energy Efficiency:
      a. Thermal Transmittance Test: (U-Factor): When tested in accordance with AAMA 1503, the conductive thermal transmittance (U-Factor) shall not be more than:
         1) U-factor not more than .55 BTU/hr/sf/°F per AAMA 507 or NFRC 100 when using project specified glass.

b. Condensation Resistance Test (CRF): When tested to AAMA Specification 1503, the condensation resistance factor shall not be less than (CRF) 50_{frame} and 61_{glass} (clear).

1.5 Submittals

A. Product Data: Include construction details, material descriptions, fabrication methods, dimensions of individual components and profiles, hardware, finishes, and operating instructions for each type of aluminum window indicated.

B. Shop Drawings: Include plans, elevations, sections, details, hardware, attachments to other work, operational clearances and installation details.

C. Samples for Initial Selection: For units with factory-applied color finishes including samples of hardware and accessories involving color selection.

D. Samples for Verification: For aluminum windows and components required.

E. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency for each type, class, grade, and size of aluminum window. Test results based on use of downsized test units will not be accepted.

1.6 Quality Assurance

A. Installer Qualifications: An installer which has had successful experiences with installation of the same or similar units required for this project and other projects of similar size and scope.

B. Manufacturer Qualifications: A manufacturer capable of fabricating aluminum windows that meet or exceed performance requirements indicated and of documenting this performance by inclusion of test reports, and calculations.

C. Source Limitations: Obtain aluminum windows through one source from a single manufacturer.

D. Product Options: Drawings indicate size, profiles, and dimensional requirements of aluminum windows and are based on the specific system indicated. Refer to Division 01 Section “Product Requirements.” Do not modify size and dimensional requirements.
   1. Do not modify intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If modifications are proposed, submit comprehensive explanatory data to Architect for review.

1.7 Project Conditions

A. Field Measurements: Verify aluminum window openings by field measurements before fabrication and indicate measurements on Shop Drawings.

1.8 Warranty

A. Manufacturer’s Warranty: Submit, for Owner’s acceptance, manufacturer’s standard warranty.
   1. Warranty Period: Two (2) years from Date of Substantial Completion of the project provided however that the Limited Warranty shall begin in no event later than six months from date of shipment by manufacturer.

B. Insulating Glass: Warranted to be free from defects (excluding breakage) for a period of five (5) years.

PART 2 - PRODUCTS

2.1 Manufacturers

A. Basis-of-Design Product:
   1. Kawneer Company Inc.
   2. Series 8400TL Thermal Windows
   3. Model 8470TL Horizontal Sliding Window
   4. 4" (101.6 mm) frame depth
   5. HS-AW40 (OXXO)

B. Substitutions: Refer to Substitutions Section for procedures and submission requirements.

C. Substitution Acceptance: Acceptance will be in written form, either as an addendum or modification, and documented by a formal change order signed by the Owner and Contractor.

2.2 Materials

A. Aluminum Extrusions: Alloy and temper recommended by aluminum window manufacturer for strength, corrosion resistance, and application of required finish and not less than 0.070" (1.78 mm) wall thickness at any location for the main frame and sash members.

B. Thermal Barrier:
   1. Thermal Barrier: The thermal barrier shall be Kawneer IsoLock™ with a nominal 3/8" (9.53 mm) separation consisting of a two-part, chemically curing high density polyurethane which is mechanically and adhesively bonded to the aluminum.

C. Fasteners: Aluminum, nonmagnetic stainless steel or other materials to be non-corrosive and compatible with aluminum window members, trim, hardware, anchors, and other components.

D. Anchors, Clips, and Accessories: Aluminum, nonmagnetic stainless steel, or zinc-coated steel or iron complying with ASTM B 633 for SC 3 severe service conditions; provide sufficient strength to withstand design pressure indicated.

E. Reinforcing Members: Aluminum, nonmagnetic stainless steel, or nickel/chrome-plated steel complying with ASTM B 456 for Type SC 3 severe service conditions, or zinc-coated steel or iron complying with ASTM B 633 for SC 3 severe service conditions; provide sufficient strength to withstand design pressure indicated.

F. Sealant: For sealants required within fabricated windows, provide window manufacturer's standard, permanently elastic, non-shrinking, and non-migrating type recommended by sealant manufacturer for joint size and movement.

2.3 Window System

A. Series 8400TL Thermal Window - Horizontal Sliding Window.

2.4 Glazing

A. Glass and Glazing Materials: Refer to Division 08 Section “Glazing” for glass units and glazing requirements applicable to glazed aluminum window units.

B. Glazing System: Glazing method shall be a wet/dry type in accordance with manufacturer’s standards. Exterior glazing shall be silicone back bedding sealant. Interior glazing shall be snap-in type glazing beads with an interior gasket in accordance with AAMA 702 or ASTM C864.

2.5 Hardware

A. General: Provide manufacturer's standard hardware fabricated from aluminum, stainless steel, or other corrosion-resistant material compatible with aluminum; designed to smoothly operate, tightly close, and securely lock aluminum windows, and sized to accommodate sash weight and dimensions.

B. Horizontal Sliding Window Typical Hardware:

1. Continuous Integral Pulls
2. Stainless Steel Ball Bearing Rollers
3. Stainless Steel Roller Track
4. Plunger Lock

C. Exterior Panning and Interior Trims: Extruded aluminum, 6063-T6 alloy and temper, extruded to profiles and details indicated. Seal exterior joints with manufacturer's standard sealant to assure water-tight joints.

1. Exterior Panning and Trims: All panning profiles shall be a minimum thickness of 0.062" (1.57 mm) to match the profiles as shown the drawings. Any profile variations shall be submitted to the architect and/or owner for approval 10 days prior to bid date. All panning shall be factory fabricated for field assembly. All corner joinery shall be factory cut. Joinery at the sill shall be coped and butt-type construction. All preparations for assembly shall be completed by the window manufacturer. Upon assembly, panning frame joints shall be back-sealed to prevent moisture penetration.
2. Interior Trims: The interior face trim minimum wall thickness shall be 0.062" (1.57 mm). The face trim shall snap-fit onto concealed mounting clip. Exposed fasteners shall not be accepted. The mounting clip shall be extruded aluminum of 6063-T6 alloy and temper. The minimum wall thickness shall be 0.062" (1.57 mm). The trim clips shall be provided in 4" (101.6 mm) lengths and spaced a maximum of 18" (457.2 mm) center to center.

2.6 Accessories

A. Insect Screens: Extruded aluminum frames, 6063-T6 alloy and temper, joined at corners: 18 x 16 mesh aluminum screen cloth; frames finished to match aluminum windows; splines shall be extruded vinyl, removable to permit rescreening.

2.7 Fabrication

A. Framing Members, General: Fabricate components that, when assembled, have the following characteristics:

1. Profiles that are sharp, straight, and free of defects or deformations.
2. Accurately fit joints; make joints flush, hairline and weatherproof.
3. Means to drain water passing joints, condensation within framing members, and moisture migrating within the system to exterior.
4. Physical and thermal isolation of glazing from framing members.
5. Accommodations for thermal and mechanical movements of glazing and framing to maintain required glazing edge clearances.
6. Provisions for field replacement of glazing.
7. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.

B. Window Frame Joinery: Screw-spline, factory sealed frame and vent corner joints.

C. Fabricate aluminum windows in sizes indicated. Include a complete system for assembling components and anchoring windows.

D. Fabricate aluminum windows that are re-glazable without dismantling sash or framing.

E. Mullions: Provide mullions and cover plates as shown, matching window units, complete with anchors for support to structure and installation of window units. Allow for erection tolerances and provide for movement of window units due to thermal expansion and building deflections, as indicated. Provide mullions and cover plates capable of withstanding design loads of window units.

F. Sub frames: Provide sub frames with anchors for window units as shown, of profile and dimensions indicated but not less than 0.093" (2.4 mm) thick extruded aluminum. Miter or cope corners, and join with concealed mechanical joint fasteners. Finish to match window units. Provide sub frames capable of withstanding design loads of window units.

G. Factory-Glazed Fabrication: Glaze aluminum windows in the factory where practical and possible for applications indicated. Comply with requirements in Division 08 Section “Glazing” and with AAMA/WDMA/CSA 101/I.S.2/A440-08 (NAFS).

H. Glazing Stops: Provide snap-on glazing stops coordinated with Division 08 Section “Glazing” and glazing system indicated. Provide glazing stops to match frame.

2.8 Aluminum Finishes

A. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.

B. Factory Finishing:
   1. Kawneer Permanodic™ AA-M10C21A31, AAMA 611, Architectural Class II Clear Anodic Coating (Color #17 Clear) (Standard).

PART 3 - EXECUTION

3.1 Examination

A. Examine openings, substrates, structural support, anchorage, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work. Verify rough opening dimensions, levelness of sill plate and operational clearances. Examine wall flashings, vapor retarders, water and weather barriers, and other built-in components to ensure a coordinated, weather tight window installation.
   1. Masonry Surfaces: Visibly dry and free of excess mortar, sand, and other construction debris.
   2. Wood Frame Walls: Dry, clean, sound, well nailed, free of voids, and without offsets at joints. Ensure that nail heads are driven flush with surfaces in opening and within 3 inches (76 mm) of opening.
   3. Metal Surfaces: Dry; clean; free of grease, oil, dirt, rust, corrosion, and welding slag; without sharp edges or offsets at joints.
   4. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 Installation

A. Comply with Drawings, Shop Drawings, and manufacturer's written instructions for installing windows, hardware, accessories, and other components.

B. Install aluminum-framed window system level, plumb, square, true to line, without distortion or impeding thermal movement, anchored securely in place to structural support, and in proper relation to wall flashing and other adjacent construction.

C. Set sill members in bed of sealant or with gaskets, as indicated, for weather tight construction.

D. Install aluminum-framed window system and components to drain condensation, water penetrating joints, and moisture migrating within system to the exterior.

E. Separate aluminum from dissimilar material to prevent corrosion or electrolytic action at points of contact.

3.3 Field Quality Control

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections and prepare test reports.
   1. Testing and inspecting agency will interpret tests and state in each report whether tested work complies with or deviates from requirements.

B. Testing Services: Testing and inspecting of installed windows shall take place as follows:
   1. Testing Methodology: Testing Standard shall be per AAMA 502 including reference to ASTM E 783 for Air Leakage Test and ASTM E 1105 for Water Penetration Test.
      a. Air Leakage Test: Conduct test in accordance with ASTM E 783 at a minimum uniform static test pressure of 6.2 psf (300 Pa). The maximum allowable rates of air leakage for field testing shall not exceed 1.5 times the project specifications.
      b. Water Infiltration Test: Water penetration resistance tests shall be conducted in accordance with ASTM E 1105 at a static test pressure equal to 2/3 the specified water test pressure.
   2. Testing Extent: Architect shall select window units to be tested as soon as a representative portion of the project has been installed, glazed, perimeter caulked and cured. Conduct tests for air infiltration and water penetration with manufacturer’s representative present.
   3. Test Reports: Shall be prepared according to AAMA 502.

3.4 Adjusting, Cleaning, And Protection

A. Adjust operating sashes, screens, hardware, and accessories for a tight fit at contact points and weather stripping for smooth operation and weather tight closure. Lubricate hardware and moving parts.

B. Clean aluminum surfaces immediately after installing windows. Avoid damaging protective coatings and finishes. Remove excess sealants, glazing materials, dirt, and other substances.

C. Clean glass immediately after installing windows. Comply with manufacturer's written recommendations for final cleaning and maintenance. Remove nonpermanent labels, and clean surfaces.

D. Remove and replace glass that has been broken, chipped, cracked, abraded, or damaged during construction period.

E. Protect window surfaces from contact with contaminating substances resulting from construction operations. In addition, monitor window surfaces adjacent to and below exterior concrete and masonry surfaces during construction for presence of dirt, scum, alkaline deposits, stains, or other contaminants. If contaminating substances do contact window surfaces, remove contaminants immediately according to manufacturer's written recommendations.

END 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 "General Requirements" sections for Allowances, Alternates, Owner Furnished Contractor Installed, Project Management and Coordination.
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 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.

1.03 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.

1.04 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.

1.05 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.

1.06 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.

1.07 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. 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.

B. 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.

C. 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.

2.04 CONTINUOUS HINGES

A. Manufacturers:

1. Scheduled Manufacturer:
   a. Ives

2. Acceptable Manufacturers:
   a. Select
   b. ABH

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. ABH PT1000
   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. Rockwood
   b. Trimco

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. Rockwood
   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 SECURITY MORTISE LOCKS (CLASSROOMS ONLY)

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product:
   a. Securitech QID

B. Requirements:

1. Provide QID locks where specified.

2.09 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. Falcon MA 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.
7. Provide electrified options as scheduled in the hardware sets. Where scheduled, provide switches and sensors integrated into the locks and latches.
8. Provide motor based electrified locksets with electrified options as scheduled in the hardware sets.
9. 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: 06N

2.10 EXIT DEVICES

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product:
   a. Falcon 24/25 series

2. Acceptable Manufacturers and Products:
   a. Sargent 19-43-GL-80 series
   b. Precision Apex 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 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 flush end caps for exit devices.
7. Provide exit devices with manufacturer's approved strikes.
8. 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.
9. 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.
10. Provide cylinder or hex-key dogging as specified at non fire-rated openings.
11. 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.
12. Provide factory drilled weep holes for exit devices used in full exterior application, highly corrosive areas, and where noted in hardware sets.
13. Provide electrified options as scheduled.
14. Provide exit devices with optional trim designs to match other lever and pull designs used on the project.

2.11 POWER SUPPLIES

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product:
   a. Schlage/Von Duprin PS900 Series

2. Acceptable Manufacturers and Products:
   a. Precision ELR 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.

2.12 CYLINDERS

A. Manufacturers:

1. Scheduled Manufacturer and Product:
    a. MATCH EXISTING SYSTEM

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.

2.13 KEYING

A. Scheduled System:

1. Existing keying system:
    a. Provide cylinders/cores keyed into Owner’s existing keying system managed by Owner’s locksmith, complying with guidelines in ANSI/BHMA A156.28, incorporating decisions made at keying conference.

B. Requirements:

1. Construction Keying:
    a. Temporary Construction Cylinder Keying.
        1) Provide construction cores that permit voiding construction keys without cylinder removal, furnished in accordance with the following requirements.
            a) Split Key or Lost Ball Construction Keying System.
            b) 3 construction control keys, and extractor tools or keys as required to void construction keying.
            c) 12 construction change (day) keys.
        2) Owner or Owner’s Representative will void operation of temporary construction keys.

b. 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).
        3) Geographically Exclusive: Where High Security or Security cylinders/cores are indicated, provide nationwide, geographically exclusive key system complying with the following restrictions.
    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.

2.14 DOOR CLOSERS

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product:
    a. LCN 4050A series

2. Acceptable Manufacturers and Products:
    a. Falcon SC70A series
    b. Sargent 351 series

B. Requirements:

1. Provide door closers conforming to ANSI/BHMA A156.4 Grade 1 requirements by BHMA certified independent testing laboratory. ISO 9000 certify closers. Stamp units with date of manufacture code.

2. Provide door closers with fully hydraulic, full rack and pinion action with cast aluminum cylinder.
3. Closer Body: 1-1/2-inch (38 mm) diameter with 11/16-inch (17 mm) diameter heat-treated pinion journal and full complement bearings.
4. Hydraulic Fluid: Fireproof, passing requirements of UL10C, and all weather 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 back check.
7. Pressure Relief Valve (PRV) Technology: Not permitted.
8. Provide stick on templates, 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.

2.15 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 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.

2.18 THRESHOLDS, SEALS, DOOR SWEEPS, AUTOMATIC DOOR BOTTOMS, AND GASKETING

A. Manufacturers:

1. Scheduled Manufacturer:
   a. Zero International

2. Acceptable Manufacturers:
   a. National Guard
   b. Reese

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.

2.19 MAGNETIC HOLDERS

A. Manufacturers:

1. Scheduled Manufacturer:
   a. LCN

2. Acceptable Manufacturers:
   a. ABH
   b. Rixson

B. Requirements:

1. Provide wall or floor mounted electromagnetic door release as specified with minimum of 25 pounds of holding force. Coordinate projection of holder and armature with other hardware and wall conditions to ensure that door sits parallel to wall when fully open. Connect magnetic holders on fire-rated doors into the fire control panel for fail-safe operation.

2.20 DOOR POSITION SWITCHES

A. Manufacturers:

1. Scheduled Manufacturer:
   a. Schlage

2. Acceptable Manufacturers:
   a. Nascom
   b. Security Door Controls

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.

2.21 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

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. Continuous Hinges: Re-locate the door and frame fire rating labels where they will remain visible so that the hinge does not cover the label once installed.

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. Electric Strikes: Adjust horizontal and vertical alignment of keeper to properly engage lock bolt.
2. 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

For use on Door #(s):
100.1

Provide each RU door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
		DOOR/HARDWARE BY	OVERHEAD DOOR MANUFACTURER			B/O

Hardware Group No. 02

For use on Door #(s):
382

Provide each PR door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
6	EA	HINGE	5BB1HW 4.5 X 4.5 NRP		652	IVE
1	EA	CONST LATCHING BOLT	FB51T/FB61T (AS REQ'D)		630	IVE
1	EA	INSTITUTION LOCK	L9082L 06N		626	SCH
2	EA	MORTISE CYLINDER/CORE	(TO MATCH EXISTING SYSTEM)		626	
1	EA	COORDINATOR	COR X FL		628	IVE
2	EA	MOUNTING BRACKET	MB (AS REQ'D)		689	IVE
2	EA	SURFACE CLOSER	4050A SCUSH		689	LCN
2	EA	KICK PLATE	8400 10" X 1" LDW B-CS		630	IVE
1	EA	GASKETING	488SBK PSA		BK	ZER
1	EA	OVERLAPPING ASTRAGAL	BY DOOR/FRAME MANUFACTURER			B/O

Hardware Group No. 03

For use on Door #(s):
380

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	F-25-C-L-BE-LBRAFL-DANE		626	FAL
2	EA	SURFACE CLOSER	4050A EDA		689	LCN
2	EA	KICK PLATE	8400 10" X 1" LDW B-CS		630	IVE
2	EA	FIRE WALL MAGNET	SEM7840/7850 (SERIES AS REQ'D)	✓	689	LCN
1	EA	GASKETING	488SBK PSA		BK	ZER
1	EA	MEETING SEAL	8217SBK PSA		BK	ZER
1	SET	FIRE ALARM CONTACTS	PROVIDED BY FIRE ALARM CONTRACTOR			B/O

THE MAGNETIC HOLD-OPENS SHALL BE CONTINUOUSLY ENERGIZED, ALLOWING THE DOORS TO BE HELD-OPEN UNDER NORMAL BUILDING CONDITIONS. UPON FIRE ALARM ACTIVATION, POWER TO THE MAGNETIC HOLD-OPENS WILL BE DISCONNECTED, CAUSING THE DOORS TO CLOSE.

VERIFY WALL-MAGNETS HAVE NECESSARY SPACE REQUIRED TO MEET CLEARANCE REQUIREMENTS AND CODES.

Hardware Group No. 04

For use on Door #(s):
381

Provide each PR door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
2	EA	CONT. HINGE	224XY	628	IVE
1	EA	AUTO FLUSH BOLT	FB32/FB42 (AS REQ'D)	630	IVE
1	EA	SECURITY LOCK	QID-MN2	626	SEC
2	EA	MORTISE CYLINDER/CORE	(TO MATCH EXISTING SYSTEM)	626	
1	EA	COORDINATOR	COR X FL	628	IVE
2	EA	MOUNTING BRACKET	MB (AS REQ'D)	689	IVE
2	EA	SURFACE CLOSER	4050A EDA	689	LCN
2	EA	KICK PLATE	8400 10" X 1" LDW B-CS	630	IVE
2	EA	WALL STOP	WS33/WS33X	626	IVE
1	EA	GASKETING	488SBK PSA	BK	ZER
1	EA	MEETING SEAL	8217SBK PSA	BK	ZER

Hardware Group No. 05

For use on Door #(s):
105.1

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/ OUTSIDE INDICATOR	L9056L 06N 09-544 OS-OCC		626	SCH
1	EA	MORTISE CYLINDER/CORE	(TO MATCH EXISTING SYSTEM)		626	
1	EA	SURFACE CLOSER	4050A EDA		689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
1	EA	WALL STOP	WS401/402CCV		626	IVE
1	EA	GASKETING	488SBK PSA		BK	ZER

Hardware Group No. 06

For use on Door #(s):
102 106

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/ OUTSIDE INDICATOR	L9056L 06N 09-544 OS-OCC		626	SCH
1	EA	MORTISE CYLINDER/CORE	(TO MATCH EXISTING SYSTEM)		626	
1	EA	SURFACE CLOSER	4050A SCUSH		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. 07

For use on Door #(s):
103

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/ OUTSIDE INDICATOR	L9056L 06N 09-544 OS-OCC		626	SCH
1	EA	MORTISE CYLINDER/CORE	(TO MATCH EXISTING SYSTEM)		626	
1	EA	SURFACE CLOSER	4050A RW/PA (PULL SIDE MOUNT) ST-5203		689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
1	EA	WALL STOP	WS401/402CCV		626	IVE
1	EA	GASKETING	488SBK PSA		BK	ZER

Hardware Group No. 08

For use on Door #(s):
107

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	STOREROOM LOCK	L9080L 06N		626	SCH
1	EA	MORTISE CYLINDER/CORE	(TO MATCH EXISTING SYSTEM)		626	
1	EA	SURFACE CLOSER	4050A EDA		689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
1	EA	WALL STOP	WS401/402CCV		626	IVE
1	EA	GASKETING	488SBK PSA		BK	ZER

Hardware Group No. 09

For use on Door #(s):
344

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
1	EA	CONT. HINGE	112XY		628	IVE
1	EA	PANIC HARDWARE	LD-25-R-EO		626	FAL
1	EA	SURFACE CLOSER	4050A SCUSH		689	LCN
1	EA	CUSH SHOE SUPPORT	4050A-30 (AS REQ'D)		689	LCN
1	EA	BLADE STOP SPACER	4050A-61 (AS REQ'D)		689	LCN
1	EA	MOUNTING PLATE	4050A-XX (AS REQ'D)		689	LCN
1	EA	WEATHERSTRIPPING/GASKETING	BY DOOR/FRAME MANUFACTURER			B/O
1	EA	DOOR SWEEP	8197AA		AA	ZER
1	EA	THRESHOLD	655A-223		A	ZER

Hardware Group No. 10

For use on Door #(s):
382.1

Provide each PR door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER			FINISH	MFR
1	EA	CONT. HINGE	112XY			628	IVE
1	EA	CONT. HINGE	112XY EPT			628	IVE
1	EA	POWER TRANSFER	EPT10		✓	689	VON
1	EA	CONST LATCHING BOLT	FB51P/FB61P (AS REQ'D)			630	IVE
1	EA	DUST PROOF STRIKE	DP1			626	IVE
1	EA	ELR STOREROOM LOCK	L9580L 06N			626	SCH
1	EA	MORTISE CYLINDER/CORE	(TO MATCH EXISTING SYSTEM)			626	
1	EA	COORDINATOR	COR X FL			628	IVE
2	EA	MOUNTING BRACKET	MB (AS REQ'D)			689	IVE
2	EA	SURFACE CLOSER	4050A SCUSH			689	LCN
2	EA	CUSH SHOE SUPPORT	4050A-30 (AS REQ'D)			689	LCN
2	EA	BLADE STOP SPACER	4050A-61 (AS REQ'D)			689	LCN
2	EA	MOUNTING PLATE	4050A-XX (AS REQ'D)			689	LCN
1	EA	WEATHERSTRIPPING/GASKETING	BY DOOR/FRAME MANUFACTURER				B/O
1	EA	OVERLAPPING ASTRAGAL	BY DOOR/FRAME MANUFACTURER				B/O
2	EA	DOOR SWEEP	8197AA			AA	ZER
1	EA	THRESHOLD	655A-223			A	ZER
2	EA	DOOR CONTACT	679-05HM		✓	BLK	SCE
1	EA	POWER SUPPLY	PS902 BBK 900-4R		✓	LGR	SCE
1	EA	ACCESS CONTROL/CARD READER	SPECIFIED & FURNISHED UNDER DIVISION 28.		✓		B/O

DOOR NORMALLY CLOSED AND LOCKED. PRESENTING A VALID CREDENTIAL TO THE READER WILL MOMENTARILY RETRACT THE LATCH ALLOWING ACCESS. DOOR TO REMAIN LOCKED WITH LOSS OF POWER OR ACTIVATION OF THE FIRE ALARM. FREE EGRESS AT ALL TIMES.

DEVICES ARE ALSO CAPABLE OF BEING ELECTRONICALLY DOGGED DOWN FOR CERTAIN TIMES OF THE DAY VIA THE ACCESS CONTROL SYSTEM.

Hardware Group No. 11

For use on Door #(s):
380.1

Provide each PR door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
1	EA	CONT. HINGE	112XY		628	IVE
1	EA	CONT. HINGE	112XY EPT		628	IVE
1	EA	POWER TRANSFER	EPT10	✓	689	VON
1	EA	REMOVABLE MULLION	KR4023 STAB		689	FAL
1	EA	PANIC HARDWARE	LD-25-R-EO		626	FAL
1	EA	ELEC PANIC HARDWARE	MEL-25-R-NL-OP	✓	626	FAL
1	EA	RIM CYLINDER/CORE	(TO MATCH EXISTING SYSTEM)		626	
1	EA	MORTISE CYLINDER/CORE	(TO MATCH EXISTING SYSTEM)		626	
2	EA	FLUSH PULL	BY DOOR/FRAME MANUFACTURER			B/O
2	EA	SURFACE CLOSER	4050A SCUSH		689	LCN
2	EA	CUSH SHOE SUPPORT	4050A-30 (AS REQ'D)		689	LCN
2	EA	BLADE STOP SPACER	4050A-61 (AS REQ'D)		689	LCN
2	EA	MOUNTING PLATE	4050A-XX (AS REQ'D)		689	LCN
1	EA	MULLION SEAL	8780NBK PSA		BK	ZER
1	EA	WEATHERSTRIPPING/GASKETING	BY DOOR/FRAME MANUFACTURER			B/O
2	EA	DOOR SWEEP	8197AA		AA	ZER
1	EA	THRESHOLD	655A-223		A	ZER
2	EA	DOOR CONTACT	679-05HM	✓	BLK	SCE
1	EA	POWER SUPPLY	PS902 BBK 900-4R	✓	LGR	SCE
1	EA	ACCESS CONTROL/CARD READER	SPECIFIED & FURNISHED UNDER DIVISION 28.	✓		B/O

DOOR NORMALLY CLOSED AND LOCKED. PRESENTING A VALID CREDENTIAL TO THE READER WILL MOMENTARILY RETRACT THE LATCH ALLOWING ACCESS. DOOR TO REMAIN LOCKED WITH LOSS OF POWER OR ACTIVATION OF THE FIRE ALARM. FREE EGRESS AT ALL TIMES.

DEVICES ARE ALSO CAPABLE OF BEING ELECTRONICALLY DOGGED DOWN FOR CERTAIN TIMES OF THE DAY VIA THE ACCESS CONTROL SYSTEM.

Hardware Group No. 12

For use on Door #(s):
100

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER			FINISH	MFR
1	EA	CONT. HINGE	112XY			628	IVE
1	EA	STOREROOM LOCK	L9080L 06N			626	SCH
1	EA	MORTISE CYLINDER/CORE	(TO MATCH EXISTING SYSTEM)			626	
1	EA	SURFACE CLOSER	4050A SCUSH			689	LCN
1	EA	WEATHERSTRIPPING/GASKETING	BY DOOR/FRAME MANUFACTURER				B/O
1	EA	DOOR SWEEP	8197AA			AA	ZER
1	EA	THRESHOLD	655A-223			A	ZER
1	EA	DOOR CONTACT	679-05HM		✓	BLK	SCE

Hardware Group No. 13

For use on Door #(s):
101 108

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER			FINISH	MFR
1	EA	CONT. HINGE	112XY EPT			628	IVE
1	EA	POWER TRANSFER	EPT10		✓	689	VON
1	EA	PANIC HARDWARE	CD-25-R-NL-OP			626	FAL
1	EA	RIM CYLINDER/CORE	(TO MATCH EXISTING SYSTEM)			626	
1	EA	MORTISE CYLINDER/CORE	(TO MATCH EXISTING SYSTEM)			626	
1	EA	FLUSH PULL	BY DOOR/FRAME MANUFACTURER				B/O
1	EA	SURFACE CLOSER	4050A SCUSH			689	LCN
1	EA	CUSH SHOE SUPPORT	4050A-30 (AS REQ'D)			689	LCN
1	EA	BLADE STOP SPACER	4050A-61 (AS REQ'D)			689	LCN
1	EA	MOUNTING PLATE	4050A-XX (AS REQ'D)			689	LCN
1	EA	WEATHERSTRIPPING/GASKETING	BY DOOR/FRAME MANUFACTURER				B/O
1	EA	DOOR SWEEP	8197AA			AA	ZER
1	EA	THRESHOLD	655A-223			A	ZER
1	EA	DOOR CONTACT	679-05HM		✓	BLK	SCE

DOORS/FRAMES PREPPED FOR FUTURE CARD ACCESS.

Hardware Group No. 14

For use on Door #(s):
104 105

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
1	EA	CONT. HINGE	112XY EPT		628	IVE
1	EA	POWER TRANSFER	EPT10		689	VON
1	EA	ELR STOREROOM LOCK	L9580L 06N		626	SCH
1	EA	MORTISE CYLINDER/CORE	(TO MATCH EXISTING SYSTEM)		626	
1	EA	SURFACE CLOSER	4050A SCUSH		689	LCN
1	EA	CUSH SHOE SUPPORT	4050A-30 (AS REQ'D)		689	LCN
1	EA	BLADE STOP SPACER	4050A-61 (AS REQ'D)		689	LCN
1	EA	MOUNTING PLATE	4050A-XX (AS REQ'D)		689	LCN
1	EA	WEATHERSTRIPPING/GASKETING	BY DOOR/FRAME MANUFACTURER			B/O
1	EA	DOOR SWEEP	8197AA		AA	ZER
1	EA	THRESHOLD	655A-223		A	ZER
1	EA	DOOR CONTACT	679-05HM		BLK	SCE

DOORS/FRAMES PREPPED FOR FUTURE CARD ACCESS.

Hardware Group No. 15

For use on Door #(s):
381.1

Provide each PR door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
1	EA	CONT. HINGE	112XY		628	IVE
1	EA	CONT. HINGE	112XY EPT		628	IVE
1	EA	POWER TRANSFER	EPT10	✓	689	VON
1	EA	REMOVABLE MULLION	KR4023 STAB		689	FAL
1	EA	PANIC HARDWARE	CD-25-R-EO		626	FAL
1	EA	PANIC HARDWARE	CD-25-R-NL-OP		626	FAL
1	EA	RIM CYLINDER/CORE	(TO MATCH EXISTING SYSTEM)		626	
3	EA	MORTISE CYLINDER/CORE	(TO MATCH EXISTING SYSTEM)		626	
2	EA	FLUSH PULL	BY DOOR/FRAME MANUFACTURER			B/O
2	EA	SURFACE CLOSER	4050A SCUSH		689	LCN
2	EA	CUSH SHOE SUPPORT	4050A-30 (AS REQ'D)		689	LCN
2	EA	BLADE STOP SPACER	4050A-61 (AS REQ'D)		689	LCN
2	EA	MOUNTING PLATE	4050A-XX (AS REQ'D)		689	LCN
1	EA	MULLION SEAL	8780NBK PSA		BK	ZER
1	EA	WEATHERSTRIPPING/GASKETING	BY DOOR/FRAME MANUFACTURER			B/O
2	EA	DOOR SWEEP	8197AA		AA	ZER
1	EA	THRESHOLD	655A-223		A	ZER
2	EA	DOOR CONTACT	679-05HM	✓	BLK	SCE

DOORS/FRAMES PREPPED FOR FUTURE CARD ACCESS.

END OF SECTION

SECTION 088000 - GLAZING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Glass for windows, doors, and storefront framing.
2. Glazing sealants and accessories.

B. Related Requirements:

1. Section 081740 FRP Doors and Aluminum Framing

1.2 COORDINATION

A. Coordinate glazing channel dimensions to provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Glass Samples: For each type of glass product other than clear monolithic vision glass; 12 inches square.

1. Tinted glass.
2. Coated glass.
3. Tempered glass
4. Insulating glass.

C. Glazing Schedule: List glass types and thicknesses for each size opening and location. Use same designations indicated on Drawings.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Protect glazing materials according to manufacturer's written instructions. Prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.

B. Comply with insulating-glass manufacturer's written instructions for venting and sealing units to avoid hermetic seal ruptures due to altitude change.

1.5 FIELD CONDITIONS

A. Environmental Limitations: Do not proceed with glazing when ambient and substrate temperature conditions are outside limits permitted by glazing material manufacturers and when glazing channel substrates are wet from rain, frost, condensation, or other causes.

1. Do not install glazing sealants when ambient and substrate temperature conditions are outside limits permitted by sealant manufacturer or are below 40 deg F.

1.6 WARRANTY

A. Manufacturer's Special Warranty for Coated-Glass Products: Manufacturer agrees to replace coated-glass units that deteriorate within specified warranty period. Deterioration of coated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning coated glass contrary to manufacturer's written instructions. Defects include peeling, cracking, and other indications of deterioration in coating.

1. Warranty Period: 10 years from date of Substantial Completion.

B. Manufacturer's Special Warranty for Laminated Glass: Manufacturer agrees to replace laminated-glass units that deteriorate within specified warranty period. Deterioration of laminated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning laminated glass contrary to manufacturer's written instructions. Defects include edge separation, delamination materially obstructing vision through glass, and blemishes exceeding those allowed by referenced laminated-glass standard.

1. Warranty Period: 10 years from date of Substantial Completion.

C. Manufacturer's Special Warranty for Insulating Glass: Manufacturer agrees to replace insulating-glass units that deteriorate within specified warranty period. Deterioration of insulating glass is defined as failure of hermetic seal under normal use that is not attributed to glass breakage or to maintaining and cleaning insulating glass contrary to manufacturer's written instructions. Evidence of failure is the obstruction of vision by dust, moisture, or film on interior surfaces of glass.

1. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

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

1. Guardian Glass; SunGuard.
2. Oldcastle BuildingEnvelope™.
3. Pilkington North America.
4. Viracon, Inc.
5. Vitro Architectural Glass.

B. Source Limitations for Glass: Obtain from single source from single manufacturer for each glass type.

1. Obtain tinted glass from single source from single manufacturer.
2. Obtain reflective-coated glass from single source from single manufacturer.

C. Source Limitations for Glazing Accessories: Obtain from single source from single manufacturer for each product and installation method.

2.2 PERFORMANCE REQUIREMENTS

A. General: Installed glazing systems shall withstand normal thermal movement and wind and impact loads (where applicable) without failure, including loss or glass breakage attributable to the following: defective manufacture, fabrication, or installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; or other defects in construction.

B. Thermal and Optical Performance Properties: Provide glass with performance properties specified, as indicated in manufacturer's published test data, based on procedures indicated below:

1. For monolithic-glass lites, properties are based on units with lites 6 mm thick.
2. For laminated-glass lites, properties are based on products of construction indicated.
3. For insulating-glass units, properties are based on units of thickness indicated for overall unit and for each lite.
4. U-Factors: Center-of-glazing values, according to NFRC 100 and based on LBL's WINDOW 5.2 computer program, expressed as Btu/sq. ft. x h x deg F.
5. Solar Heat-Gain Coefficient and Visible Transmittance: Center-of-glazing values, according to NFRC 200 and based on LBL's WINDOW 5.2 computer program.
6. Visible Reflectance: Center-of-glazing values, according to NFRC 300.

2.3 GLASS PRODUCTS, GENERAL

A. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below unless more stringent requirements are indicated. See these publications for glazing terms not otherwise defined in this Section or in referenced standards.

1. GANA Publications: "Laminated Glazing Reference Manual" and "Glazing Manual."
2. AAMA Publications: AAMA GDSG-1, "Glass Design for Sloped Glazing," and AAMA TIR A7, "Sloped Glazing Guidelines."
3. IGMA Publication for Sloped Glazing: IGMA TB-3001, "Guidelines for Sloped Glazing."
4. IGMA Publication for Insulating Glass: SIGMA TM-3000, "North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial and Residential Use."

B. Safety Glazing Labeling: Where safety glazing is indicated, permanently mark glazing with certification label of the SGCC or another certification agency acceptable to authorities having jurisdiction. Label shall indicate manufacturer's name, type of glass, thickness, and safety glazing standard with which glass complies.

C. Insulating-Glass Certification Program: Permanently marked either on spacers or on at least one component lite of units with appropriate certification label of IGCC.

D. Thickness: Where glass thickness is indicated, it is a minimum. Provide glass that complies with performance requirements and is not less than the thickness indicated.

1. Minimum Glass Thickness for Exterior Lites: 6 mm.
2. Thickness of Tinted Glass: Provide same thickness for each tint color indicated throughout Project.

E. Strength: Where annealed float glass is indicated, provide annealed float glass, heat-strengthened float glass, or fully tempered float glass as needed to comply with "Performance Requirements" Article. Where heat-strengthened float glass is indicated, provide heat-strengthened float glass or fully tempered float glass. Where fully tempered float glass is indicated, provide fully tempered float glass.

2.4 GLASS PRODUCTS

A. Clear Annealed Float Glass: ASTM C1036, Type I, Class 1 (clear), Quality-Q3.

B. Ultraclear Float Glass: ASTM C1036, Type I, Class I (clear), Quality-Q3; and with visible light transmission of not less than 91 percent and solar heat gain coefficient of not less than 0.87.

C. Tinted Annealed Float Glass: ASTM C1036, Type I, Class 2 (tinted), Quality-Q3.

D. Fully Tempered Float Glass: ASTM C1048, Kind FT (fully tempered), Condition A (uncoated) unless otherwise indicated, Type I, Class 1 (clear) or Class 2 (tinted) as indicated, Quality-Q3.

1. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed unless otherwise indicated.

E. Heat-Strengthened Float Glass: ASTM C1048, Kind HS (heat strengthened), Type I, Condition A (uncoated) unless otherwise indicated, Type I, Class 1 (clear) or Class 2 (tinted) as indicated, Quality-Q3.

1. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed unless otherwise indicated.

F. Reflective-Coated Vision Glass: ASTM C1376.

2.5 LAMINATED GLASS

A. Laminated Glass: ASTM C1172. Use materials that have a proven record of no tendency to bubble, discolor, or lose physical and mechanical properties after fabrication and installation.

1. Construction: Laminate glass with polyvinyl butyral interlayer to comply with interlayer manufacturer's written instructions.
2. Interlayer Thickness: Provide thickness not less than that indicated and as needed to comply with requirements.
3. Interlayer Color: Clear unless otherwise indicated.

B. Windborne-Debris-Impact-Resistant Laminated Glass: Comply with requirements specified above for laminated glass except laminate glass with one of the following to comply with interlayer manufacturer's written instructions:

1. Polyvinyl butyral interlayers reinforced with polyethylene terephthalate film.
2. Ionomeric polymer interlayer.
3. Cast-in-place and cured-transparent-resin interlayer.
4. Cast-in-place and cured-transparent-resin interlayer reinforced with polyethylene terephthalate film.

2.6 INSULATING GLASS

A. Insulating-Glass Units: Factory-assembled units consisting of sealed lites of glass separated by a dehydrated interspace, qualified according to ASTM E2190.

1. Sealing System: Dual seal, with manufacturer's standard primary and secondary sealants.
2. Perimeter Spacer: Manufacturer's standard spacer material and construction.
3. Desiccant: Molecular sieve or silica gel, or a blend of both.

2.7 MISCELLANEOUS GLAZING MATERIALS

A. General: Provide products of material, size, and shape complying with referenced glazing standard, with requirements of manufacturers of glass and other glazing materials for application indicated, and with a proven record of compatibility with surfaces contacted in installation.

B. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.

C. Setting Blocks:

1. Silicone with a Shore A durometer hardness of 85, plus or minus 5.
2. Type recommended by sealant or glass manufacturer.

D. Spacers:

1. Neoprene blocks or continuous extrusions of hardness required by glass manufacturer to maintain glass lites in place for installation indicated.
2. Type recommended by sealant or glass manufacturer.

E. Edge Blocks:

1. Silicone with a Shore A durometer hardness per manufacturer's written instructions.
2. Type recommended by sealant or glass manufacturer.

2.8 FABRICATION OF GLAZING UNITS

A. Fabricate glazing units in sizes required to fit openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing publications, to comply with system performance requirements.

1. Allow for thermal movements from ambient and surface temperature changes acting on glass framing members and glazing components.
   a. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

B. Clean-cut or flat-grind vertical edges of butt-glazed monolithic lites to produce square edges with slight chamfers at junctions of edges and faces.

C. Grind smooth and polish exposed glass edges and corners.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine framing, glazing channels, and stops, with Installer present, for compliance with the following:

1. Manufacturing and installation tolerances, including those for size, squareness, and offsets at corners.
2. Presence and functioning of weep systems.
3. Minimum required face and edge clearances.
4. Effective sealing between joints of glass-framing members.

3.2 PREPARATION

A. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings not firmly bonded to substrates.

B. Examine glazing units to locate exterior and interior surfaces. Label or mark units as needed so that exterior and interior surfaces are readily identifiable. Do not use materials that leave visible marks in the completed Work.

3.3 GLAZING, GENERAL

A. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.

B. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass includes glass with edge damage or other imperfections that, when installed, could weaken glass, impair performance, or impair appearance.

C. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction testing.

D. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.

E. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.

F. Provide spacers for glass lites where length plus width is larger than 50 inches.

1. Locate spacers directly opposite each other on both inside and outside faces of glass. Install correct size and spacing to preserve required face clearances, unless gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances and to comply with system performance requirements.
2. Provide 1/8-inch minimum bite of spacers on glass and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.

G. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and according to requirements in referenced glazing publications.

H. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.

I. Set glass lites with proper orientation so that coatings face exterior or interior as specified.

J. Where wedge-shaped gaskets are driven into one side of channel to pressurize sealant or gasket on opposite side, provide adequate anchorage so gasket cannot walk out when installation is subjected to movement.

K. Square cut wedge-shaped gaskets at corners and install gaskets in a manner recommended by gasket manufacturer to prevent corners from pulling away; seal corner joints and butt joints with sealant recommended by gasket manufacturer.

3.4 GASKET GLAZING (DRY)

A. Cut compression gaskets to lengths recommended by gasket manufacturer to fit openings exactly, with allowance for stretch during installation.

B. Insert soft compression gasket between glass and frame or fixed stop so it is securely in place with joints miter cut and bonded together at corners.

C. Installation with Drive-in Wedge Gaskets: Center glass lites in openings on setting blocks, and press firmly against soft compression gasket by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.

D. Installation with Pressure-Glazing Stops: Center glass lites in openings on setting blocks, and press firmly against soft compression gasket. Install dense compression gaskets and pressure-glazing stops, applying pressure uniformly to compression gaskets. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.

E. Install gaskets so they protrude past face of glazing stops.

3.5 CLEANING AND PROTECTION

A. Immediately after installation remove nonpermanent labels and clean surfaces.

B. Protect glass from contact with contaminating substances resulting from construction operations. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for buildup of dirt, scum, alkaline deposits, or stains.

1. If, despite such protection, contaminating substances do come into contact with glass, remove substances immediately as recommended in writing by glass manufacturer. Remove and replace glass that cannot be cleaned without damage to coatings.

C. Remove and replace glass that is damaged during construction period.

D. Wash glass on both exposed surfaces not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended in writing by glass manufacturer.

3.6 MONOLITHIC GLASS SCHEDULE

A. Annealed Clear Float Glass: ASTM C 1036, Type 1, Class 1, Quality q3.
B. Minimum Thickness: 6 mm.

3.7 TEMPERED GLASS SCHEDULE

A. Glass Type GL-2: Clear heat strengthened fully tempered float glass.

1. Basis-of-Design Product: Guardian Clear
2. Minimum Thickness of Each Glass Ply: 6 mm.
3. Tempered; ASTM C 1048, Kind FT; CPSC 16CFR-1201; ANSI Z 97.1.
4. Safety glazing required.

3.8 LAMINATED GLASS SCHEDULE

A. Glass Type: Clear laminated glass with two plies of clear fully tempered float glass.

1. Basis-of-Design Product: Guardian Clear
2. Minimum Thickness of Each Glass Ply: 6 mm.
3. Interlayer Thickness: 0.090 inch.
4. Heat Treatment: Tempered; ASTM C 1048, Kind FT; CPSC 16CFR-1201; ANSI Z 97.1.
5. Safety glazing required.

3.9 INSULATING GLASS SCHEDULE

A. Type GL-1, Classroom and Corridor Units:
1. Conformance: ASTM E 2190.
2. Outboard Lite: Guardian CrystalGray® float glass.
   a. CrystalGray® Float Glass: ASTM C 1036, Type 1, Class 2, Quality q3.
   b. Coating on Surface No. 2: SunGuard SuperNeutral 68.
   c. Glass Thickness: 6 mm (1/4 inch).
   e. Heat Treatment: Tempered; ASTM C 1048, Kind FT; CPSC 16CFR-1201; ANSI Z 97.1.
3. Air Space: 12 mm (1/2 inch) wide, hermetically sealed, dehydrated air space.
4. Inboard Lite: Guardian 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).
   d. Heat-Treatment: Tempered; ASTM C 1048, Kind FT; CPSC 16CFR-1201; ANSI Z 97.1.
5. Glass Unit Performance Characteristics:
   a. Visible Light Transmittance: 48 percent
   b. Visible Light Reflectance Outdoors: 9 percent
   c. Direct Solar Energy Transmittance: 23 percent
   d. Direct Solar Energy Reflectance Outdoors: 17 percent
   e. Winter U-Value Nighttime: 0.29
   f. Summer U-Value Daytime: 0.28
   g. Solar Heat Gain Coefficient: 0.35
   h. Summer Relative Heat Gain: 71
6. Edge Seals: ASTM E 2188, with aluminum spacers, dual-sealed with a primary seal of polyisobutylene and a secondary seal of silicone sealant for glass-to-spacer seals.
7. Sealant: Approved by glass manufacturer.

3.10 MIRROR GLASS SCHEDULE

1. UltraMirror heat strengthened fully tempered float glass.
2. Heat Treatment: Tempered; ASTM C 1048, Kind FT; CPSC 16CFR-1201; ANSI Z 97.1.

END OF SECTION

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Safety and Security Window Film:

1. Clear safety film. Safety S140

1.2 REFERENCES

A. ANSI Z97.1 - American National Standard for Safety Glazing Materials Used in Buildings - Safety Performance Specifications and Methods of Test.
B. ASHRAE - American Society for Heating, Refrigeration, and Air Conditioning Engineers; Handbook of Fundamentals.
C. ASTM International (ASTM):

1. ASTM D 1044 - Standard Method of Test for Resistance of Transparent Plastics to Surface Abrasion (Taber Abrader Test).
2. ASTM E 84 - Standard Method of Test for Surface Burning Characteristics of Building Materials.
3. ASTM E 903 - Standard Methods of Test for Solar Absorbance, Reflectance and Transmittance of Materials Using Integrating Spheres.

D. Consumer Products Safety Commission 16 CFR, Part 1201 - Safety Standard for Architectural Glazing Materials.
E. NFRC 100/200 (Formerly ASTM E903) - Standard Methods of Test for Solar Absorbance, Reflectance and Transmittance of Materials Using Integrating Spheres.
F. ISO 16933, International Standard for Glass in Building: Explosion-resistant security glazing - Test and classification for arena air-blast testing.
G. Underwriters Laboratories Inc. (UL): UL 972 - Burglary Resisting Glazing Material.

1.3 PERFORMANCE REQUIREMENTS

A. Safety Glazing Impact Performance:

1. 400 ft-lbs impact resistance, meeting ANSI Z97.1 (Class A, Unlimited) or 16 CFR 1201 (Category 2) impact requirements with film applied on 1/4 inch annealed glass.

B. Blast Hazard Mitigation Performance:

1. GSA Rating of "3B" with minimum blast load of 8 psi and 44 psi*msec, on 1/4 inch (6 mm) single pane glass and film attachment system.
2. GSA Rating of "3B" with minimum blast load of 15 psi and 59 psi*msec, on 1 inch (25 mm) double pane glass without film attachment system.

C. Adhesion to Glass:

1. Minimum 2 lbs/in peel strength per ASTM D3330 (Method A).

D. Flammability: Surface burning characteristics when tested in accordance ASTM E 84, demonstrating film applied to glass rated Class A for Interior Use:

1. Flame Spread Index: no greater than 25.
2. Smoke Developed Index: no greater than 55.

E. Abrasion Resistance:

1. Film shall have a surface coating that is resistant to abrasion such that less than 5 percent increase of transmitted light haze will result when tested in accordance to ASTM D 1044 using 100 cycles, 500 grams weight, and the CS10F Calibrase Wheel.

F. UV Light Rejection:

1. Minimum of 99% UV light rejection (300 - 380 nm), per ASTM E903, as determined with film applied on 1/4 inch clear glass.

1.4 SUBMITTALS

A. Submit under provisions of Section 013000.
B. Product Data: Manufacturer's current technical literature on each product to be used, including:

1. Manufacturer's Data Sheets.
2. Preparation instructions and recommendations.
3. Storage and handling requirements and recommendations.
4. Installation methods.

C. 3rd Party Test Report Submittal Requirements. Submit the following 3rd Party test reports indicating compliance with the test values listed in this section.

1. Flammability Testing, ASTM E84.
2. Film Properties Testing, ASTM D882.
3. Abrasion Resistance Testing, ASTM D1044.
4. Peel Strength Testing, ASTM D3330
5. Puncture Strength Testing, ASTM D4830.
6. Burglary Resistance Glazing, UL 972
7. Impact Resistance and Pressure Cycling, ASTMs E1886 and E1996.
8. Blast Hazard Mitigation Testing, ASTM F1642 / F2912 and/or GSA-TS01-2003.

D. Verification Samples: For each film specified, two samples representing actual film color and pattern.

1.5 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.

1. Provide documentation that the adhesive used on the specified films is a Pressure Sensitive Adhesive (PSA).

B. Installer Qualifications: All products listed in this section are to be installed by a single installer with a minimum of five years demonstrated experience in installing products of the same type and scope as specified.

1. Provide documentation that the installer is authorized by the Manufacturer to perform Work specified in this section.
2. Provide a commercial building reference list of 5 properties where the installer has applied window film. This list will include the following information:
   a. Name of building.
   b. The name and telephone number of a management contact.
   c. Type of glass.

d. Type of film and/or film attachment system.
e. Amount of film and/or film attachment system installed.
f. Date of completion.

C. Mock-Up: Provide a mock-up for evaluation of surface preparation techniques and application workmanship.

1. Finish areas designated by Architect.
2. Do not proceed with remaining work until workmanship, color, and sheen are approved by Architect.
3. Refinish mock-up area as required to produce acceptable work.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Follow Manufacturer's instructions for storage and handling.
B. Store products in manufacturer's unopened packaging until ready for installation.
C. Store and dispose of hazardous materials, and materials contaminated by hazardous materials, in accordance with requirements of local authorities having jurisdiction.

1.7 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.

1.8 WARRANTY

A. At project closeout, provide to Owner or Owners Representative an executed current copy of the manufacturer's standard limited warranty against manufacturing defect, outlining its terms, conditions, and exclusions from coverage.
B. In order to validate warranty, installation must be performed by an Authorized 3M dealer and according to Manufacturer's installation instructions. Verification of Authorized 3M dealer can be confirmed by submission of active 3M dealer code number.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturer: 3M Commercial Solutions, which is located at: 3M Center Bldg. 220-12-E-04; St. Paul, MN 55144-1000
B. Substitutions: Under Division 1.

2.2 CLEAR SAFETY AND SECURITY WINDOW FILM

A. 3M Safety S140 (SH14CLARL): Optically clear polyester film with a durable acrylic abrasion resistant coating over one surface and a pressure sensitive adhesive over the other. The adhesive is pressure-activated, not water-activated, and forms a physical bond, not chemical bond, to the glass. The film may be laminated to other clear polyester film layers to achieve the desired thickness of the film.

1. Physical / Mechanical Performance Properties:
   a. Film Color: Clear.
   b. Thickness: Nominal 14 mils
   c. Tensile Strength (ASTM D 882): 25,000 psi.
   d. Break Strength (ASTM D 882) (Per Inch Width): 350 lbs.
2. Uniformity: No noticeable pin holes, streaks, thin spots, scratches, banding or other

optical defects.

3. Variation in Total Transmission across the Width: Less than 2 percent over the average at any portion along the length.
4. Identification: Labeled as to Manufacturer as listed in this Section.
5. Impact Resistance for Safety Glazing: Tested on 1/4 inch (6 mm) annealed glass.
   a. Safety Rating (CPSC 16 CFR, Part 1201): Category II (400 ft.-lbs).
6. Impact Resistance and Pressure Cycling:
   a. Film shall pass impact of Medium Large Missile "C" and withstand subsequent pressure cycling (per ASTMs E 1996 and E 1886) at +/- 50 psf Design Pressure with use of 3M Impact Protection Adhesive attachment system.
7. Blast Hazard Mitigation: Independent testing with results from high explosive arena blast testing.
   a. GSA Rating of "3B" with minimum blast load of 8 psi and 44 psi*msec, on 1/4 inch single pane annealed glass and 3M Impact Protection Profile film attachment system.
   b. GSA level 3B rating with minimum blast load of 15 psi overpressure and 58 psi*msec blast impulse on 1 inch double pane annealed glass without use of film attachment system.
8. Forced Entry Protection: Independent lab testing according to UL 972 protocol (Multiple Impact Test).
   a. Annealed Glass (1/4 inch) - Pass
   b. Tempered Glass (1/4 inch) – Pass

PART 3 - EXECUTION

3.1 EXAMINATION

A. Film Examination:

1. If preparation of glass surfaces is the responsibility of another installer, notify Architect in writing of deviations from manufacturer's recommended installation tolerances and conditions.
   a. Glass surfaces receiving new film should first be examined to verify that they are free from defects and imperfections, which will affect the final appearance.
2. Do not proceed with installation until glass surfaces have been properly prepared and deviations from manufacturer's recommended tolerances are corrected. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result under the project conditions.
3. Commencement of installation constitutes acceptance of conditions.

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. Refer to Manufacturer's installation instructions for methods of preparation for Impact Protection Adhesive or Impact Protection Profile film attachment systems.

3.3 INSTALLATION

A. Film Installation, General:

1. Install in accordance with manufacturer's instructions.
2. Cut film edges neatly and square at a uniform distance of 1/8 inch (3 mm) to 1/16 inch (1.5 mm) of window sealant. Use new blade tips after 3 to 4 cuts.
3. Spray the slip solution, composed of one capful of baby shampoo or dishwashing

liquid to 1 gallon of water, on window glass and adhesive to facilitate proper positioning of film.

4. Apply film to glass and lightly spray film with slip solution.
5. Squeegee from top to bottom of window. Spray slip solution to film and squeegee a second time.
6. Bump film edge with lint-free towel wrapped around edge of a 5-way tool.
7. Upon completion of film application, allow 30 days for moisture from film installation to dry thoroughly, and to allow film to dry flat with no moisture dimples when viewed under normal viewing conditions.
8. If completing an exterior application, check with the manufacturer as to whether edge sealing is required.

3.4 CLEANING AND PROTECTION

A. Remove left over material and debris from Work area. Use necessary means to protect film before, during, and after installation.
B. Touch-up, repair or replace damaged products before Substantial Completion.
C. After application of film, wash film using common window cleaning solutions, including ammonia solutions, 30 days after application. Do not use abrasive type cleaning agents and bristle brushes to avoid scratching film. Use synthetic sponges or soft cloths.

END OF SECTION

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.
3. Grid suspension systems for gypsum board ceilings.

B. Related Requirements:

1. Section 054000 "Cold-Formed Metal Framing" for exterior and interior load-bearing and exterior non-load-bearing wall studs; floor joists; and roof rafters and ceiling joists.

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. Horizontal Deflection: For composite wall assemblies, limited to 1/240 of the wall height based on horizontal loading of 5 lbf/sq. ft..

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, G60, hot-dip galvanized unless otherwise indicated.
   a. G40 may be used in lieu of G60 at interior, non-structural framing applications.

B. Studs and Tracks: ASTM C 645. Use either conventional steel studs and tracks or embossed, high-strength steel studs and tracks.

1. Steel Studs and Tracks:

   a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      1) ClarkDietrich.
      2) Jaimes Industries.
      3) SCAFCO Steel Stud Company.
   b. Minimum Base-Steel Thickness: As required by performance requirements for horizontal deflection.
   c. Depth: As indicated on Drawings.

2. Embossed, High Strength Steel Studs and Tracks: Roll-formed and embossed with surface deformations to stiffen the framing members so that they are structurally comparable to conventional ASTM C 645 steel studs and tracks.

    a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
        1) ClarkDietrich.
        2) MarinoWARE.
        3) MBA Building Supplies.
        4) SCAFCO Steel Stud Company.
    b. Minimum Base-Steel Thickness: As required by horizontal deflection performance requirements 0.0190 inch.
    c. Depth: As indicated on Drawings.

C. Slip-Type Head Joints: Where indicated, provide one of 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.

    a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
        1) ClarkDietrich.
        2) MarinoWARE.
        3) MBA Building Supplies.
        4) SCAFCO Steel Stud Company.

D. Hat-Shaped, Rigid Furring Channels: ASTM C 645.

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

    a. ClarkDietrich.
    b. Jaimes Industries.
    c. MarinoWARE.
    d. MRI Steel Framing, LLC.
    e. SCAFCO Steel Stud Company.
2. Minimum Base-Steel Thickness: 0.0296 inch.
3. Depth: 1-1/2 inches.

E. Resilient Furring Channels: 1/2-inch- deep, steel sheet members designed to reduce sound transmission.

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

    a. ClarkDietrich.
    b. MarinoWARE.
    c. MRI Steel Framing, LLC.
    d. SCAFCO Steel Stud Company.
2. Configuration: hat shaped.

F. Cold-Rolled Furring Channels: 0.053-inch uncoated-steel thickness, with minimum 1/2-inch- wide flanges.

1. Depth: 3/4 inch.
2. Furring Brackets: Adjustable, corrugated-edge-type steel sheet with minimum uncoated-steel thickness of 0.0329 inch.
3. 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.

G. Z-Shaped Furring: With slotted or nonslotted web, face flange of 1-1/4 inches, wall attachment flange of 7/8 inch, minimum uncoated-steel thickness of 0.0179 inch, and depth required to fit insulation thickness indicated.

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

a. ClarkDietrich.
b. MarinoWARE.
c. MRI Steel Framing, LLC.
d. SCAFCO Steel Stud Company.

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. Hanger Attachments to Concrete:

1. Power-Actuated Anchors: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.

C. Wire Hangers: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.16 inch in diameter.

D. 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: 1-1/2 inches.

E. Furring Channels (Furring Members):

1. Cold-Rolled Channels: 0.0538-inch uncoated-steel thickness, with minimum 1/2-inch- wide flanges, 3/4 inch deep.
2. Steel Studs and Tracks: ASTM C 645.

a. Minimum Base-Steel Thickness: 0.0269 inch.
b. Depth: As indicated on Drawings 1-5/8 inches 3-5/8 inches.

3. Embossed, High-Strength Steel Studs and Tracks: ASTM C 645.

a. Minimum Base-Steel Thickness: 0.0190 inch.
b. Depth: 1-5/8 inches 3-5/8 inches.

4. Hat-Shaped, Rigid Furring Channels: ASTM C 645, 7/8 inch deep.

a. Minimum Base-Steel Thickness: 0.0296 inch.

5. Resilient Furring Channels: 1/2-inch- deep members designed to reduce sound transmission.

a. Configuration: hat shaped.

F. Grid Suspension System for Gypsum Board Ceilings: ASTM C 645, direct-hung system composed of main beams and cross-furring members that interlock.

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

a. Armstrong World Industries, Inc.
b. USG Corporation.

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.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames, cast-in anchors, and structural framing, for compliance with requirements and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Suspended Assemblies: Coordinate installation of suspension systems with installation of overhead structure to ensure that inserts and other provisions for anchorages to building structure have been installed to receive hangers at spacing required to support the Work and that hangers will develop their full strength.

3.3 INSTALLATION, GENERAL

A. Installation Standard: ASTM C 754.

1. 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.

3.4 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.

1. Single-Layer Application: As required by horizontal deflection performance requirements 16 inches o.c. unless otherwise indicated.
2. Tile Backing Panels: 16 inches o.c. unless otherwise indicated.

B. Install studs so flanges within framing system point in same direction.

C. 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. 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.
4. Fire-Resistance-Rated Partitions: Install framing to comply with fire-resistance-rated assembly indicated and support closures and to make partitions continuous from floor to underside of solid structure.
    a. Firestop Track: Where indicated, install to maintain continuity of fire-resistance-rated assembly indicated.

D. Direct Furring:

1. Screw to wood framing.
2. Attach to concrete or masonry with stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches o.c.

E. Z-Shaped Furring Members:

1. Erect insulation, specified in Section 072100 "Thermal Insulation," vertically and hold in place with Z-shaped furring members spaced 24 inches o.c.
2. Except at exterior corners, securely attach narrow flanges of furring members to wall with concrete stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches o.c.
3. At exterior corners, attach wide flange of furring members to wall with short flange extending beyond corner; on adjacent wall surface, screw-attach short flange of furring channel to web of attached channel. At interior corners, space second member no more than 12 inches from corner and cut insulation to fit.

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.

3.5 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.

1. Hangers: 48 inches o.c.
2. Carrying Channels (Main Runners): 48 inches o.c.
3. Furring Channels (Furring Members): 24 inches o.c.

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. Grid Suspension Systems: Attach perimeter wall track or angle where grid suspension systems meet vertical surfaces. Mechanically join main beam and cross-furring members to each other and butt-cut to fit into wall track.

F. 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

SECTION 092900 - GYPSUM BOARD

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. Interior gypsum board.
2. Tile backing panels.

B. Related Requirements:

1. Section 061600 "Sheathing" for gypsum sheathing for exterior walls.
2. Section 092216 "Non-Structural Metal Framing" for non-structural steel framing and suspension systems that support gypsum board panels.
3. Section 093013 "Ceramic Tiling" for cementitious backer units installed as substrates for ceramic tile.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.4 DELIVERY, STORAGE AND HANDLING

A. Store materials inside under cover and keep them dry and protected against weather, condensation, direct sunlight, construction traffic, and other potential causes of damage. Stack panels flat and supported on risers on a flat platform to prevent sagging.

1.5 FIELD CONDITIONS

A. Environmental Limitations: Comply with ASTM C 840 requirements or gypsum board manufacturer's written instructions, whichever are more stringent.

B. Do not install paper-faced gypsum panels until installation areas are enclosed and conditioned.

C. Do not install panels that are wet, moisture damaged, and mold damaged.

1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

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 E 119 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 C 1396/C 1396M.

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

    a. CertainTeed Corporation.
    b. Continental Building Products, LLC.
    c. Georgia-Pacific Gypsum LLC.
    d. National Gypsum Company.
    e. USG Corporation.
2. Thickness: 5/8 inch
3. Long Edges: Tapered and featured (rounded or beveled) for prefilling.

B. Gypsum Board, Type X: ASTM C 1396/C 1396M.

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

    a. CertainTeed Corporation.
    b. Continental Building Products, LLC.
    c. Georgia-Pacific Gypsum LLC.
    d. National Gypsum Company.
    e. USG Corporation.
2. Thickness: 5/8 inch.
3. Long Edges: Tapered and featured (rounded or beveled) for prefilling.

C. Gypsum Ceiling Board: ASTM C 1396/C 1396M.

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

    a. CertainTeed Corporation.
    b. Continental Building Products, LLC.
    c. Georgia-Pacific Gypsum LLC.
    d. National Gypsum Company.
    e. USG Corporation.
2. Thickness: 5/8 inch

3. Long Edges: Tapered.

D. Impact-Resistant Gypsum Board: ASTM C 1396/C 1396M gypsum board, tested according to ASTM C 1629/C 1629M.

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

   a. CertainTeed Corporation.
   b. Continental Building Products, LLC.
   c. Georgia-Pacific Gypsum LLC.
   d. National Gypsum Company.
   e. USG Corporation.
2. Core: 5/8 inch, Type X.
3. Surface Abrasion: ASTM C 1629/C 1629M, meets or exceeds Level 3 requirements.
4. Indentation: ASTM C 1629/C 1629M, meets or exceeds Level 3 requirements.
5. Soft-Body Impact: ASTM C 1629/C 1629M, meets or exceeds Level 3 requirements.
6. Hard-Body Impact: ASTM C 1629/C 1629M, meets or exceeds Level 3 requirements according to test in Annex A1.
7. Long Edges: Tapered.
8. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.

2.4 SPECIALTY GYPSUM BOARD

A. Glass-Mat Interior Gypsum Board: ASTM C 1658/C 1658M. With fiberglass mat laminated to both sides. Specifically designed for interior use.

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

   a. Continental Building Products, LLC.
   b. Georgia-Pacific Gypsum LLC.
   c. National Gypsum Company.
   d. USG Corporation.
2. Core: 5/8 inch, Type X 5/8 inch, abuse resistant.
3. Long Edges: Tapered.
4. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.

2.5 TILE BACKING PANELS

A. Cementitious Backer Units: ANSI A118.9 and ASTM C 1288 or ASTM C 1325, with manufacturer's standard edges.

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

   a. CertainTeed Corporation.
   b. National Gypsum Company.
   c. USG Corporation.
2. Thickness: 1/2 inch.
3. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.

2.6 TRIM ACCESSORIES

A. Interior Trim: ASTM C 1047.

1. Material: Galvanized or aluminum-coated steel sheet, rolled zinc, plastic, or paper-faced galvanized-steel sheet.
2. Shapes:

    a. Cornerbead.
    b. LC-Bead: J-shaped; exposed long flange receives joint compound.
    c. L-Bead: L-shaped; exposed long flange receives joint compound.
    d. U-Bead: J-shaped; exposed short flange does not receive joint compound.
    e. Expansion (control) joint.

2.7 JOINT TREATMENT MATERIALS

A. General: Comply with ASTM C 475/C 475M.

B. Joint Tape:

1. Interior Gypsum Board: Paper.
2. Tile Backing Panels: As recommended by panel manufacturer.

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 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 compound.

    a. Use setting-type compound for installing paper-faced metal trim accessories.
3. Fill Coat: For second coat, use setting-type, sandable topping compound.
4. Finish Coat: For third coat, use setting-type, sandable topping compound.
5. Skim Coat: For final coat of Level 5 finish, use setting-type, sandable topping compound high-build interior coating product designed for application by airless sprayer and to be used instead of skim coat to produce Level 5 finish.

D. Joint Compound for Tile Backing Panels:

1. Cementitious Backer Units: As recommended by backer unit manufacturer.

2.8 AUXILIARY MATERIALS

A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written instructions.

B. Steel Drill Screws: ASTM C 1002 unless otherwise indicated.

1. Use screws complying with ASTM C 954 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. Sound-Attenuation Blankets: 3 1/2”, ASTM C 665, Type I (blankets without membrane facing) produced by combining thermosetting resins with mineral fibers manufactured from glass, slag wool, or rock wool.

1. Fire-Resistance-Rated Assemblies: Comply with mineral-fiber requirements of assembly.

D. Thermal Insulation: As specified in Section 072100 "Thermal Insulation."

E. Vapor Retarder: As specified in Section 072600 "Vapor Retarders."

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and substrates including welded hollow-metal frames and support framing, with Installer present, for compliance with requirements and other conditions affecting performance of the Work.

B. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 APPLYING AND FINISHING PANELS, GENERAL

A. Comply with ASTM C 840.

B. Install ceiling panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.

C. Install panels with face side out. Butt panels together for a light contact at edges and ends with not more than 1/16 inch of open space between panels. Do not force into place.

D. Locate edge and end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Do not make joints other than control joints at corners of framed openings.

E. Form control and expansion joints with space between edges of adjoining gypsum panels.

F. Cover both faces of support framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases braced internally.

1. Unless concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. in area.
2. Fit gypsum panels around ducts, pipes, and conduits.
3. Where partitions intersect structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by structural members; allow 1/4- to 3/8-inch- wide joints to install sealant.

G. 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.

H. Attachment to Steel Framing: Attach panels so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.

I. Install sound attenuation blankets before installing gypsum panels unless blankets are readily installed after panels have been installed on one side.

3.3 APPLYING INTERIOR GYPSUM BOARD

A. Install interior gypsum board in the following locations:

1. Wallboard Type: As indicated on Drawings.
2. Type X: Where required for fire-resistance-rated assembly.
3. Ceiling Type: As indicated on Drawings.
4. Impact-Resistant Type: As indicated on Drawings.
5. Glass-Mat Interior Type: As indicated on Drawings.

B. Single-Layer Application:

1. On ceilings, apply gypsum panels before wall/partition board application to greatest extent possible and at right angles to framing unless otherwise indicated.
2. On partitions/walls, apply gypsum panels horizontally (perpendicular to framing) unless otherwise indicated or required by fire-resistance-rated assembly, and minimize end joints.
    a. Stagger abutting end joints not less than one framing member in alternate courses of panels.
    b. At stairwells and other high walls, install panels horizontally unless otherwise indicated or required by fire-resistance-rated assembly.
3. On Z-shaped furring members, apply gypsum panels vertically (parallel to framing) with no end joints. Locate edge joints over furring members.
4. Fastening Methods: Apply gypsum panels to supports with steel drill screws.

C. Multilayer Application:

1. On ceilings, apply gypsum board indicated for base layers before applying base layers on walls/partitions; apply face layers in same sequence. Apply base layers at right angles to framing members and offset face-layer joints one framing member, 16 inches minimum, from parallel base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly.
2. On partitions/walls, apply gypsum board indicated for base layers and face layers vertically (parallel to framing) with joints of base layers located over stud or furring member and face-layer joints offset at least one stud or furring member with base-layer joints unless otherwise indicated or required by fire-resistance-rated assembly. Stagger joints on opposite sides of partitions.
3. On Z-shaped furring members, apply base layer vertically (parallel to framing) and face layer either vertically (parallel to framing) or horizontally (perpendicular to framing) with vertical joints offset at least one furring member. Locate edge joints of base layer over furring members.
4. Fastening Methods: Fasten base layers with screws; fasten face layers with adhesive and supplementary fasteners.

3.4 APPLYING TILE BACKING PANELS

A. Cementitious Backer Units: ANSI A108.11, at locations indicated to receive tile.

B. Where tile backing panels abut other types of panels in same plane, shim surfaces to produce a uniform plane across panel surfaces.

3.5 INSTALLING TRIM ACCESSORIES

A. General: 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.

B. Control Joints: Install control joints according to ASTM C 840 and in specific locations approved by Architect for visual effect.

C. Interior Trim: Install in the following locations:

1. Cornerbead: Use at outside corners.
2. LC-Bead: Use at exposed panel edges.
3. U-Bead: Use at exposed panel edges.

3.6 FINISHING GYPSUM BOARD

A. General: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.

B. Prefill open joints, rounded or beveled edges, and damaged surface areas.

C. Apply joint tape over gypsum board joints, except for trim products specifically indicated as not intended to receive tape.

D. Gypsum Board Finish Levels: Finish panels to levels indicated below and according to ASTM C 840:

1. Level 1: Ceiling plenum areas, concealed areas, and where indicated.
2. Level 2: Panels that are substrate for tile.
3. Level 4: At panel surfaces that will be exposed to view and receive a flat paint unless otherwise indicated.
4. Level 4: At panel surfaces that will be exposed to view and receive a paint finish other than flat unless otherwise indicated.

    a. Primer and its application to surfaces are specified in Section 099123 "Interior Painting."

E. Glass-Mat Faced Panels: Finish according to manufacturer's written instructions.

F. Cementitious Backer Units: Finish according to manufacturer's written instructions.

3.7 PROTECTION

A. Protect adjacent surfaces from drywall compound and promptly remove from floors and other non-drywall surfaces. Repair surfaces stained, marred, or otherwise damaged during drywall application.

B. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.

C. Remove and replace panels that are wet, moisture damaged, and mold damaged.

1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION

SECTION 095100 - ACOUSTICAL CEILINGS

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 423 Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method
5. ASTM C 635 Standard Specification for Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings
6. ASTM C 636 Recommended Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels
7. ASTM D 3273 Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber
8. ASTM E 84 Standard Test Method for Surface Burning Characteristics of Building Materials
9. ASTM E 119 Standard Test Methods for Fire Tests of Building Construction and Material
10. ASTM E 580 Installation of Metal Suspension Systems in Areas Requiring Moderate Seismic Restraint
11. ASTM E 1111 Standard Test Method for Measuring the Interzone Attenuation of Ceilings Systems
12. ASTM E 1414 Standard Test Method for Airborne Sound Attenuation Between Rooms Sharing a Common Ceiling Plenum
13. ASTM E 1264 Classification for Acoustical Ceiling Products

B. 2015 Michigan Building Code

C. ASHRAE Standard 62.1-2004, Ventilation for Acceptable Indoor Air Quality

D. NFPA 70 National Electrical Code

E. 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.

D. Acoustical Certifications: Manufacturer's certifications that products comply with specified requirements, including laboratory reports showing compliance with specified tests and standards. For acoustical performance, each carton of material must carry an approved independent laboratory classification of NRC, CAC, and AC.

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. Armstrong World Industries, Inc.
2. CertainTeed Corporation
3. USG.

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 UNIT

A. Acoustical Panels: 24x24 (1810) School Zone Fine Fissured High Acoustics Square Lay in.

1. White, NRC: 0.70
2. Sound Blocking, CAC: 40
3. Fire Resistance: FireGuard
4. Light Reflectance: 82%

2.3 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: Environmental 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. 7902 - 15/16" Shadow Reveal Transition Molding

2.4 ALUMINUM CUSTOM TRIM - EXTRUDED

A. Product/Manufacturer: Axiom Trim Channel: 12-inch Axiom Classic Curved Armstrong World Industries, Incorporated

B. Commercial quality extruded aluminum alloy 6063 trim channel, factory finished in baked polyester paint. Commercial quality galvanized steel unfinished T-bar connection clips; galvanized steel splice plates.

1. Color: Classic white.
2. Size: Refer to drawings.
3. Recycle Content: Post-Consumer - 50% Pre-Consumer - 0%
4. Acceptable Product: AXIOM Classic, 12-inch Axiom Classic Curved as manufactured by Armstrong World Industries

C. Axiom Trim Channel:

1. 12-inch Axiom Classic Curved. Refer to drawings for radius scale

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

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Luxury vinyl tile (LVT) flooring
   2. Vinyl Composition Tile (VCT) flooring.
   3. Resilient Flooring
   4. Accessories
B. See Alternate section

1.2 REFERENCES

A. Flooring Manufactures Technical Manuals
B. ASTM International:

   1. ASTM E 648 Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source
   2. ASTM E 662 Standard Test Method for Specific Optical Density of Smoke Generated by Solid Materials
   3. ASTM F 710 Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring
   4. ASTM F 1482, Standard Guide to Wood Underlayment Products Available for Use Under Resilient Flooring
   5. ASTM F 1700 Standard Specification for Solid Vinyl Tile
   6. ASTM F 1861 Standard Specification for Resilient Wall Base
   7. ASTM F 1869 Standard Test Method for Measuring Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride
   8. ASTM F 2170 Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes

C. National Fire Protection Association (NFPA):

   1. NFPA 253 Standard Method of Test for Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source
   2. NFPA 258 Standard Test Method for Measuring the Smoke Generated by Solid Materials.

1.3 SYSTEM DESCRIPTION

A. Performance Requirements: Provide flooring which has been manufactured, fabricated and installed to performance criteria certified by manufacturer without defects, damage, or failure.
B. Administrative Requirements

   1. Pre-installation Meeting: Conduct an on-site pre-installation meeting to verify project requirements, substrate conditions, manufacturer’s installation instructions and manufacturer’s warranty requirements
   2. Pre-installation Testing: Conduct pre-installation testing as required by manufacturer for installation conditions.

C. Sequencing and Scheduling

   1. Install flooring and accessories after the other finishing operations, including painting, have been completed. Close spaces to traffic during the installation of the flooring.

2. Do not install flooring over concrete slabs until they are sufficiently dry to achieve a bond with the adhesive, in accordance with the manufacturer's recommended bond, moisture tests and pH test.

1.4 SUBMITTALS

A. Submit shop drawings, seaming plan, coving details, and manufacturer's technical data, installation and maintenance instructions for flooring and accessories.
B. Submit the manufacturer's standard samples showing the required colors for flooring and applicable accessories if requested.
C. Submit Safety Data Sheets (SDS) available for flooring product, adhesives, patching/leveling compounds, floor finishes and cleaning agents.
D. If required, submit the manufacturer's certification that the flooring has been tested by an independent laboratory and complies with the required fire tests.
E. Closeout Submittals: Submit the following:

1. Operation and Maintenance Data: Operation and maintenance data for installed products in accordance with Division 1 Closeout Submittals (Maintenance Data and Operation Data) Section. Include methods for maintaining installed products, and precautions against cleaning materials and methods detrimental to finishes and performance.
2. Warranty: Warranty documents specified herein

1.5 QUALITY ASSURANCE

A. Single-Source Responsibility: provide types of flooring and accessories supplied by one manufacturer, including leveling and patching compounds, and adhesives.
B. Select an installer who is competent in the installation of Armstrong resilient solid vinyl tile flooring.

1. Engage installers certified as manufacturers certified installers

C. Fire Performance Characteristics: Provide resilient tile flooring with the following fire performance characteristics as determined by testing material in accordance with ASTM test methods indicated below by a certified testing laboratory or other testing agency acceptable to authorities having jurisdiction:

1. ASTM E 648 (NFPA 253) Critical Radiant Flux of 0.45 watts per sq. cm. or greater, Class I
2. ASTM E 662 (NFPA 258) (Smoke Generation) Maximum Specific Optical Density of 450 or less
3. CAN/ULC-S102.2 – Flame Spread Rating and Smoke Developed – Results as tested

1.6 DELIVERY, STORAGE AND HANDLING

A. Comply with Division 1 Product Requirements Sections
B. Comply with manufacturer's ordering instructions and lead time requirements to avoid construction delays.
C. Deliver materials in good condition to the jobsite in the manufacturer's original unopened containers that bear the name and brand of the manufacturer, project identification, and shipping and handling instructions.
D. Store materials in a clean, dry, enclosed space off the ground, protected from harmful weather conditions and at temperature and humidity conditions recommended by the manufacturer. Protect adhesives from freezing. Store flooring, adhesives and accessories in the spaces where they will be installed for at least 48 hours before beginning installation.

1.7 PROJECT CONDITIONS

A. Maintain a minimum temperature in the spaces to receive the flooring and accessories of 65ºF and a maximum temperature of 85ºF for at least 48 hours before, during, and for not less than 48 hours after installation. Thereafter, maintain a minimum temperature of 55ºF in areas where work is completed. Protect all materials from the direct flow of heat from hot-air registers, radiators, or other heating fixtures and appliances.

1.8 LIMITED WARRANTY

A. Resilient Flooring: Submit a written warranty executed by the manufacturer, agreeing to repair or replace resilient flooring that fails within the warranty period.
B. Limited Warranty Period: 20 years.
C. The Limited 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.
D. For the Limited Warranty to be valid, this product is required to be installed using the appropriate Armstrong Flooring Guaranteed Installation System. Product installed not using the specific instructions from the Guaranteed Installation System will void the warranty.

1.9 MAINTENANCE

A. Extra Materials: Deliver extra materials to Owner. Furnish extra materials from same production run as products installed. Packaged with protective covering for storage and identified with appropriate labels.

1. Quantity: Furnish quantity of flooring units equal to 5% of amount installed but no less than (1) one carton of each color and style used.
2. Delivery, Storage and Protection: Comply with Owner's requirements for delivery, storage and protection of extra material.

PART 2 - PRODUCTS

2.1 MANUFACTURER

A. Resilient tile flooring, wall base, adhesives and accessories:
B. Mannington Amtico
C. Tandus Centiva
D. Armstrong Flooring

2.2 RESILIENT LUXARY VINYL TILE FLOORING MATERIALS

A. (LVT-1) Tandus Centiva, *to be determined.*

1. Reference specification - ASTM F 1700, “Standard Specification for Solid Vinyl Tile", Class III, Type B – Embossed Surface. Meets requirements for size, squareness, thickness, thickness of wear layer, residual indentation, resistance to chemicals, resistance to light and resistance to heat.
2. Pattern and Color: refer to drawings for color and size.
3. Installation: *to be determined.*

B. (LVT-2) Mannington *to be determined*

1. Reference specification - ASTM F 1700, “Standard Specification for Solid Vinyl Tile", Class III, Type B – Embossed Surface. Meets requirements for size, squareness, thickness, thickness of wear layer, residual indentation, resistance to chemicals, resistance to light and resistance to heat.
2. Pattern and Color: refer to drawings for color and size.
3. Installation: *to be determined*

2.3 RESILIENT VINYL COMPOSITION TILE FLOORING MATERIALS

A. Provide Vinyl Composition Tile: EXCELON® Feature™ Tile, Strips & Insets manufactured by Armstrong Flooring, Inc**.**

1. Description: Tile composed of polyvinyl chloride resin, plasticizers, fillers, stabilizers and pigments with colors and texture dispersed uniformly throughout its entire thickness.
2. All tiles shall be Diamond 10 Technology
3. Vinyl composition tile shall conform to the requirements of ASTM F 1066, “Standard Specification for Vinyl Composition Floor Tile", Class 1, Solid Color Tile
4. Pattern and Color: To be selected from the range currently available from Armstrong Flooring, Inc. Refer to Drawings
5. Color to match surrounding tile where called for on drawings
6. Size: 12 in. x 12 in.
7. Thickness:1/8"/0.125 in.

2.4 WALL BASE MATERIALS

A. (VB-1) For top set wall base: Provide 1/8 in. thick, 4 in. high Tarkett Coved Wall Base with a matte finish, conforming to ASTM F 1861, Type TV – Vinyl

1. Thermoplastic Group 1 Solid
2. Style B: Cove. Provide in areas with resilient floor coverings, new carpet areas, and as otherwise indicated in drawings.
3. Color: Refer to drawings.

B. Lengths: Coils in manufacturer's standard length.
C. Outside Corners: Job formed or preformed.
D. Inside Corners: Job formed or preformed.

2.5 ADHESIVES

A. Provide manufacturers epoxy adhesive under the flooring and manufacturers wall base adhesive at the wall base as recommended by the flooring manufacturer.

2.6 ACCESSORIES

A. For patching, smoothing, and leveling monolithic subfloors (concrete, terrazzo, quarry tile, ceramic tile, and certain metals), provide fast-setting cement-based patch and underlayment as recommended by the flooring manufacture.
B. For sealing joints between the top of wall base or integral cove cap and irregular wall surfaces such as masonry, provide plastic filler applied according to the manufacturer's recommendations.
C. Provide transition/reducing strips tapered to meet abutting materials.
D. Provide threshold indicated on drawings. If none indicated provide metal edge strips of required thickness to protect exposed edges of the flooring. Provide where new flooring

meets existing and where new flooring types/heights meet together. Provide units of maximum available length to minimize the number of joints. Provide Schluter or similar. Unless otherwise shown, provide strips made of extruded aluminum with a mill finish.

PART 3 - EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

A. Compliance: Comply with manufacturer's product data, including technical bulletins, product catalog, installation instructions, and product carton instructions for installation and maintenance procedures as needed.

3.2 EXAMINATION

A. Site Verification of Conditions: Verify substrate conditions (which have been previously installed under other sections) are acceptable for product installation in accordance with manufacturer's instructions (i.e. moisture tests, bond test, pH test, etc.).
B. Visually inspect flooring materials, adhesives and accessories prior to installation. Flooring material with visual defects shall not be installed and shall not be considered as a legitimate claim.
C. Examine subfloors prior to installation to determine that surfaces are smooth and free from cracks, holes, ridges, and other defects that might prevent adhesive bond or impair durability or appearance of the flooring material.
D. Inspect subfloors prior to installation to determine that surfaces are free from curing, sealing, parting and hardening compounds; residual adhesives; adhesive removers; and other foreign materials that might prevent adhesive bond. Visually inspect for evidence of moisture, alkaline salts, carbonation, dusting, mold, or mildew.
E. Report conditions contrary to contract requirements that would prevent a proper installation. Do not proceed with the installation until unsatisfactory conditions have been corrected.
F. Failure to call attention to defects or imperfections will be construed as acceptance and approval of the subfloor. Installation indicates acceptance of substrates with regard to conditions existing at the time of installation.

3.3 PREPARATION

A. Subfloor Preparation: Smooth concrete surfaces, removing rough areas, projections, ridges, and bumps, and filling low spots, control or construction joints, and other defects with flooring patch and adhesives as recommended by the flooring manufacturer.
B. Subfloor Cleaning: The surface shall be free of dust, solvents, varnish, paint, wax, oil, grease, sealers, release agents, curing compounds, residual adhesive, adhesive removers and other foreign materials that might affect the adhesion of resilient flooring to the concrete or cause a discoloration of the flooring from below. Remove residual adhesives as recommended by the flooring manufacturer. Remove curing and hardening compounds not compatible with the adhesives used, as indicated by a bond test or by the compound manufacturer's recommendations for flooring. Avoid organic solvents. Spray paints, permanent markers and other indelible ink markers must not be used to write on the back of the flooring material or used to mark the concrete slab as they could bleed through, telegraphing up to the surface and permanently staining the flooring material. If these contaminants are present on the substrate they must be mechanically removed prior to the installation of the flooring material.
C. When using adhesives, perform subfloor moisture testing in accordance with ASTM F 1869,"Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride" and Bond Tests as required by flooring manufacture to determine if surfaces are dry; free of curing and hardening compounds, old adhesive, and other coatings; and ready to receive flooring. Internal relative humidity of the concrete shall not exceed 90%. On installations where both the Percent Relative Humidity

and the Moisture Vapor Emission Rate tests are conducted, results for both tests shall comply with the allowable limits listed above. Do not proceed with flooring installation until results of moisture tests are acceptable. All test results shall be documented and retained

D. Concrete pH Testing: Perform pH tests on concrete floors regardless of their age or grade level. All test results shall be documented and retained.
E. Where existing bases are being removed, it is assumed that painting will occur. Install base after painting.

3.4 INSTALLATION OF FLOORING

A. Install flooring in strict accordance with the latest edition of manufactures recommended installation guide.
B. Install flooring wall to wall before the installation of floor-set cabinets, casework, furniture, equipment, movable partitions, etc. Extend flooring into toe spaces, door recesses, closets, and similar openings as shown on the drawings.
C. If required, install flooring on pan-type floor access covers. Maintain continuity of color and pattern within pieces of flooring installed on these covers. Adhere flooring to the subfloor around covers and to covers.
D. Scribe, cut, and fit to permanent fixtures, columns, walls, partitions, pipes, outlets, and built-in furniture and cabinets.
E. Roll with a 100-pound (45.36 kilogram) roller in the field areas. Refer to specific rolling instructions of the flooring manufacturer
F. Install flooring with adhesives, tools, and procedures in strict accordance with the manufacturer's written instructions. Observe the recommended adhesive trowel notching, open times, and working times.

3.5 INSTALLATION OF ACCESSORIES

A. Apply top set wall base to walls, columns, casework, and other permanent fixtures in areas where top-set base is required. Install base in lengths as long as practical, with inside corners fabricated from base materials that are mitered or coped. Tightly bond base to vertical substrate with continuous contact at horizontal and vertical surfaces.
B. Fill voids with plastic filler along the top edge of the resilient wall base or integral cove cap on masonry surfaces or other similar irregular substrates.
C. Place edge strips tightly butted to flooring, and secure with adhesive recommended by the edge strip manufacturer. Install edge strips at edges of flooring that would otherwise be exposed.

3.6 CLEANING

A. Perform initial and on-going maintenance according to manufacturer’s recommendations.

3.7 PROTECTION

A. Protect installed flooring as recommended by the flooring manufacturer against damage from rolling loads, other trades, or the placement of fixtures and furnishings.

END OF SECTION

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 surface preparation and the application of paint systems on the following exterior substrates:

1. Concrete.
2. Concrete masonry units (CMUs).
3. Steel and iron.
4. Galvanized metal.
5. Gypsum board.

B. Related Requirements:

1. Section 051200 "Structural Steel Framing" for shop priming of metal substrates.
2. Section 055000 "Metal Fabrications" for shop priming metal fabrications.
3. Section 055116 "Metal Floor Plate Stairs" for shop priming metal floor plate stairs.
4. Section 055119 "Metal Grating Stairs" for shop priming metal grating stairs.
5. Section 055213 "Pipe and Tube Railings" for shop priming pipe and tube railings.
6. Section 099300 "Staining and Transparent Finishing" for surface preparation and the application of wood stains and transparent finishes on exterior wood substrates.
7. Section 099600 "High-Performance Coatings" for tile-like coatings.

1.3 DEFINITIONS

A. MPI Gloss Level 1: Not more than five units at 60 degrees and 10 units at 85 degrees, in accordance with ASTM D523.

B. MPI Gloss Level 3: 10 to 25 units at 60 degrees and 10 to 35 units at 85 degrees, in accordance with ASTM D523.

C. MPI Gloss Level 4: 20 to 35 units at 60 degrees and not less than 35 units at 85 degrees, in accordance with ASTM D523.

D. MPI Gloss Level 5: 35 to 70 units at 60 degrees, in accordance with ASTM D523.

E. MPI Gloss Level 6: 70 to 85 units at 60 degrees, in accordance with ASTM D523.

F. MPI Gloss Level 7: More than 85 units at 60 degrees, in accordance with ASTM D523.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F.

1. Maintain containers in clean condition, free of foreign materials and residue.
2. Remove rags and waste from storage areas daily.

1.5 FIELD CONDITIONS

A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F.

B. Do not apply paints in snow, rain, fog, or mist; when relative humidity exceeds 85 percent; at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design Product: Subject to compliance with requirements, provide Sherwin-Williams; products as designated in the Finish Schedule or comparable product by one of the following:

1. Behr Process Corporation.
2. Benjamin Moore Company.
3. PPG Paints

B. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to products listed in the Finish Schedule for the paint category indicated.

2.2 PAINT, GENERAL

A. Material Compatibility:

1. Materials for use within each paint system shall be compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
2. For each coat in a paint system, products shall be recommended in writing by topcoat manufacturers for use in paint system and on substrate indicated.

B. Colors: As selected by Architect from manufacturer's full range.

2.3 SOURCE QUALITY CONTROL

A. Testing of Paint Materials: Owner reserves the right to invoke the following procedure:

1. Owner will engage the services of a qualified testing agency to sample paint materials. Contractor will be notified in advance and may be present when samples are taken. If

paint materials have already been delivered to Project site, samples may be taken at Project site. Samples will be identified, sealed, and certified by testing agency.

2. Testing agency will perform tests for compliance with product requirements.
3. Owner may direct Contractor to stop applying paints if test results show materials being used do not comply with product requirements. Contractor shall remove noncomplying paint materials from Project site, pay for testing, and repaint surfaces painted with rejected materials. Contractor will be required to remove rejected materials from previously painted surfaces if, on repainting with complying materials, the two paints are incompatible.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:

1. Concrete: 12 percent.
2. Masonry (Clay and CMUs): 12 percent.
3. Gypsum Board: 12 percent.

C. Exterior Gypsum Board Substrates: Verify that finishing compound is sanded smooth.

D. Verify suitability of substrates, including surface conditions and compatibility, with existing finishes and primers.

E. Proceed with coating application only after unsatisfactory conditions have been corrected.

1. Application of coating indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates and paint systems indicated.

B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.

1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection.

C. Clean substrates of substances that could impair bond of paints, including dust, dirt, oil, grease, and incompatible paints and encapsulants.

1. Remove incompatible primers and re-prime substrate with compatible primers or apply tie coat as required to produce paint systems indicated.

D. Concrete Substrates: Remove release agents, curing compounds, efflorescence, and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces to be painted exceeds that permitted in manufacturer's written instructions.

E. Masonry Substrates: Remove efflorescence and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces or mortar joints exceeds that permitted in manufacturer's written instructions.

F. Steel Substrates: Remove rust, loose mill scale, and shop primer if any. Clean using methods recommended in writing by paint manufacturer.

G. Shop-Primed Steel Substrates: Clean field welds, bolted connections, and areas where shop paint is abraded. Paint exposed areas with the same material as used for shop priming to comply with SSPC-PA 1 for touching up shop-primed surfaces.

H. Galvanized-Metal Substrates: Remove grease and oil residue from galvanized sheet metal by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints.

3.3 APPLICATION

A. Apply paints in accordance with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual."

1. Use applicators and techniques suited for paint and substrate indicated.
2. Paint surfaces behind movable items same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed items with prime coat only.
3. Paint both sides and edges of exterior doors and entire exposed surface of exterior door frames.
4. Paint entire exposed surface of window frames and sashes.
5. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
6. Primers specified in painting schedules may be omitted on items that are factory primed or factory finished if acceptable to topcoat manufacturers.

B. Tint undercoats same color as topcoat, but tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Provide sufficient difference in shade of undercoats to distinguish each separate coat.

C. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.

D. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.

E. Painting Fire Suppression, Plumbing, HVAC, Electrical, Communication, and Electronic Safety and Security Work:

1. Paint the following work where exposed to view:
    a. Equipment, including panelboards.
    b. Uninsulated metal piping.
    c. Pipe hangers and supports.
    d. Metal conduit.

3.4 CLEANING AND PROTECTION

A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.

B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.

C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.

D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.5 EXTERIOR PAINTING SCHEDULE

A. Concrete Substrates, Nontraffic Surfaces:

1. Latex System:
   a. Prime Coat: Latex, exterior.
      1) Sherwin-Williams: Loxon Concrete and Masonry Primer, A24 Series (5.3 – 8.0 mil wet, 2.1-3.2 mil dry)
   b. Intermediate Coat: Latex, exterior, matching topcoat.
   c. Topcoat: Latex, exterior, low sheen (MPI Gloss Level 3-4).
      1) Sherwin-Williams: A-100 Exterior Acrylic Latex Satin, A82 Series

B. Concrete Substrates, Traffic Surfaces:

1. Latex Floor Paint System:
   a. Prime Coat: Floor paint, latex, matching topcoat.
      1) Sherwin-Williams: ArmorSeal Tread-Plex , Semi Gloss, B90 Series
   b. Topcoat: Floor paint, latex, low gloss (maximum MPI Gloss Level 3).
      1) Sherwin-Williams: ArmorSeal Tread-Plex , Semi Gloss, B90 Series

C. CMU Substrates:

1. Latex System:

   a. Prime Coat: Block filler, latex, interior/exterior.
      1) Sherwin-Williams: PrepRite Block Filler, B25 Series (16 mil wet, 7.7 mil dry)
   b. Intermediate Coat: Latex, exterior, matching topcoat.
   c. Topcoat: Latex, exterior, low sheen (MPI Gloss Level 3-4).
      1) Sherwin-Williams: A-100 Exterior Acrylic Latex Satin, A82 Series

D. Steel and Iron Substrates:

1. Water-Based Light Industrial Coating System:
   a. Prime Coat: Primer, rust inhibitive, metal.
      1) Sherwin-Williams: Pro Industrial Pro Cryl Universal Primer, B66 Series (5-10 mil wet, 1.8-3.6 mil dry)
   b. Intermediate Coat: Light industrial coating, exterior, water based, matching topcoat.
   c. Topcoat: Light industrial coating, exterior, water based (MPI Gloss Level 3).

1) Sherwin-Williams: Pro Industrial Acrylic Eg-Shel, B66 Series (6-12 mil wet, 2.1-4.2 mil dry).

E. Galvanized-Metal Substrates:

1. Water-Based Light Industrial Coating System:
   a. Prime Coat: Primer, galvanized, cementitious.
      1) Sherwin-Williams: Pro Industrial Pro Cryl Universal Primer, B66 Series (5-10 mil wet, 1.8-3.6 mil dry)
   b. Intermediate Coat: Light industrial coating, exterior, water based, matching topcoat.
   c. Topcoat: Light industrial coating, exterior, water based (MPI Gloss Level 3).
      1) Sherwin-Williams: Pro Industrial Acrylic Eg-Shel, B66 Series (6-12 mil wet, 2.1-4.2 mil dry).

END OF SECTION

SECTION 099123 - INTERIOR PAINTING

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 surface preparation and the application of paint systems on the following interior substrates:

1. Concrete.
2. Clay masonry.
3. Concrete masonry units (CMUs).
4. Steel and iron.
5. Galvanized metal.
6. Gypsum board.

B. Related Requirements:

1. Section 051200 "Structural Steel Framing" for shop priming structural steel.
2. Section 055000 "Metal Fabrications" for shop priming metal fabrications.

1.3 DEFINITIONS

A. MPI Gloss Level 1: Not more than five units at 60 degrees and 10 units at 85 degrees, in accordance with ASTM D523.

B. MPI Gloss Level 2: Not more than 10 units at 60 degrees and 10 to 35 units at 85 degrees, in accordance with ASTM D523.

C. MPI Gloss Level 3: 10 to 25 units at 60 degrees and 10 to 35 units at 85 degrees, in accordance with ASTM D523.

D. MPI Gloss Level 4: 20 to 35 units at 60 degrees and not less than 35 units at 85 degrees, in accordance with ASTM D523.

E. MPI Gloss Level 5: 35 to 70 units at 60 degrees, in accordance with ASTM D523.

F. MPI Gloss Level 6: 70 to 85 units at 60 degrees, in accordance with ASTM D523.

G. MPI Gloss Level 7: More than 85 units at 60 degrees, in accordance with ASTM D523.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product. Include preparation requirements and application instructions.

1. Include Printout of current "MPI Approved Products List" for each product category specified, with the proposed product highlighted.
2. Indicate VOC content.

B. Samples for Initial Selection: For each type of topcoat product.

C. Product List: Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules. Include color designations.

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. Paint: 5 percent, but not less than 1 gal. of each material and color applied.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F.

1. Maintain containers in clean condition, free of foreign materials and residue.
2. Remove rags and waste from storage areas daily.

1.7 FIELD CONDITIONS

A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F.

B. Do not apply paints when relative humidity exceeds 85 percent; at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design Product: Subject to compliance with requirements, provide Sherwin-Williams products as designated in the Finish Schedule or comparable products by one of the following:

1. Behr Process Corporation.
2. Benjamin Moore Company.
3. PPG Paints

B. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to products listed in the Finish Schedule for the paint category indicated.

2.2 PAINT, GENERAL

A. Material Compatibility:

1. Materials for use within each paint system shall be compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
2. For each coat in a paint system, products shall be recommended in writing by topcoat manufacturers for use in paint system and on substrate indicated.

B. Colors: As selected by Architect from manufacturer's full range.

2.3 SOURCE QUALITY CONTROL

A. Testing of Paint Materials: Owner reserves the right to invoke the following procedure:

1. Owner will engage the services of a qualified testing agency to sample paint materials. Contractor will be notified in advance and may be present when samples are taken. If paint materials have already been delivered to Project site, samples may be taken at Project site. Samples will be identified, sealed, and certified by testing agency.
2. Testing agency will perform tests for compliance with product requirements.
3. Owner may direct Contractor to stop applying paints if test results show materials being used do not comply with product requirements. Contractor shall remove noncomplying paint materials from Project site, pay for testing, and repaint surfaces painted with rejected materials. Contractor will be required to remove rejected materials from previously painted surfaces if, on repainting with complying materials, the two paints are incompatible.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:

1. Concrete: 12 percent.
2. Masonry (Clay and CMUs): 12 percent.
3. Gypsum Board: 12 percent.

C. Gypsum Board Substrates: Verify that finishing compound is sanded smooth.

D. Verify suitability of substrates, including surface conditions and compatibility, with existing finishes and primers.

E. Proceed with coating application only after unsatisfactory conditions have been corrected.

1. Application of coating indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates and paint systems indicated.

B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.

1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.

C. Clean substrates of substances that could impair bond of paints, including dust, dirt, oil, grease, and incompatible paints and encapsulants.

1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce paint systems indicated.

D. Concrete Substrates: Remove release agents, curing compounds, efflorescence, and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces to be painted exceeds that permitted in manufacturer's written instructions.

E. Masonry Substrates: Remove efflorescence and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces or mortar joints exceeds that permitted in manufacturer's written instructions.

F. Steel Substrates: Remove rust, loose mill scale, and shop primer, if any. Clean using methods recommended in writing by paint manufacturer.

G. Shop-Primed Steel Substrates: Clean field welds, bolted connections, and areas where shop paint is abraded. Paint exposed areas with the same material as used for shop priming to comply with SSPC-PA 1 for touching up shop-primed surfaces.

H. Galvanized-Metal Substrates: Remove grease and oil residue from galvanized sheet metal by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints.

3.3 APPLICATION

A. Apply paints in accordance with manufacturer's written instructions and to recommendations in "MPI Manual."

1. Use applicators and techniques suited for paint and substrate indicated.
2. Paint surfaces behind movable equipment and furniture same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
3. Paint front and backsides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.
4. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
5. Primers specified in painting schedule may be omitted on items that are factory primed or factory finished if acceptable to topcoat manufacturers.

B. Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Tint undercoats to match color of topcoat, but provide sufficient difference in shade of undercoats to distinguish each separate coat.

C. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.

D. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.

E. Painting Fire Suppression, Plumbing, HVAC, Electrical, Communication, and Electronic Safety and Security Work:

1. Paint the following work where exposed in equipment rooms:
   a. Equipment, including panelboards.
   b. Uninsulated metal piping.
   c. Pipe hangers and supports.
   d. Metal conduit.

2. Paint the following work where exposed in occupied spaces:
   a. Equipment, including panelboards.
   b. Uninsulated metal piping.
   c. Pipe hangers and supports.
   d. Metal conduit.

3. Paint portions of internal surfaces of metal ducts, without liner, behind air inlets and outlets that are visible from occupied spaces.

3.4 FIELD QUALITY CONTROL

A. Dry Film Thickness Testing: Owner may engage the services of a qualified testing and inspecting agency to inspect and test paint for dry film thickness.

1. Contractor shall touch up and restore painted surfaces damaged by testing.
2. If test results show that dry film thickness of applied paint does not comply with paint manufacturer's written instructions, Contractor shall pay for testing and apply additional coats as needed to provide dry film thickness that complies with paint manufacturer's written instructions.

3.5 CLEANING AND PROTECTION

A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.

B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.

C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.

D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.6 INTERIOR PAINTING SCHEDULE

A. Concrete Substrates, Nontraffic Surfaces:

1. Latex System:
   a. Prime Coat: Latex, interior, matching topcoat.
      1) Sherwin-Williams: Loxon Concrete and Masonry Primer, A24 Series (5.3 – 8.0 mil wet, 2.1-3.2 mil dry)
   b. Intermediate Coat: Latex, interior, matching topcoat.
   c. Topcoat: Latex, interior (MPI Gloss Level 2).
      1) Sherwin-Williams: ProMar 200 Zero VOC Interior Latex Eg-shel, B20 Series (4 mil wet, 1.7 mil dry)

2. High-Performance Architectural Latex System:

   a. Prime Coat: Primer, alkali resistant, water based.
      1) Sherwin-Williams: Loxon Concrete and Masonry Primer, A24 Series (5.3 – 8.0 mil wet, 2.1-3.2 mil dry)
   b. Intermediate Coat: Latex, interior, high performance architectural, matching topcoat.
   c. Topcoat: Latex, interior, high performance architectural (MPI Gloss Level 2).
      1) Sherwin-Williams: Pro Industrial Pre Catalyzed Waterbased Epoxy Eg-shel, K45 Series

B. CMU Substrates:

1. Latex System:

   a. Block Filler: Block filler, latex, interior/exterior.
      1) Sherwin-Williams: PrepRite Block Filler, B25 Series (16 mil wet, 7.7 mil dry)
   b. Intermediate Coat: Latex, interior, matching topcoat.
   c. Topcoat: Latex, interior (MPI Gloss Level 2).
      1) Sherwin-Williams: ProMar 200 Zero VOC Interior Latex Eg-shel, B20 Series (4 mil wet, 1.7 mil dry)

2. High-Performance Architectural Latex System:

   a. Prime Coat: Primer, alkali resistant, water based.
      1) Sherwin-Williams: PrepRite Block Filler, B25 Series (16 mil wet, 7.7 mil dry)
   b. Intermediate Coat: Latex, interior, high performance architectural, matching topcoat.
   c. Topcoat: Latex, interior, high performance architectural (MPI Gloss Level 2).
      1) Sherwin-Williams: Pro Industrial Pre Catalyzed Waterbased Epoxy Eg-shel, K45 Series

C. Steel Substrates:

1. Latex over Shop-Applied Quick-Drying Shop Primer System:

   a. Prime Coat: Primer, rust inhibitive, metal.
      1) Sherwin-Williams: Pro Industrial Pro Cryl Universal Primer, B66 Series (5-10 mil wet, 1.8-3.6 mil dry)

b. Intermediate Coat: Latex, interior, matching topcoat.
c. Topcoat: Latex, interior (MPI Gloss Level 2).
1) Sherwin-Williams: Pro Industrial Acrylic Eg-Shel, B66 Series (6-12 mil wet, 2.1-4.2 mil dry)

2. Acrylic Dry-Fall System:
a. Prime Coat: Primer, quick dry.
1) Sherwin-Williams: Waterborne Acrylic Dryfall, B42 Series (6-9 mil wet, 1.5-2.3 mil dry)
b. Topcoat: Dry fall, flat.
1) Sherwin-Williams: Waterborne Acrylic Dryfall, B42 Series (6-9 mil wet, 1.5-2.3 mil dry)

D. Galvanized-Metal Substrates:

1. Latex System:
a. Prime Coat: Primer, galvanized, cementitious.
1) Sherwin-Williams: Pro Industrial Pro Cryl Universal Primer, B66 Series (5-10 mil wet, 1.8-3.6 mil dry)
b. Intermediate Coat: Latex, interior, matching topcoat.
c. Topcoat: Latex, interior (MPI Gloss Level 2).
1) Sherwin-Williams: Pro Industrial Acrylic Eg-Shel, B66 Series (6-12 mil wet, 2.1-4.2 mil dry)

E. Gypsum Board Substrates:

1. Latex over Latex Sealer System:
a. Prime Coat: Primer sealer, latex, interior.
1) Sherwin-Williams: ProMar 200 Zero VOC Interior Latex Primer, B28 Series (4 mil wet, 1.0 mil dry)
b. Intermediate Coat: Latex, interior, matching topcoat.
c. Topcoat: Latex, interior (MPI Gloss Level 2).
1) Sherwin-Williams: ProMar 200 Zero VOC Interior Latex Eg-shel, B20 Series (4 mil wet, 1.7 mil dry)

END OF SECTION

SECTION 101100 - VISUAL DISPLAY UNITS

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

A. Section Includes:

1. Porcelain Enamel Steel Markerboards
2. Tack boards and strips

1.2 REFERENCED STANDARDS

A. American Society for Testing Materials

1. ASTM B221Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wires, Profiles and Tubes.
2. ANSI Z97.1 Safety Glazing Materials Used in Buildings – Safety Performance Specifications and Methods of Test
3. ASTM E84 Standard Test Method for Surface Burning Characteristics for Building Materials
4. ASTM B221 Standard Specification for Aluminum and Aluminum Alloy Extruded Bars, Rods, Wires, Profiles and Tubes

B. Porcelain Enamel Institute

1. PEI-1002 Manual and Performance Specifications for Porcelain Enamel Writing Surfaces

1.3 SUBMITTALS

A. Shop Drawings: Provide shop drawings for each visual display board required.

B. Product Data: Provide technical data for materials specified. Include Material Safety Data Sheets, when applicable.

C. Samples and color charts: Provide Manufacturer's color charts and composition samples of face, core, backing and trim to illustrate finish, color and texture, where required.

D. Manufacturer’s Instructions: Provide Manufacturer’s installation and cleaning instructions.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications:

1. Manufacturer shall be a firm engaged in the manufacture of visual display boards in the United States.
2. Manufacturer shall have a minimum of 5 years’ experience in the manufacture of visual display boards.

B. Regulatory Requirements: Conforms to applicable code for flame/smoke rating in tackboards in accordance with ASTM E84.

C. Operation and Maintenance: Include data on regular cleaning, stain removal, and precautions.

1.5 PROJECT CONDITIONS

A. Field measure prior to preparation of shop drawings and fabrication to ensure proper fit.

B. Comply with manufacturer’s recommendations for acclimatizing area for interior moisture and temperature to approximate normal occupied conditions.

1.6 DELIVERY, STORAGE AND HANDLING

A. Schedule delivery of visual display boards with spaces sufficiently complete so that visual display boards can be installed upon delivery.

B. Store products in manufacturer’s unopened packaging until ready for installation.

C. Store materials protected from exposure to harmful weather conditions and at temperatures and humidity conditions recommended by manufacturer.

1.7 WARRANTY

A. Submit a “Life of the Building” warranty, stating that under normal usage and maintenance, and when installed in accordance with manufacturer’s instructions and recommendations, porcelain enamel steel markerboard writing surfaces are guaranteed for the Life of the Building. Guarantee covers replacement of defective boards but does not include cost of removal or reinstallation.

B. Submit a standard warranty, stating that when installed in accordance with manufacturer’s instructions and recommendations, tackboards are guaranteed for one year against defects in materials and workmanship. Guarantee does not cover normal wear and tear, improper handling, any misuse, or any defects caused by vandalism or subsequent abuse. Guarantee covers replacement of defective material but does not include cost of removal or reinstallation.

C. Submit a standard warranty, stating that under normal usage and maintenance, and when installed in accordance with manufacturer's instructions and recommendations, Manufacturer glass marker wall writing surfaces are guaranteed for 10 years. Guarantee covers replacement of defective boards but does not include cost of removal or reinstallation.

D. Writing Surface Warranty Period: 10 years commencing on Date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Claridge Products and Equipment, Inc.
B. Koraseal
C. Magnatag Visible Systems
D. PolyVision Corporation

2.2 MATERIALS

A. Fixed Markerboard Panel Make-Up (Claridge Evolve is basis of design)

1. Face Sheet: LCS3 porcelain enamel steel Markerboard
2. Core Material: 7/16” Medium Density Fiberboard
3. Backing: Moisture Barrier Back
4. Size: Refer to drawings
5. Color: LCS3 No. 100 Low Gloss
6. Snap-in Accessory Tray, approx. 2” wide, furnished with each fixed markerboard
7. Claridge Extruded Aluminum Trim and Adhesive

2.3 TACKBOARDS

A. Materials for Tackboards (Claridge Evolve is basis of design)

1. Claridge Cork: Composed of 1/4” thick self-healing, burlap backed cork laminated to a 1/4" hardboard backing.
2. Fabrics: Select from pre-approved Guilford, Carnegie and Maharam fabrics.
3. Tack Surface: Fabric
4. Size: Refer to drawings.
5. Color: from manufacturer’s standard colors.
6. Trim: To match marker and chalk boards.

2.4 FABRICATION

A. Shop assembly: Specify factory assembled.

PART 3 - EXECUTION

3.1 PROJECT CONDITIONS

A. Verify before installation that interior moisture and temperature approximate normal occupied conditions.

B. Verify that wall surfaces are prepared and ready to receive panels.

3.2 INSTALLATION

A. Deliver factory built units completely assembled and of dimensions shown in details and in accordance with manufacturers shop drawings as approved by the architect.

B. Deliver in accordance with manufacturer’s shop drawings as approved by the architect.

C. Follow manufacturer’s instructions for storage and handling of units before installation.

D. Do not install on damp walls or in damp and humid weather without heat in the building.

E. Install level and plumb, keeping perimeter trim straight in accordance with manufacturer’s recommendations.

3.3 ADJUST AND CLEAN

A. Verify that all accessories are installed as required for each unit.

B. At completion of work, clean surfaces and trim in accordance with manufacturer's recommendations, leaving all materials ready for use.

END OF SECTION

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.

B. Related Requirements:

1. Section 055000 "Metal Fabrications" for supports that attach to overhead structural system.
2. Section 061000 "Rough Carpentry" for blocking.
3. Section 092216 "Non-Structural Metal Framing" for blocking.
4. Section 102800 "Toilet, Bath, and Laundry Accessories" for accessories mounted on toilet compartments.

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 COMPARTMENTS

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

Basis of Design – **ASI Global Partitions, TT** Texture or equal, Color: TBD, Standard Color Selections.

1. Global Partitions Corp., an ASI Group Company. (basis of design)
2. Accurate Partitions Corp., an ASI Group Company.
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 Floor anchored Overhead braced.

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: Basis of Design – **ASI Global Partitions, Color:TBD, 9509 TT** Texture or equal.
4. Pilaster Shoes and Sleeves (Caps): Manufacturer's standard design; stainless steel.
5. Polymer Color and Pattern: Matching pilaster.

E. Urinal-Screen Post: Manufacturer's standard post design of material matching the thickness and construction of pilasters; with shoe matching that on the pilaster.

F. Brackets (Fittings):

1. Full-Height (Continuous) Type: Manufacturer's standard design; stainless steel.
   a. Polymer Color and Pattern: Matching pilaster.

G. 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

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

A. Bobrick and American Specialties Inc. is used as a quality standard set to be expected on all items of this Section.
B. The following accessories are:

1. Mirrors in toilet rooms:
   a. Frame shall be one piece roll formed 3/4" x 3/4", Type 304 stainless steel channel with satin finish.
   b. Provide concealed wall hangers for theft-proof mounting.
   c. Frame shall be mitered, welded, ground, and polished smooth.

d. Mirrors shall be No. 1 quality, 1/4" polished tempered glass, electrolytically copper plated, or 1/4" polycarbonate or Lexan sheet. Mirrors shall be fabricated of minimum 4 layer coating consisting of silver, copper, and 2 heat-cured protective coats, tested in Accordance with FS-DD-M-411.
e. Mirrors shall be warranted against silver spoilage for a minimum of 10 years. Back of mirrors protected with 1/4" shock absorbing polystyrene padding and 20 gage galvanized steel back.
f. Bobrick B-290 2436.

2. Grab Bars:
   a. Grab bars shall be constructed of type 304 stainless steel with satin and peened non-slip finish. Wall thickness shall be 18-gage and outside diameter of 1-1/2". Stainless steel flanges shall be 11 gage, 3" minimum diameter snap on mounting cover with minimum of 3 concealed stainless steel vandal-proof set screws. Concealed anchor plates shall be 11 gage, minimum, stainless steel.
   b. Bobrick B-6806.99: 18”, 36", and 42” long straight bars.

3. Paper Towel, Toilet Paper, and Soap Dispensers provided by Owner, Installed by Contractor.

END OF SECTION

SECTION 104413 - FIRE PROTECTION CABINETS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Fire-protection cabinets for the following:

a. Portable fire extinguisher.

B. Related Requirements:

1. Section 104416 "Fire Extinguishers" for portable, hand-carried fire extinguishers accommodated by fire-protection cabinets

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Show door hardware, cabinet type, trim style, and panel style. Include roughing-in dimensions and details showing recessed-, semi-recessed-, or surface-mounting method and relationships of box and trim to surrounding construction.

B. Shop Drawings: For fire-protection cabinets.

1. Include plans, elevations, sections, details, and attachments to other work.

1.3 CLOSEOUT SUBMITTALS

A. Maintenance Data: For fire-protection cabinets to include in maintenance manuals.

1.4 COORDINATION

A. Coordinate size of fire-protection cabinets to ensure that type and capacity of fire extinguishers indicated are accommodated.

B. Coordinate sizes and locations of fire-protection cabinets with wall depths.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain fire-protection cabinets, accessories, and fire extinguishers from single source from single manufacturer.

2.2 FIRE-PROTECTION CABINET

A. Cabinet Type: Suitable for fire extinguisher.

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

a. Babcock-Davis.
b. Guardian Fire Equipment, Inc.
c. JL Industries, Inc.; a division of the Activar Construction Products Group.
d. Larsens Manufacturing Company.
e. Nystrom, Inc.

B. Cabinet Construction: Nonrated.

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: Aluminum sheet.

1. Shelf: Same metal and finish as cabinet.

D. Semi-recessed 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: 4-inch backbend depth.

E. Cabinet Trim Material: Aluminum sheet.

F. Door Material: Aluminum sheet.

G. Door Style: Solid opaque panel with frame.

H. Door Hardware: Manufacturer's standard door-operating hardware of proper type for cabinet type, trim style, and door material and style indicated.

1. Provide recessed door pull and friction latch.
2. Provide continuous hinge, of same material and finish as trim,, permitting door to open 180 degrees.

I. 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. 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: Silk-screened.
3) Lettering Color: Red.
4) Orientation: Vertical.

J. Materials:

1. Aluminum: ASTM B221 for extruded shapes and aluminum sheet, with strength and durability characteristics of not less than Alloy 6063-T5 for aluminum sheet.

   a. Finish: Clear anodic.
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.

1. Weld joints and grind smooth.
2. Miter corners and grind smooth.
3. Provide factory-drilled mounting holes.
4. Prepare doors and frames to receive locks.
5. Install door locks at factory.

B. Cabinet Doors: Fabricate doors according to manufacturer's standards, from materials indicated and coordinated with cabinet types and trim styles.

1. Fabricate door frames with tubular stiles and rails and hollow-metal design, minimum 1/2 inch thick.
2. Fabricate door frames of one-piece construction with edges flanged.
3. Miter and weld perimeter door frames and grind smooth.

C. Cabinet Trim: Fabricate cabinet trim in one piece with corners mitered, welded, and ground smooth.

2.4 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM's AMP 500, "Metal Finishes Manual for Architectural and Metal Products," for recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces of fire-protection cabinets from damage by applying a strippable, temporary protective covering before shipping.

C. Finish fire-protection cabinets after assembly.

D. Appearance of Finished Work: Noticeable variations in same piece are unacceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine roughing-in cabinets to verify actual locations of piping connections before cabinet installation.

B. Examine walls and partitions for suitable framing depth and blocking where semirecessed cabinets will be installed.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Prepare recesses for semirecessed fire-protection cabinets as required by type and size of cabinet and trim style.

3.3 INSTALLATION

A. General: Install fire-protection cabinets in locations and at mounting heights indicated or, if not indicated, at heights acceptable to authorities having jurisdiction.

1. Fire-Protection Cabinets: 42 inches above finished floor to top of fire extinguisher.

B. Fire-Protection Cabinets: Fasten cabinets to structure, square and plumb.

1. Unless otherwise indicated, provide recessed fire-protection cabinets. If wall thickness is inadequate for recessed cabinets, provide semirecessed fire-protection cabinets.
2. Provide inside latch and lock for break-glass panels.
3. Fasten mounting brackets to inside surface of fire-protection cabinets, square and plumb.

C. Identification:

1. Apply vinyl lettering at locations indicated.
2. Apply vinyl lettering on field-painted fire-protection cabinets after painting is complete.

3.4 ADJUSTING AND CLEANING

A. Remove temporary protective coverings and strippable films, if any, as fire-protection cabinets are installed unless otherwise indicated in manufacturer's written installation instructions.

B. Adjust fire-protection cabinet doors to operate easily without binding. Verify that integral locking devices operate properly.

C. On completion of fire-protection cabinet installation, clean interior and exterior surfaces as recommended by manufacturer.

D. Touch up marred finishes, or replace fire-protection cabinets that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by fire-protection cabinet and mounting bracket manufacturers.

E. Replace fire-protection cabinets that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION

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.

1.3 ACTION 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.

B. Product Schedule: For fire extinguishers. Coordinate final fire-extinguisher schedule with fire-protection cabinet schedule to ensure proper fit and function. Use same designations indicated on Drawings.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For fire extinguishers to include in maintenance manuals.

1.5 COORDINATION

A. Coordinate type and capacity of fire extinguishers with fire-protection cabinets to ensure fit and function.

1.6 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: Type, size, and capacity for each fire-protection cabinet indicated.

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, fire-protection cabinets, 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.

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

SECTION 105113
METAL LOCKERS

PART 1 - GENERAL

1.1 SCOPE:

A. Furnish and install new steel lockers, accessories and finish metal trim as shown or indicated on approved drawings.

B. Concrete or masonry bases, wood furring, blocking or trim as may be required by drawings are included in other sections of this specification.

1.2 SUBMITTALS:

A. Shop Drawings: Submit drawings showing locker types, sizes and quantities, including all necessary details relating to anchoring, trim installation and relationship to adjacent surfaces. Numbering:

B. The locker numbering sequence shall be provided by the approving authority and noted on approved drawings returned to the locker contractor.

C. Color Charts: Provide color charts showing manufacturer's available colors.

D. Lock Combination Listings and Master Keys: Use only when combination locks are specified. Delivered directly to the owner's representative.

1.3 QUALITY ASSURANCE:

A. Provide each type of metal locker as produced by a single manufacturer, including necessary accessories, fittings and fasteners.

1.4 JOB CONDITIONS:

A. Do not deliver metal lockers until building is enclosed and ready for locker installation. Protect from damage during delivery, handling, storage and installation.

PART 2 - PRODUCTS

2.1 MANUFACTURER:

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

1. Republic Storage Products, basis of design.
2. Lyon Workspace Products, LLC.
3. Penco Products, Inc.

2.2 MATERIAL:

A. Specified locker components shall be manufactured from Galvannealed steel and finished by the manufacturer’s standard process.

2.3 FINISH:

A. The surfaces of the steel to be thoroughly cleaned, phosphatized and prepared for baked enamel or powder coat finish in accordance with paint manufacturer's instructions.

2.4 CONSTRUCTION:

A. Lockers shall be built on the unit principle, each locker shall have an individual door and frame, an individual top, bottom, back and shelves with common intermediate uprights separating units.

B. Lockers shall be pre-assembled of welded construction conforming to job requirements. All welds shall be smooth and without burrs. No nuts, bolts, or rivets shall be allowed in assembly of main locker groups. Optional Lock Compartment are not welded into assembly.

C. Frames shall be 16-gauge steel formed into 1" wide face channel shapes with continuous stiffening members on both sides of the locker opening.

D. Channel-shaped, 16 gauge top and bottom cross frame members shall be securely welded to vertical framing members to ensure a square and rigid assembly.

E. Locker body components shall be made of cold rolled steel specially formed for added strength and rigidity and to ensure tight joints at fastening points.

1. 16-gauge side uprights are perforated with diamond shaped openings 3/4" wide by 1 1/2" high for maximum ventilation.

2. Diamond pattern shall be located between the foot locker and the clothes hooks.

3. Solid steel sections shall occur at the locked compartment above the shelf and at the foot locker to provide closed compartments.

4. Locker backs shall be 16-gauge steel with right angle flanges on each vertical side for stiffness, ease of assembly and corner rigidity.

5. Tops, bottoms, shelves and compartment dividers shall be 16 gauge steel, fully flanged on all sides for added stiffness.

6. Shelves shall have an additional return flange on the front edge creating a channel shape to rigidize the impact surface.

7. All locker components are finished in the same color.

2.5 INTERIOR EQUIPMENT:

A. MVP Lockers shall be equipped with one full width shelf located a nominal 12 3/4" down from the top of the locker and having a 13 3/4" nominal depth.

B. The locker shall be equipped with four single-prong clothes hooks, one mounted on each side and two mounted on the locker back.

C. Provide coat rod shall be provided for the full width of the locker.

2.6 LOCKER COMPARTMENT

A. Shall consist of a 16-gauge vertical partition extending from the 13 3/4" deep, full width shelf to the locker top, forming a security box on the left side of the shelf.

B. Channel-shaped, 16-gauge framing members complete the door opening.

C. The locked compartment door shall be 14-gauge steel with right angle flanges on all four sides.

D. The door latch shall be a protruding padlock hasp and a stainless-steel strike plate with an integral handle.

E. The door shall be punched to accept built-in combination or key locks.

F. The door shall also be equipped with two spring-loaded hinges to hold it closed for safety purposes.

2.7 NUMBER PLATES

A. Each locker shall have a polished aluminum number plate with black numerals not less than 1/2" high.

B. Plates may be riveted to the shelf face with two rivets and on the bottom flange of the recessed foot locker front panel if required.

2.8 COLOR:

A. Lockers shall be finished in colors selected from Republic's collection of twenty-five baked enamel colors.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Lockers must be installed in accordance with manufacturer's approved drawings and assembly instructions.

B. Installation shall be level and plumb with flush surfaces and rigid attachment to anchoring surfaces.

C. Space fasteners at 36" O.C. or less as recommended by manufacturer. Use fasteners appropriate to load and anchoring substratum.

D. Use reinforcing plates wherever fasteners could distort metal.

E. Various trim accessories where shown, such as sloping tops, fillers, bases, recess trim, etc., shall be installed using concealed fasteners.

F. Flush, hairline joints are provided at all abutting trim parts and at adjoining surfaces.

3.2 ADJUSTMENT

A. Upon completion of installation, inspect lockers and adjust as necessary for proper door and locking mechanism operation.

END OF SECTION

SECTION 116833.43
TRACK AND FIELD EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes furnishing all labor, materials, tools and equipment necessary to install the Track & Field Equipment, as indicated on the drawings and as specified herein; including components and accessories required for a complete installation, including, but not limited to:
   1. Pole Vault – Vault Box
   2. Long Jump – Take Off Board System

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
   2. Section 321216 – Asphalt Paving
   3. Section 321216.20 – Track Surface and Marking
   4. Section 321313 – Concrete Paving

1.3 SUBMITTALS

A. Manufacturers Product Data
   1. Provide manufacturer's product literature, technical specifications and other data prior to actual field installation work for Engineers review.

B. Shop Drawings
   1. Provide drawings of manufacturers recommended installation and foundation requirements prior to actual field installation work for Engineers review.

1.4 REFERENCES

A. Manufacturers Data and Recommended Installation Requirements

B. U.S. Tennis Court and Track Builders Association

C. National Federation of State High School Associations (NFSHSA)

D. National Collegiate Athletic Association (NCAA)

E. International Amateur Athletic Foundation (I.A.A.F.)

1.5 QUALITY ASSURANCE

A. Manufacturers warranties shall pass to the Owner and certification made that the product materials meet all applicable grade trademarks or conform to industry standards and inspection 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. Manufacturers and product selections named are provided to establish the minimum standard.

B. Source Limitations:
1. Obtain items as complete units, including fittings, accessories, bases, and anchorage devices, from single source from single manufacturer.

C. Track & Field Equipment
1. AAE (Aluminum Athletic Equipment Co.), Basis of Design; 1000 Enterprise Drive, Royersford, PA 19468; Toll Free (800) 523-5471.
2. Gill Athletics, Basis of Design; 601 Mercury Dr, Champaign, IL 61822; Toll Free (800) 637-3090
3. Or approved equal.

2.2 EQUIPMENT

A. Pole Vault – Vault Box; Shall be as manufactured by AAE:
1. Model # SSVB Stainless Steel Vault Box and Stainless Steel Cover product consisting of 13 gauge (.090") formed 304 stainless steel sheet with welded anchor collars, meets NFHS, NCAA and IAAF specifications, unit is to be set in concrete according to manufacturer's specifications. Standard stainless steel cover with hinge fittings and locking mechanism to cover pit.

B. Long Jump – Take Off Board System - Shall be as manufactured by AAE:

1. Model #IT-12 Take Off Board System with Contractor Applied Surface, consisting of a 12” Stainless Steel Tray (Model #12ST), 8” Take-Off Board w/ Synthetic Surface (Model #8TW) and a Nuron Foul Board (Model #4FB-NR).

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions, with installer present, for compliance with requirements for correct and level finished grade, mounting surfaces, installation tolerances, and other conditions affecting performance. Notify the contractor of conditions detrimental to the proper and timely installation and completion of the work.

B. 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.

C. Beginning of installation means acceptance of existing conditions.

3.2 INSTALLATION

A. All athletic equipment shall be installed as indicated on approved submittals as recommended and in strict accordance with manufacturer's written directions and as indicated on the drawings and specified herein.

B. All athletic equipment shall be installed in strict accordance with the latest rules, regulations and specifications governing that sport or event for which it is being installed.

C. Install all equipment level, plumb, true and securely anchored at locations indicated on the drawings. Provide concrete footings in accordance with the manufacture’s requirements or recommendations.

3.3 ADJUSTMENT AND CLEANING

A. After completing installation, inspect components and adjust as necessary.
   1. Core a weep hole in the bottom of the pole vault planting box and the associated concrete slab to facilitate drainage.
   2. Core a weep hole in the bottom of the stainless steel tray assembly and the associated concrete slab to facilitate drainage.

B. Remove spots, dirt and debris.

C. Repair any damaged finishes to match original finish or replace components.

END OF SECTION 116833.43

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SECTION 123623.13 - PLASTIC-LAMINATE-CLAD COUNTERTOPS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Plastic-laminate-clad countertops.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For plastic-laminate-clad countertops.

1. Apply AWI Quality Certification Program label to Shop Drawings.

C. Samples: Plastic laminates in each type, color, pattern, and surface finish required.

1.3 INFORMATIONAL SUBMITTALS

A. Product Certificates: For the following:

1. Composite wood products.
2. High-pressure decorative laminate.
3. Adhesives.

PART 2 - PRODUCTS

2.1 PLASTIC-LAMINATE-CLAD COUNTERTOPS

A. Quality Standard: Unless otherwise indicated, comply with the "Architectural Woodwork Standards" for grades of plastic-laminate-clad countertops indicated for construction, finishes, installation, and other requirements.

1. Provide inspections of fabrication and installation together with labels and certificates from AWI certification program indicating that countertops comply with requirements of grades specified.

B. Grade: Premium.

C. High-Pressure Decorative Laminate: NEMA LD 3, Grade HGS.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Wilsonart LLC. Basis of Design
   b. Formica Corporation.
   c. Lamin-Art, Inc.
   d. Nevamar; a Panolam Industries International, Inc. brand.

e. Pionite; a Panolam Industries International, Inc. brand.

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

1. Refer to Finish Schedule of Construction Documents

E. Edge Treatment: Same as laminate cladding on horizontal surfaces.

F. Core Material: MDF made with exterior glue.

G. Core Material at Sinks: MDF made with exterior glue.

H. Core Thickness: 1-1/8 inch.

1. Build up countertop thickness to 1-1/2 inches at front, back, and ends with additional layers of core material laminated to top.

I. Backer Sheet: Provide plastic-laminate backer sheet, NEMA LD 3, Grade BKL, on underside of countertop substrate.

J. Paper Backing: Provide paper backing on underside of countertop substrate.

2.2 WOOD MATERIALS

A. Wood Products: Provide materials that comply with requirements of referenced quality standard 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 countertop and quality grade specified unless otherwise indicated.

1. Particleboard: ANSI A208.1, Grade M-2-Exterior Glue.

2.3 ACCESSORIES

A. Wire-Management Grommets: Circular, molded-plastic grommets and matching plastic caps with slot for wire passage.

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

a. Doug Mockett & Company, Inc.
2. Outside Diameter: 1-1/4 inch
3. Color: Black
4. Install where indicated on drawings or where indicated in field by Architect or Owner. Provide 2 per classroom.

2.4 FABRICATION

A. Fabricate countertops to dimensions, profiles, and details indicated. Provide front and end overhang of 1 inch over base cabinets. Ease edges to radius indicated for the following:

1. Solid-Wood (Lumber) Members: 1/16 inch unless otherwise indicated.

B. Complete fabrication, including assembly, 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.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Grade: Install countertops to comply with same grade as item to be installed.

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

1. Provide cutouts for appliances, plumbing fixtures, 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.
2. Seal edges of cutouts by saturating with varnish.

C. Field Jointing: Where possible, make in the same manner as shop jointing, using dowels, splines, adhesives, and fasteners recommended by manufacturer. Prepare edges to be joined in shop so Project-site processing of top and edge surfaces is not required. Locate field joints where shown on Shop Drawings.

1. Secure field joints in countertops with concealed clamping devices located within 6 inches of front and back edges and at intervals not exceeding 24 inches. Tighten according to manufacturer's written instructions to exert a constant, heavy-clamping pressure at joints.

D. Scribe and cut countertops to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.

E. Countertop Installation: Anchor securely by screwing through corner blocks of base cabinets or other supports into underside of countertop.

1. Install countertops level and true in line. Use concealed shims as required to maintain not more than a 1/8-inch-in-96-inches variation from a straight, level plane.
2. Secure backsplashes to walls with adhesive.
3. Seal joints between countertop and backsplash, if any, and joints where countertop and backsplash abut walls with mildew-resistant silicone sealant or another permanently elastic sealing compound recommended by countertop material manufacturer.

F. Protection: Provide Kraft paper or other suitable covering over countertop surfaces, taped to underside of countertop at a minimum of 48 inches o.c. Remove protection at Substantial Completion.

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.

B. Valve numbering scheme.

C. Valve Schedules: For each piping system to include in maintenance manuals.

PART 2 - PRODUCTS

2.1 EQUIPMENT LABELS

A. 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.

B. 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.

C. 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 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 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. 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

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. Sanitary waste piping exposed to freezing conditions.
4. Storm-water piping exposed to freezing conditions.
5. Roof drains and rainwater leaders.
6. 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.

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. Products that come into contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested in accordance with ASTM C871.

D. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable in accordance with ASTM C795.

E. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.

F. 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.

G. 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. Preformed Pipe Insulation: Type I, Grade A, with factory-applied ASJ-SSL.
3. 850 deg F.
4. Factory fabricate shapes in accordance with ASTM C450 and ASTM C585.
5. 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.

B. Expanded or Exfoliated Vermiculite Insulating Cement: Comply with ASTM C196.

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

a. Ramco Insulation, Inc.

C. Mineral-Fiber, Hydraulic-Setting Insulating and Finishing Cement: Comply with ASTM C449.

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 LAGGING ADHESIVES

A. Adhesives shall comply with MIL-A-3316C, Class I, Grade A, and shall be compatible with insulation materials, jackets, and substrates.

2.6 SEALANTS

A. Materials shall be as recommended by the insulation manufacturer and shall be compatible with insulation materials, jackets, and substrates.

2.7 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.

2.8 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.

2.9 TAPES

A. ASJ Tape: White 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 Industrial Adhesives and Tapes Division.
    b. Avery Dennison Corporation, Specialty Tapes Division.

c. Ideal Tape Co., Inc., an American Biltrite Company.
d. Knauf Insulation.

2. Width: 3 inches.
3. Thickness: 11.5 mils.
4. Adhesion: 90 ounces force/inch in width.
5. Elongation: 2 percent.
6. Tensile Strength: 40 lbf/inch in width.
7. ASJ Tape Disks and Squares: Precut disks or squares of ASJ tape.

B. 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 Industrial Adhesives and Tapes Division.
b. Avery Dennison Corporation, Specialty Tapes Division.
c. Ideal Tape Co., Inc., 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.

C. PVC Tape: White vapor-retarder tape matching field-applied PVC jacket with acrylic adhesive; suitable for indoor and outdoor applications.

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

a. 3M Industrial Adhesives and Tapes Division.
b. Ideal Tape Co., Inc., an American Biltrite Company.

2. Width: 2 inches.
3. Thickness: 6 mils.
4. Adhesion: 64 ounces force/inch in width.
5. Elongation: 500 percent.
6. Tensile Strength: 18 lbf/inch in width.

D. Aluminum-Foil Tape: Vapor-retarder tape with acrylic adhesive.

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

a. 3M Industrial Adhesives and Tapes Division.
b. Avery Dennison Corporation, Specialty Tapes Division.
c. Ideal Tape Co., Inc., an American Biltrite Company.
d. Knauf Insulation.

2. Width: 2 inches.
3. Thickness: 3.7 mils.

4. Adhesion: 100 ounces force/inch in width.
5. Elongation: 5 percent.
6. Tensile Strength: 34 lbf/inch in width.

2.10 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.

2.11 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.

2. NPS 1-1/4 and Larger: Insulation shall be the following:

   a. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1 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.

2. NPS 1-1/2 and Larger: Insulation shall be the following:

   a. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1-1/2 inches 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.

E. Exposed Sanitary Drains, Domestic Water, Domestic Hot Water, and Stops for Plumbing Fixtures for People with Disabilities:

1. See “Protective Shielding Pipe Cover” Article above.

F. Floor Drains, Traps, and Sanitary Drain Piping within 10 Feet of Drain Receiving Condensate and Equipment Drain Water below 60 Deg F:

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.

3.12 INDOOR, FIELD-APPLIED JACKET SCHEDULE

A. Install jacket over insulation material. For insulation with factory-applied jacket, install the field-applied jacket over the factory-applied jacket.

B. Piping, Exposed:

1. None.
2. PVC: 20 mils 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. PP-R pipe and fittings.
3. Piping joining materials.
4. Transition fittings.
5. Dielectric fittings.

1.3 ACTION SUBMITTALS

A. Product Data:

1. Pipe and tube.
2. Fittings.
3. Joining materials.
4. Transition fittings.

1.4 WARRANTY

A. Polypropylene Piping (PP-R) Manufacturer's Warranty: Manufacturer agrees to repair or replace PP-R pipe and fittings that fail in materials or workmanship within 10 years from date of Substantial Completion.

1. Warranty is to cover labor and material costs of repairing and/or replacing defective materials and repairing any incidental damage caused by failure of the piping system due to defects in materials or manufacturing.
2. Warranty is to be in effect only upon submission by the Contractor to the manufacturer of valid pressure/leak documentation indicating that the system was tested and passed the manufacturer's pressure/leak test.

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 K and L.

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. 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 POLYPROPYLENE (PP-R) PIPE AND FITTINGS

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

1. Aquatherm.
2. IPEX USA LLC.

B. Polypropylene Pipe: ASTM F2389, pipe pressure rating to comply with temperature and pressure ratings of code requirements for the applicable service.

1. Polypropylene Fittings: ASTM F2389, socket fusion, butt fusion, electrofusion, or fusion outlet fittings to be used for fusion-welded joints between pipe and fittings.
2. Mechanical fittings and transition fittings to be used where transitions are made to other piping materials or to valves and appurtenances.
3. Polypropylene pipe is to be unthreaded. Threaded transition fittings per ASTM F2389 to be used where a threaded connection is required.

C. Smoke and Fire Ratings:

1. Where indicated on the Drawings that a plenum-rated piping system is required, the pipe is to be wrapped and/or insulated with fiberglass or mineral wool pipe insulation, and field installed.
2. The system is to have a flame spread classification of less than 25 and smoke development rating of less than 50.
3. Pipe, wrap, or insulation as a system to meet the requirements of CAN/ULC-S102.2-03, ASTM E84, or UL 2846.
4. For insulation required for thermal and condensation reasons, see Section 220719 "Plumbing Piping Insulation."

D. Integration of PP-R Piping Systems with Other Systems:

1. When integrating PP-R piping systems with other systems or with components not made of PP-R (for example, valves, pumps, other piping, check valves, or strainers), ensure the operating parameters for PP-R will not damage other materials in the system or vice versa.
2. Verify that all parts of the system are compatible with the medium being carried before installation. PP-R pipe does not require treatment to protect it from corrosion. Metals (ferrous and non-ferrous) in the system may be susceptible to corrosion. Provide water treatment to protect system metals.
3. Do not mix PP-R pipe with other piping systems in conditions that will cause the other system or components to fail.

E. PP-R Socket Fittings: ASTM F2389.

2.4 PIPING JOINING MATERIALS

A. Solder Filler Metals: ASTM B32, lead-free alloys.

B. Flux: ASTM B813, water flushable.

2.5 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.

B. Fitting-Type Transition Couplings: Manufactured piping coupling or specified piping system fitting.

C. Sleeve-Type Transition Coupling: AWWA C219.

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

a. Cascade Waterworks Mfg. Co.
b. Dresser, Inc.
c. Ford Meter Box Company, Inc. (The)
d. Jay R. Smith Mfg Co; a division of Morris Group International.
e. JCM Industries, Inc.
f. Romac Industries, Inc.
g. Smith-Blair, Inc.
h. Viking Johnson.

D. Plastic-to-Metal Transition Fittings:

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

a. Aquatherm.
b. Charlotte Pipe and Foundry Company.

c. Harvel Plastics, Inc.
d. Sioux Chief Manufacturing Company, Inc.
e. Spears Manufacturing Company.
f. Uponor.

2. Description:

a. PVC one-piece fitting with manufacturer's Schedule 80 equivalent dimensions.
b. One end with threaded brass insert and one solvent-cement-socket or threaded end.

E. Plastic-to-Metal Transition Unions:

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

a. Aquatherm.
b. Colonial Engineering, Inc.
c. NIBCO INC.
d. Spears Manufacturing Company.

2. Description:

a. PVC four-part union.
b. Brass or stainless steel threaded end.
c. Solvent-cement-joint or threaded plastic end.
d. Rubber O-ring.
e. Union nut.

2.6 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.

C. Dielectric Nipples:

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: IAPMO PS 66.
3. Electroplated steel nipple complying with ASTM F1545.
4. Pressure Rating and Temperature: 300 psig at 225 deg F.
5. End Connections: Male threaded or grooved.
6. 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 one of the following:

1. Drawn-temper or annealed-temper copper tube, ASTM B88, Type L.
2. Polypropylene (PP-R), SDR 7.4 pipe and socket fusion, butt fusion, fusion outlet, or electrofusion fittings and joints.
3. Piping shall not contain any joints below slab.

E. Aboveground domestic water piping, NPS 2 and smaller, shall be one of the following:

1. Drawn-temper copper tube, ASTM B88, Type L; 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 EARTHWORK

A. Comply with requirements in Section 312000 "Earth Moving" for excavating, trenching, and backfilling.

3.3 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. Rough-in domestic water piping for water-meter installation according to utility company's requirements.

F. Install piping concealed from view and protected from physical contact by building occupants unless otherwise indicated and except in equipment rooms and service areas.

G. 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.

H. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal, and coordinate with other services occupying that space.

I. Install piping to permit valve servicing.

J. 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.

K. Install piping free of sags and bends.

L. Install fittings for changes in direction and branch connections.

M. Install unions in copper tubing at final connection to each piece of equipment, machine, and specialty.

N. Comply with requirements in Section 220500 “Common Work Results for Plumbing” for the following:

1. Install pressure gauges on suction and discharge piping for each plumbing pump and packaged booster pump.
2. Install thermostats in hot-water circulation piping.
3. Install thermometers on inlet and outlet piping from each water heater.
4. Install sleeves for piping penetrations of walls, ceiling, and floors.
5. Install sleeve seals for piping penetrations of concrete walls and slabs.
6. Install escutcheons for piping penetrations of walls, ceilings, and floors.

3.4 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. 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."

E. 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.

F. Extruded-Tee Connections: Form tee in copper tube according to ASTM F2014. Use tool designed for copper tube; drill pilot hole, form collar for outlet, dimple tube to form seating stop, and braze branch tube into collar.

G. Joints for Dissimilar-Material Piping: Make joints using adapters compatible with materials of both piping systems.

3.5 INSTALLATION OF TRANSITION FITTINGS

A. Install transition couplings at joints of dissimilar piping.

B. Transition Fittings in Underground Domestic Water Piping:

1. Fittings for NPS 1-1/2 and Smaller: Fitting-type coupling.
2. Fittings for NPS 2 and Larger: Sleeve-type coupling.

C. Transition Fittings in Aboveground Domestic Water Piping NPS 2 and Smaller: Plastic-to-metal transition fittings or unions.

3.6 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.

3.7 INSTALLATION OF HANGERS AND SUPPORTS

A. Comply with requirements for hangers, supports, and anchor devices in Section 220500 "Common Work Results for Plumbing Piping and Equipment."

3.8 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.

C. Connect domestic water piping to exterior water-service piping. Use transition fitting to join dissimilar piping materials.

D. Connect domestic water piping to water-service piping with shutoff valve; extend and connect to the following:

1. Domestic Water Booster Pumps: Cold-water suction and discharge piping.
2. Water Heaters: Cold-water inlet and hot-water outlet piping in sizes indicated, but not smaller than sizes of water heater connections.
3. Plumbing Fixtures: Cold- and hot-water-supply piping in sizes indicated, but not smaller than that required by plumbing code.
4. Equipment: Cold- and hot-water-supply piping as indicated, but not smaller than equipment connections. Provide shutoff valve and union for each connection. Use flanges instead of unions for NPS 2-1/2 and larger.

3.9 IDENTIFICATION

A. Identify system components. Comply with requirements for identification materials and installation in Section 220553 "Identification for Plumbing Piping and Equipment."

3.10 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.

3.11 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. Hydrostatic testing and documentation of test results for polypropylene piping to be in accordance with the manufacturer's instructions and submitted to the manufacturer upon successful completion per warranty requirements.
f. Repair leaks and defects with new materials, and retest piping or portion thereof until satisfactory results are obtained.
g. 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.

3.12 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. Backflow preventers.
2. Balancing valves.
3. Temperature-actuated, water mixing valves.
4. Strainers for domestic water piping.
5. Drain valves.
6. Water-hammer arresters.
7. 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 BACKFLOW PREVENTERS

A. Reduced-Pressure-Principle Backflow Preventers:

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

    a. Ames Fire & Waterworks; A WATTS Brand.
    b. Apollo Valves; a part of Aalberts Integrated Piping Systems.
    c. FEBCO; A WATTS Brand.
    d. WATTS.
    e. Zurn Industries, LLC.

2. Standard: ASSE 1013.
3. Operation: Continuous-pressure applications.
4. Size: NPS 2.
5. Design Flow Rate: 50 gpm.
6. Selected Unit Flow Range Limits: 80 gpm max.
7. Pressure Loss at Design Flow Rate: 13 psig
8. Body: Lead free cast silicon copper alloy.
9. End Connections: Threaded.
10. Configuration: Designed for horizontal, straight-through flow.
11. Accessories:

    a. Valves NPS 2 and Smaller: Ball type with threaded ends on inlet and outlet.
    b. Air-Gap Fitting: ASME A112.1.2, matching backflow-preventer connection.

2.4 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 or bronze.
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.

2.5 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.

2.6 STRAINERS FOR DOMESTIC WATER PIPING

A. Y-Pattern Strainers:

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

a. Jomar Valve.

b. Keckley Company.
c. Titan Flow Control, Inc.
d. WATTS.
e. Zurn Industries, LLC.

2. Pressure Rating: 125 psig minimum unless otherwise indicated.
3. Body: Bronze.
4. End Connections: Threaded.
5. Screen: Stainless steel with round perforations unless otherwise indicated.
6. Perforation Size:

a. Strainers NPS 2 and Smaller: 0.062 inch.

7. Drain: Factory-installed, hose-end drain valve.

2.7 DRAIN VALVES

A. Ball-Valve-Type, Hose-End Drain Valves:

1. Standard: MSS SP-110 for standard-port, two-piece ball valves.
2. Pressure Rating: 400-psig minimum CWP.
3. Size: NPS 3/4.
4. Body: Copper alloy.
5. Ball: Chrome-plated brass.
6. Seats and Seals: Replaceable.
7. Handle: Vinyl-covered steel.
8. Inlet: Threaded or solder joint.
9. Outlet: Threaded, short nipple with garden-hose thread complying with ASME B1.20.7 and cap with brass chain.

B. Gate-Valve-Type, Hose-End Drain Valves:

1. Standard: MSS SP-80 for gate valves.
2. Pressure Rating: Class 125.
3. Size: NPS 3/4.
4. Body: ASTM B62 bronze.
5. Inlet: NPS 3/4 threaded or solder joint.
6. Outlet: Garden-hose thread complying with ASME B1.20.7 and cap with brass chain.

C. Stop-and-Waste Drain Valves:

1. Standard: MSS SP-110 for ball valves or MSS SP-80 for gate valves.
2. Pressure Rating: 200-psig minimum CWP or Class 125.
3. Size: NPS 3/4.
4. Body: Copper alloy or ASTM B62 bronze.
5. Drain: NPS 1/8 side outlet with cap.

2.8 WATER-HAMMER ARRESTERS

A. Water-Hammer Arresters:

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

a. AMTROL, Inc.
b. Jay R. Smith Mfg Co; a division of Morris Group International.
c. Josam Company.
d. Precision Plumbing Products.
e. Sioux Chief Manufacturing Company, Inc.
f. WATTS.
g. Zurn Industries, LLC.

2. Standard: ASSE 1010 or PDI-WH 201.
3. Type: Piston
4. Size: ASSE 1010, Sizes AA and A through F, or PDI-WH 201, Sizes A through F.

2.9 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. Backflow Preventers: Install in each water supply to mechanical equipment and systems and to other equipment and water systems that may be sources of contamination. Comply with authorities having jurisdiction.

1. Locate backflow preventers in same room as connected equipment or system.
2. Install drain for backflow preventers with atmospheric-vent drain connection with air-gap fitting, fixed air-gap fitting, or equivalent positive pipe separation of at least two pipe diameters in drain piping and pipe-to-floor drain. Locate air-gap device attached to or under backflow preventer. Simple air breaks are unacceptable for this application.
3. Do not install bypass piping around backflow preventers.

B. Balancing Valves: Install in locations where they can easily be adjusted. Set at indicated design flow rates.

C. Temperature-Actuated, Water Mixing Valves: Install with check stops or shutoff valves on inlets and with shutoff valve on outlet.

D. Water-Hammer Arresters: Install in water piping in accordance with PDI-WH 201.

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.

C. Adjust each reduced-pressure-principle backflow preventer in accordance with manufacturer's written instructions, authorities having jurisdiction and the device's reference standard.

3.4 FIELD QUALITY CONTROL

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

B. Perform the following tests and inspections.

1. Test each reduced-pressure-principle backflow preventer according to authorities having jurisdiction and the device's reference standard.
2. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
3. Operational Test: After electrical circuitry has been energized, start units to confirm unit operation.
4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

C. Domestic water piping specialties will be considered defective if they do not pass tests and inspections.

D. 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.

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. Prier Products, Inc.
    d. Sioux Chief Manufacturing Company, Inc.
    e. Wade; a subsidiary of McWane Inc.
    f. WATTS.
    g. Zurn Industries, LLC.

2. Standard: ASME A112.6.3[**with backwater valve**].
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: None.
11. Sediment Bucket: Not required.
12. Top or Strainer Material: Nickel bronze.
13. Top of Body and Strainer Finish: Nickel bronze.
14. Top Shape: Round.
15. Dimensions of Top or Strainer: 5”Ø
16. Top Loading Classification: Light Duty.
17. Funnel: Not required.
18. 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: Acid-resistant enamel.
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: Acid-resistant enamel.
14. Top Shape: Square.
15. Top Loading Classification: No traffic.
16. 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.

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.

D. Ground equipment according to Section 260526 "Grounding and Bonding for Electrical Systems."

E. Connect wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

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 223400 - FUEL-FIRED, DOMESTIC-WATER 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:

1. Commercial, power direct vent, gas-fired, storage, domestic-water heaters.
2. Gas-fired, tankless, domestic-water heaters.
3. Domestic-water heater accessories.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For fuel-fired, domestic-water heaters to include in emergency, operation, and maintenance manuals.

1.5 COORDINATION

A. Coordinate sizes and locations of concrete bases with actual equipment provided.

1.6 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of fuel-fired, domestic-water heaters that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Structural failures including storage tank and supports.
b. Faulty operation of controls.
c. Deterioration of metals, metal finishes, and other materials beyond normal use.

2. Warranty Periods: From date of Substantial Completion.

a. Commercial, Gas-Fired, Storage, Domestic-Water Heaters:

1) Storage Tank: Three years.
2) Controls and Other Components: One year.

b. Gas-Fired, Tankless, Domestic-Water Heaters:

1) Heat Exchanger: Five years.
2) Controls and Other Components: Three years.

c. Expansion Tanks: Five years.

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 use.

B. ASHRAE/IES Compliance: Fabricate and label fuel-fired, domestic-water heaters to comply with ASHRAE/IES 90.1.

C. ASME Compliance:

1. Where ASME-code construction is indicated, fabricate and label commercial, domestic-water heater storage tanks to comply with ASME Boiler and Pressure Vessel Code: Section VIII, Division 1.
2. Where ASME-code construction is indicated, fabricate and label commercial, finned-tube, domestic-water heaters to comply with ASME Boiler and Pressure Vessel Code: Section IV.

D. NSF Compliance: Fabricate and label equipment components that will be in contact with potable water to comply with NSF 61 and NSF 372.

2.2 COMMERCIAL, GAS-FIRED, STORAGE, DOMESTIC-WATER HEATERS

A. Commercial, Power Direct Vent, Gas-Fired, Storage, Domestic-Water Heaters:

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

a. A. O. Smith Corporation.
b. American Water Heaters.
c. Bock.
d. Bradford White Corporation.
e. Rheem Manufacturing Company.
f. State Industries.

2. Source Limitations: Obtain domestic-water heaters from single source from single manufacturer.
3. Standard: ANSI Z21.10.3/CSA 4.3.
4. Storage-Tank Construction: Non-ASME-code steel with 150-psig working-pressure rating.

a. Tappings: Factory fabricated of materials compatible with tank. Attach tappings to tank before testing.

1) NPS 2 and Smaller: Threaded ends in accordance with ASME B1.20.1.

b. Interior Finish: Comply with NSF 61 and NSF 372 barrier materials for potable-water tank linings, including extending finish into and through tank fittings and outlets.
c. Lining: Glass complying with NSF 61 and NSF 372 barrier materials for potable-water tank linings, including extending lining into and through tank fittings and outlets.

5. Factory-Installed, Storage-Tank Appurtenances:

a. Anode Rod: Replaceable magnesium.
b. Dip Tube: Required unless cold-water inlet is near bottom of tank.
c. Drain Valve: Corrosion-resistant metal with hose-end connection.
d. Insulation: Comply with ASHRAE/IES 90.1. Surround entire storage tank except connections and controls.
e. Jacket: Steel with enameled finish.
f. Burner: For use with power-vent, gas-fired, domestic-water heaters and natural-gas fuel.
g. Automatic Ignition: ANSI Z21.20/CSA C22.2 No. 60730-2-5, electric, automatic, gas-ignition system.
h. Temperature Control: Adjustable thermostat.
i. Safety Controls: Automatic, high-temperature-limit and low-water cutoff devices or systems.
j. Combination Temperature-and-Pressure Relief Valves: ANSI Z21.22/CSA 4.4. Include one or more relief valves with total relieving capacity at least as great as heat input, and include pressure setting less than working-pressure rating of domestic-water heater. Select one relief valve with sensing element that extends into storage tank.

6. Power Direct Vent System: Through-roof, coaxial- or double-channel vent assembly.

2.3 GAS-FIRED, TANKLESS, DOMESTIC-WATER HEATERS

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

1. A. O. Smith Corporation.
2. Bosch Thermotechnology.
3. Bradford White Corporation.
4. Laars Heating Systems Company; a subsidiary of Bradford White Corporation.
5. Navien.
6. Rheem Manufacturing Company.
7. Rinnai Corporation.
8. State Industries.

B. Source Limitations: Obtain domestic-water heaters from single source from single manufacturer.

C. Standard: ANSI Z21.10.3/CSA 4.3 for gas-fired, instantaneous, domestic-water heaters for indoor application.

D. Construction: Copper piping or tubing complying with NSF 61 and NSF 372 barrier materials for potable water, without storage capacity.

1. Tappings: ASME B1.20.1 pipe thread.
2. Pressure Rating: 150 psig.

3. Heat Exchanger: Copper tubing.
4. Insulation: Comply with ASHRAE/IES 90.1.
5. Jacket: Metal, with enameled finish, or plastic.
6. Burner: For use with tankless, domestic-water heaters and natural-gas fuel.
7. Automatic Ignition: Manufacturer's proprietary system for automatic, gas ignition.
8. Temperature Control: Adjustable thermostat.

E. Support: Bracket for wall mounting.

2.4 DOMESTIC-WATER HEATER ACCESSORIES

A. Domestic-Water Expansion Tanks:

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

    a. A. O. Smith Corporation.
    b. AMTROL, Inc.
    c. Flexcon Industries.
    d. Honeywell International Inc.
    e. State Industries.
    f. Taco Comfort Solutions, Inc.

2. Source Limitations: Obtain domestic-water heaters from single source from single manufacturer.
3. Description: Steel, pressure-rated tank constructed with welded joints and factory-installed, butyl-rubber diaphragm. Include air precharge to minimum system-operating pressure at tank.
4. Construction:

    a. Tappings: Factory-fabricated steel, welded to tank before testing and labeling. Include ASME B1.20.1 pipe thread.
    b. Interior Finish: Comply with NSF 61 and NSF 372 barrier materials for potable-water tank linings, including extending finish into and through tank fittings and outlets.
    c. Air-Charging Valve: Factory installed.

B. Drain Pans: Corrosion-resistant metal with raised edge. Include dimensions not less than base of domestic-water heater, and include drain outlet not less than NPS 3/4 with ASME B1.20.1 pipe threads.

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

    a. Holdrite.

C. Piping-Type Heat Traps: Field-fabricated piping arrangement in accordance with ASHRAE/IES 90.1.

D. Heat-Trap Fittings: ASHRAE 90.2.

E. Gas Shutoff Valves: ANSI Z21.15/CSA 9.1, manually operated. Furnish for installation in piping.

F. Combination Temperature-and-Pressure Relief Valves: Include relieving capacity at least as great as heat input, and include pressure setting less than working-pressure rating of domestic-water heater. Select relief valves with sensing element that extends into storage tank.

1. Gas-Fired, Domestic-Water Heaters: ANSI Z21.22/CSA 4.4.

G. Pressure Relief Valves: Include pressure setting less than working-pressure rating of domestic-water heater.

1. Gas-Fired, Domestic-Water Heaters: ANSI Z21.22/CSA 4.4.

H. Vacuum Relief Valves: ANSI Z21.22/CSA 4.4.

I. Domestic-Water Heater Mounting Brackets: Manufacturer's factory-fabricated steel bracket for wall mounting, capable of supporting domestic-water heater and water.

2.5 SOURCE QUALITY CONTROL

A. Hydrostatically test commercial domestic-water heaters and storage tanks to minimum of one and one-half times pressure rating before shipment.

B. Domestic-water heaters will be considered defective if they do not pass tests and inspections.

C. Prepare test and inspection reports.

PART 3 - EXECUTION

3.1 DOMESTIC-WATER HEATER INSTALLATION

A. Commercial, Domestic-Water Heater Mounting: Install commercial domestic-water heaters on concrete base. Comply with requirements for concrete base specified in Section 033000 "Cast-in-Place Concrete."

1. Exception: Omit concrete bases for commercial domestic-water heaters if installation on stand, bracket, suspended platform, or directly on floor is indicated.
2. Maintain manufacturer's recommended clearances.
3. Arrange units so controls and devices that require servicing are accessible.
4. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around the full perimeter of concrete base.
5. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete floor.
6. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
7. Install anchor bolts to elevations required for proper attachment to supported equipment.
8. Anchor domestic-water heaters to substrate.

B. Tankless, Domestic-Water Heater Mounting: Install tankless, domestic-water heaters at least 18 inches above floor on wall bracket.

1. Maintain manufacturer's recommended clearances.
2. Arrange units so controls and devices that require servicing are accessible.

3. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
4. Install anchor bolts to elevations required for proper attachment to supported equipment.
5. Anchor domestic-water heaters to substrate.

C. Install domestic-water heaters level and plumb, in accordance with layout drawings, original design, and referenced standards. Maintain manufacturer's recommended clearances. Arrange units so controls and devices needing service are accessible.

1. Install shutoff valves on domestic-water-supply piping to domestic-water heaters and on domestic-hot-water outlet piping.

D. Install gas-fired, domestic-water heaters in accordance with NFPA 54.

1. Install gas shutoff valves on gas supply piping to gas-fired, domestic-water heaters without shutoff valves.
2. Install gas pressure regulators on gas supplies to gas-fired, domestic-water heaters without gas pressure regulators if gas pressure regulators are required to reduce gas pressure at burner.
3. Install automatic gas valves on gas supplies to gas-fired, domestic-water heaters if required for operation of safety control.
4. Comply with requirements for gas shutoff valves, gas pressure regulators, and automatic gas valves specified in Section 231123 "Facility Natural-Gas Piping."

E. Install combination temperature-and-pressure relief valves in top portion of storage tanks. Use relief valves with sensing elements that extend into tanks. Extend domestic-water-heater relief-valve outlet, with drain piping same as domestic-water piping in continuous downward pitch, and discharge by positive air gap onto closest floor drain.

F. Install combination temperature-and-pressure relief valves in water piping for domestic-water heaters without storage. Extend domestic-water-heater relief-valve outlet, with drain piping same as domestic-water piping in continuous downward pitch, and discharge by positive air gap onto closest floor drain.

G. Install water-heater drain piping as indirect waste to spill by positive air gap into open drains or over floor drains. Install hose-end drain valves at low points in water piping for domestic-water heaters that do not have tank drains. Comply with requirements for hose-end drain valves specified in Section 221119 "Domestic Water Piping Specialties."

H. Install thermometer on outlet piping of domestic-water heaters. Comply with requirements for thermometers specified in Section 220500 "Common Work Results for Plumbing."

I. Install piping-type heat traps on inlet and outlet piping of domestic-water heater storage tanks without integral or fitting-type heat traps.

J. Fill domestic-water heaters with water.

K. Charge domestic-water expansion tanks with air to required system pressure.

L. Install dielectric fittings in all locations where piping of dissimilar metals is to be joined. The wetted surface of the dielectric fitting contacted by potable water shall contain less than 0.25 percent of lead by weight.

3.2 PIPING CONNECTIONS

A. Comply with requirements for domestic-water piping specified in Section 221116 "Domestic Water Piping."

B. Comply with requirements for gas piping specified in Section 231123 "Facility Natural-Gas Piping."

C. Drawings indicate general arrangement of piping, fittings, and specialties.

D. Where installing piping adjacent to fuel-fired, domestic-water heaters, allow space for service and maintenance of water heaters. Arrange piping for easy removal of domestic-water heaters.

3.3 IDENTIFICATION

A. Identify system components. Comply with requirements for identification specified in Section 220553 "Identification for Plumbing Piping and Equipment."

3.4 FIELD QUALITY CONTROL

A. Perform tests and inspections with the assistance of a factory-authorized service representative.

B. Tests and Inspections:

1. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
2. Operational Test: After electrical circuitry has been energized, start units to confirm proper operation.
3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

C. Domestic-water heaters will be considered defective if they do not pass tests and inspections.

D. Prepare test and inspection reports.

3.5 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain commercial, gas-fired, storage, and gas-fired, tankless domestic-water heaters.

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. Wall-mounted water closets.
2. Flushometer valves.
3. Toilet seats.
4. 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.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For flushometer valves and electronic sensors 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: Equal to 10 percent of amount of each type installed, but no fewer than one of each type.

PART 2 - PRODUCTS

2.1 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. Support: Water closet carrier.
5. Water-Closet Mounting Height: Standard and Handicapped/elderly according to ICC/ANSI A117.1. Refer to architectural plans and elevations for exact location of ADA compliant fixtures.

2.2 FLUSHOMETER VALVES

A. Solenoid-Actuator, Diaphragm Flushometer Valves:

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

a. Delaney Products.
b. I-Con Systems, Inc.
c. Sloan Valve Company.
d. 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. Actuator: Solenoid complying with UL 1951, and listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
10. Trip Mechanism: Battery-powered electronic sensor complying with UL 1951, and listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
11. Consumption: 1.6 gal. per flush.
12. Minimum Inlet: NPS 1.
13. Minimum Outlet: NPS 1-1/4.

2.3 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: Check.
7. Hinge Material: Noncorroding metal.
8. Seat Cover: Not required.
9. Color: White.

2.4 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 accessible, wall-mounted water closets at mounting height for handicapped/elderly, according to ICC/ANSI A117.1.

B. Support Installation:

1. Use carrier supports with waste-fitting assembly and seal.
2. Install wall-mounted, back-outlet water-closet supports with waste-fitting assembly and waste-fitting seals; and affix to building substrate.

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.
5. Install fresh batteries in battery-powered, electronic-sensor mechanisms.

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.

C. Install fresh batteries in battery-powered, electronic-sensor mechanisms.

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.

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.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For flushometer valves and electronic sensors 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: Equal to 10 percent of amount of each type installed, but no fewer than one of each type.

1.6 WALL-HUNG URINALS

A. Urinals, Wall Hung, Back Outlet, Washout, 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. 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. Flushometer Valve: Semi-red brass construction with synthetic rubber diaphragm.
4. Waste Fitting:

a. Standard: ASME A112.18.2/CSA B125.2 for coupling.
b. Size: NPS 2.

5. Support: **Type I Urinal Carrier** with fixture support plates and coupling with seal and fixture bolts and hardware matching fixture..
6. Urinal Mounting Height: Standard and Handicapped/elderly according to ICC A117.1. Refer to architectural plans and elevations for exact locations of ADA fixtures.

1.7 URINAL FLUSHOMETER VALVES

A. Solenoid-Actuator, Diaphragm Flushometer Valves:

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

a. Delaney Products.
b. I-Con Systems, Inc.
c. Sloan Valve Company.
d. Stern Engineering Ltd.
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 construction 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. Actuator: Solenoid complying with UL 1951; listed and labeled as defined in NFPA 70, by a qualified testing agency; and marked for intended location and application.
10. Trip Mechanism: Battery-powered electronic sensor complying with UL 1951; listed and labeled as defined in NFPA 70, by a qualified testing agency; and marked for intended location and application.
11. Consumption: 1.0 gal. per flush.
12. Minimum Inlet: NPS 3/4.

13. Minimum Outlet: NPS 1-1/4.

1.8 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. Wade Drains.
d. WATTS.
e. Zurn Industries, LLC.

2. Standard: ASME A112.6.1M.

PART 2 - EXECUTION

2.1 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.

2.2 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.
4. Install fresh batteries in battery-powered, electronic-sensor mechanisms.

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."

2.3 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.

2.4 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.

C. Install fresh batteries in battery-powered, electronic-sensor mechanisms.

2.5 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. Vitreous-china, wall-mounted lavatories.
2. Automatically 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, 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. 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.

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 Cartridges and O-rings: Equal to 5 percent of amount of each type and size installed.

PART 2 - PRODUCTS

2.1 VITREOUS-CHINA, WALL-MOUNTED LAVATORIES

A. Lavatory - Vitreous China, Wall Mounted, with Back:

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. Zurn Industries, LLC.

2. Fixture:

    a. Standard: ASME A112.19.2/CSA B45.1.
    b. Type: For wall hanging.
    c. Nominal Size: Rectangular, 20 by 18 inches.
    d. Faucet-Hole Punching: Three holes, 4-inch centerset.
    e. Faucet-Hole Location: Top.
    f. Color: White.
    g. Mounting Material: Chair carrier.

3. Lavatory Mounting Height: Standard and Handicapped/elderly in accordance with ICC A117.1. Coordinate with architectural plans and elevations for exact locations of ADA compliant fixtures.

2.2 AUTOMATICALLY 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 - Automatic Type: Battery Powered Electronic Sensor Operated:

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

    a. Advance Modern Technologies Corporation – AMTC.
    b. American Standard.
    c. Bradley Corporation.
    d. Chicago Faucets; Geberit Company.
    e. GROHE America, Inc.
    f. Kohler Co.
    g. Moen Incorporated.
    h. Sloan Valve Company.
    i. Speakman Company.
    j. Symmons.
    k. T&S Brass and Bronze Works, Inc.
    l. TOTO USA, INC.
    m. Zurn Industries, LLC.

2. Standards: ASME A112.18.1/CSA B125.1 and UL 1951.
3. 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.
4. General: Coordinate faucet inlets with supplies and fixture hole punchings; coordinate outlet with spout and fixture receptor.
5. Body Type: Integrated Base, 3 hole 4” centerset.
6. Body Material: Commercial, solid-brass, or die-cast housing with brazed copper and brass waterway.
7. Finish: Polished chrome plate.
8. Maximum Flow Rate: 0.5 gpm.
9. Mounting Type: Deck, concealed.
10. Spout: Rigid type.
11. Spout Outlet: Multi-laminar spray.

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: 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.

1. McGuire LFBV series.

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. Seamless pre-wrapped, all-cast-brass ground joint swivel P-trap, less cleanout.

1) McGuire Manufacturing PW series.

b. Stainless steel, two-piece trap and swivel elbow with 0.012-inch thick stainless steel tube to wall, and stainless 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. Wade; a subsidiary of McWane, Inc.
d. WATTS.
e. 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. Comply with escutcheon requirements specified in Section 220500 "Common Work Results for Plumbing."

E. Seal joints between lavatories, counters, 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."

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 ELECTRICAL CONNECTIONS

A. Connect 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 in accordance with NFPA 70 and NECA 1.

3.5 ADJUSTING

A. Operate and adjust lavatories and controls. Replace damaged and malfunctioning lavatories, fittings, and controls.

B. Install new batteries in battery-powered, electronic-sensor mechanisms.

3.6 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. Service basins.
2. Stainless steel sinks.
3. Sink faucets.
4. Supports.
5. Supply fittings.
6. 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 SERVICE BASINS

A. Service Basins: Composite, floor mounted “MS-1”.

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

   a. E.L. Mustee & Sons, Inc.
   b. Fiat Products.
   c. PROFLO.

2. Fixture:

   a. Standard: IAPMO/ANSI Z124.6.
   b. Shape: Square.
   c. Nominal Size: 24 by 24 inches.
   d. Height: 10 inches.
   e. Tiling Flange: Not required.
   f. Rim Guard: On front top surfaces.
   g. Drain: Grid with NPS 3 outlet.

3. Mounting: On floor and flush to wall.
4. Faucet: F-1

2.2 STAINLESS STEEL SINKS

A. Single basin, wall-mount, accessible “SK-1”.

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

   a. Elkay.
   b. Just Manufacturing.
   c. Kohler.
   d. Moen Incorporated.
   e. Sani-Lav.

2. Fixture:

   a. Standard: ASME A112.19.1/CSA B45.4 and NSF/ANSI 2.
   b. Overall Dimensions: 22 inches by 19 inches by 14 inches
   c. Metal thickness: 16 gauge.
   d. Bowl:

      1) Dimensions: 19 inches by 15-1/2 inches by 5 inches.
      2) Drain: 2-inch.
      3) Location: Center.

3. Wall-mounting brackets.

4. Faucet: Integral to sink package. Manual type.

    a. Standard: ASME A112.18.1/CSA B125.1.
    b. General: Coordinate faucet inlets with supplies and fixture hole punchings; coordinate outlet with spout and sink receptor.
    c. Body Type: Widespread.
    d. Body Material: Commercial, solid brass.
    e. Finish: Polished chrome plated.
    f. Maximum Flow Rate:0.5 gpm aerator.
    g. Handles: 4” wing levers.
    h. Mounting Type: Back of sink.
    i. Spout Type: Swivel gooseneck.
    j. Vacuum Breaker: Not required for hose outlet.
    k. Spout Outlet: Non-aerating laminar flow.

B. Single basin, wall-mount “SK-2”.

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

    a. Elkay.
    b. Just Manufacturing.
    c. Kohler.
    d. Moen Incorporated.
    e. Sani-Lav.

2. Fixture:

    a. Standard: ASME A112.19.1/CSA B45.4 and NSF/ANSI 2.
    b. Overall Dimensions: 23 inches by 20-1/2 inches by 19-1/2 inches
    c. Metal thickness: 16 gauge.
    d. Bowl:

        1) Dimensions: 20 inches by 17 inches by 9 inches.
        2) Drain: 2-inch.
        3) Location: Center.

3. Wall-mounting brackets.

4. Faucet: Integral to sink package. Manual type.

    a. Standard: ASME A112.18.1/CSA B125.1.
    b. General: Coordinate faucet inlets with supplies and fixture hole punchings; coordinate outlet with spout and sink receptor.
    c. Body Type: Widespread.
    d. Body Material: Commercial, solid brass.
    e. Finish: Polished chrome plated.
    f. Maximum Flow Rate:0.5 gpm aerator.
    g. Handles: 4” wing levers.
    h. Mounting Type: Back of sink.
    i. Spout Type: Swivel gooseneck.
    j. Vacuum Breaker: Not required for hose outlet.
    k. Spout Outlet: Non-aerating laminar flow.

5.

2.3 SINK FAUCETS

A. NSF Standard: Comply with NSF 372 for faucet-spout materials that will be in contact with potable water.

A. Sink Faucets: Manual type, two lever handle “F-1.”

1. Commercial, Solid-Brass Faucets:

a. 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.

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 sink receptor.
4. Body Type: Widespread.
5. Body Material: Commercial, solid brass.
6. Finish: Chrome plate.
7. Maximum Flow Rate: 2.2 gpm.
8. Handles: Cross, four arm.
9. Mounting Type: Back/wall, exposed.
10. Spout Type: Rigid, solid brass with wall brace.
11. Vacuum Breaker: Required for hose outlet.
12. Spout Outlet: Hose thread according to ASME B1.20.7.

2.4 SUPPLY FITTINGS

A. NSF Standard: Comply with 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, braided or corrugated stainless-steel flexible hose.

2.5 WASTE FITTINGS

A. Standard: ASME A112.18.2/CSA B125.2.

B. Drain: Grid type with NPS 1-1/2 offset and straight tailpiece.

C. Trap:

1. Size: NPS 1-1/2 by NPS 1-1/4.
2. Material:

a. Seamless pre-wrapped, all-cast-brass ground joint swivel P-trap, less cleanout.

1) McGuire Manufacturing PW series.

b. Stainless steel, two-piece trap and swivel elbow with 0.012-inch thick stainless steel tube to wall, and stainless steel wall flange.

2.6 GROUT

A. Standard: ASTM C1107/C1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.

B. Characteristics: Nonshrink; recommended for interior and exterior applications.

C. Design Mix: 5000-psi, 28-day compressive strength.

D. Packaging: Premixed and factory packaged.

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 supports, affixed to building substrate, for wall-hung sinks.

C. Install accessible wall-mounted sinks at handicapped/elderly mounting height according to ICC/ANSI A117.1.

D. Set floor-mounted sinks in leveling bed of cement grout.

E. Install water-supply piping with stop on each supply to each sink faucet.

F. Install wall flanges or escutcheons at piping wall penetrations in exposed, finished locations. Use deep-pattern escutcheons if required to conceal protruding fittings. Comply with escutcheon requirements specified in Section 220500 "Common Work Results for Plumbing."

G. 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."

H. Install protective shielding pipe covers and enclosures on exposed supplies and waste piping of accessible sinks.

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 224500 - EMERGENCY PLUMBING FIXTURES

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. Eye/face wash equipment.
2. Water-tempering equipment.

1.3 DEFINITIONS

A. Accessible Fixture: Emergency plumbing fixture that can be approached, entered, and used by people with disabilities.

B. Plumbed Emergency Plumbing Fixture: Fixture with fixed, potable-water supply.

C. Tepid: Moderately warm.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include flow rates and capacities, furnished specialties, and accessories.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For emergency plumbing fixtures to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. ISEA Standard: Comply with ISEA Z358.1.

B. NSF Standard: Comply with NSF 61 and NSF 372, for fixture materials that will be in contact with potable water.

C. Regulatory Requirements: Comply with requirements in ICC A117.1; Public Law 90-480, "Architectural Barriers Act"; and Public Law 101-336, "Americans with Disabilities Act"; for plumbing fixtures for people with disabilities.

2.2 EYE/FACE WASH EQUIPMENT

A. Accessible, Wall-Mounted, Plumbed Eye/Face Wash Units:

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

a. Acorn Safety; a Division of Morris Group International.
b. Bradley Corporation.
c. Guardian Equipment Co.
d. Haws Corporation.
e. Speakman Company.
f. Stingray Systems LLC.
g. WaterSaver Faucet Co.

2. Capacity: Not less than 3.0 gpm for at least 15 minutes.
3. Supply Piping: NPS 1/2 chrome-plated brass or stainless steel with flow regulator and stay-open control valve.
4. Control-Valve Actuator: Paddle.
5. Spray-Head Assembly: Four receptor-mounted spray heads.
6. Receptor: Stainless-steel bowl.
7. Mounting: Wall bracket.
8. Special Construction: Comply with ICC A117.1.

2.3 WATER-TEMPERING EQUIPMENT

A. Hot- and Cold-Water, Water-Tempering Equipment:

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

a. Acorn Safety; a Division of Morris Group International.
b. Armstrong International, Inc.
c. Bradley Corporation.
d. Guardian Equipment Co.
e. Haws Corporation.
f. Lawler Manufacturing Company., Inc.
g. Leonard Valve Company.
h. Speakman Company.
i. Stingray Systems LLC.
j. WaterSaver Faucet Co.
k. WATTS.

2. Description: Factory-fabricated equipment with thermostatic mixing valve.

a. Thermostatic Mixing Valve: Designed to provide 60-100 deg F tepid, potable water at emergency plumbing fixtures, to maintain temperature at plus or minus 5 deg F throughout required 15-minute test period, and in case of unit failure to continue cold-water flow, with union connections, controls, metal piping, and corrosion-resistant enclosure.
b. Supply Connections: For hot and cold water.

2.4 SOURCE QUALITY CONTROL

A. Certify performance of emergency plumbing fixtures by independent testing organization acceptable to authorities having jurisdiction.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine roughing-in for water and waste piping systems to verify actual locations of piping connections before plumbed emergency plumbing fixture installation.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION OF EMERGENCY PLUMBING FIXTURE INSTALLATION

A. Assemble emergency plumbing fixture piping, fittings, control valves, and other components.

B. Install fixtures level and plumb.

C. Fasten fixtures to substrate.

D. Install shutoff valves in water-supply piping to fixtures, to facilitate maintenance of the equipment. Use ball or gate valve if specific type valve is not indicated. Install valves chained or locked in open position if permitted. Install valves in locations where they can easily be reached for operation.

E. Install dielectric fitting in supply piping to emergency equipment if piping and equipment connections are made of different metals. Comply with requirements for dielectric fittings specified in Section 221116 "Domestic Water Piping."

F. Install thermometers in supply and outlet piping connections to water-tempering equipment. Comply with requirements for thermometers specified in Section 220500 "Common Work Results for Plumbing."

G. Install trap and waste piping on drain outlet of emergency equipment receptors that are indicated to be directly connected to drainage system. Comply with requirements for waste piping specified in Section 221316 "Sanitary Waste and Vent Piping."

H. Install escutcheons on piping wall and ceiling penetrations in exposed, finished locations. Comply with requirements for escutcheons specified in Section 220500 "Common Work Results for Plumbing."

3.3 CONNECTIONS

A. Connect hot- and cold-water-supply piping to hot- and cold-water, water-tempering equipment. Connect output from water-tempering equipment to emergency plumbing fixtures. Comply with requirements for hot- and cold-water piping specified in Section 221116 "Domestic Water Piping."

B. Directly connect emergency plumbing fixture receptors with trapped drain outlet to sanitary waste and vent piping. Comply with requirements for waste piping specified in Section 221316 "Sanitary Waste and Vent Piping."

C. Where installing piping adjacent to emergency plumbing fixtures, allow space for service and maintenance of fixtures.

3.4 FIELD QUALITY CONTROL

A. Mechanical-Component Testing: After plumbing connections have been made, test for compliance with requirements. Verify ability to achieve indicated capacities.

B. Tests and Inspections:

1. Perform each visual and mechanical inspection.
2. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
3. Operational Test: After electrical circuitry has been energized, start units to confirm proper unit operation.
4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

C. Emergency plumbing fixtures and water-tempering equipment will be considered defective if they do not pass tests and inspections.

D. Prepare test and inspection reports.

3.5 ADJUSTING

A. Adjust or replace fixture flow regulators for proper flow.

B. Adjust equipment temperature settings.

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.

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: One per fixture.

PART 2 - PRODUCTS

2.1 PRESSURE WATER COOLERS

A. Pressure Water Coolers: Wall mounted, wheelchair accessible, bottle filler, 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. Larco Inc.
e. Murdock Manufacturing.
f. Oasis International.

2. Standards:

    a. Filter First Legislation Requirements: Comply with NSF (Class 1 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: Single, vinyl-covered steel with stainless-steel top.
4. Bubbler: One, with adjustable stream regulator, located on each cabinet deck.
5. Control: Push button.
6. Bottle Filler: Sensor activation with 20-second automatic shutoff timer. Fill rate 0.5 to 1.5 gpm.
7. Drain: Grid with NPS 1-1/4 tailpiece.
8. 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.

9. Waste Fitting: ASME A112.18.2/CSA B125.2, NPS 1-1/4 brass P-trap.
10. 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.
11. 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.

12. Support: Type I Water Cooler Carrier.
13. Water Cooler 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.

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. For fixtures indicated for children, install at height required by authorities having jurisdiction.

B. Set freestanding pressure water coolers on floor.

C. Install off-the-floor carrier supports, affixed to building substrate, for wall-mounted fixtures.

D. Install mounting frames, affixed to building construction, and attach recessed, pressure water coolers, and in-wall bottle filling stations to mounting frames.

E. Install water-supply piping with shutoff valve on supply to each fixture to be connected to domestic-water distribution piping.

F. Install trap and waste piping on drain outlet of each fixture to be connected to sanitary drainage system.

G. 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

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. American Society of Heating, Refrigerating, Air Conditioning Engineers (ASHRAE)
2. American Society of Mechanical Engineers (ASME).
3. American Society for Testing and Materials (ASTM).
4. Factory Mutual Laboratories (FM).
5. National Electrical Manufacturer's Association (NEMA).
6. National Fire Protection Association (NFPA).
7. Plumbing and Drainage Institute (PDI).
8. Underwriters' Laboratories, Inc. (UL).
9. 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, bases, supports, vibration isolators, structural members, openings in structure and other apparatus that may be affected by its use.

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 contractor’s 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.

1.5 QUIET OPERATION AND VIBRATION

A. All mechanical 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. In case of moving machinery, 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. Mechanical contractor shall file for, pay all fees, and obtain all applicable boiler, mechanical, 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 final payment.

PART 2 - PRODUCTS

2.1 VALVES, CHECK VALVES AND STRAINERS

A. All valves, except as otherwise specified in detail specifications, shall be of one manufacturer: Victaulic, Apollo, Milwaukee Valve, Crane, Kennedy, Jenkins, Hammond, Powell, or 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. Ball Valves:

1. Valves 2” and smaller shall be rated 150 psi SWP, 600 psi nonshock CWP; and have two-piece, cash brass bodies, replaceable reinforced Teflon seats, full-port ¼”-1”, conventional-port 1¼”-2”, blow-out-proof stems, chrome-plated brass ball, and threaded or soldered ends. Valves shall comply with MSS SP-110.

E. Gas Cocks:

1. Corrosion resistant plug permanently lubricated, corrosion resistant bearings, suitable seals for intended service, lever operation, DeZurik Series 400.

F. Lift (non-slam) Check Valves:

1. 2" and smaller – Class 125 bronze, non-slam spring loaded lift check, brass disk, teflon seats. Screwed ends - Watts series 600. Valves can be installed in horizontal or vertical position.

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	8'-0"	3/8"
Copper Pipe	1/2"	6'-0"	3/8"
	3/4" thru 1”	8'-0"	3/8"
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”	7’-0”	1/2"

2.3 ELECTRICAL EQUIPMENT

A. All electrical equipment shall conform to the electrical specifications and shall be suitable for operation on the voltage and phase available at the building site. These characteristics shall be verified by the Contractor prior to ordering equipment.

B. Provide motors as required for proper operation of all equipment furnished under this Division.

1. Minimum motor horsepower ratings are specified or scheduled on the drawings. Minimum requirements for all motors are as follows:

a. Constructed for operation at work site altitude and surrounding temperature.
b. Dustproof/leakproof bearing rings.
c. Built to NEMA standards.
d. Factory balanced.
e. Open dripproof unless noted otherwise.
f. Integral thermal overload protection.

C. When not specifically noted under Division 16000 or electrical drawings, provide the following:

1. Furnish all necessary control devices such as speed controls, transformers and relays as required for proper operation of all equipment furnished under this Division.
2. Furnish identification as to purpose for each switch and/or pushbutton station furnished herein. Identification may be either engraved plastic sign or permanent mounting to wall below switch, or stamping on switch cover proper. All such identification signs and/or switch covers in finished areas shall match other hardware in the immediate area.

2.4 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.

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 disconnect points.)

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 adhered to.

3.4 WELDING

A. Joints in black steel pipe may be welded.

B. All welders engaged in work under this section shall be certified by the National Certified Pipe Welding Bureau. Each operator's certificate shall be on file at the site and shall be made available to the Architect/Engineer upon request.

C. Welded joints shall be made in accordance with the applicable sections of the ASME Code and/or the applicable provisions of the ANSI B31 Standards.

D. Piping ends for welded joints shall be machine cut and beveled for V-type joints. Make all changes in direction and intersections of welded lines with welding fittings. Mitering of pipe to form tees will not be permitted.

3.5 MECHANICAL WIRING

A. Provide all temperature control wiring, all interlock wiring, and equipment control wiring for the equipment that is to be provided under this Division unless specifically shown on electrical drawings.

B. All wiring shall be not less than No. 14 insulated color coded wire in thin wall conduit.

C. The following schedule is intended to summarize the division of work and material responsibilities between the mechanical contractor and the electrical contractor.

ITEM	FURNISHED BY	SET BY	POWER WIRING	CONTROL WIRING
Equipment motors	MC	MC	EC	--
Motor starters, contractors and overload heaters	EC	EC	EC	MC
Fused and unfused disconnect switches	EC	EC	EC	
Manual operating switches, multi-speed switches, push-button stations and pilot lights	MC	EC	EC	EC
Control relays and transformers	MC	MC	EC	MC
Thermostats, time switches*	MC	MC	EC	MC

Temperature control panels	MC	MC	EC	MC
Motor and solenoid valves, damper motors, PE and EP switches	MC	MC	--	MC
Refrigeration equipment and controls	MC	MC	EC	MC
Fire protection controls and switches	MC	MC	EC	MC(a)
Smoke detectors (duct mounted)	EC	MC	EC(a)	MC(a)

MC = Mechanical Contractor
EC = Electrical Contractor

* Motor driven units which are controlled from line voltage automatic controls such as line voltage thermostats, float switches or time switches which conduct full load current of the motor shall be wired for both power and control circuit under the electrical contract. However, if the control device does not conduct full load current, then the responsibility shall be set forth in the above schedule. (Example: a 208-volt, 3-phase, 3-wire motor requires 120-volt control. Electrical contractor shall furnish a 120-volt circuit for control and 208 volt circuit for power and wire the power circuit. Mechanical contractor shall wire the control circuit).

(a) Wiring from alarm contacts to alarm system by EC; all control function wiring by MC. MC to coordinate location with EC.

3.6 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.

3.7 ACCEPTANCE TEST

A. Subsequent to the final air and water balance test, all environmental systems shall be tested to prove satisfactory performance of all units.

B. The entire heating system shall be tested during the first heating season following completion of the mechanical systems and it shall be established that all controls are calibrated accurately and performing properly and that all units are heating satisfactorily.

C. The entire air conditioning system shall be tested during first cooling season following the completion of the mechanical systems; and it shall be established that all controls are calibrated accurately and performing properly and that all units are cooling satisfactorily.

D. The entire ventilation system shall be tested at the completion of the project; and it shall be established that controls are performing properly and that all rooms are being ventilated satisfactorily.

E. Check all duct smoke detectors and freezestats to assure that they are functioning properly

3.8 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 15 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 15 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.

3.9 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.

3.10 THERMAL CONTINUITY

A. Where openings are created for duct work, piping, outdoor intake ducts, or any type of mechanical equipment penetration thru an insulated wall, roof, or partition, Mechanical Contractor shall be responsible for providing an air tight seal against air infiltration.

B. Where openings are larger than ¼", Mechanical 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.

3.11 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.

3.12 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.

3.13 REMOVAL AND RELOCATION OF EXISTING PIPING AND/OR EQUIPMENT

A. The layout of the existing mechanical system as shown on the drawings has been prepared from existing building drawings and 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.

C. The Owner has the right of first refusal of all removed equipment and materials.

3.14 CLEANING AND FLUSHING WATER CIRCULATING SYSTEMS

A. All water circulating systems for the project shall be thoroughly cleaned before placing in operation to rid the system of dirt, piping compound, mill scale, oil, and any and all other material foreign to the water being circulated.

B. Extreme care shall be exercised during construction to prevent all dirt and other foreign matter from entering the pipe or other parts of the system. Pipe stored on the project shall have the open ends capped and equipment shall have all openings fully protected. Before erection, each piece of pipe, fitting, or valves shall be visually examined and all dirt removed

C. After non-potable system(s) are complete, the subcontractor shall add trisodium phosphate in an aqueous solution to the system at the proportion of 1 lb. per 50 gallons of water in the system. After the system is filled with this solution, the system shall be brought up to temperature and allowed to circulate for two hours. The system shall then be drained completely and refilled with fresh water. The Architect/Engineer shall be given 72 hour advanced notice of this cleaning operation and will have his representative present to observe the cleaning operation, and if, the Architect/Engineer's representative deems it necessary, the cleaning operation shall be repeated.

D. After the system has been completely cleaned as specified herein, it shall be tested by litmus paper or other dependable method and shall be left on the slightly alkaline side (pH = 7.5+\-). If the system is found to be still on the acid side, the cleaning by the use of trisodium phosphate shall be repeated.

E. "Stop-leak" compounds shall not be added to the system at any time.

3.15 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.

3.16 ACCESSIBILITY

A. Locate all equipment which must be serviced, operated, or maintained in fully accessible positions. Equipment shall include, but not be limited to, dampers, valves, traps, clean-outs, motors, controllers, switchgear, and drain points. If required for better accessibility, locate access doors for this purpose. Minor deviations from drawings may be made to allow for better accessibility.

3.17 CLEAN-UP

A. At the completion of work, all equipment on the project shall be checked and thoroughly cleaned including coils, plenum, under equipment and all other areas around or in equipment provided under this Section. Clean all exposed surfaces of all piping, hangers, ducts, 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.

3.18 DAMAGED SURFACES

A. At the completion of work, all mechanical equipment furnished under this contract shall be checked for paint damage, and any factory-finished paint that has been damaged shall be repaired to match the adjacent areas. Any metal cabinet, jacket, or enclosure that has been deformed shall be replaced with new material and repainted to match the adjacent areas.

3.19 HOLES IN PRECAST CONCRETE

A. All openings in precast concrete over 6" square or 6" diameter shall be cast in place at the time of fabrication. The mechanical contractor shall cut all openings 6" and under at the site or shall make proper arrangements with the fabricator to cast same during fabrication. All openings if cut shall be cut with rotary-type drill, or other method as approved by the Architect. Holes cut with pneumatic hammer will not be accepted.

3.20 SLEEVES AND INSERTS

A. The contractor shall provide and locate all sleeves and inserts required before the floors and walls are built, or shall be responsible for the cost of cutting and patching required to facilitate installation after walls or floors are constructed.

B. Each contractor shall be responsible for any drilling required for installation of hangers.

C. Sleeves shall be provided for all mechanical piping passing through concrete floor slabs and concrete or masonry exterior wall construction.

D. Where sleeves are placed in exterior below grade walls, the space between pipe and the sleeve shall be made water tight using a link seal or other approved method of water seal.

E. Where pipe motion due to expansion or contraction will occur, make interior wall sleeves of sufficient diameter to permit free movement of pipe and insulation.

F. Terminate sleeves flush with wall. Extend floor sleeves ¼" above finished floor, except in rooms having floor drains, in which sleeves shall extend ¾" above finished floor.

G. All sleeves shall be constructed of steel pipe unless otherwise noted on the drawings or specifically specified for a particular installation.

3.21 OLD PIPE LINES

A. Old sewer, water, steam, or other pipes encountered which interfere with the proper installation of new work and which will not be used in connection with the new work, shall have openings closed in a proper manner concealed in wall; or, if necessary, relocate or remove the pipes as directed by the Architect/Engineer.

3.22 EXCAVATING AND BACKFILLING

A. Provide all excavating and backfilling required in connection with the work under this Division including the new building domestic water main.

B. Trench Excavation: The Contractor shall proceed with trench excavation with due regard for the protection of life, health, and property. Appropriate equipment shall be used to perform the work and, where necessary, extra measures such as the use of sheeting or shoring shall be used. The following shall be observed in excavating trenches:

1. Excavation shall not proceed until the location of nearby utilities have been ascertained and clearly marked by their owners and/or utility companies. Call "MISS DIG" (811 or 1-800-482-7171) at least three (3) full working days prior to any excavation.
2. Excavation in close proximity to utilities shall be done by hand to expose all utilities and physically locate in order to protect them from damage prior to the use of any power equipment.
3. Trenches shall be excavated in reasonably close proximity to the lines and grades on the plans or as established by the Engineer. Special attention shall be given to requirements for depth of burial.
4. The trench shall be of sufficient width to provide free access for completing the work.
5. Rock or hardpan shall be excavated to a depth of 4 inches below the bottom of the pipe and replaced with granular bedding material acceptable to the Engineer.
6. Where unstable soil conditions are encountered, the Engineer shall be notified for special requirements which may be required.
7. Where work is within a paved roadway, the pavement shall be cut and removed prior to excavation.

C. Backfilling Trench: Backfill material, free of rocks, sticks, and other debris, shall be placed by hand to a depth of six (6) inches over the service piping and compacted. Machine backfilling may then proceed by placing and compacting twelve (12) inch lifts of suitable material up to subgrade elevations (95% density Standard Proctor test). No muck, peat, stumps, roots, boulders, or other large debris will be included in the backfill in any part of the trench. Where the trench is within a roadway, backfill and subgrade material as required by the plans or other parts of this document shall be used, unless otherwise directed by the Engineer.

3.23 SURFACE RESTORATION

A. Upon completion of backfilling operations up to the required subgrade elevation, the surface will be restored in kind to the same or better condition as existing prior to excavation, unless otherwise directed by the Engineer.

3.24 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.

B. Where the mechanical work will be installed in close proximity to, or will interfere with work of other trades, the Contractor shall assist in working out space conditions to make a satisfactory adjustment. If so directed by the Engineer, the Contractor shall prepare composite working drawings and sections at a suitable scale not less than 1/4" = 1'-0", clearly showing his work is to be installed in relation to the work of other trades. If the Contractor installs his work before coordinating with other trades, or so as to cause any interference with work of other trades, he shall make the necessary changes in his work to correct the condition without extra charge.

3.25 RECORD OF CHANGES

A. Show on blue line 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 for "As-Built" drawings and specification requirements.

3.26 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.

3.27 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.

3.28 RESPONSIBILITY OF CONTRACTOR

A. The Contractor is responsible for the complete and satisfactory installation of the work in accodance 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.

3.29 EQUIPMENT ON ROOFS OR ELEVATED SURFACES

A. Where mechanical appliances are installed on a roof having a slope of 3 units vertical in 12 units horizontal (25% slope) or greater and having an edge more than 30" above grade, a level platform shall be provided on each side of the appliance to which access is required by the manufacturer's installation instructions for service, repair, or maintenance. The platform shall not be less than 30" in any dimension and shall be provided with guards.

B. Do not locate mechanical appliances, equipment, or fans that require service within 10-feet of a roof edge or open side of a walking surface located more than 30" above the floor, roof, or grade below. Where equipment is placed closer than described herein, guards shall be furnished with top of the guard located not less than 42" above the elevated surface adjacent to the guard. The guard shall be constructed so as to prevent the passage of a 21-inch diameter sphere and shall comply with the loading requirements for guards specified in the Building Code.

3.30 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 15 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.

D. Fire and smoke dampers for duct systems shall comply with Section 15800.

3.31 COMMISSIONING RESPONSIBILITIES

A. The mechanical contractor, all sub-contractors, and suppliers within Division 15 shall cooperate in the Commissioning process, to facilitate the successful completion of the Commissioning of all HVAC equipment, controls, and other items specified within this Division. Refer to Section 15995 – Commissioning for further details concerning the commissioning process.

B. The Contractor and following sub-contractors shall assign a representative to the Commissioning team:

1. Mechanical Contractor
2. Controls Contractor
3. Sheet Metal Contractor (if separate sub-contractor to Mechanical)
4. Testing, Adjusting, and Balancing Agent
5. Electrical Contractor

C. Each contractor representative shall have the authority to make decisions on behalf of the mechanical contractor as they relate to organization and scheduling of the Commissioning process.

D. The Mechanical Contractor shall ensure communication between Division 15 sub-contractors and suppliers with all other commissioning team members, and shall foster necessary cooperative action.

E. The Mechanical Contractor and sub-contractors shall participate in the commissioning process as follows:

1. Each contractor shall include in their bid, the cost of participating in the commissioning process.
2. Include requirements for Commissioning in each purchase order or sub-contract written.
3. Attend commissioning meetings.
4. Provide the Commissioning Agent (CA) a copy of all equipment cut sheets and shop drawing submittals, operational and maintenance submittals, equipment installation and start-up instructions, and other documentation or submittals pertinent to the commissioning process.
5. Ensure cooperation and participation of appropriate equipment manufacturers, or their authorized representatives, in start-up, testing and training activities.
6. Prior to commissioning, inspect, check and confirm the correct and complete installation of all equipment, piping, ductwork, and systems for which system verification checklists are included in the Commissioning plan. If deficient or incomplete work is discovered, ensure action is taken immediately to correct the problem and the system is ready to be commissioned.
7. Provide written notification to the Commissioning Agent that the HVAC work is complete, checked, tested and ready to be Commissioned.
8. Set up a meeting with the Test and Balancing (TAB) Contractor, Commissioning Agent, and Engineer at least one month prior to substantial completion of the HVAC work to discuss the requirements of the TAB Contractor for completing TAB work. Notify the TAB in writing a minimum of two weeks in advance, with a copy to the Commissioning Agent and the Engineer, that systems are installed, performance has been verified, and that TAB work can proceed.
9. Provide sufficient personnel to assist the Commissioning Agent as necessary during the systems verification and performance testing.
10. Operate all equipment and systems as directed by the Commissioning Agent to complete the Commissioning functional and performance verification processes. If, during the commissioning process, equipment or systems are not functioning correctly, or are incomplete, the Commissioning process may be stopped at the discretion of the CA. Those responsible for deficient of incomplete work will be responsible for all costs associated with re-participating in the commissioning of that particular equipment or system.
11. Provide instruction and demonstrations for the Owner’s designated operating staff, in conjunction with the Commissioning Agent and mechanical engineer, and with the participation of qualified technicians from major equipment suppliers and the controls contractor.

3.32 OPERATION AND MAINTENANCE MANUALS

A. The Contractor shall prepare operation and maintenance manuals which shall cover all systems installed under Division 15.

B. The manuals 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 manuals 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. These descriptions shall be supported with a schematic flow diagram when applicable.
7. Temperature control diagrams including an explanation of the control sequence of each system along with the following instruction whenever applicable.

    a. Emergency procedures for failure of major equipment.
    b. Normal starting, operating and shutdown.
    c. Summer or winter shutdown.

8. System Balancing report.
9. Valve tag list when applicable.
10. 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.

3.33 DUST PROTECTION

A. During the course of demolition, work will be performed in areas where dust can be a nuisance to occupants or cause operating difficulties to equipment. The contractor shall take appropriate measures to minimize production of dust and provide dust barriers to separate the work area in an approved method to minimize dirt and dust migration with the use of tarpaulins, plastic enclosures, temporary walls, or other means as necessary, to be approved by the Owner.

B. The Contractor may, with approval of Owner, wet down concrete and masonry surfaces being demolished, but the contractor shall also provide means to control water migration to

adjoining spaces, provide means to remove water which may accumulate due to this wetting process, and be responsible for any structural or occupants material damage caused from the use of water.

3.34 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 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. Duct leakage tests.
3. 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.

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) 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 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.

3.7 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.

3.8 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.

B. Maintaining pressure relationships as designed shall have priority over the tolerances specified above.

3.9 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.

3.10 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. Fan curves.
2. Manufacturers' test data.
3. Field test reports prepared by system and equipment installers.
4. 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. Gas-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.

G. Fan Test Reports: For supply, return, and exhaust fans, include the following:

1. Fan Data:

a. System identification.
b. Location.
c. Make and type.
d. Model number and size.
e. Manufacturer's serial number.
f. Arrangement and class.
g. Sheave make, size in inches, and bore.
h. Center-to-center dimensions of sheave and amount of adjustments in inches.

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.
g. Number, make, and size of belts.

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. Suction static pressure in inches wg.

H. Round, Flat-Oval, 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.

I. Instrument Calibration Reports:

1. Report Data:

a. Instrument type and make.
b. Serial number.
c. Application.
d. Dates of use.
e. Dates of calibration.

3.11 VERIFICATION OF TAB REPORT

A. The TAB specialist's test and balance engineer shall conduct the inspection in the presence of Owner or Construction Manager.

B. Owner 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 and Architect may contact AABC Headquarters regarding the AABC National Performance Guaranty.

F. Prepare test and inspection reports.

3.12 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, exposed supply and outdoor air.
3. Indoor, concealed return located in unconditioned space.
4. Indoor, exposed return located in unconditioned space.
5. Indoor, concealed exhaust between isolation damper and penetration of building exterior.
6. Indoor, exposed exhaust between isolation damper and penetration of building exterior.
7. Outdoor, concealed supply and return.
8. Outdoor, exposed supply and return.

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.
2. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 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.

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 "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 ASJ or 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 FIRE-RATED INSULATION SYSTEMS

A. Fire-Rated Board: Structural-grade, press-molded, xonolite calcium silicate, fireproofing board suitable for operating temperatures up to 1700 deg F. Comply with ASTM C656, Type II, Grade 6. Tested and certified to provide a 2-hour fire rating by an NRTL acceptable to authorities having jurisdiction.

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

a. Johns Manville; a Berkshire Hathaway company.

B. Fire-Rated Blanket: High-temperature, flexible, blanket insulation with FSK jacket that is tested and certified to provide a 2-hour fire rating by an NRTL acceptable to authorities having jurisdiction.

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

a. 3M.
b. Thermal Ceramics.
c. Unifrax Corporation.

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.

B. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.

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.

C. ASJ Adhesive, and FSK Jacket Adhesive: Comply with MIL-A-3316C, Class 2, Grade A for bonding insulation jacket lap seams and joints.

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.

D. PVC Jacket Adhesive: Compatible with PVC jacket.

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

a. Dow Consumer Solutions.
b. Johns Manville; a Berkshire Hathaway company.
c. P.I.C. Plastics, Inc.
d. Proto Corporation.
e. Speedline Corporation.

2.4 MASTICS AND COATINGS

A. Materials shall be compatible with insulation materials, jackets, and substrates.

B. Vapor-Retarder Mastic: Water based; suitable for indoor use on below ambient services.

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

a. Childers Brand; H. B. Fuller Construction Products.
b. Foster Brand; H. B. Fuller Construction Products.
c. Knauf Insulation.

d. Vimasco Corporation.

2. Water-Vapor Permeance: Comply with ASTM C755, Section 7.2.2, Table 2, for insulation type and service conditions.
3. Service Temperature Range: Minus 20 to plus 180 deg F.
4. Comply with MIL-PRF-19565C, Type II, for permeance requirements.
5. Color: White.

C. Vapor-Retarder Mastic: Solvent based; suitable for indoor use on below ambient services.

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. Water-Vapor Permeance: Comply with ASTM C755, Section 7.2.2, Table 2, for insulation type and service conditions.
3. Service Temperature Range: 0 to 180 deg F.
4. Color: White.

D. Vapor-Retarder Mastic: Solvent based; suitable for outdoor use on below ambient services.

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.

2. Water-Vapor Permeance: Comply with ASTM C755, Section 7.2.2, Table 2, for insulation type and service conditions.
3. Service Temperature Range: Minus 50 to plus 220 deg F.
4. Color: White.

E. Breather Mastic: Water based; suitable for indoor and outdoor use on above ambient services.

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. Knauf Insulation.
e. Mon-Eco Industries.
f. Vimasco Corporation.

2. Water-Vapor Permeance: ASTM E96, greater than 1.0 perm at manufacturer's recommended dry film thickness.
3. Service Temperature Range: Minus 20 to plus 180 deg F.
4. Color: White.

2.5 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.

B. ASJ Flashing Sealants, and Vinyl and PVC 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. Foster Brand; H. B. Fuller Construction Products.

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: White.

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 TAPES

A. ASJ Tape: White 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: 11.5 mils.
4. Adhesion: 90 ounces force/inch in width.
5. Elongation: 2 percent.
6. Tensile Strength: 40 lbf/inch in width.
7. ASJ Tape Disks and Squares: Precut disks or squares of ASJ tape.

B. 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.

C. PVC Tape: White vapor-retarder tape matching field-applied PVC jacket with acrylic adhesive; suitable for indoor and outdoor applications.

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

a. 3M.
b. Ideal Tape Co., an American Biltrite Company.

2. Width: 2 inches.
3. Thickness: 6 mils.
4. Adhesion: 64 ounces force/inch in width.
5. Elongation: 500 percent.
6. Tensile Strength: 18 lbf/inch in width.

D. Aluminum-Foil Tape: Vapor-retarder tape with acrylic adhesive.

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: 2 inches.
3. Thickness: 3.7 mils.
4. Adhesion: 100 ounces force/inch in width.

5. Elongation: 5 percent.
6. Tensile Strength: 34 lbf/inch in width.

2.8 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.

2.9 CORNER ANGLES

A. PVC Corner Angles: 30 mils thick, minimum 1 by 1 inch, PVC according to ASTM D1784, Class 16354-C. White or color-coded to match adjacent surface.

B. Aluminum Corner Angles: 0.040-inch-thick, minimum 1 by 1 inch, aluminum according to ASTM B209, Alloy 3003, 3005, 3105, or 5005; Temper H-14.

C. Stainless-Steel Corner Angles: 0.024-inch-thick, minimum 1 by 1 inch, stainless steel according to ASTM A167 or ASTM A240/A240M, [**Type 304**] [**or**] [**Type 316**].

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 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.

C. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.

D. 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."

E. Insulation Installation at Floor Penetrations:

1. Duct: For penetrations through fire-rated assemblies, terminate insulation at fire damper sleeves and externally insulate damper sleeve beyond floor to match adjacent duct insulation. Overlap damper sleeve and duct insulation at least 2 inches.
2. Seal penetrations through fire-rated assemblies. 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 FIRE-RATED INSULATION SYSTEM INSTALLATION

A. Where fire-rated insulation system is indicated, secure system to ducts and duct hangers and supports to maintain a continuous fire rating.

B. Insulate duct access panels and doors to achieve same fire rating as duct.

C. Install firestopping at penetrations through fire-rated assemblies. Fire-stop systems are specified in Section 078413 "Penetration Firestopping."

3.7 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.

3.8 DUCT INSULATION SCHEDULE, GENERAL

A. Plenums and Ducts Requiring Insulation:

1. Indoor, concealed supply and outdoor air.
2. Indoor, exposed supply and outdoor air.
3. Indoor, concealed return located in unconditioned space.
4. Indoor, exposed return located in unconditioned space.
5. Indoor, concealed exhaust between isolation damper and penetration of building exterior.
6. Indoor, exposed exhaust between isolation damper and penetration of building exterior.
7. Outdoor, concealed supply and return.
8. Outdoor, exposed supply and return.

B. Items Not Insulated:

1. Fibrous-glass ducts.
2. Metal ducts with duct liner of sufficient thickness to comply with energy code and ASHRAE/IESNA 90.1.
3. Factory-insulated flexible ducts.
4. Factory-insulated plenums and casings.
5. Flexible connectors.
6. Vibration-control devices.
7. Factory-insulated access panels and doors.

3.9 INDOOR DUCT AND PLENUM INSULATION SCHEDULE

A. Concealed, round and flat-oval, 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, round and flat-oval, 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.

C. Concealed, round and flat-oval, 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.

D. Concealed, round and flat-oval, exhaust-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.

E. 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.

F. 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.

G. 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.

H. Concealed, rectangular, exhaust-air duct insulation between isolation damper and penetration of building exterior 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.

I. Concealed, Type I, Commercial, Kitchen Hood Exhaust Duct and Plenum Insulation: Fire-rated blanket or board; thickness as required to achieve 2-hour fire rating.

J. Concealed, supply-air plenum 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.

K. Concealed, return-air plenum 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.

L. Concealed, outdoor-air plenum 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.

M. Concealed, exhaust-air plenum 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.

N. Exposed, round and flat-oval, 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.

O. Exposed, round and flat-oval, 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.

P. Exposed, round and flat-oval, 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.

Q. Exposed, round and flat-oval, exhaust-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.

R. Exposed, 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.

S. Exposed, 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.

T. Exposed, 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.

U. Exposed, rectangular, exhaust-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.

V. Exposed, supply-air plenum 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.

W. Exposed, return-air plenum 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.

X. Exposed, outdoor-air plenum 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.

Y. Exposed, exhaust-air plenum 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.

3.10 ABOVEGROUND, OUTDOOR DUCT AND PLENUM INSULATION SCHEDULE

A. Insulation materials and thicknesses are identified below. If more than one material is listed for a duct system, selection from materials listed is Contractor's option.

B. Concealed, round and flat-oval, supply-air duct insulation shall be one of the following:

1. Mineral-Fiber Blanket: 4-1/2 inches thick and 0.75 lb/cu.ft. density or of a thickness and density to achieve a minimum, installed, total R-value of 12.

C. Concealed, round and flat-oval, return-air duct insulation shall be one of the following:

1. Mineral-Fiber Blanket: 4-1/2 inches thick and 0.75 lb/cu.ft. density or of a thickness and density to achieve a minimum, installed, total R-value of 12.

D. Concealed, round and flat-oval, outdoor-air duct insulation shall be one of the following:

1. Mineral-Fiber Blanket: 4-1/2 inches thick and 0.75 lb/cu.ft. density or of a thickness and density to achieve a minimum, installed, total R-value of 12.

E. Concealed, rectangular, supply-air duct insulation shall be one of the following:

1. Mineral-Fiber Blanket: 4-1/2 inches thick and 0.75 lb/cu.ft. density or of a thickness and density to achieve a minimum, installed, total R-value of 12.
2. Mineral-Fiber Board: 3 inches thick and 3.0 lb/cu.ft. density or of a thickness and density to achieve a minimum, installed, total R-value of 12.

F. Concealed, rectangular, return-air duct insulation shall be one of the following:

1. Mineral-Fiber Blanket: 4-1/2 inches thick and 0.75 lb/cu.ft. density or of a thickness and density to achieve a minimum, installed, total R-value of 12.
2. Mineral-Fiber Board: 3 inches thick and 3.0 lb/cu.ft. density or of a thickness and density to achieve a minimum, installed, total R-value of 12.

G. Concealed, supply-air plenum insulation shall be one of the following:

1. Mineral-Fiber Blanket: 4-1/2 inches thick and 0.75 lb/cu.ft. density or of a thickness and density to achieve a minimum, installed, total R-value of 12.
2. Mineral-Fiber Board: 3 inches thick and 3.0 lb/cu.ft. density or of a thickness and density to achieve a minimum, installed, total R-value of 12.

H. Concealed, return-air plenum insulation shall be one of the following:

1. Mineral-Fiber Blanket: 4-1/2 inches thick and 0.75 lb/cu.ft. density or of a thickness and density to achieve a minimum, installed, total R-value of 12.
2. Mineral-Fiber Board: 3 inches thick and 3.0 lb/cu.ft. density or of a thickness and density to achieve a minimum, installed, total R-value of 12.

I. Exposed, round and flat-oval, supply-air duct insulation shall be one of the following:

1. Mineral-Fiber Blanket: 4-1/2 inches thick and 0.75 lb/cu.ft. density or of a thickness and density to achieve a minimum, installed, total R-value of 12.

J. Exposed, round and flat-oval, return-air duct insulation shall be one of the following:

1. Mineral-Fiber Blanket: 4-1/2 inches thick and 0.75 lb/cu.ft. density or of a thickness and density to achieve a minimum, installed, total R-value of 12.

K. Exposed, rectangular, supply-air duct insulation shall be one of the following:

1. Mineral-Fiber Board: 3 inches thick and 3.0 lb/cu.ft. density or of a thickness and density to achieve a minimum, installed, total R-value of 12.

L. Exposed, rectangular, return-air duct insulation shall be one of the following:

1. Mineral-Fiber Board: 3 inches thick and 3.0 lb/cu.ft. density or of a thickness and density to achieve a minimum, installed, total R-value of 12.

M. Exposed, supply-air plenum insulation shall be one of the following:

1. Mineral-Fiber Board: 3 inches thick and 3.0 lb/cu.ft. density or of a thickness and density to achieve a minimum, installed, total R-value of 12.

N. Exposed, return-air plenum insulation shall be one of the following:

1. Mineral-Fiber Board: 3 inches thick and 3.0 lb/cu.ft. density or of a thickness and density to achieve a minimum, installed, total R-value of 12.

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. Building Automation System (BAS) Controls Contractor shall furnish and install all components necessary to fully integrate new HVAC equipment into existing BAS, incorporating direct digital control (DDC) for energy management, equipment monitoring and control.
2. The BAS shall include all required computer software and hardware, controllers, sensors, transmission equipment, 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 new HVAC device specified in Division 23 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 233423 HVAC Power Ventilators;
2. Section 235416.13 Gas-Fired Furnaces;
3. Section 237223.19 Packaged Indoor Fixed Plate Energy Recovery Units;
4. Section 237416 Packaged Rooftop Air-Conditioning Units;
5. Control Diagrams and Sequence of Operations shown on the Construction Drawings;
6. 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. DDC controllers.
    b. Electrical power devices.
    c. Accessories.
    d. Instruments.
    e. Control dampers and actuators.
    f. 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. 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..

C. 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.

D. 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. The current controls provider is Tri-City Controls.

B. Controls installers must be able to integrate existing and new controls through a single I/P address and meet the requirements of these construction documents.

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. 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.

B. 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.

C. 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.

D. 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.

2.5 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.

2.6 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.

2.7 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.

2.8 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.

2.9 RACEWAYS, FIBER OPTICS AND CONNECTORS

A. Comply with requirements in Division 26 and 27.

2.10 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.

2.11 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 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.

3.4 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.

3.5 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.

3.6 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.

3.7 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.

3.8 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.

3.9 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.

3.10 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.

3.11 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.

3.12 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.

3.13 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.

3.14 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.

3.15 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. 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.

3.16 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.

3.17 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.

3.18 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.

3.19 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 specialties.
3. Piping and tubing joining materials.
4. Manual gas shutoff valves.
5. Pressure regulators.
6. Service meters.
7. 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. Corrugated, stainless-steel tubing with associated components.
3. Valves. Include pressure rating, capacity, settings, and electrical connection data of selected models.
4. Pressure regulators. Indicate pressure ratings and capacities.
5. Service meters. Indicate pressure ratings and capacities. Include supports.
6. Dielectric fittings.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For pressure regulators and service meters to include in emergency, operation, and maintenance manuals.

1.6 QUALITY ASSURANCE

A. Steel Support Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

B. Pipe Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.

C. 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.

1.7 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.

1.8 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.

B. Interruption of Existing Natural-Gas Service: Do not interrupt natural-gas service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide purging and startup of natural-gas supply according to requirements indicated:

1. Notify Construction Manager and Owner no fewer than two days in advance of proposed interruption of natural-gas service.

1.9 COORDINATION

A. Coordinate sizes and locations of concrete bases with actual equipment provided.

B. Coordinate requirements for access panels and doors for valves installed concealed behind finished surfaces. Comply with requirements in Section 083113 "Access Doors and Frames."

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Minimum Operating-Pressure Ratings:

1. Piping and Valves: 100 psig minimum unless otherwise indicated.

2. Service Regulators: Check with local utility service provider.
3. Minimum Operating Pressure of Service Meter: Check with local utility service provider.

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. Unions: ASME B16.39, Class 150, malleable iron with brass-to-iron seat, ground joint, and threaded ends.
3. Protective Coating for Underground Piping: Factory-applied, three-layer coating of epoxy, adhesive, and PE.

    a. Joint Cover Kits: Epoxy paint, adhesive, and heat-shrink PE sleeves.

4. Mechanical Couplings:

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

        1) Baker Hughes Company.
        2) Smith-Blair, Inc.
        3) Viega LLC.

    b. Steel flanges and tube with epoxy finish.
    c. Buna-nitrile seals.
    d. Steel bolts, washers, and nuts.
    e. Coupling shall be capable of joining PE pipe to PE pipe, steel pipe to PE pipe, or steel pipe to steel pipe.
    f. Steel body couplings installed underground on plastic pipe shall be factory equipped with anode.

B. Corrugated, Stainless-Steel Tubing: Comply with ANSI/IAS LC 1.

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

    a. FlashShield Products; Gastite, a division of Titeflex Corp.
    b. TracPipe CounterStrike; Omega Flex, Inc.
    c. Tru-Flex Metal Hose Corp.
    d. Ward Manufacturing LLC.

2. Tubing: ASTM A240/A240M, corrugated, Series 300 stainless steel.
3. Coating: PE with flame retardant.

    a. Surface-Burning Characteristics: As determined by testing identical products according to ASTM E84 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.

4. Fittings: Copper-alloy mechanical fittings with ends made to fit and listed for use with corrugated stainless-steel tubing and capable of metal-to-metal seal without gaskets. Include brazing socket or threaded ends complying with ASME B1.20.1.
5. Striker Plates: Steel, designed to protect tubing from penetrations.
6. Manifolds: Malleable iron or steel with factory-applied protective coating. Threaded connections shall comply with ASME B1.20.1 for pipe inlet and corrugated tubing outlets.
7. Operating-Pressure Rating: 5 psig.

2.3 PIPING SPECIALTIES

A. Appliance Flexible Connectors:

1. Indoor, Fixed-Appliance Flexible Connectors: Comply with ANSI Z21.24.
2. Indoor, Movable-Appliance Flexible Connectors: Comply with ANSI Z21.69.
3. Outdoor, Appliance Flexible Connectors: Comply with ANSI Z21.75.
4. Corrugated stainless-steel tubing with polymer coating.
5. Operating-Pressure Rating: 0.5 psig.
6. End Fittings: Zinc-coated steel.
7. Threaded Ends: Comply with ASME B1.20.1.
8. Maximum Length: 72 inches.

B. Y-Pattern Strainers:

1. Body: ASTM A126, Class B, cast iron with bolted cover and bottom drain connection.
2. End Connections: Threaded ends for NPS 2 and smaller; flanged ends for NPS 2-1/2 and larger.
3. Strainer Screen: 60-mesh startup strainer, and perforated stainless-steel basket with 50 percent free area.
4. CWP Rating: 125 psig.

C. Basket Strainers:

1. Body: ASTM A126, Class B, high-tensile cast iron with bolted cover and bottom drain connection.
2. End Connections: Threaded ends for NPS 2 and smaller; flanged ends for NPS 2-1/2 and larger.
3. Strainer Screen: 60-mesh startup strainer, and perforated stainless-steel basket with 50 percent free area.
4. CWP Rating: 125 psig.

D. T-Pattern Strainers:

1. Body: Ductile or malleable iron with removable access coupling and end cap for strainer maintenance.
2. End Connections: Grooved ends.
3. Strainer Screen: 60-mesh startup strainer, and perforated stainless-steel basket with 57 percent free area.
4. CWP Rating: 750 psig.

E. Weatherproof Vent Cap: Cast- or malleable-iron increaser fitting with corrosion-resistant wire screen, with free area at least equal to cross-sectional area of connecting pipe and threaded-end connection.

2.4 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.

C. Brazing Filler Metals: Alloy with melting point greater than 1000 deg F complying with AWS A5.8/A5.8M. Brazing alloys containing more than 0.05 percent phosphorus are prohibited.

2.5 MANUAL GAS SHUTOFF VALVES

A. See "Aboveground Manual Gas Shutoff Valve Schedule" Articles 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 "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles.
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. Lyall, R. W. & Company, Inc.
    e. Perfection Corporation.

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 "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles.
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.
    b. Lee Brass Company.

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.

2.6 PRESSURE REGULATORS

A. General Requirements:

1. Single stage and suitable for natural gas.
2. Steel jacket and corrosion-resistant components.
3. Elevation compensator.
4. End Connections: Threaded for regulators NPS 2 and smaller; flanged for regulators NPS 2-1/2 and larger.

B. Service Pressure Regulators: Comply with ANSI Z21.80.

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

    a. Actaris.
    b. American Meter Company.
    c. Fisher Control Valves & Instruments; a brand of Emerson Process Management.
    d. Invensys.
    e. Itron Gas.
    f. Richards Industries.

2. Body and Diaphragm Case: Cast iron or die-cast aluminum.
3. Springs: Zinc-plated steel; interchangeable.
4. Diaphragm Plate: Zinc-plated steel.
5. Seat Disc: Nitrile rubber resistant to gas impurities, abrasion, and deformation at the valve port.
6. Orifice: Aluminum; interchangeable.
7. Seal Plug: Ultraviolet-stabilized, mineral-filled nylon.
8. Single-port, self-contained regulator with orifice no larger than required at maximum pressure inlet, and no pressure sensing piping external to the regulator.
9. Pressure regulator shall maintain discharge pressure setting downstream, and not exceed 150 percent of design discharge pressure at shutoff.
10. Overpressure Protection Device: Factory mounted on pressure regulator.
11. Atmospheric Vent: Factory- or field-installed, stainless-steel screen in opening if not connected to vent piping.
12. Maximum Inlet Pressure: 100 psig.

2.7 SERVICE METERS

A. Diaphragm-Type Service Meters: Comply with ANSI B109.1 and ANSI B109.2.

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

a. Actaris.
b. American Meter Company.
c. Invensys.
d. Itron Gas.

2. Case: Die-cast aluminum.
3. Connections: Steel threads.
4. Diaphragm: Synthetic fabric.
5. Diaphragm Support Bearings: Self-lubricating.
6. Compensation: Continuous temperature and pressure.
7. Meter Index: Cubic feet.
8. Meter Case and Index: Tamper resistant.
9. Remote meter reader compatible.
10. Maximum Inlet Pressure: 100 psig.
11. Pressure Loss: Maximum 0.5-inch wg.
12. Accuracy: Maximum plus or minus 1.0 percent.

2.8 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. 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.

C. Dielectric Flanges:

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

a. Capitol Manufacturing Company.
b. Central Plastics Company.
c. Matco-Norca.
d. WATTS.
e. Wilkins.

2. Description:

a. Standard: ASSE 1079.
b. Factory-fabricated, bolted, companion-flange assembly.
c. Pressure Rating: 125 psig minimum at 180 deg F.
d. End Connections: Solder-joint copper alloy and threaded ferrous; threaded solder-joint copper alloy and threaded ferrous.

2.9 LABELING AND IDENTIFYING

A. Detectable Warning Tape: Acid- and alkali-resistant, PE film warning tape manufactured for marking and identifying underground utilities, a minimum of 6 inches wide and 4 mils thick, continuously inscribed with a description of utility, with metallic core encased in a protective jacket for corrosion protection, detectable by metal detector when tape is buried up to 30 inches deep; colored yellow.

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 underground, natural-gas piping buried at least 36 inches below finished grade. Comply with requirements in Section 312000 "Earth Moving" for excavating, trenching, and backfilling.

1. If natural-gas piping is installed less than 36 inches below finished grade, install it in containment conduit.

C. Steel Piping with Protective Coating:

1. Apply joint cover kits to pipe after joining to cover, seal, and protect joints.
2. Repair damage to PE coating on pipe as recommended in writing by protective coating manufacturer.
3. Replace pipe having damaged PE coating with new pipe.

D. Copper Tubing with Protective Coating:

1. Apply joint cover kits over tubing to cover, seal, and protect joints.
2. Repair damage to PE coating on pipe as recommended in writing by protective coating manufacturer.

E. Install fittings for changes in direction and branch connections.

F. Install pressure gage upstream and downstream from each service regulator.

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. Extend relief vent connections for service regulators, line regulators, and overpressure protection devices to outdoors and terminate with weatherproof vent cap.

O. Conceal pipe installations in walls, pipe spaces, utility spaces, above ceilings, below grade or floors, and in floor channels unless indicated to be exposed to view.

P. Concealed Location Installations: Except as specified below, install concealed natural-gas piping and piping installed under the building in containment conduit constructed of steel pipe with welded joints as described in Part 2. Install a vent pipe from containment conduit to outdoors and terminate with weatherproof vent cap.

1. Above Accessible Ceilings: Natural-gas piping, fittings, valves, and regulators may be installed in accessible spaces without containment conduit.
2. In Floors: Install natural-gas piping with welded or brazed joints and protective coating in cast-in-place concrete floors. Cover piping to be cast in concrete slabs with minimum of 1-1/2 inches of concrete. Piping may not be in physical contact with other metallic structures such as reinforcing rods or electrically neutral conductors. Do not embed piping in concrete slabs containing quick-set additives or cinder aggregate.
3. In Floor Channels: Install natural-gas piping in floor channels. Channels must have cover and be open to space above cover for ventilation.
4. In Walls or Partitions: Protect tubing installed inside partitions or hollow walls from physical damage using steel striker barriers at rigid supports.

    a. Exception: Tubing passing through partitions or walls does not require striker barriers.

5. Prohibited Locations:

    a. Do not install natural-gas piping in or through circulating air ducts, clothes or trash chutes, chimneys or gas vents (flues), ventilating ducts, or dumbwaiter or elevator shafts.
    b. Do not install natural-gas piping in solid walls or partitions.

Q. Use eccentric reducer fittings to make reductions in pipe sizes. Install fittings with level side down.

R. Connect branch piping from top or side of horizontal piping.

S. 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.

T. Do not use natural-gas piping as grounding electrode.

U. Install strainer on inlet of each line-pressure regulator and automatic or electrically operated valve.

V. Install pressure gage upstream and downstream from each line regulator.

W. Install sleeves for piping penetrations of walls, ceilings, and floors.

X. Install sleeve seals for piping penetrations of concrete walls and slabs.

Y. Install escutcheons for piping penetrations of walls, ceilings, and floors.

3.5 SERVICE-METER ASSEMBLY INSTALLATION

A. Install service-meter assemblies aboveground, on concrete bases.

B. Install metal shutoff valves upstream from service regulators. Shutoff valves are not required at second regulators if two regulators are installed in series.

C. Install strainer on inlet of service-pressure regulator and meter set.

D. Install service regulators mounted outside with vent outlet horizontal or facing down. Install screen in vent outlet if not integral with service regulator.

E. Install service meters downstream from pressure regulators.

3.6 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.

3.7 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.

3.8 HANGER AND SUPPORT INSTALLATION

A. Comply with requirements for pipe hangers and supports specified in Section 230500 "Common Work Results for HVAC."

3.9 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.

3.10 LABELING AND IDENTIFYING

A. Comply with requirements in Section 230553 "Identification for HVAC Piping and Equipment" for piping and valve identification.

B. Install detectable warning tape directly above gas piping, 12 inches below finished grade, except 6 inches below subgrade under pavements and slabs.

3.11 PAINTING

A. Paint exposed, exterior metal piping, valves, service regulators, service meters and meter bars, earthquake 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: Gray.

B. Paint exposed, interior metal piping, valves, service regulators, service meters and meter bars, earthquake 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**] [**Quick-drying alkyd**] metal primer.
    b. Intermediate Coat: Interior latex matching topcoat.
    c. Topcoat: Interior latex
    d. Color: Gray.

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: Gray.

C. Damage and Touchup: Repair marred and damaged factory-applied finishes with materials and by procedures to match original factory finish.

3.12 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.

3.13 OUTDOOR PIPING SCHEDULE

A. Underground natural-gas piping shall be the following:

1. Steel pipe with wrought-steel fittings and welded joints, or mechanical couplings. Coat pipe and fittings with protective coating for steel piping.

B. Aboveground natural-gas piping shall be one of the following:

1. Steel pipe with malleable-iron fittings and threaded joints.

3.14 INDOOR PIPING SCHEDULE FOR SYSTEM PRESSURES LESS THAN 0.5 PSIG

A. Aboveground, branch piping NPS 1 and smaller shall be one of the following:

1. Corrugated stainless-steel tubing with mechanical fittings having socket or threaded ends to match adjacent piping.
2. Steel pipe with malleable-iron fittings and threaded joints.

B. Aboveground, distribution piping shall be one of the following:

1. Steel pipe with malleable-iron fittings and threaded joints.

C. Underground, below building, piping shall be one of the following:

1. Steel pipe with malleable-iron fittings and threaded joints.

D. Containment Conduit: Steel pipe with wrought-steel fittings and welded joints. Coat pipe and fittings with protective coating for steel piping.

3.15 ABOVEGROUND MANUAL GAS SHUTOFF VALVE SCHEDULE

A. Valves for pipe sizes NPS 2 and smaller at service meter shall be the following:

1. Bronze plug valve with lock wing.

B. Distribution piping valves for pipe sizes NPS 2 and smaller shall be the following:

1. Two-piece, full-port, bronze ball valves with bronze trim.

C. Valves in branch piping for single appliance shall be the following:

1. Two-piece, full-port, bronze ball valves with bronze trim.

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.

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.

B. Shop Drawings:

1. Fabrication, assembly, and installation, including plans, elevations, sections, components, and attachments to other work.
2. Factory- and shop-fabricated ducts and fittings.
3. Duct layout indicating sizes, configuration, liner material, and static-pressure classes.
4. Elevation of top of ducts.
5. Fittings.
6. Reinforcement and spacing.
7. Seam and joint construction.
8. Penetrations through fire-rated and other partitions.
9. Equipment installation based on equipment being used on Project.
10. Locations for duct accessories, including dampers, turning vanes, and access doors and panels.
11. Hangers and supports, including methods for duct and building attachment.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Duct Design: Duct construction, including sheet metal thicknesses, seam and joint construction, reinforcements, and hangers and supports, shall comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" and with performance requirements and design criteria indicated in "Duct Schedule" Article.

B. 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.

C. Airstream Surfaces: Surfaces in contact with airstream shall comply with requirements in ASHRAE 62.1.

D. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 5 - "Systems and Equipment," and Section 7 - "Construction and System Startup."

E. ASHRAE/IES Compliance: Applicable requirements in ASHRAE/IES 90.1, Section 6.4.4 - "HVAC System Construction and Insulation."

F. 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."

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. Fibrous-Glass Duct Liner: Comply with ASTM C1071, NFPA 90A, or NFPA 90B; and with NAIMA AH124, "Fibrous Glass Duct Liner Standard."

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

a. CertainTeed Corporation; Saint-Gobain North America.
b. Johns Manville; a Berkshire Hathaway company.
c. Knauf Insulation.
d. Owens Corning.

2. Stamped Fittings Inc.
3. Maximum Thermal Conductivity:

a. Type I, Flexible: 0.27 Btu x in./h x sq. ft. x deg F at 75 deg F mean temperature.
b. Type II, Rigid: 0.23 Btu x in./h x sq. ft. x deg F at 75 deg F mean temperature.

4. Antimicrobial Erosion-Resistant Coating: Apply to the surface of the liner that will form the interior surface of the duct to act as a moisture repellent and erosion-resistant coating. Antimicrobial compound shall be tested for efficacy by an NRTL and registered by the EPA for use in HVAC systems.
5. Solvent-Based Liner Adhesive: Comply with NFPA 90A or NFPA 90B and with ASTM C916.

a. Adhesive shall have a VOC content of 80 g/L or less.
b. Adhesive shall comply with the testing and product requirements

B. 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.
b. Armacell LLC.
c. Ductmate Industries, Inc.
d. K-Flex USA.

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 comply with the testing and product requirements

C. 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.

D. 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. 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.

D. 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 comply with the testing and product requirements

E. Flange Gaskets: Butyl rubber, neoprene, or EPDM polymer with polyisobutylene plasticizer.

F. 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. Route ducts to avoid passing through transformer vaults and electrical equipment rooms and enclosures.

I. 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.

J. Install fire and smoke dampers where indicated on Drawings and as required by code, and by local authorities having jurisdiction. Comply with requirements in Section 233300 "Air Duct Accessories" for fire and smoke dampers and specific installation requirements of the damper UL listing.

K. Install heating coils, cooling coils, air filters, dampers, and all other duct-mounted accessories in air ducts where indicated on Drawings.

L. 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."

M. 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.

N. Branch Connections: Use lateral or conical branch connections.

3.2 INSTALLATION OF EXPOSED DUCTWORK

A. Protect ducts exposed in finished spaces from being dented, scratched, or damaged.

B. Trim duct sealants flush with metal. Create a smooth and uniform exposed bead. Do not use two-part tape sealing system.

C. Grind welds to provide smooth surface free of burrs, sharp edges, and weld splatter. When welding stainless steel with a No. 3 or 4 finish, grind the welds flush, polish the exposed welds, and treat the welds to remove discoloration caused by welding.

D. Maintain consistency, symmetry, and uniformity in arrangement and fabrication of fittings, hangers and supports, duct accessories, and air outlets.

E. Repair or replace damaged sections and finished work that does not comply with these requirements.

3.3 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.

3.4 HANGER AND SUPPORT INSTALLATION

A. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 5, "Hangers and Supports."

B. 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.

C. Hangers Exposed to View: Threaded rod and angle or channel supports.

D. Support vertical ducts with steel angles or channel secured to the sides of the duct with welds, bolts, sheet metal screws, or blind rivets; support at each floor and at a maximum intervals of 16 feet.

E. 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.

3.5 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.

3.6 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 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.

3.7 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.
2. Test sections of metal duct system, chosen randomly by Owner, for cleanliness in accordance with "Description of Method 3 - NADCA Vacuum Test" in NADCA ACR, "Assessment, Cleaning and Restoration of HVAC Systems."

    a. Acceptable Cleanliness Level: Net weight of debris collected on the filter media shall not exceed 0.75 mg/100 sq. cm.

D. Duct system will be considered defective if it does not pass tests and inspections.

E. Prepare test and inspection reports.

3.8 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.

3.9 STARTUP

A. Air Balance: Comply with requirements in Section 230593 "Testing, Adjusting, and Balancing for HVAC."

3.10 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. Outdoor-Air (Not Filtered, Heated, or Cooled) 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.

F. Intermediate Reinforcement:

1. Galvanized-Steel Ducts: Galvanized steel or carbon steel coated with zinc-chromate primer.

G. Liner:

1. Supply-Air Ducts: Fibrous glass, Type I, 1 inch thick.
2. Return-Air Ducts: Fibrous glass, Type I, 1 inch thick.
3. Transfer Ducts: Fibrous glass, Type I, 1 inch thick.

H. 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.
c. Round Elbows, 14 Inches and Larger in Diameter: Standing seam.

I. 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. Backdraft and pressure relief dampers.
2. Manual volume dampers/balancing dampers.
3. Control Dampers.
4. Fire dampers.
5. Flange connectors.
6. Duct access panel assemblies.
7. Flexible connectors.
8. Duct accessory hardware.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For air duct accessories to include in operation and maintenance manuals.

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 BACKDRAFT AND PRESSURE RELIEF DAMPERS

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

1. Air Balance; a division of MESTEK, Inc.

a. A335 (Rectangular)

2. Greenheck Fan Corporation.

a. EM-10 (Rectangular, Horizontal)
b. EM-30 (Rectangular, Vertical)

3. Pottorff.

a. BD-250 (Rectangular)

4. Ruskin Company.

a. BD2A2 (Rectangular)

5. United Enertech.

a. CB-600 (Rectangular)

B. Description: Gravity balanced.

C. Performance:

1. Maximum Air Velocity: 1000 fpm.
2. Maximum System Pressure: 1 inch wg.
3. AMCA Certification: Test and rate in accordance with AMCA 500.
4. Leakage:

a. Class III: Leakage shall not exceed 40 cfm/sq. ft. against 1-inch wg differential static pressure.

D. Construction:

1. Frame:

a. Flanged.
b. Minimum 0.060-inch-thick extruded aluminum, with welded or mechanically attached corners and mounting flange.

2. Blades:

a. Multiple single-piece blades.
b. End pivoted, maximum 6-inch width, minimum 0.045-inch-thick aluminum with sealed edges.

3. Blade Action: Parallel.

E. Blade Seals: Silicone rubber or vinyl off-set leg at blade edges.

F. Blade Axles:

1. Material: Extruded aluminum or plated steel.
2. Diameter: minimum 0.125 inch.

G. Bearings: Synthetic.

H. Accessories:

1. Adjustment device to permit setting for varying differential static pressure.
2. Counterweights for vertical airflow installations.
3. Screen Mounting:

    a. Mounted in sleeve.

        1) Sleeve Thickness: 20 gauge minimum.
        2) Sleeve Length: 6 inches minimum.

4. Screen Material: Galvanized steel or aluminum.
5. Screen Type: Bird.
6. 90-degree stops.

2.3 MANUAL VOLUME DAMPERS/BALANCING DAMPERS

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

1. Air Balance; a division of MESTEK, Inc.

    a. AC111 (Rectangular)
    b. AC112 (Round)

2. Greenheck Fan Corporation.

    a. MBD-10 (Rectangular)
    b. MBDR-50 (Round)

3. McGill AirFlow LLC.

    a. VC8 (Rectangular)
    b. VC9 (Round)

4. Pottorff.

    a. CD-10 (Parallel Blade)
    b. CD-10R (Opposed Blade)

5. Ruskin Company.

    a. MDRS25 (Round)

6. United Enertech.

    a. CD-111 (Parallel Blade)
    b. CD-110 (Opposed Blade)

B. 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. Velocity: Up to 1500 fpm.
4. Pressure Rating: Low to medium pressure and velocity systems. Up to 1 in. wg pressure differential.

C. Construction:

1. Linkage: Out of airstream.
2. Suitable for horizontal or vertical airflow applications.
3. Frames:

a. Hat, U, or angle shaped.
b. Material: Galvanized steel, minimum 22 gauge thick.
c. Mitered and welded corners.
d. Flanges for attaching to walls and flangeless frames for installing in ducts.

4. Blades:

a. Multiple or single blade.
b. Parallel- or opposed-blade design.
c. Stiffen damper blades for stability.
d. Galvanized, roll-formed steel; minimum 22 gauge thick.

5. Blade Axles: 1/2-inch diameter, plated steel.
6. Bearings:

a. Molded synthetic.
b. Dampers mounted with vertical blades to have thrust bearing at each end of every blade.

7. Operator: Locking manual quadrant.
8. Tie Bars and Brackets: Galvanized steel.
9. Locking device to hold damper blades in a fixed position without vibration.

2.4 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.

2.5 FIRE DAMPERS

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

1. Air Balance; a division of MESTEK, Inc.
2. Aire Technologies.

a. 75 (1-1/2 hours)
b. 05 (3 hours)

3. Arrow United Industries.

a. 117 (1-1/2 hours)
b. 317 (3 hours)

4. Cesco Products; a division of MESTEK, Inc.

a. 15S (1-1/2 hours)
b. 30S (3 hours)

5. CL WARD LLC.

a. 75A (1-1/2 hours)
b. 05A (3 hours)

6. Greenheck Fan Corporation.

a. FD-110 (1-1/2 hours)
b. FD-310 (3 hours)

7. Pottorff.

a. VFD-10-A (1-1/2 hours)
b. VFD-30-A (3 hours)

8. Ruskin Company.
9. Safe Air – Dowco Products.
10. United Enertech.

a. FD-ALB

11. Vent Products Co., Inc.

B. Type: Static; rated and labeled in accordance with UL 555 by an NRTL.

C. Closing rating in ducts up to 4-inch wg static pressure class and minimum 2000 fpm velocity.

D. Fire Rating: 1-1/2 and 3 hours.

E. Frame: Curtain type with blades inside airstream; fabricated with roll-formed galvanized steel; with mitered and interlocking corners; gauge in accordance with UL listing.

F. Mounting Sleeve: Factory- or field-installed, galvanized sheet steel; gauge in accordance with UL listing.

G. Mounting Orientation: Vertical or horizontal as indicated.

H. Blades: Roll-formed galvanized sheet steel, interlocking. Material gauge is to be in accordance with UL listing.

I. Horizontal Dampers: Include blade lock and stainless steel closure spring.

J. Heat-Responsive Device:

1. Replaceable, 165 deg F rated, fusible links.

2.6 FLANGE CONNECTORS

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

1. CL WARD LLC.
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.

2.7 DUCT ACCESS PANEL ASSEMBLIES

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

1. CL WARD LLC.
2. Ductmate Industries, Inc.
3. Flame Gard, Inc.

B. Access panels used in cooking applications:

1. Labeled compliant to NFPA 96 for grease duct access doors.
2. Labeled in accordance with UL 1978 by an NRTL.

C. Panel and Frame: Minimum thickness 16-gauge carbon or stainless steel.

D. Fasteners: Carbon or Stainless steel. Panel fasteners shall not penetrate duct wall.

E. Gasket: Comply with NFPA 96, grease-tight, high-temperature ceramic fiber, rated for minimum 2000 deg F.

F. Minimum Pressure Rating: 10 inches wg positive or negative.

2.8 FLEXIBLE CONNECTORS

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

1. CL WARD LLC.
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 inches wide attached to two strips of 3-inch-wide, 0.028-inch-thick (24 gauge), 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.

2.9 DUCT ACCESSORY HARDWARE

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

1. CL WARD LLC.
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.

B. Install duct accessories of materials suited to duct materials; use galvanized-steel accessories in galvanized-steel ducts.

C. Install backdraft dampers at inlet of exhaust fans or exhaust ducts as close as possible to exhaust fan unless otherwise indicated.

D. Install volume dampers at points on supply, return, and exhaust systems where branches extend from larger ducts.

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 fire dampers in accordance with UL listing.

G. Install flexible connectors to connect ducts to equipment.

H. Install duct test holes where required for testing and balancing purposes.

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. Operate fire dampers to verify full range of movement and that proper heat-response device is installed.

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 233423 - HVAC POWER 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. Centrifugal ventilators - roof downblast.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Construction details, material descriptions, dimensions of individual components and profiles, and finishes for fans.
2. Rated capacities, operating characteristics, and furnished specialties and accessories.
3. Certified fan performance curves with system operating conditions indicated.
4. Certified fan sound-power ratings.
5. Motor ratings and electrical characteristics, plus motor and electrical accessories.
6. Material thickness and finishes, including color charts.
7. Dampers, including housings, linkages, and operators.
8. Prefabricated roof curbs.
9. Fan speed controllers.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For HVAC power ventilators to include in normal and emergency operation, and maintenance manuals.

PART 2 - PRODUCTS

2.1 CENTRIFUGAL VENTILATORS - ROOF DOWNBLAST

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

1. Acme Engineering & Manufacturing Corp.
2. Aerovent; a division of Twin City Fan Companies, Ltd.
3. Airmaster Fan Company.
4. American Coolair Corporation.
5. Carnes Company.
6. FloAire National.
7. Greenheck Fan Corporation.

8. JencoFan.
9. Loren Cook Company.
10. New York Blower Company (The).
11. Northern Blower, Inc.
12. PennBarry.
13. Quietaire Inc.
14. Rupp Air Management Systems.
15. S & P USA Ventilation Systems, LLC.

B. Housing: Downblast; removable spun-aluminum; square, one-piece aluminum base with venturi inlet cone.

C. Fan Wheels: Aluminum hub and wheel with backward-inclined blades.

D. Accessories:

1. Disconnect Switch: Nonfusible type, with thermal-overload protection mounted inside fan housing, factory wired through an internal aluminum conduit.
2. Bird Screens: Removable, 1/2-inch mesh, aluminum or brass wire.
3. Dampers: Counterbalanced, parallel-blade, backdraft dampers mounted in curb base; factory set to close when fan stops.
4. Mounting Pedestal: Galvanized steel with removable access panel.

E. Prefabricated Roof Curbs: Galvanized steel; 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 suit roof opening and fan base.

1. Configuration: Self-flashing without a cant strip, with mounting flange. Manufactured to accommodate roof slope.
2. Overall Height: 24 inches.
3. Sound Curb: Curb with sound-absorbing insulation.
4. Hinged sub-base to provide access to damper or as cleanout for grease applications.
5. Metal Liner: Galvanized steel.
6. Mounting Pedestal: Galvanized steel with removable access panel.

2.2 MOTORS

A. Type: Brushless DC.

B. Insulation: Type B.

C. Service Factor: 1.0.

D. Thermal Protection: Auto Overload.

E. Nominal Efficiency: 85.

2.3 SOURCE QUALITY CONTROL

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. AMCA Certification: Fans shall comply with AMCA 11 and bear the AMCA-Certified Ratings Seal.

C. Fan Sound Ratings: Comply with AMCA 311, and label fans with the AMCA-Certified Ratings Seal. Sound ratings shall comply with AMCA 301. The fans shall be tested according to AMCA 300.

D. Fan Performance Ratings: Comply with AMCA 211 and label fans with AMCA-Certified Rating Seal. The fans shall be tested for air performance - flow rate, fan pressure, power, fan efficiency, air density, speed of rotation, and fan efficiency - according to AMCA 210/ASHRAE 51.

E. Operating Limits: Classify according to AMCA 99.

F. UL Standards: Power ventilators shall comply with UL 705. Power ventilators for use for restaurant kitchen exhaust shall also comply with UL 762.

PART 3 - EXECUTION

3.1 INSTALLATION OF HVAC POWER VENTILATORS

A. Install power ventilators level and plumb.

B. Secure roof-mounted fans to roof curbs with zinc-plated hardware. See Section 077200 "Roof Accessories" for installation of roof curbs.

C. Install units with clearances for service and maintenance.

D. Label units according to requirements specified in Section 230553 "Identification for HVAC Piping and Equipment."

3.2 DUCTWORK CONNECTIONS

A. Drawings indicate general arrangement of ducts and duct accessories. Make final duct connections with flexible connectors. Flexible connectors are specified in Section 233300 "Air Duct Accessories."

3.3 ELECTRICAL CONNECTIONS

A. Connect 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.

3.4 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."

3.5 FIELD QUALITY CONTROL

A. Perform tests and inspections with the assistance of a factory-authorized service representative.

B. Tests and Inspections:

1. Verify that shipping, blocking, and bracing are removed.
2. Verify that unit is secure on mountings and supporting devices and that connections to ducts and electrical components are complete. Verify that proper thermal-overload protection is installed in motors, starters, and disconnect switches.
3. Verify that there is adequate maintenance and access space.
4. Verify that cleaning and adjusting are complete.
5. Disconnect fan drive from motor, verify proper motor rotation direction, and verify fan wheel free rotation and smooth bearing operation. Reconnect fan drive system, align and adjust belts, and install belt guards.
6. Adjust damper linkages for proper damper operation.
7. Verify lubrication for bearings and other moving parts.
8. Verify that manual and automatic volume control and fire and smoke dampers in connected ductwork systems are in fully open position.
9. Disable automatic temperature-control operators, energize motor and adjust fan to indicated rpm, and measure and record motor voltage and amperage.
10. Shut unit down and reconnect automatic temperature-control operators.
11. Remove and replace malfunctioning units and retest as specified above.

C. Test and adjust controls and safeties. Controls and equipment will be considered defective if they do not pass tests and inspections.

D. Prepare test and inspection reports.

3.6 ADJUSTING

A. Adjust damper linkages for proper damper operation.

B. Comply with requirements in Section 230593 "Testing, Adjusting, and Balancing for HVAC" for testing, adjusting, and balancing procedures.

C. Replace fan and motor pulleys as required to achieve design airflow.

D. Lubricate bearings.

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.

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: Prime coated for field painting by others.

E. Face Style: Four 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: Refer to architectural reflected ceiling plan for ceiling types.

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: Refer to architectural reflected ceiling plan for ceiling types.

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. 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 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 235416.13 - GAS-FIRED FURNACES

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. Gas-fired, condensing furnaces and accessories complete with controls.
2. Air filters.

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 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 each furnace 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. Furnace and accessories complete with controls.
b. Air filter.

1.5 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. Disposable Air Filters: Furnish two complete sets.

1.6 QUALITY ASSURANCE

A. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 5 - "Systems and Equipment" and Section 7 - "Construction and Startup."

B. ASHRAE/IES 90.1 Compliance: Applicable requirements in ASHRAE/IES 90.1, Section 6 - "Heating, Ventilating, and Air-Conditioning."

C. Comply with NFPA 70.

1.7 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace the following components of furnaces that fail in materials or workmanship within specified warranty period:

1. Warranty Period, Commencing on Date of Substantial Completion:

a. Furnace Heat Exchanger: 10 years.
b. Integrated Ignition and Blower Control Circuit Board: Five years.
c. Draft-Inducer Motor: Five years.
d. Other parts: one year.

PART 2 - PRODUCTS

2.1 ASSEMBLY DESCRIPTION

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a qualified testing agency, and marked for intended location and application.

B. General Requirements for Noncondensing Gas-Fired Furnaces: Factory assembled, piped, wired, and tested; complying with ANSI Z21.47/CSA 2.3 and NFPA 54.

2.2 GAS-FIRED FURNACES, CONDENSING

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

1. Amana Heating & Air Conditioning; under license to Goodman Company, L.P.
2. Bryant Heating & Cooling Systems; a unit of United Technologies Corp.
3. Carrier Corporation.
4. Comfortmaker Air Conditioning & Heating; an International Comfort Products brand; a unit of United Technologies Corp.
5. Daikin Applied.
6. Goodman Manufacturing Company, L.P.
7. Lennox Industries, Inc.; Lennox International.
8. Rheem Manufacturing Company; Heating and Cooling Products.
9. Ruud Air Conditioning Division.
10. Trane.
11. YORK; a Johnson Controls company.

B. Cabinet: Steel.

1. Cabinet interior around heat exchanger shall be factory-installed insulation.
2. Lift-out panels shall expose burners and all other items requiring access for maintenance.
3. Factory paint external cabinets in manufacturer's standard color.
4. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.

C. Fan: Centrifugal, factory balanced, resilient mounted, direct drive.

1. Special Motor Features, ECM: Electronically controlled motor (ECM) controlled by integrated furnace/blower control.

D. Type of Gas: Natural.

E. Heat Exchanger:

1. Primary: Stainless steel.
2. Secondary: Stainless steel.

F. Burner:

1. Gas Valve: 100 percent safety two-stage main gas valve, main shutoff valve, pressure regulator, safety pilot with electronic flame sensor, limit control, transformer, and combination ignition/fan timer control board.
2. Ignition: Electric pilot ignition, with hot-surface igniter or electric spark ignition.

G. Gas-Burner Safety Controls:

1. Electronic Flame Sensor: Prevents gas valve from opening until pilot flame is proven; stops gas flow on ignition failure.
2. Flame Rollout Switch: Installed on burner box; prevents burner operation.
3. Limit Control: Fixed stop at maximum permissible setting; de-energizes burner on excessive bonnet temperature; automatic reset.

H. Combustion-Air Inducer: Centrifugal fan with thermally protected motor and sleeve bearings prepurges heat exchanger and vents combustion products; pressure switch prevents furnace operation if combustion-air inlet or flue outlet is blocked.

I. Furnace Controls: Solid-state board integrates ignition, heat, cooling, and fan speeds; adjustable fan-on and fan-off timing; terminals for connection to accessories.

J. Accessories:

1. Combination Combustion-Air Intake and Vent: PVC plastic fitting to combine combustion-air inlet and vent through roof.

2.3 THERMOSTATS

A. Controls shall comply with requirements in ASHRAE/IES 90.1, Section 6 - "Heating, Ventilating, and Air Conditioning."

B. Solid-State Thermostat: Wall-mounted, programmable, microprocessor-based unit with manual switching from heating to cooling, preferential rate control, seven-day programmability with minimum of four temperature presets per day, and battery backup protection against power failure for program settings.

C. Control Wiring: Balanced twisted-pair cabling.

2.4 AIR FILTERS

A. Disposable Filters: 1-inch-thick fiberglass media with ASHRAE 52.2 MERV rating of 8 or higher**,** in sheet metal frame.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine factory-installed insulation before furnace installation. Reject units that are wet, moisture damaged, or mold damaged.

C. Examine roughing-in for gas piping systems to verify actual locations of piping connections before equipment installation.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install gas-fired furnaces and associated fuel and vent features and systems according to NFPA 54.

B. Base-Mounted Units: Secure units to substrate. Provide optional bottom closure base if required by installation conditions.

C. Controls: Install thermostats at mounting height of 60 inches above floor.

D. Wiring Method: Install control wiring in accessible ceiling spaces and in gypsum board partitions where unenclosed wiring method may be used. Conceal control wiring except in unfinished spaces.

3.3 PIPING CONNECTIONS

A. Gas piping installation requirements are specified in Section 231123 "Facility Natural-Gas Piping." Drawings indicate general arrangement of piping, fittings, and specialties. Connect gas piping with union or flange and appliance connector valve.

B. Install piping adjacent to equipment to allow service and maintenance.

C. Vent and Outside-Air Connection, Condensing, Gas-Fired Furnaces: Connect plastic piping vent material to furnace connections and extend outdoors. Terminate vent outdoors with a cap and in an arrangement that will protect against entry of birds, insects, and dirt.

1. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

2. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.
3. Plastic Piping Solvent-Cement Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:

    a. Comply with ASTM F402 for safe-handling practice of cleaners, primers, and solvent cements.
    b. CPVC Piping: Join according to ASTM D2846/D2846M, Appendix.
    c. PVC Pressure Piping: Join schedule number ASTM D1785 PVC pipe and PVC socket fittings according to ASTM D2672. Join other-than-schedule-number PVC pipe and socket fittings according to ASTM D2855.

4. Slope pipe vent back to furnace or to outside terminal.

3.4 DUCTWORK CONNECTIONS

A. Connect ducts to furnace with flexible connector. Comply with requirements in Section 233300 "Air Duct Accessories."

3.5 ELECTRICAL CONNECTIONS

A. Connect 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. Complete installation and startup checks according to manufacturer's written instructions and perform the following:

1. Inspect for physical damage to unit casings.
2. Verify that access doors move freely and are weathertight.
3. Clean units and inspect for construction debris.
4. Verify that all bolts and screws are tight.
5. Adjust vibration isolation and flexible connections.
6. Verify that controls are connected and operational.

B. Start unit according to manufacturer's written instructions and complete manufacturer's operational checklist.

C. Measure and record airflows.

D. Verify proper operation of capacity control device.

E. After startup and performance test, lubricate bearings.

3.8 ADJUSTING

A. Adjust initial temperature set points.

B. Set controls, burner, and other adjustments for optimum heating performance and efficiency. Adjust heat-distribution features, including shutters, dampers, and relays, to provide optimum heating performance and system efficiency.

3.9 CLEANING

A. After completing installation, clean furnaces internally according to manufacturer's written instructions.

B. Install new filters in each furnace within 14 days after Substantial Completion.

3.10 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. Perform electrical test and visual and mechanical inspection.
2. Leak Test: After installation, charge systems with refrigerant and test for leaks. Repair leaks, replace lost refrigerant, and retest until no leaks exist.
3. Operational Test: After electrical circuitry has been energized, start units to confirm proper operation, product capability, and compliance with requirements.
4. Verify that fan wheel is rotating in the correct direction and is not vibrating or binding.
5. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

B. Verify that vibration isolation and flexible connections properly dampen vibration transmission to structure.

3.11 DEMONSTRATION

A. Train Owner's maintenance personnel to adjust, operate, and maintain condensing units. Refer to Section 017900 "Demonstration and Training."

END OF SECTION

SECTION 235533.16 - GAS-FIRED 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 gas-fired unit heaters.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of gas-fired unit heater.

1. Include rated capacities, operating characteristics, and accessories.

B. Shop Drawings: For gas-fired unit heaters. Include plans, elevations, sections, and attachment details.

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 gas-fired unit heaters to include in emergency, operation, and 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. Fan Belts: One for each belt-driven fan size.

1.6 QUALITY ASSURANCE

A. ASHRAE/IES 90.1 Compliance: Applicable requirements in ASHRAE/IES 90.1, Section 6 - "Heating, Ventilating, and Air-Conditioning."

1.7 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace heat exchanger of gas-fired unit heater that fails in materials or workmanship within specified warranty period.

1. Warranty Period, Components: One year from date of Substantial Completion.
2. Warranty Period, Heat exchangers: Five years from date of Substantial Completion.
3. Warranty Period, Burners: Ten years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

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

1. Detroit Radiant Products Company.
2. Lennox Industries, Inc.; Lennox International.
3. Modine Manufacturing Company.
4. REZNOR, a brand of Nortek Global HVAC.
5. Sterling HVAC Products; a Mestek company.
6. Trane.

2.2 PERFORMANCE REQUIREMENTS

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.

2.3 MANUFACTURED UNITS

A. Description: Factory assembled, piped, and wired, and complying with ANSI Z83.8/CSA 2.6.

B. Gas Type: Design burner for natural gas having characteristics same as those of gas available at Project site.

C. Type of Venting: Separated combustion.

D. Housing: Steel, with integral draft hood and inserts for suspension mounting rods.

1. External Casings and Cabinets: Baked enamel or powder coating over corrosion-resistant-treated surface.
2. Discharge Louvers: Independently adjustable, horizontal blades.

E. Accessories:

1. Four-point suspension kit.

F. Heat Exchanger: Aluminized steel.

G. Burner Material: Aluminized steel with stainless-steel inserts.

H. Propeller Unit Fan:

1. Formed-steel propeller blades riveted to heavy-gage steel spider bolted to cast-iron hub, dynamically balanced, and resiliently mounted.
2. Fan-Blade Guard: Galvanized steel, complying with OSHA specifications, removable for maintenance.

I. Motors:

1. Enclosure Materials: Rolled steel.
2. Efficiency: Premium efficient.

J. Controls: Regulated redundant gas valve containing pilot solenoid valve, electric gas valve, pilot filter, pressure regulator, pilot shutoff, and manual shutoff all in one body.

1. Gas Control Valve: Single stage.
2. Ignition: Electronically controlled electric spark with flame sensor.
3. Fan Thermal Switch: Operates fan on heat-exchanger temperature.
4. Vent Flow Verification: Differential pressure switch to verify open vent.
5. Control transformer.
6. High Limit: Thermal switch or fuse to stop burner.
7. **Wall-**Mounted Thermostat:

a. Single stage.
b. Fan on-off-automatic switch.
c. 24-V ac.
d. 50 to 90 deg F operating range.

K. Electrical Connection: Factory wire motors and controls for a single electrical connection.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install and connect gas-fired unit heaters and associated gas and vent features and systems according to NFPA 54 and CSA B149.1, applicable local codes and regulations, and manufacturer's written instructions.

3.2 EQUIPMENT MOUNTING

A. Suspended Units: Suspend from substrate using threaded rods, spring hangers, and building attachments. Secure rods to unit hanger attachments. Adjust hangers so unit is level and plumb.

3.3 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 gas-fired unit heater, allow space for service and maintenance.

C. Gas Piping: Comply with Section 231123 "Facility Natural-Gas Piping." Connect gas piping to gas train inlet; provide union with enough clearance for burner removal and service.

D. Vent Connections: Comply with Section 235123 "Gas Vents."

E. Ground equipment according to Section 260526 "Grounding and Bonding for Electrical Systems."

F. 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. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
2. Verify bearing lubrication.
3. Verify proper motor rotation.
4. Test Reports: Prepare a written report to record the following:

    a. Test procedures used.
    b. Test results that comply with requirements.
    c. Test results that do not comply with requirements and corrective action taken to achieve compliance with requirements.

B. Gas-fired unit heater will be considered defective if it does not pass tests and inspections.

C. Prepare test and inspection reports.

3.5 ADJUSTING

A. Adjust initial temperature and humidity set points.

B. Adjust burner and other unit components for optimum heating performance and efficiency.

END OF SECTION

SECTION 237223.19 – PACKAGED INDOOR FIXED PLATE ENERGY RECOVERY 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. Fixed-plate, total heat exchangers in packaged, indoor, energy-recovery units.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include packaged, indoor, fixed-plate, energy-recovery unit rated capacities, operating characteristics, furnished specialties, and accessories.
2. Fans:

    a. Certified fan-performance curves with system operating conditions indicated.
    b. Certified fan-sound power ratings.
    c. Fan construction and accessories.
    d. Motor ratings, electrical characteristics, and motor accessories.

B. Shop Drawings: For packaged, indoor, fixed-plate, energy-recovery units.

1. Include plans, elevations, sections, details, 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.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For air-to-air energy recovery equipment 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. Filters: One set of each type of filter specified.

1.6 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of packaged, indoor, fixed-plate, energy-recovery units that fail in materials or workmanship within specified warranty period.

1. Warranty Period for Packaged Energy-Recovery Units: Two years.
2. Warranty Period for Fixed-Plate Total Heat Exchangers: 10 years.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. NFPA Compliance: Comply with NFPA 90A for design, fabrication, and installation of air-handling units and components.

B. ASHRAE Compliance:

1. Applicable requirements in ASHRAE 62.1.
2. Capacity ratings for fixed-plate energy-recovery units shall comply with ASHRAE 84.

C. ASHRAE/IES 90.1 Compliance: Applicable requirements in ASHRAE/IES 90.1.

D. UL Compliance:

1. Packaged heat-recovery ventilators shall comply with requirements in UL 1812 or UL 1815.
2. Electric coils shall comply with requirements in UL 1995.

E. Comply with ASTM E84 or UL 723.

2.2 PACKAGED, INDOOR, FIXED-PLATE TOTAL ENERGY RECOVERY UNITS

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

1. Airia Brands Inc.
2. Carnes Company.
3. Greenheck Fan Corporation.
4. Multistack, LLC.
5. RenewAire LLC.
6. Systemair USA.
7. Venmar CES Inc.

B. Source Limitations: Obtain from single source from single manufacturer.

C. Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.

D. Cabinet:

1. Formed double wall insulated 20-gauge galvanized steel cabinet.
2. Access doors shall be hinged with airtight closed cell foam gaskets.

3. Door pressure taps, with captive plugs, shall be provided for cross-core pressure measurement allowing for accurate airflow measurement.
4. Fully insulated with 1 inch expanded polystyrene foam insulation faced with a cleanable foil face on all exposed surfaces.

E. Enthalpy core:

1. Energy recovery core shall be of the total enthalpy type, capable of transferring both sensible and latent energy between airstreams. Latent energy transfer shall be accomplished by direct water vapor transfer from one airstream to the other, without exposing transfer media in succeeding cycles directly to the exhaust air and then to the fresh air. No condensate drains shall be allowed. The energy recovery core shall be designed and constructed to permit cleaning and removal for servicing. Performance criteria are to be as specified in AHRI Standard 1060. The ERV core shall perform without condensing or frosting under normal operating conditions (defined as outside temperatures above -10 deg F and inside relative humidity below 40%).

F. Dampers:

1. Factory installed, motorized, AMCA Class 1 low leakage type, in exhaust air and supply air streams.

G. Blower: Direct driven backward-curved blower.

H. Motor: ECM, premium efficiency, totally enclosed, supplied with factory installed motor starters.

I. Filters: 2” thick MERV 8 minimum disposable pleasted filters located in the outdoor air and exhaust airstreams. All filters shall be accessible from the exterior of the unit.

J. Wiring: Fabricate units with space within housing for electrical conduits. Wire motors and controls so only external connections are required during installation.

1. Outdoor Enclosure: NEMA 250, Type 3R enclosure contains relays, starters, and terminal strip.
2. Include non-fused disconnect switches.

2.3 CONTROLS

A. Fan control: Terminal strip for EC motors.

B. Sensors: Dirty filter monitor for both airstreams.

C. Factory-installed microprocessor controller and sensors.

1. Has factory-installed hardware and software to enable the building automation interface via Modbus/BACnet to monitor, control, and display status and alarms.
2. The microprocessor controller shall be capable of operating at temperatures between -20F to 160F.
3. The microprocessor controller shall be a DIN rail mounting type.
4. Factory-installed microprocessor controller shall come with backlit display that allows menu-driven display for navigation and control of unit.
5. The microprocessor controller shall have the ability to communicate with the BMS via Modbus RTU/TCP and BACnet MSTP/IP.

6. The microprocessor controller shall have integrated ethernet interface and a web server for displaying unit parameters.
7. The microprocessor shall have near field communication (NFC) capability for android devices.
8. The microprocessor controller shall have an internal programmable time clock that will allow the user to add up to different occupancy schedules and add holidays.
9. The microprocessor control shall be capable of integral diagnostics.
10. The microprocessor control shall be capable of IP or SI unit display.
11. The microprocessor controller shall have a battery powered clock.
12. The microprocessor controller shall at a minimum offer the ability for three modes of determining occupancy: a dry contact, the internal time clock or the BMS.
13. A remote user terminal to allow for remote monitoring and adjustment of parameters, allowing ease of control access without going outdoors or into the mechanical room if desired by the user.
    The microprocessor controller shall have at a minimum (10) universal inputs/outputs (AI, DI, AO) and have (6) six relay outputs (DO).
14. The microprocessor controller shall have an integrated fieldbus port.
15. The microprocessor controller shall have the capability for I/O expansion.
16. The microprocessor controller shall have a micro USB port to load the application program, the unit parameters, saving logs, etc.
17. The sensors that will be required for control are:

    a. (2) Temperature sensor for fresh air and exhaust air
    b. (2) Temperature and humidity sensor for outside air, return air
    c. (2) Differential pressure sensors for filter alarms
    d. (2) Differential pressure sensors for measuring pressure drop across energy recovery core and for determining airflow in both airstreams
    e. (2) Adjustable current switches

18. The microprocessor controller shall have the capability to monitor the unit conditions for alarm conditions. Upon detecting an alarm, the microprocessor controller shall have the capability to record the alarm description, time, date, available temperatures, and unit status for user review. A digital output shall be reserved for remote alarm indication. Alarms to be also communicated via BMS as applicable. Provide the following alarm functions:

    a. Outside air temperature sensor alarm
    b. Outside air humidity sensor alarm
    c. Return air temperature sensor alarm
    d. Return air humidity sensor alarm
    e. Fresh air sensor alarm
    f. Exhaust air sensor alarm
    g. Dirty filter alarm
    h. Supply and exhaust air proving alarm

19. Display the following on the face of microprocessor controller:

    a. Unit on
    b. Heating status
    c. Outdoor air temperature
    d. Outdoor air humidity
    e. Return air temperature
    f. Return air humidity
    g. Supply air temperature
    h. Unit on/off
    i. Fan on/off

j. Damper status
k. Alarm digital display

20. The microprocessor controller shall have factory pre-programmed multiple operating sequences for control of the ERV. Factory default settings shall be fully adjustable in the field.

2.4 SOURCE QUALITY CONTROL

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. AHRI Compliance: Capacity ratings for air-to-air energy-recovery equipment certified as complying with AHRI 1060.

C. Fan Performance Rating: Comply with AMCA 211 and label fans with AMCA-certified rating seal. Factory test fan performance for airflow, pressure, power, air density, rotation speed, and efficiency according to AMCA 210/ASHRAE 51.

D. Fan Sound Ratings: Comply with AMCA 301 or AHRI 260 (IP). Air-handling unit fan sound ratings shall comply with AMCA 301 or AHRI 260 (IP).

E. UL Compliance:

1. Packaged fixed plate energy recovery units shall comply with requirements in UL 1812; or UL 1815.
2. Electric Coils: Comply with UL 1995.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine casing insulation materials and filter media before packaged, indoor, fixed-plate, energy-recovery unit installation. Replace with new insulation materials and filter media that are wet, moisture damaged, or mold damaged.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install packaged, indoor, fixed-plate, energy-recovery units, so supply and exhaust airstreams flow in opposite directions.

1. Install access doors in both supply and exhaust ducts, both upstream and downstream, for access to interior components.
2. Install removable panels or access doors between supply and exhaust ducts on building side for bypass during startup.
3. Access doors and panels are specified in Section 233300 "Air Duct Accessories."

B. Install units with clearances for service and maintenance.

C. Do not operate fan system until filters (temporary or permanent) are in place. Replace temporary filters used during construction and testing with new, clean filters.

3.3 DUCTWORK CONNECTIONS

A. Comply with requirements for ductwork according to Section 233113 "Metal Ducts."

B. Connect duct to units with flexible connections. Comply with requirements in Section 233300 "Air Duct Accessories."

3.4 ELECTRICAL CONNECTIONS

A. Install electrical devices furnished with units but not factory mounted.

B. Connect wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

C. Ground equipment according to Section 260526 "Grounding and Bonding for Electrical Systems."

D. Install electrical devices furnished by manufacturer, but not factory mounted, according to NFPA 70 and NECA 1.

3.5 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."

3.6 FIELD QUALITY CONTROL

A. Perform tests and inspections with the assistance of a factory-authorized service representative.

B. Tests and Inspections:

1. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

C. Packaged, indoor, fixed-plate, energy-recovery units will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

3.7 STARTUP SERVICE

A. Engage a factory-authorized service representative to perform startup service.

1. Complete installation and startup checks according to manufacturer's written instructions.

3.8 ADJUSTING

A. Adjust moving parts to function smoothly, and lubricate as recommended by manufacturer.

B. Adjust initial temperature setpoints.

C. Set field-adjustable switches and circuit-breaker trip ranges as indicated.

3.9 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain air-to-air energy-recovery units.

END OF SECTION

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 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 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, and 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 dampers, including housings, linkages, and operators.

B. Shop Drawings: For each packaged rooftop air-conditioning unit.

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.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For RTUs to include in emergency, operation, and 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. Filters: One set of filters for each unit.
2. Gaskets: One set for each access door.

1.6 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. Warranty Period: One year from date of Substantial Completion.
2. Warranty Period for Heat Exchangers: Manufacturer's standard, but not less than five years from date of Substantial Completion

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. Carrier Corporation.
3. Daikin Applied.
4. Trane.
5. 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. All components shall be mounted in a weather resistant steel cabinet with an enamel finish. Access panels shall be provided for unit controls and indoor coil and fans. Indoor air section compartment shall be completely insulated with fireproof, permanent, odorless fiber material. Knockouts shall be provided for utility and control connections. Drain connections shall be provided to accommodate indoor water runoff.

C. Airstream Surfaces: Surfaces in contact with airstream shall comply with requirements in ASHRAE 62.1.

2.4 FANS, DRIVES, AND MOTORS

A. Indoor Air Fan: Constant Torgue, forward-curved, centrifugal wheel in a Composite Vortica ® Blower housing. Motor shall have thermal overload protection and permanently lubricated motor bearings. Motor/blower assembly isolated from unit with rubber mounts.

B. Outdoor Fan: One direct-drive, statically and dynamically balanced propeller fan shall be used in a draw-through vertical discharge configuration. Permanently lubricated weather proof motor shall have built-in thermal overload protection.

2.5 COILS

A. Evaporator Coil: All aluminum micro channel, extruded tubes, mechanically bonded to aluminum fins, and factory pressure and leak tested at 480 —650 psig. All units have TXV to control refrigerant flow.

B. Condenser Coil: The Spine Fin ™ condenser coil shall be continuously wrapped, corrosion resistant all aluminum with minimum brazed joints. This coil is 3/8” OD seamless aluminum tubing glued to a continuous aluminum fin. Coils are lab tested to withstand 2.000 pounds of pressure per square inch. The outdoor coil provides low airflow resistance and efficient heat transfer. The coil is protected on all four sides by louvered panels.

2.6 REFRIGERANT CIRCUIT COMPONENTS

A. Compressor: The compressor shall be hermetically sealed, high efficiency scroll compressors. Internal overcurrent and over temperature protection, internal pressure relief shall be standard. Other features include centrifugal oil pump, low vibration and noise.

2.7 AIR FILTRATION

A. Panel Filters:

1. Description: Pleated factory-fabricated, self-supported, disposable air filters with holding frames.
2. Filter Unit Class: UL 900.
3. Media: Interlaced glass, synthetic or cotton fibers coated with nonflammable adhesive and antimicrobial coating.
4. Filter-Media Frame: Beverage board with perforated metal retainer, or metal grid, on outlet side.

2.8 GAS FURNACES

A. Models shall provide completely assembled, wired and piped gas fired heating systems within unit. Design certified by UL, specifically for outdoor application. Threaded gas connection on the unit.

B. Electric Ignition System: Main burner is lit each time thermostat calls for heat. Flame sensor proves flame and keeps the main burner on. Should a loss of flame occur, the main valve closes and the spark recurs within 0.8 seconds. When thermostat is satisfied, main burner is extinquished.

C. Forced Combustion Blower: Insures flame stability under varying wind conditions. Gives higher combustion efficiency and location flexibility.

D. Heat Exchanger: Stainless steel tubes. Free floating design.

E. Burners: Stainless steel. Multi-port inshot.

2.9 ELECTRICAL POWER CONNECTIONS

A. This accessory when used with electric heat accessory shall allow single source power connection to unit and heater combination. Single source power entry kits shall have specific matching heater(s). Kit shall include high voltage terminal blocks, fuse blocks and fuses, cut-to-length interconnecting wiring, and junction box (if required) to provide power sources with fuse protection as required for both the unit and accessory heater. Kit components shall install within the heater cabinet in the heater access section. Single source branch power circuit shall be protected and wired in accordance with local codes.

2.10 CONTROLS

A. Fully Modulating Economizer: This accessory shall be field installed and be composed of the following items: 0–100 % fresh air damper, damper drive motor, fixed dry bulb enthalpy control, and low voltage pigtails for electrical connections. Solid state enthalpy or differential enthalpy control is optional. Economizer operations shall be controlled by the preset position of the enthalpy control. A barometric relief damper shall be standard with the economizer and provide a pressure operated damper that shall be gravity closing and prohibit entrance of outside

air on equipment "off" cycle. Economizer requires BAYRLAY004A relay kit to interface the economizer to the heat pump.

B. Manual Outside Air Dampers: Rain hood and screen shall be field installed. Suitable for up to 25% outside air.

C. Standard Indoor Thermostats: Two stage heating/cooling or one stage heating/ cooling thermostats shall be available in either manual or automatic changeover

D. Programmable Electronic Night Setting Thermostat: Programmable electronic thermostat shall provide heating setback and cooling setup with 7–day programming capability. 1H/1C or 2H/2C models available.

2.11 ROOF CURBS

A. The roof curb shall be designed to mate with the unit and provide support and complete weathertight installation when properly installed. Adhesive back polyurethane sealing strips shall be provided to ensure an airtight seal between supply and return openings of the curb and unit. The roof curb design allows field fabricated ductwork to be connected directly to the curb. Curb ships knocked down for field assembly, and includes factory installed wood nailer strips.

2.12 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.

E. Comply with Section 230546 "Coatings for HVAC" for corrosion-resistant coating.

2.13 SOURCE QUALITY CONTROL

A. AHRI Compliance:

1. Comply with AHRI 210/240 for testing and rating energy efficiencies for RTUs.
2. Comply with AHRI 340/360 for testing and rating energy efficiencies for RTUs.
3. Comply with AHRI 270 for testing and rating sound performance for RTUs.
4. Comply with AHRI 1060 for testing and rating performance for air-to-air exchanger.

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 according to 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." 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 or concrete base 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 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.

D. 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 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 FIELD QUALITY CONTROL

A. Perform tests and inspections with the assistance of a factory-authorized service representative.

B. Tests and Inspections:

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.

C. RTU will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

3.8 STARTUP SERVICE

A. Engage a factory-authorized service representative to perform startup service.

1. Complete installation and startup checks according to manufacturer's written instructions.
2. Inspect for visible damage to unit casing.
3. Inspect for visible damage to furnace combustion chamber.
4. Inspect for visible damage to compressor, coils, and fans.
5. Inspect internal insulation.
6. Verify that labels are clearly visible.

7. Verify that clearances have been provided for servicing.
8. Verify that controls are connected and operable.
9. Verify that filters are installed.
10. Clean condenser coil and inspect for construction debris.
11. Clean furnace flue and inspect for construction debris.
12. Connect and purge gas line.
13. Remove packing from vibration isolators.
14. Inspect operation of barometric relief dampers.
15. Verify lubrication on fan and motor bearings.
16. Inspect fan-wheel rotation for movement in correct direction without vibration and binding.
17. Adjust fan belts to proper alignment and tension.
18. 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.

19. Inspect and record performance of interlocks and protective devices; verify sequences.
20. Operate unit for an initial period as recommended or required by manufacturer.
21. 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.

22. Calibrate thermostats.
23. Adjust and inspect high-temperature limits.
24. Inspect outdoor-air dampers for proper stroke and interlock with return-air dampers.
25. 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.

26. Inspect controls for correct sequencing of heating, mixing dampers, refrigeration, and normal and emergency shutdown.
27. 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.

28. 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.

29. 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. Relief-air fan operation.
f. Smoke and firestat alarms.

30. After startup and performance testing and prior to Substantial Completion, replace existing filters with new filters.

3.9 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 visits to Project during other-than-normal occupancy hours for this purpose.

3.10 CLEANING

A. After completing system installation and testing, adjusting, and balancing RTUs and air-distribution systems, 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.

3.11 FIELD QUALITY CONTROL

A. Perform tests and inspections with the assistance of a factory-authorized service representative.

B. Tests and Inspections:

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.

C. RTU will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

3.12 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain RTUs.

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 260500
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 26 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

SECTION 260505
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 260519
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

SECTION 260526
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 COUNTERPOISE

A. Ground the steel framework of the building with a driven ground rod at the base of every corner column and at intermediate exterior columns at distances not more than 60 feet apart. Provide a grounding (counterpoise), electrically connected to each ground rod and to each steel column, extending around the perimeter of the building. Use tinned-copper conductor not less than No. 2/0 AWG for counterpoise and for tap to building steel. Bury counterpoise not less than 18 inches below grade and 24 inches from building foundation.

3.4 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.

3.5 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.

3.6 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.

3.7 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

SECTION 260529
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

SECTION 260533
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

SECTION 260553
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

SECTION 262416
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

SECTION 262419
MOTOR CONTROL

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. Manual motor starters.
B. Magnetic motor starters.
C. Combination magnetic motor starters.

1.4 REFERENCES

A. ANSI/NEMA ICS 6 - Enclosures for Industrial Controls and Systems.
B. ANSI/UL 198C - High-Intensity Capacity Fuses; Current-Limiting Types.
C. NEMA ICS 2 - Industrial Control Devices, Controllers, and Assemblies.
D. NEMA PB 1.1 - Instructions for Safe Installation, Operation and Maintenance of Panelboards Rated 600 Volts or Less.

1.5 SUBMITTALS

A. Submit shop drawings and product data under provisions of Division 1 – General Requirements.
B. Provide produce data on motor starters and combination motor starters, relays, pilot devices, and switching and overcurrent protective devices.
C. Submit manufacturer's instructions under provisions of Division 1 – General Requirements.

1.6 OPERATION AND MAINTENANCE DATA

A. Submit operation and maintenance data under provisions of Division 1 – General Requirements.
B. Include spare parts data listing; source and current prices of replacement parts and supplies; and recommended maintenance procedures and intervals.

1.7 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.

1.8 SPARE PARTS

A. Fuses: Furnish 3 each type used on Project.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS - MOTOR STARTERS

A. Square D
B. Cutler Hammer
C. General Electric

2.2 MANUAL MOTOR STARTERS

A. Fractional Horsepower Manual Starter: NEMA ICS 2; AC general-purpose Class A manually operated, 1 pole, full-voltage controller for fractional horsepower induction motors, with thermal overload unit, toggle operator, Green "RUN" pilot light. Provide means for positive Lockout in OFF position.
B. Enclosure: ANSI/NEMA ICS 6; Type 1, or 3R as required.

2.3 MAGNETIC MOTOR STARTERS

A. Magnetic Motor Starters: NEMA ICS 2; AC general-purpose Class A magnetic controller for induction motors rated in horsepower.
B. Full Voltage Starting: Non-reversing type.
C. Coil Operating Voltage: 120 volts.
D. Size: NEMA ICS 2; size as shown on Drawings.
E. Overload Relay: NEMA ICS 2; melting alloy.
F. Enclosure: NEMA ICS 6; Type 1 or 3R as noted on drawings.
G. Combination Motor Starters: Combine motor starters with fusible switch disconnect in common enclosure.
H. Auxiliary Contacts: NEMA ICS 2; two normally open field convertible contacts in addition to seal-in contact.
I. Indicating Lights: NEMA ICS 2; Run: green in front cover.
J. Selector Switches: NEMA ICS 2; HAND/OFF/AUTO type in front cover.
K. Provide means for positive Lockout in OFF position.

2.4 CONTROLLER OVERCURRENT PROTECTION AND DISCONNECTING MEANS

A. Fusible Switch Assemblies: NEMA KS1; quick-make, quick-break, load interrupter enclosed knife switch with externally operable handle. Provide interlock to prevent opening front cover with switch in ON position. Handle lockable in OFF position. Fuse Clips: Designed to accommodate Class R fuses
B. Non fusible switch assemblies: NEMA KS1: Quick-make, quick-break, load interrupter enclosed knife switch with externally operated handle. Provide interlock to prevent opening front cover with switch in ON position. Handle lockable in OFF position.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install motor control equipment in accordance with manufacturer's instructions.
B. Select and install heater elements in motor starters to match installed motor characteristics.
C. Install fuses in fusible switches.
D. Motor Data: Provide neatly typed label inside each motor starter enclosure door identifying motor served, nameplate horsepower, full load amperes, code letter, service factor, and voltage/phase rating.

END OF SECTION

SECTION 262726
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

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: White plastic.

2.3 ACCEPTABLE MANUFACTURERS - RECEPTACLES

A. Bryant
B. Hubbell
C. Eagle
D. Arrow Hart

2.4 RECEPTACLES

A. Convenience and Straight-Blade Receptacles: NEMA WD 1.
B. Locking-Blade Receptacles: NEMA WD 5.
C. Convenience Receptacle Configuration: NEMA WD 1; Type 5-15 R, Tamper Resistant 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 type, White Plastic Face.

2.5 ACCEPTABLE MANUFACTURERS - WALL PLATES

A. Bryant
B. Hubbell
C. Eagle
D. Arrow Hart

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

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

SECTION 265100
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.

1.4 SUBMITTALS

A. Submit product data under provisions of Division 1 – General Requirements.
B. Include outline drawings, support points, weights, and accessory information for each luminary type.
C. Submit manufacturer's installation instructions under provisions of Division 1 – General Requirements.

1.5 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. 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

SECTION 265600
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 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.

2.4 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

SECTION 271501
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

SECTION 271513
NETWORK AND COMMUNICATION CABLING

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, 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 equipment, hardware 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. Data/voice cabling.
B. Connections and terminations.
C. Patch panels.
D. Equipment racks.

1.4 REFERENCES

A. ANSI/NFPA 70 - National Electric Code.
B. Owner requires compliance with ANSI/TIA/EIA-568-A-1, A-2, A-3, A-4, A-5(e), and B.3, 569-A, 606, 607, TSB-67, TSB-72, TSB-75, and TSB-95 standards. All telecommunications and networking copper and fiber installations will adhere to the same standards.
C. Jack and cabling standards follow T568B standard wiring pattern.
D. All hardware for racks and tray systems shall be commercially manufactured hardware.

1.5 SUBMITTALS

A. Submit under provisions of Division 1 – General Requirements.
B. Product Data: Provide cable, terminations, connections, cable supports, equipment racks and patch panels.
C. Certified test reports: Indicate results of all tested cables in booklet and electronic form.

1.6 PROJECT RECORD DOCUMENTS

A. Submit under provisions of Division 1 – General Requirements.
B. Accurately record all cable routing, cable numbers/identification and destinations.

PART 2 - PRODUCTS

2.1 WALL JACK

A. Leviton #4108W-1SP Wall Jack assembly.

2.2 COVER PLATES

A. Face Plate: Leviton #43080-1S4 single gang 4 hole face plate.
B. Frame: 4 Position, White, Leviton Quickport Type.
C. Blank Inserts: Leviton #41084-BIB.

2.3 DATA CABLE (CATEGORY 6)

A. Plenum Rated: General Cable GenSPEED 6 Category 6 cable. Provide 2' patch cords. Plenum rated cable or conduit must be used in plenum areas indicated on mechanical plans.

2.4 DATA JACK (CATEGORY 6)

A. Leviton #61110-R06 Blue RJ45 Jack.

2.5 DATA PATCH PANEL

Leviton #6910G-U24 eXtreme Quickport Patch Panel.

2.6 FLOOR MOUNTED EQUIPMENT RACK

A. See plans for rack locations.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install products in accordance with manufacturers instructions.
B. All communication cables shall be installed in conduit, cable tray, or approved raceway. The Division 17000 contractor shall provide cable rings, j-hooks or other type of approved cable support system for all fiber optic and communication cabling not required to be run in conduit. All cabling to be supported from building structure, connection to ceiling support systems not acceptable.
C. All data and telephone runs will be direct runs with no splice points. All ends will be terminated in 19 inch rack mount equipment in 19 inch equipment racks at data/communication terminal boards located the drawings.

3.2 GENERAL WIRING METHODS.

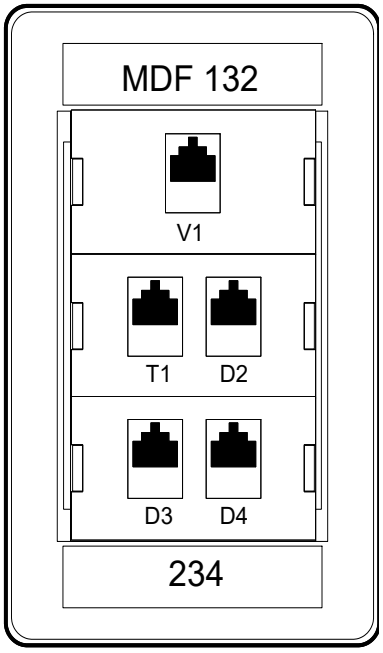
A. Leave sufficient cable slack inside TC to permit movement of patch panels up to 10 feet without rewiring.
B. Perform testing on all cables. Test all cables to standards listed herein. Submit printout of each cable tested, in booklet and electronic form to engineer and district technology coordinator. Any wire not meeting this test will be repaired or replaced.
C. Verify continuity and polarity on all pairs of all voice cables using a simple pair tester. Any wire not meeting this test shall be repaired or replaced.
D. The Contractor shall terminate all conductors, both ends, in devices and equipment indicated in this section and on the drawings. Provide quantities at a minimum to terminate all cables indicated on the drawings and leave 25% spare patch panel and wire

management for future use.

3.3 LABELING AND DOCUMENTATION

A. Each horizontal UTP cable shall be labeled at each end with an adhesive-backed designation strip.
B. Each communications outlet shall be labeled (to be clearly visible) with a permanent label such as those available from Brady USA, Inc.
C. Faceplate labeling shall have a permanent designation strip at the top with MDF or IDF and room number of the MDF or IDF.
D. Faceplate labeling will also include a permanent designation strip at the bottom with the room number of the location of the faceplate.
E. Faceplate labeling will identify each drop with the following:

1. V#, T1 or D#
2. where V# would indicate a voice drop and drop number
3. T1 would be the teacher data drop for that room (only if it is an instructional room)
4. D# would be all other data drops in that room



3.4 WARRANTY

A. Product Warranty

1. The Product Warranty shall ensure against product defects, that all approved cabling components exceed the specifications of TIA/EIA 568A and ISO/IEC IS 11801, exceed the attenuation and NEXT requirements of TIA/EIA TSB 67 and ISO/IEC IS 11801 for cabling links/channels, that the installation will exceed the loss and bandwidth requirements of TIA/EIA TSB 67 and ISO/IEC IS 11801 for fiber links/channels. The warranty shall apply to all passive SCS components.

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

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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

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SECTION 312300
FOOTBALL FIELD EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. This section includes furnishing all labor, materials, tools and equipment necessary to install football field equipment as indicated on the plans and as specified herein; including components and accessories required for a complete installation, including but not limited to:
   1. Combination Football and soccer goal post package and accessories.

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 REFERENCES

A. Manufacturers Data and Recommended Installation Requirements

B. National Federation of State High School Associations (NFSHSA)

C. National Collegiate Athletic Association (NCAA)

1.4 SUBMITTALS

A. Manufacturers Product Data
   1. Provide manufacturer's product literature, technical specifications and other data prior to actual field installation work for Engineer or Owner's Representative review

B. Shop Drawings
   1. Provide drawings of manufacturers recommended installation and foundation requirements prior to actual field installation work for Engineer or Owner's Representative review

C. Maintenance Data:
   1. For athletic equipment, to include any maintenance manuals.

1.5 QUALITY ASSURANCE

A. Manufacturers warranties shall pass to the Owner and certification made that the product materials meet all applicable grade trademarks or conform to industry standards and inspection 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 ATHLETIC EQUIPMENT:

A. Manufacturers and product selections named are provided to establish the minimum standard.

B. Source Limitations:
1. Obtain items as complete units, including fittings, accessories, bases, and anchorage devices, from single source from single manufacturer.

C. Approved manufactures are as follows:
1. Football and soccer goal post package and accessories: Provide equipment, complete and installed as follows:
a. Combination Football and soccer goal post package and accessories shall include football goal post (8' offset, 30' uprights, sleeve inserted model, color "yellow), round faced soccer goal with integrated wheel kit with turf box to accommodate locking soccer goal safety system. GPKR30HSPL Ground Sleeve Insert High School Goalpak ® Combination Football/Soccer Goal System and Accessories by Sportsfield Specialties (888-975-3343),or approved equal.
2. Other alternative providers are acceptable and must meet and/or be equivalent to all listed requirements, qualifications and specifications.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions, with installer present, for compliance with requirements for correct and level finished grade, mounting surfaces, installation tolerances, and other conditions affecting performance. Notify the contractor of conditions detrimental to the proper and timely installation and completion of the work.

B. 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.

C. Beginning of installation means acceptance of existing conditions.

3.2 INSTALLATION

A. All athletic equipment shall be installed as indicated on approved submittals as recommended and in strict accordance with manufacturer's written directions and as indicated on the drawings and specified herein.

B. All athletic equipment shall be installed in strict accordance with the latest rules, regulations and specifications governing that sport or event for which it is being installed.

C. Install all equipment level, plumb, true and securely anchored at locations indicated on the drawings. Provide concrete footings in accordance with the manufacture’s requirements or recommendations.

3.3 ADJUSTMENT AND CLEANING

A. After completing installation, inspect components and adjust as necessary.

B. Remove spots, dirt and debris.

C. Repair any damaged finishes to match original finish or replace components.

END OF SECTION 312300

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SECTION 312319
DEWATERING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:
   1. Construction dewatering.

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 312000 – Earth Moving
   3. Section 315000 – Excavation Support and Protection

1.3 PORMANCE REQUIREMENTS

A. Dewatering Performance: Design, furnish, install, test, operate, monitor, and maintain dewatering system of sufficient scope, size, and capacity to control ground-water flow into excavations and permit construction to proceed on dry, stable subgrades.

1.4 SUBMITTALS

A. Shop Drawings for Information: For dewatering system. Show arrangement, locations, and details of wells and well points; locations of headers and discharge lines; and means of discharge and disposal of water.
   1. Include Shop Drawings signed and sealed by the qualified professional engineer responsible for their preparation.

1.5 QUALITY ASSURANCE

A. Regulatory Requirements: Comply with water disposal requirements of authorities having jurisdiction.

PART 2 - EXECUTION

2.1 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by dewatering operations.
   1. Prevent surface water and subsurface or ground water from entering excavations, from ponding on prepared subgrades, and from flooding site and surrounding area.

2. Protect subgrades and foundation soils from softening and damage by rain or water accumulation.

2.2 INSTALLATION

A. Install dewatering system utilizing wells, well points, or similar methods complete with pump equipment, standby power and pumps, filter material gradation, valves, appurtenances, water disposal, and surface-water controls.

B. Before excavating below ground-water level, place system into operation to lower water to specified levels. Operate system continuously until drains, sewers, and structures have been constructed and fill materials have been placed, or until dewatering is no longer required.

C. Provide an adequate system to lower and control ground water to permit excavation, construction of structures, and placement of fill materials on dry subgrades. Install sufficient dewatering equipment to drain water-bearing strata above and below bottom of foundations, drains, sewers, and other excavations.
   1. Do not permit open-sump pumping that leads to loss of fines, soil piping, subgrade softening, and slope instability.

D. Reduce hydrostatic head in water-bearing strata below subgrade elevations of foundations, drains, sewers, and other excavations.
   1. Maintain piezometric water level a minimum of 24 inches below surface of excavation.

E. Dispose of water removed by dewatering in a manner that avoids endangering public health, property, and portions of work under construction or completed. Dispose of water in a manner that avoids inconvenience to others. Provide sumps, sedimentation tanks, and other flow-control devices as required by authorities having jurisdiction.

F. Provide standby equipment on-site, installed and available for immediate operation, to maintain dewatering on continuous basis if any part of system becomes inadequate or fails. If dewatering requirements are not satisfied due to inadequacy or failure of dewatering system, restore damaged structures and foundation soils at no additional expense to Owner.

   1. Remove dewatering system from Project site on completion of dewatering. Plug or fill well holes with sand or cut off and cap wells a minimum of 36 inches below overlying construction.

G. Damages: Promptly repair damages to adjacent facilities caused by dewatering operations.

END OF SECTION 312319

SECTION 315000
EXCAVATION SUPPORT AND PROTECTION

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:
   1. Temporary excavation support and protection 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 311000 – Site Clearing
   2. Section 312000 – Earth Moving
   3. Section 312319 – Dewatering

1.3 PERFORMANCE REQUIREMENTS

A. Design, furnish, install, monitor, and maintain excavation support and protection system capable of supporting excavation sidewalls and of resisting soil and hydrostatic pressure and superimposed and construction loads.
   1. Provide professional engineering services needed to assume engineering responsibility, including preparation of Shop Drawings and a comprehensive engineering analysis by a qualified professional engineer.

1.4 SUBMITTALS

A. Shop Drawings for Information: Prepared by or under the supervision of a qualified professional engineer for excavation support and protection systems.
   1. Include Shop Drawings signed and sealed by the qualified professional engineer responsible for their preparation.

1.5 PROJECT CONDITIONS

A. Survey adjacent structures and improvements, employing a qualified professional engineer or land surveyor; establish exact elevations at fixed points to act as benchmarks. Clearly identify benchmarks and record existing elevations.
   1. During installation of excavation support and protection systems, regularly resurvey benchmarks, maintaining an accurate log of surveyed elevations and positions for comparison with original elevations and positions. Promptly notify Engineer if changes in elevations or positions occur or if cracks, sags, or other damage is evident in adjacent construction.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General: Provide materials that are either new or in serviceable condition.

B. Structural Steel: ASTM A 36/A 36M, ASTM A 690/A 690M, or ASTM A 992/A 992M.

C. Steel Sheet Piling: ASTM A 328/A 328M, ASTM A 572/A 572M, or ASTM A 690/A 690M; with continuous interlocks.

D. Wood Lagging: Lumber, mixed hardwood, nominal rough thickness of 4 inches.

E. Cast-in-Place Concrete: ACI 301, of compressive strength required for application.

F. Reinforcing Bars: ASTM A 615/A 615M, Grade 60, deformed.

PART 3 - EXECUTION

3.1 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards that could develop during excavation support and protection system operations.

B. Install excavation support and protection systems to ensure minimum interference with roads, streets, walks, and other adjacent occupied and used facilities.

C. Monitor excavation support and protection systems daily during excavation progress and for as long as excavation remains open. Promptly correct bulges, breakage, or other evidence of movement to ensure that excavation support and protection systems remain stable.

D. Promptly repair damages to adjacent facilities caused by installing excavation support and protection systems.

3.2 REMOVAL AND REPAIRS

A. Remove excavation support and protection systems when construction has progressed sufficiently to support excavation and bear soil and hydrostatic pressures. Remove in stages to avoid disturbing underlying soils or damaging structures, pavements, facilities, and utilities.
   1. Remove excavation support and protection systems to a minimum depth of 48 inches below overlying construction and abandon remainder.
   2. Repair or replace, as approved by Engineer, adjacent work damaged or displaced by removing excavation support and protection systems.

END OF SECTION 315000

SECTION 321216
ASPHALT PAVING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:
   1. Placement of bituminous pavements including paving and surfacing for roads, driveways, parking lots, walkways, paths and shoulders.

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 Definitions:
   1. Asphalt Base course: The layer of asphalt of designed thickness placed on the aggregate base to support leveling and surface courses, a mix layer below 4 inches from the finished surface.
   2. Asphalt Leveling course: Layer of specified material placed on the asphalt base course in preparation for the surface course, a mix layer within 4 inches of the surface.
   3. Asphalt Surface course: The top layer of a pavement structure, a mix layer within 4 inches of the surface.
   4. Maximum density (bituminous mixtures): Maximum unit weight of a representative sample of the hot mix asphalt according to the Marshall Method ASTM D2726.
   5. Maximum density (soils): Maximum unit weight of soil material according to Modified Proctor Method ASTM D1557.
   6. Pavement structure: Any combination of subbase, base and asphalt courses, including shoulders, placed on subgrade.
   7. Subbase: The layer of specified material of designed thickness placed on the subgrade as a part of the pavement structure.
   8. Subgrade: That portion of the earth grade upon which the pavement structure is to be placed.

1.4 REFERENCES:

A. A. MDOT – Michigan Department of Transportation, "Standard Specifications for Construction", latest edition.

B. ASTM - American Society of Testing Materials, latest edition.

1.5 SUBMITTALS:

A. Asphalt and Concrete Mix Designs: Provide job-mix formula prepared by independent AASHTO Accredited lab or approved by MDOT for bituminous base, leveling and surface courses to the Engineer a minimum of two weeks prior to paving.

B. Certification of quality by producer for the following:
   1. Aggregates
   2. Asphalt cement
   3. Pavement marking material
   4. Prime coat
   5. Bond coat

1.6 JOB CONDITIONS:

A. Seasonal Limitations: Unless otherwise approved by the Engineer in writing, place HMA in accordance with subsection 501.03.I.1 of the MDOT Spec Book and the following seasonal limitations:
   1. From June 1 to October 15 for the Upper Peninsula;
   2. From May 15 to November 1 for the Lower Peninsula, north of M-46; and
   3. From May 5 to November 15 for the Lower Peninsula, south of M-46.

B. Clean up promptly following pavement installation.

C. Maintenance of Temporary Surfaces: Maintain temporary surfaces until permanent pavement installation is completed.

D. Driveway Closing: Twenty-four (24) hour maximum.

E. Allow access to the bituminous plant for verification of mix proportions, aggregate gradations and temperatures.

PART 2 - PRODUCTS

2.1 MATERIALS:

A. Aggregate Shoulders and Approaches:
   1. Use Aggregate 22A for construction of Class AA shoulders and approaches. MDOT 307.02 and 902.06.
   2. Use Aggregate 23A for construction of Class A shoulders and approaches. MDOT 307.02 and 902.06.
   3. Use roadway excavation or borrow material for construction of Class B shoulders and approaches. MDOT 307.02 and 902.06.

B. Hot Mix Asphalt (HMA) Base Course (if required):
   1. MDOT 501.03, HMA 3EL.
   2. MDOT 902.06, Dense-Graded Aggregate.
   3. MDOT 904.03, Asphalt binder, PG 58-28.

C. Hot Mix Asphalt (HMA) Leveling Course:
   1. MDOT 501.03, HMA 4EL.
   2. MDOT 902.06, Dense-Graded Aggregate.
   3. MDOT 904.03, Asphalt binder, PG 58-28.

D. Hot Mix Asphalt (HMA) Top Course:
   1. MDOT 501.03, HMA 5EL.
   2. MDOT 902.06, Dense-Graded Aggregate.
   3. MDOT 904.03, Asphalt binder, PG 58-28.

E. Hot Mix Asphalt (HMA) Hand Patching:
   1. MDOT 501.02, HMA, 5EL.
   2. MDOT 902.05, Dense-Graded Aggregate.
   3. MDOT 904.03, Asphalt binder, PG 58-28.

F. Bond Coat: Asphalt material Asphalt material SS-1h or CSS-1h, when bond coat is required. MDOT 501.02 and 904.03C.

G. Pavement Marking: Conform to MDOT 811.02.

H. Track Top Course shall have virgin material (no RAP), no aggregates with Iron, and 3% Air Voids.

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 PLACEMENT

A. Shoulder Area (aggregate): Provide compacted aggregate shoulder on an aggregate base to the thickness noted in the plans.

B. Shoulder Area (other than aggregate): Stabilize shoulder to a 4 inch depth with compacted soil or topsoil.

C. Bituminous Base Course:
   1. Construction Methods: Conform placement of the bituminous base course mixture in accordance with MDOT 501.03.F through 501.03.J.
   2. Tolerances:
      a. Curbed streets: Shape the bituminous base course to the established grade and cross section, within a tolerance of 3/8 inch.
      b. Other: Unless otherwise specified, shape within 3/4 inch of the established grade and cross section.

D. Bituminous Bond Coat:
   1. Construction Method: Apply between successive paving courses and along longitudinal joint between successive lanes/pulls.
   2. Application Rate: Provide 0.05-0.15 gallon per square yard. (Adequate even coverage).

E. Bituminous Leveling and Surface Courses:
   1. Cutting: Saw vertically and in straight lines at any angle with pavement centerline.
   2. Thickness: Do not place bituminous surface course mixture in lifts exceeding 2 inches unless otherwise approved. Provide design thickness.
   3. Construction Methods:
      a. Paving: Conform method of paving to MDOT 501.03.F through 501.03.J.
      b. Prior to placement of bituminous surface, verify crowns and grades of roadway for positive drainage. Any deficiencies in grade or crown shall be corrected prior to placement of surface course.
   4. Tolerances: Bituminous surface on streets with new curbs shall have a finish elevation of ¼ inch above curb.
   5. Pavement Density: Minimum ninety-two percent (92%) of theoretical maximum density.

3.3 TESTING AND INSPECTION:

A. Observation: By the Owners Representative.

B. Acceptance Testing: Contractor shall employ a qualified testing agency. Contractor shall coordinate for access to test materials as required.
   1. If initial testing indicates failed or nonconformance to specification, perform additional test. If further testing verifies nonconformance, additional testing shall be paid by CONTRACTOR. Replace nonconforming material at no additional cost to OWNER.
   2. Contractor shall provide all test reports to owner within 24 hours of test.

C. Aggregates:
   1. Sampling and Analysis: Michigan Testing Methods, Series 100.
   2. Exception: Provide certification of approved stockpiled material.

D. Bituminous Mix Composition:
   1. Sampling: ASTM D979, one sample per mix or one per two thousand tons.
   2. Extraction: ASTM D2172.
   3. Sieve Analysis: ASTM C117 and ASTM C136.

E. Testing agency will test compaction of bituminous concrete in place according to ASTM D2950 and provide copies of the test reports to the engineer.

END OF SECTION 321216

SECTION 321220
TRACK SURFACE AND MARKING

PART 1 - GENERAL

1.1 SUMMARY

A. This section includes the following:
   1. Preparation and finishing of new synthetic track surface.
   2. Preparation and finishing of new synthetic long jump and pole vault track surface.
   3. Preparation and finishing of new synthetic high jump track surface.
   4. Layout and marking of all track and field event lines and markings as required and specified by current NFHS and MHSAA.

B. Related Sections
   1. Section 116833.43 – Track and Field Equipment
   2. Section 321216 – Asphalt Paving
   3. Section 321313 – Concrete Paving

1.2 REFERENCES:

A. Manufacturers Data and Recommended Installation Requirements

B. U.S. Tennis Court and Track Builders Association

C. National Federation of State High School Associations (NFSHSA)

D. National Collegiate Athletic Association (NCAA)

E. International Amateur Athletic Foundation (I.A.A.F.)

1.3 SUBMITTALS:

A. Track surface – two samples, 12” X 12” (minimum), of surfacing material, representative of thickness and color to be installed on the project, including lane marking.

B. Each Bidder shall submit a complete set of the manufactures installation instructions/specification with the bid and any items that are regarded as technical guidelines for the installation of the surface, including maintenance and repair instructions and/or recommendations, including cleaning and sweeping procedures, etc.

C. An affidavit attesting that the synthetic track surfacing material to be installed meets the requirements defined by the manufacturers currently published specifications and any modifications outlined in those technical specifications.

D. Qualification Data: For firms and persons specified in the “Quality Assurance” Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and contact information (address, phone number, email) for the Engineers and owners, and other information specified.

E. Installer Certification: At the time of bidding, track surface installer shall provide certification of training from track surface manufacturer. Installer shall provide proof of at least 20 prior installation of the surface type specified with a current name and phone number of contact person at each installation.

F. Contractor must submit copies of the Material Data Safety Sheets (MSDM) for all products to be used, before materials are delivered to the site.

G. Markings:
1. Submit to the Engineer a drawings showing location of all proposed track markings and a chart with the appropriate colors to be used.
   a. Computations:
      1) Verify the locations of proposed events with the Owner.
      2) Calculations shall be made to the nearest 1/100,000th of a foot.
      3) Calculations of the angle shall be made to the nearest one second.
      4) Calculations shall be submitted two weeks prior to the painting.
      5) Calculations shall be made by or certified by the surveyor completing the work.
      6) All measurements and tolerances shall conform to those recommended by the NFHS and MHSAA for track and field event layout.
   b. Submit product literature for paint for prior approval from Engineer. The paint must be recommended by the manufacturer of track surface.
   c. Upon completion, supply the Owner with all necessary as-built drawings showing markings color coding of each event.
   d. Upon completion, a letter of certification attesting to the accuracy of the markings shall be submitted by the Licensed Surveyor in charge of the layout. The letter shall be signed and sealed by the person or persons in charge of the layout indicating the state of registration, number and name.

1.4 QUALITY ASSURANCE

A. The manufacturer must have ten (10) uninterrupted years of experience in the installation of permeable polyurethane synthetic track surfaces with structural sprays while operating business under the same name.

B. The polyurethane manufacturer must have a minimum of ten (10) years of experience with the compounding of two-part polyurethane for athletic surfaces.

C. The synthetic track surface shall be installed by authorized applicators of the approved manufacturer. The Owner reserves the right to final acceptance with regards to any installers.

D. The supervisor for the installation must have installed a minimum of ten (10) permeable polyurethane synthetic track surfaces with structural sprays in the last 3 years. A reference list must be submitted.

E. The Contractor must have a minimum of ten (10) ASBA Class 4 Certified facilities installed in the United States.

F. The Contractor must have a certified track builder on staff.

1.5 SEQUENCING AND SCHEDULING

A. Coordinate the Work with installation of work of related trades as the Work proceeds.

1.6 Sequence the Work in order to prevent deterioration of installed system.

PART 2 - PRODUCTS

2.1 TRACK SURFACE

A. Color: Base bid is for color “Black”*.

B. Shall be a permeable synthetic sport surface comprising a base layer of polyurethane bound rubber granules topped with a structural spray-applied coat of one component polyurethane and EPDM rubber granules and shall meet or exceed the following criteria:
   1. Thickness: Minimum ½” (13 mm) thickness to be achieved with multiple layer application.
   2. Final two coats shall be a structural spray coating

2.2 MATERIALS

A. TRACK
   1. FT Poly Mat SS 10k, Fisher Tracks, 1192 235th St, Boone, IA 50036, P: (800) 432-3191 – or – (515) 432-3191
   2. BSS 1000, Beynon 16 Alt Road, Hunt Valley, MD 21030, P: (410) 771-9473
   3. Other alternative providers are acceptable and must meet and/or be equivalent to all listed requirements, qualifications and specifications.

B. Line Marking Paint
   1. Single-component, moisture cured, aliphatic polyurethane paint specified by the track surface manufacture.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Prior to the application of the synthetic track surface, the asphaltic or concrete base shall be allowed to cure and shall be surveyed to verify dimensional accuracy, strength and to conform to all required dimensions prior to any resilient surfacing application.
   1. Curing: Before application of the synthetic surface can begin, the asphalt should be cured for a minimum of 14 days; and a concrete base a minimum of 28 days.
   2. Cleaning: The area to be surfaced shall be cleaned and free of any loose or foreign particles (dirt, oil, etc.) prior to commencement of the work. The surface shall be cleaned by use of a power blower and/or high pressure washer.

B. It is the responsibility of the paving contractor to water flood the surface with the use of a water truck. If after 30 minutes, “bird baths” are evident in a depth more than 1/8”, the paving contractor, track surfacing contractor and the owner’s representative will determine the best method of corrective action. No cold tar patching, skin patching of san mix patching will be acceptable. All areas not in conformance with the above requirements are to be repaired, with compatible materials as approved by the manufacturer and allowed to cure prior to application of synthetic surface.

C. Any oil spills (hydraulic, diesel, motor oil, etc.) must be completely removed and replaced with either polyurethane or new, keyed in asphalt. It shall be the responsibility of the surfacing

contractor to determine if the asphalt substrate has cured sufficiently prior to the application of the polyurethane surfacing system

D. For certification, the following criteria shall be followed:
   1. The track surface shall not vary from the cross slope shown on the plans by more than ±0.1%.
   2. The maximum lateral slope (outside to inside of the track surface) is 2%.
   3. The maximum lateral slope in the running direction is ±0.1%.
   4. The finished surface shall not vary by more than 1/8" when measured with a 10' straight edge.

E. Beginning of installation means acceptance of existing conditions. Adhesion to the existing asphalt is the surfacing contractor's responsibility.

3.2 INSTALLATION

A. Installation shall not take place if adjacent or concurrent construction generates excessive dust, abrasives or any other byproduct that, in the opinion of the installer, would be harmful to the track material, until completion of such works.

B. If, in the opinion of the installer of the synthetic material, the weather and/or climatic conditions are detrimental to the proper installation of the surfacing materials, work shall be delayed until conditions are acceptable. Preferred installed temperature is 50 degrees Fahrenheit and rising. Installation shall be executed only in dry conditions.

C. Contractor shall protect all areas directly adjacent to track from over spay. Protection shall be removed shortly thereafter to prevent any damage to lawn.

3.3 TRACK SURFACING APPLICATION

A. The permeable synthetic UV stabilized resilient track surface shall be applied in full accordance with manufacturer's requirements. Thickness shall be 13mm (1/2") minimum.

B. Final two coats shall be a structural spray coating.

3.4 LINE MARKINGS AND SYMBOLS

A. Layout and painting of track markings shall be in accordance with the drawings, manufacturers' specifications, and recommendations of the NFHS and MHSAA for track and field event layout. Layout shall be performed by a licensed professional surveyor.
   1. Locate and confirm both new radius points.
   2. Establish and set all necessary control points.
   3. Measurements shall be made on the track to the nearest 1/100th of a foot.
   4. Angles shall be set by using a transit or theodilite capable of reading direct to 20 seconds.
   5. The markings on the curve may also be set by using the chord length method.
   6. Measurements shall be made with an engineering steel tape or EDM in engineering scale.

B. All line and event markings shall be applied by experienced personnel utilizing polyurethane based paint comparable with the synthetic track surfacing. All marking dimensions shall be

certified in accordance with the specifications issued by the appropriate sanctioning or governing body such as NFHS, MHSAA, etc.

1. The track shall be marked for 42 inch lanes.
2. The long jump and pole vault shall be marked for a 48 inch lane.
3. All lanes and lines shall be white 2" wide lines.
4. All starts and finishes shall be 2" wide lines.
5. Exchange zones shall be indicated with triangles with a 41" base and 24" high with the base as the limits of the zone.
6. Acceleration marks shall be a 2" wide by 4" long dash marked clearly in the center of the lane.
7. Hurdle marks shall be 2" x 2" tic marks on the lane line on both sides of the lane.
8. Lane numbers shall be not less than 42" high and located as directed by the Owners Representative in four (4) locations. Numbers shall be in two (2) colors (shadowed background as selected by the Owner).
9. Event identification shall be 4" letters stenciled below and to the right of each lane and mark.
10. Scratch lines for the jumping events shall be 8" wide.
11. All starts and finished shall be clearly marked with the start of the said events. All symbols shall have the proper color code for the event.
12. Check marks for the pole vault event shall be at 12" intervals. Check mark dimensions shall be 1" x 6".
13. Discus pad and shot put pad dimension boundaries shall be a 2" painted circle. See details for proper dimensions.

3.5 PAINTING

A. No painting shall be performed when the velocity of the wind exceeds twelve miles per hour (12 mph), unless the spray equipment is equipped with the proper air curtains.

B. No painting shall be performed if substrate is wet or excessively damp or if rain is imminent.

C. The Contractor shall meet with the schools representative to review, confirm and verify all markings prior to installation. All markings shall be clearly identified and color coded for the painter to identify.

3.6 CLEAN UP

A. Contractor shall be responsible for compliance with all local, state and federal codes of the storage, handling and disposing of materials.

3.7 CERTIFICATION

A. Upon completion of the installation, the owner shall be supplied with all necessary computations and drawings as well as a letter of certification attesting to the accuracy of the markings to a minimum of ASBA Class 4 certification.

3.8 WARRANTY

A. Synthetic track surfacing system shall be fully guaranteed against faulty workmanship and material failure for a period of five (5) years from the date of acceptance.

B. Synthetic surfacing material found to be defective as a result of faulty workmanship and/or material failure shall be replaced or repaired at no charge, upon written notification within the guarantee period.

END OF SECTION 321220

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.
3. Long Jump and Pole Vault Runways.
4. Shot Put and Discus Pads.

Commented [AM1]: Remove if not required

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

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SECTION 321374
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 321374

SECTION 321415
PAVEMENT MARKING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:
   1. Markings on concrete pavement areas.
   2. Markings on asphalt pavement areas.
   3. Markings on existing concrete or asphalt pavement areas.

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. 321216 - Asphalt Paving.
   2. 321313 - Concrete Paving.

1.3 SUBMITTALS

A. Manufactures Product Data
   1. Provide manufacturer's product literature, technical specifications and other data prior to actual field installation work for Engineers review.
   2. Certification of compliance: Furnish a certification from manufacturer that material for this project has been sampled, tested and complies with requirements of specifications

1.4 QUALITY ASSURANCE

A. Manufacturers warranties shall pass to the Owner and certification made that the product materials meet all applicable grade trademarks or conform to industry standards and inspection requirements.

1.5 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.

1.6 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 MATERIALS:

A. Pavement marking paint shall be fast dry and comply the current edition of the MDOT Standard Specifications for Highway Construction and shall be selected from the following list of approved manufactures:
   1. Sherwin-Williams
   2. Ennis-Flint
   3. Or approved equal

B. Provide required colors for all physically handicapped markings, complying with governing agencies having jurisdiction.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Prior to all work of this section, carefully inspect installed work of all trades and verify all such work is complete to the point where installation may properly commence. Verify all pavement markings may be installed in accordance with all pertinent codes and regulations, authorities having jurisdiction and referenced standards.

B. In the event of discrepancy, immediately notify the architect. Do not proceed with installation in areas of discrepancies until all have been fully resolved.

3.2 SURFACE PREPARATION

A. Prior to application of pavement marking, it shall be marking contractor's responsibility that pavement surfaces are clear, dry and free of all foreign materials. Air blast to remove material that prevents pavement markings from adhering to the pavement surface

B. New bituminous wearing surface shall be in place for period of not less than fourteen days prior to application of pavement markings.

3.3 CONSTRUCTION METHODS

A. Application: Pavement markings shall be solid 4" wide yellow lines and laid out as indicated on drawings. Paint shall be applied uniformly at a minimum rate of sixteen gallons per mile for single 4" solid line. Markings shall be applied so that they adhere adequately to surface.

B. Protection of wet paint shall be responsibility of contractor. Markings obliterated by traffic shall be retraced at contractor's expense.

3.4 DEFECTIVE WORK

A. Improper location: Improperly located markings shall be removed at contractor's expense in a manner acceptable to architect and reapplied in correct locations at contractor’s expense.

B. Material shortage: Markings which are applied with material shortages shall be properly reapplied at contractor's expense

3.5 CLEAN UP

A. Upon completion of the work of this section, remove all rubbish, trash and debris resulting from work of this section. Leave site in neat and orderly condition.

END OF SECTION 321415

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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.
   8. ASTM F1043 Specification for Strength and Protective Coatings of Steel Industrial Chain Link Fence Framework.
   9. ASTM F1083 Specification for Pipe, Steel, Hot-Dipped Zinc-Coated (Galvanized Welded, for Fence Structures.
   10. ASTM F1184 Specification for Industrial and Commercial Horizontal Slide Gates.
   11. ASTM F2200 Specification for Automated Vehicular Gate Construction.
   12. 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 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)

2.8 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

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.

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. 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 6 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. Athletic Fields: Seed blend shall consist of a minimum of 3 bluegrass varieties and one of the ryegrass varieties. Blend shall be 95% Kentucky Bluegrass and 5% Perennial Ryegrass by weight. Only Elite bluegrasses (according to NTEP characteristics ratings) will be allowed on Athletic surfaces. No "named common" types will be accepted. Enhanced Elite varieties will be allowed at same seeding rates.

D. 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.

E. 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 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.

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 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

3.10 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.

B. Use specified materials to reestablish turf that does not comply with requirements, and continue maintenance until turf is satisfactory.

3.11 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.

3.12 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

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SECTION 331416
SITE WATER UTILITY DISTRIBUTION PIPING

1.1 SUMMARY

A. This Section includes the following:
1. Pipe and fittings for water lines and laterals.
2. Joints and joint restraints.
3. Curb stops.
4. Gate valves and valve boxes.
5. Insulation.
6. Vaults.
7. Tapping sleeves and valves.
8. Bedding and cover materials.
9. Testing and disinfection of water piping.

B. Utility-furnished products include water meters that will be furnished to the site, ready for installation.

C. RELATED WORK
1. 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:
a. Section 312000 – Earth Moving

1.2 SUBMITTALS

A. Before the Contractor orders any pipe or other appurtenances that they are proposing to use as substitutes for specified items, they shall submit design details of the substitutes to the Engineer for consideration and approval.

B. Manufactures Product Data
1. Submit manufacturer information regarding pipe materials, pipe fittings, valves, pressure reducing valves, saddles, curb stops, valve and curb boxes, vaults, service line couplings, sleeves, appurtenances, and accessories. Submit shop drawings for all mechanical thrust restraints.

C. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

D. Field Quality-Control Submittals: Indicate results of Contractor-furnished tests and inspections.

1.3 REFERENCES

A. A. American Society of Mechanical Engineers:
1. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings.
2. ASME B16.22 - Wrought Copper and Copper Alloy Solder Joint Pressure Fittings.

B. ASTM International:
1. ASTM A48 - Standard Specification for Gray Iron Castings.
2. ASTM B88 - Standard Specification for Seamless Copper Water Tube.

ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3)).

3. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3 (2,700 kNm/m3)).
4. ASTM D1785 - Standard Specification for Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds.
5. ASTM D2241 - Standard Specification for Polyethylene (PE) Plastic Pipe (SIDR-PR) Based on Controlled Inside Diameter.
6. ASTM D2466 - Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40.
7. ASTM D2855 - Standard Practice for Making Solvent-Cemented Joints with Poly (Vinyl Chloride) (PVC) Pipe and Fittings.
8. ASTM D3035 - Standard Specification for Polyethylene (PE) Plastic Pipe (DR-PR) Based on Controlled Outside Diameter.
9. ASTM D3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).
10. ASTM D3139 - Standard Specification for Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals.
11. ASTM D6938 - Standard Test Method for Density and Water Content of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
12. ASTM F477 - Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe.
13. ASTM F2164 - Standard Practice for Field Leak Testing of Polyethylene (PE) Pressure Piping Systems Using Hydrostatic Pressure.

C. American Welding Society:
1. AWS A5.8 - Specification for Filler Metals for Brazing and Braze Welding.

D. American Water Works Association:
1. AWWA C104 - American National Standard for Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water.
2. AWWA C105 - American National Standard for Polyethylene Encasement for Ductile-Iron Pipe Systems.
3. AWWA C111 - American National Standard for Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.
4. AWWA C151 - American National Standard for Ductile-Iron Pipe, Centrifugally Cast, for Water.
5. AWWA C500 - Metal-Seated Gate Valves for Water Supply Service.
6. AWWA C502 - Dry-Barrel Fire Hydrants.
7. AWWA C504 - Rubber-Sealed Butterfly Valves.
8. AWWA C508 - Swing-Check Valves for Waterworks Service, 2 in. (50 mm) Through 24 in. (600 mm) NPS.
9. AWWA C509 - Resilient-Seated Gate Valves for Water-Supply Service.
10. AWWA C600 - Installation of Ductile-Iron Water Mains and Their Appurtenances.
11. AWWA C606 - Grooved and Shouldered Joints.
12. AWWA C700 - Cold-Water Meters - Displacement Type, Bronze Main Case.
13. AWWA C701 - Cold-Water Meters - Turbine Type, for Customer Service.
14. AWWA C702 - Cold-Water Meters - Compound Type.
15. AWWA C706 - Direct-Reading, Remote-Registration Systems for Cold-Water Meters.
16. AWWA C900 - Polyvinyl Chloride (PVC) Pressure Pipe, 4 in. through 12 in., for Water Distribution.
17. AWWA C901 - Polyethylene (PE) Pressure Pipe and Tubing, 1/2 in. through 3 in., for Water Service.
18. AWWA M6 - Water Meters - Selection, Installation, Testing, and Maintenance.

1.4 QUALITY ASSURANCE

A. Manufacturers warranties shall pass to the Owner and certification made that the product materials meet all applicable grade trademarks or conform to industry standards and inspection requirements.

B. Valves: Mark valve body with manufacturer's name and pressure rating.

C. Piping materials shall bear label, stamp, or other markings of specified testing agency.

D. Materials in Contact with Potable Water: Certified according to NSF 61 and NSF 372.

E. Perform Work according to the AWWA and ANSI standards.

F. Regulatory Requirements:
   1. Comply with requirements of utility company supplying water. Include tapping of water mains and backflow prevention.
   2. Comply with standards of authorities having jurisdiction for potable-water-service piping, including materials, installation, testing, and disinfection.

G. Comply with ASTM F 645 for selection, design, and installation of thermoplastic water piping.

H. NFPA Compliance: Comply with NFPA 24 for materials, installations, tests, flushing, and valve and hydrant supervision for fire-service-main piping for fire suppression.

1.5 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.

1.6 SEQUENCING AND SCHEDULING

A. Interruption of Existing Water-Distribution 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 water-distribution service according to requirements indicated:

   1. Notify Engineer, Construction Manager and Owner no fewer than three days in advance of proposed interruption of service.
   2. Do not proceed with interruption of water-distribution service without Engineer, Construction Manager or Owner written permission.

B. Coordinate the Work with installation of work of related trades as the Work proceeds.

C. Sequence the Work in order to prevent deterioration of installed system.

1.7 CLOSEOUT SUBMITTALS

A. Project Record Documents: Record actual locations of piping mains, valves, connections, vaults, fixtures, and centerline elevations.

B. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

PART 2 - PRODUCTS

2.1 WATER PIPING

A. Ductile Iron Pipe: AWWA C151, Class 350
   1. Fittings: Ductile iron, standard thickness.
   2. Joints:
      a. Slip on (push-on) joints:
         1) Conform to ANSI Specification A21.11.
         2) Rubber gaskets and lubricant as specified by the pipe manufacturer shall be furnished with the pipe in sufficient quantity to complete all joints in the pipeline.
      b. Mechanical Joints
         1) Conform to ANSI A21.11. Rubber gaskets shall be according to the manufacturer's standard.
         2) Mechanical joint pipe shall be required for use when watermain is to be enclosed in a casing pipe.
      c. Flanged Joints
         1) Manufactured using ANSI 125 pound pattern flanges and include all necessary bolts, nuts, washers and gaskets in accordance with ANSI B16.1.
      d. Ball Joints
         1) Cast iron, mechanical, flexible jointed tube, designed to withstand a working pressure of 200 psi and a hydrostatic test pressure of 300 psi.
         2) Joints shall be similar to those produced by the following companies:
            a) "FLEX-LOK" by American Cast Iron Pipe Company
            b) "USIFLEX" by U.S. Pipe and Foundry Company
            c) "River Crossing Pipe" by James B. Clow and Sons, Inc.
   3. Lining/Coating: Cement mortar lining and real coating.
   4. Conductivity straps: Copper.
   5. Factory install continuity straps, field install straps by cad weld as needed.
   6. Gaskets with conductivity wedges will not be accepted.
   7. Install trace wire with all ductile iron pipe.
   8. Install all ductile iron pipe in 8 mil polywrap.

B. Copper Tubing:
   1. ASTM B88 Type K, Soft annealed, seamless
   2. Fittings: ASME B16.18, cast copper, or ASME B16.22, wrought copper.
   3. Joints: Compression connection with conductivity accessories.

C. PVC, AWWA Pipe: AWWA C900, Class 200, with bell end with gasket, and with spigot end.
   1. Comply with UL 1285 for fire-service mains if indicated.
   2. PVC Fabricated Fittings: AWWA C900, Class 200, with bell-and-spigot or double-bell ends. Include elastomeric gasket in each bell.
   3. PVC Molded Fittings: AWWA C907, Class 150, with bell-and-spigot or double-bell ends. Include elastomeric gasket in each bell.

4. Push-on-Joint, Ductile-Iron Fittings: AWWA C110, ductile- or gray-iron standard pattern or AWWA C153, ductile-iron compact pattern.
    a. Gaskets: AWWA C111, rubber.
5. Mechanical-Joint, Ductile-Iron Fittings: AWWA C110, ductile- or gray-iron standard pattern or AWWA C153, ductile-iron compact pattern.
    a. Glands, Gaskets, and Bolts: AWWA C111, ductile- or gray-iron glands, rubber gaskets, and steel bolts.

D. Accessories:
1. Tapping sleeves shall be stainless steel by Romac, Smith Blair, or approved equal.
2. Couplings shall be Romac, Smith Blair, or approved equal.
3. Flange adaptors (buried) – Romac, American Ductile, or approved equal.

2.2 GATE VALVES AND BOXES

A. Resilient seated gate valves
1. Conform to AWWA Standard C509-80, or the latest revision thereof and shall be furnished with the following detailing:
    a. Open right, or clockwise
    b. 2” square wrench nuts, where applicable
    c. Bronze stem
    d. Wedge rubber bonded to ductile iron wedge
    e. Symmetrical seating about stem centerline
    f. No depressions or cavities in seat area
    g. Body and bonnet of valve to be fusion bonded epoxy coated inside and out.
    h. Double "O" ring seal.
2. Acceptable brands shall include:
    a. Waterous Series 2500,
    b. American –Darling “80 CRS”,
    c. Clow F-6100,
    d. Or approved equal.

B. Valve Boxes
1. Three piece, screw type adjustable, cast iron boxes with a 5 ¼” diameter shaft.
2. Covers shall be furnished with finger holes and shall be marked "WATER".
3. Acceptable brands shall include:
    a. Tyler/Union 6860,
    b. EJ 8560,
    c. Or approved equal.
4. Valve box adjustment rings are not allowed on new construction.

2.3 CORPORATION STOP, CURB STOP VALVES AND BOXES

A. Corporation Stops
1. Red brass, per AWWA C800, latest revision.
2. Tapered inlet thread and a flared outlet or compression joint outlet for use with copper water tube.
3. Acceptable brands shall include:
    a. Mueller H 15000N for flared-type,
    b. Mueller P 15008N for compression type,
    c. Ford F1000-NL for compression type,
    d. Or approved equal.

B. Curb Stop And Boxes
   a. Curb Stop
      1) Red brass, per AWWA C800, latest revision.
      2) Flared or compression connectors for both inlet and outlet ends.
      3) Acceptable brands shall include:
         a) Mueller H 15204N for flared type,
         b) Mueller P 15209N for compression type,
         c) Ford B44-444NL for compression type,
         d) Or an approved equal.
   b. Curb Box
      1) Cast iron, screw thread adjusted, and painted inside and out with a suitable asphalt varnish.
      2) Boxes shall be "Buffalo" style.
      3) Tyler 6500-101F, Sigma VB701F, or approved equal for 3/4” though 1 ½” diameter and a standard valve box for 2” diameter.

C. Couplings And Connections
   1. Couplings and connections shall be copper by copper, copper by IP, and copper by plastic, as needed.
   2. All curb and corporation fittings shall be conductive pack joint, grip type.

2.4 HYDRANTS

A. Dry-barrel type

B. Shall meet the requirements of AWWA Standard C502-80, including any revisions thereto and must be UL listed.

C. Manufacturers:
   1. Waterous Pacer Model WB67-DDP,
   2. EJ BR-250,
   3. Or approved equal.

D. Inside dimension of 7 inches minimum, with minimum 5 inches diameter valve seat opening; 6 inch mechanical joint inlet connection with accessories, gland bolts, and gaskets. Breakoff “traffic section”. Plugged weep hole, opens left. 1-1/2” pentagon nut with weather shield.

E. Hydrant Extensions: Fabricate for trench depth with rod and coupling to increase barrel length, if necessary, to fit field conditions per plans.

F. Hose and Pumper Connection: Check sizes with local fire department, two 2 1/2" hose nozzles, one 4 1/2" pumper nozzle, National standard hose threads. Chain keepers for nozzle caps.

G. Finish: Primer and two coats of enamel, yellow color.

2.5 INSULATION BOARD

A. Provide rigid, high density extruded polystyrene insulation board, meeting a minimum of ASTM C 578, Type VI, having a nominal board thickness of 2 inches, minimum compressive strength of 40 psi and a minimum R-Value of 10. Furnish the board in a minimum 4 foot by 8 foot sheets unless otherwise approved by the Engineer, and of the cumulative thickness as indicated on the plans or as determined at the time of construction and approved by the Engineer.

2.6 POLYWRAP

A. All ductile iron pipe installed by open trench method shall be encased with 8 mil linear polywrap.

2.7 VAULTS

A. Water Utility Vaults
   1. Vaults shall be constructed at locations shown on the drawings and shall be of the size and type called for on the drawings. They shall be constructed of pre-cast reinforced concrete and shall conform to these specifications. The latest revision of ASTM standards shall apply.
   2. Risers, cones, and base sections shall be precast reinforced concrete units conforming to ASTM C478. Base riser section shall be cast integral with the base slab. The minimum wall thickness for 4-foot diameter vaults shall be five (5) inches unless otherwise called for in the standard plan details.
   3. Joints shall be modified groove tongue with rubber gaskets conforming to ASTM C443.
   4. Vault steps shall be reinforced polypropylene plastic No. PS2-PFS as manufactured by M.A. Industries, Inc., cast iron No. 8500 as manufactured by East Jordan Iron Works, or approved equal.
   5. Grade rings shall conform to ASTM C478 and shall have a minimum thickness of three (3) inches.
   6. Gray iron castings shall be of the type, size and weight as specified on the drawings. The castings shall conform to MDOT Specification 908.05.
   7. Pipe penetrations through the vault walls shall utilize Link-Seal modular seals to seal the interface between the pipe and the concrete wall.
   8. Installation of new structures or adjustment of existing structure shall have an external chimney wrap installed in accordance with the project details and specifications. Chimney wrap shall be Wrapid Seal heat shrinkable wrap as manufactured by Canusa or approved equal.

B. Vault Covers
   1. Vault covers must be the Municipality standard cover-East Jordan (EJ) 1040A.

C. Cement Mortar
   1. Non-shrink cement mortar shall conform to MDOT Standard Specifications for Construction Type R-2 Mortar.

D. Pipe Markers:
   1. Trace Wire:
      a. Trace wire shall be solid copper, copper clad steel, or high strength copper clad steel with HDPE or HMWPW coating, color coded per APWA standards.
         1) Open trench trace wire shall be #12 AWG Copper Clad Steel, High Strength with minimum 450 lb. break load, with minimum 30 mil HDPE insulation thickness.
      b. Splices shall be made with moisture displacement 3-way lockable connectors such as 3M DBR or Copperhead SnakeBite connectors to be approved by the Engineer.
      c. All trace wire splices must utilize an approved trace wire access box (grade level), specifically manufactured for this purpose to be approved by the Engineer.
         1) Grade level wire access boxes shall be installed with the cover exposed, unless noted otherwise on the plans, and shall be color coded per APWA standard for water lines (blue) to be approved by the Engineer.
   2. Warning Tape:
      a. Warning tape shall be a minimum 4 mil thickness, inert 100% low-density acid and alkali resistant polyethylene plastic film, formulated for extended use underground.
      b. Warning tape shall be 6” wide, color coded per AWWA standards.

2.8 ACCESSORIES

A. Concrete for Thrust Restraints: Concrete type shall be 3000 psi.

B. All exposed nuts and bolts on valves and hydrants must be stainless steel.

C. Joint restraints shall be Megalug 1100 Series or equal.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that existing utility water main size, location, type, and invert are as indicated on Drawings.

3.2 PREPARATION

A. Pipe Cutting:
   1. Cut pipe ends square, ream pipe and tube ends to full pipe diameter, and remove burrs.
   2. Use only equipment specifically designed for pipe cutting; use of chisels or hand saws is not permitted.
   3. Grind edges smooth with beveled end for push-on connections.

B. Remove scale and dirt on inside and outside before assembly.

C. Prepare pipe connections to equipment with flanges or unions, as specified by the pipe manufacturer.

3.3 INSTALLATION

A. Bedding:
   1. Excavation: As specified in Section 31 20 00 Earth Moving.
      a. Hand trim for accurate placement of pipe to elevations as indicated on Drawings. Dewater excavations to maintain dry conditions and to preserve final grades at bottom of excavation.
   2. Form and place concrete for pipe thrust restraints at change of pipe direction. Place concrete to permit full access to pipe and pipe accessories. Provide thrust restraint bearing on subsoil according to table on construction plans.
   3. Place bedding material at trench bottom, level fill materials in one continuous layer not exceeding 6 inches compacted depth; compact to 95 percent.
   4. Backfill around sides and to 12” above top of pipe with cover fill, tamp in place and
   5. compact to 95 percent.
   6. Maintain optimum moisture content of fill material to attain required compaction density.

B. Piping:
   1. Comply with AWWA M55.
   2. Handle and assemble pipe according to manufacturer instructions and as indicated on Drawings.
   3. Maintain 10 feet of horizontal separation and 18 inches of vertical separation between water piping and sewer piping according to the 10 States Standards for Water Works.
   4. Flanged Joints: Do not use in underground installations except within structures.

5. High Points:
    a. Install pipe with no high points.
    b. If unforeseen field conditions arise that necessitate high points, install air-release valves as directed by Engineer.
6. Bearing:
    a. Maintain bearing along entire length of pipe.
    b. Do not lay pipe in wet or frozen trench.
7. Prevent foreign material from entering pipe during placement.
8. Allow for expansion and contraction without stressing pipe or joints.
9. Close pipe openings with watertight plugs during Work stoppages.
10. Install access fittings to permit disinfection of water system.
11. Cover:
    a. Establish elevations of buried piping with not less than 2 feet of cover.
    b. Sections of the system that remain in service all year shall have 6 feet of cover or be insulated per the table on the drawings.
    c. Measure depth of cover from final surface grade to top of pipe barrel.
12. Use seals or other devices such that no leaks are present in mains at points of connections to the existing system.
13. Pipe Markers:
    a. Trace Wire:
        1) Install two strands of trace wire continuous with each pipe line.
        2) Tape the trace wires to the bottom half of the pipe every 5 feet to protect them during backfilling and maintain integrity of pipe detection.
        3) Splices are not permitted in open trench installation.
        4) Terminate trace wire for each pipe run at structures along pipe system. Trace wire must be properly grounded at all dead ends/stubs.
        5) For runs in excess of 500 feet, trace wire access must be provided utilizing an approved grade level trace wire access box, specifically manufactured for this purpose to be approved by the Engineer. Grade level wire access boxes shall be installed with the cover exposed, unless noted otherwise on the plans, and shall be color coded per APWA standard for water lines (blue) to be approved by the Engineer.
        6) Provide extra length of trace wire at each structure such that trace wire can be pulled 3 feet out top of structure for connection to detection equipment.
        7) Test trace wire for continuity for each bore before acceptance.
    b. Warning Tape:
        1) Install non detectable warning tape 1’ above the pipe along the centerline of the pipe in open trench installation.

C. Curb Stop Assemblies:
1. Set curb stops on compacted soil.
2. Connect to the service pipe in a horizontal position with the valve stem vertical, as measured along the pipe and across the pipe.
3. After all testing and connection at the service piping has been completed, and prior to final backfilling, the curb box shall be carefully centered over the curb stop.
4. The legs of the curb box shall rest firmly upon pieces of hardwood board and clearance shall be provided so that the box does not rest on the service piping.
5. The curb box shall be sufficiently plumbed and braced so that it stays vertical and centered over the curb stop during backfilling.

D. Tapping Water Main:
1. Tapping water main shall be accomplished using a tapping machine which is capable of tapping the main and inserting the corporation stop while the main is under pressure and in service. Under no circumstances will a water main be taken out of service to perform a tap without the Engineer's prior approval. Taps shall be made at the location shown on the plan, or as directed by the Engineer, and the following specifications will be observed:

a. Corporations will be installed on the main in as nearly a horizontal position as possible (i.e. at three o'clock or nine o'clock positions on the main). In no case will they be installed at a location above 22 1/2 degrees measured from the horizontal, or on top of the main.
b. Corporations may not be installed diametrically across from one another, but must be spaced at least 2 feet apart, measured along the longitudinal axis of the water main.
c. Corporations installed on the same side of the main as each other shall be separated longitudinally on the main by at least 2 feet.
d. Corporations may not be installed closer than 2 feet from any joint in the main, measured from the lip of the bell of the joint.

2. The Contractor shall leave the service line valves in the open position, unless directed otherwise by the Engineer.

E. Connections to Existing Water Main
1. Connections to the existing water distribution system will be made only after the new section of main has been tested and approved by the Engineer.
2. Where service to the existing distribution system must be disrupted in order to cut-in tees or do similar work, arrangements will be made at least 72 hours in advance with the local utility provider to shut down the required portion of the distribution system.
3. Connections shall be made at the required location using fittings as detailed on the plans.
4. Any tees, couplings, or cutting-in sleeves used shall be provided with restrained mechanical joints.
5. Where sand cast pipe or pipe of another material is encountered which has a different outside diameter from ductile iron pipe of the same nominal size, a mechanical joint transition coupling shall be used to make the connection. Machining the outside diameter of sand cast pipe to mate with ductile iron will not be authorized.

F. Backfilling:
1. Backfill around sides and to top of pipe as specified in Section 31 20 00 Earth Moving.

3.4 TOLERANCES

A. Install pipe to indicated elevation within tolerance of 3 inches.

3.5 3.5 FIELD QUALITY CONTROL

A. Water Testing, Chlorination, and Flushing
1. Contractor shall flush through 2” ball valves or Engineer approved alternate. Flushing valves shall be mounted on 2” molded tees that are heat fused into the water main. A plug shall be placed in the short section of pipe on the downstream side of the gate valve when flushing is complete. Flushing by any method is considered incidental to the contract work.
2. Disinfection: In Accordance with AWWA C651 or latest edition thereof and the MDOT 2020 Standard Specifications for Construction Section 823.03.U, with the exception that chlorine in tablet form is not an acceptable form of disinfection:
a. Sodium hypochlorite.
b. Continuous-feed method.
c. Calcium hypochlorite granules not required.
d. Minimum residual 25 parts per million (ppm) initial concentration.
e. Minimum residual 10 ppm after 24 hours.
3. Flushing: In accordance with AWWA C651.
a. Velocity: Minimum 2-1/2 feet per second.
b. Duration:

1) Initial: Until entire volume of water in pipeline has been replaced.
2) Final: Until residual chlorine equals that of adjoining system.

c. Dispose of chlorine residual in accordance with applicable state and local
d. requirements. Disposal location to be inspected by Engineer. If there are any questions that the discharge will harm the environment, apply a reducing agent to the water to neutralize the chlorine to a 1 ppm (maximum) residual.
e. Provide temporary piping as required to supply and discharge flushing water.

4. Bacteriological Testing: In accordance with AWWA C651 and state regulatory agency requirements and under the supervision of the Engineer or Owner designated water system operator.
   a. Two consecutive bacteriologically safe samples must be taken at 24-hour intervals for each end of pipe tested.
   b. Repeat disinfection if bacteriological test fails.
   c. Contractor: Transport Samples to an authorized lab for testing. Contractor to submit test results to the Engineer upon completion of each test.
   d. Cost of initial and repeat bacteriological lab tests are the responsibility of Contractor.
5. Sequence:
   a. Pressure test.
   b. Flush.
   c. Chlorinate.
   d. Flush.
   e. Wait 24 hours.
   f. Bacteriological sample.
   g. Wait 24 hours.
   h. Bacteriological sample.
   i. Place in service at direction of Owner.

B. Hydrostatic Testing
1. Within a reasonable length of time following pipe-laying and backfilling, the Contractor shall complete all work necessary to perform hydrostatic testing.
2. The hydrostatic testing shall be conducted in accordance with Chapter 2 of PPI's Handbook of Polyethylene Pipe, 2nd ed. and with ASTM F2164, Standard Practice for Field Leak Testing of Polyethylene (PE) Pressure Piping Systems Using Hydrostatic Pressure.
3. The Contractor shall perform all necessary preliminary hydrostatic tests and shall make all necessary repairs, including the repair of all visible leaks and cracks, and retests with his own forces to ready the water mains for final hydrostatic testing. Immediately after the water mains have passed such preliminary tests, the Contractor shall submit a written request to the Engineer for final hydrostatic testing to be witnessed by the Construction Observer.
4. The hydrostatic test shall be conducted before the new water main is connected to the existing water system, except as specified below. The Contractor shall furnish all necessary personnel, temporary blow-offs, plugs, bracing, test pumps and all of the necessary apparatus for conducting the test and cost of same shall be incidental to the unit price bid for water main. Testing shall be conducted under the supervision of the Engineer or Construction Observer.
5. At the option of the Engineer, the Contractor may test against closed valves providing that the new main to be tested and the testing apparatus shall have first been flushed and chlorinated in accordance with accepted procedure. After chlorination and subsequent flushing, a sample of water must show safe bacteriological results through a test by a recognized laboratory. In the event of an unsatisfactory hydrostatic test the Contractor will cut the new main, install caps or plugs, pressure test and re-chlorinate without additional cost or charge.
6. Before applying test pressure, all air shall be expelled from the pipe.

7. Test pressure is temperature dependent. If possible, test fluid and test section temperatures should be less than 80ºF. At temperatures above 80ºF, reduced test pressure is required. Contact the pipe manufacturer for technical assistance with elevated temperature pressure reduction. Sunlight heating of exposed PE pipe especially black PE pipe can result in high pipe temperature. Before applying test pressure, allow time for the test fluid and the test section to temperature equalize.
8. The test procedure consists of initial expansion, and test phases. For the initial expansion phase, the test section is pressurized to test pressure and make-up test liquid is added as required to maintain maximum test pressure for four (4) hours. For the test phase, the test pressure is reduced by 10 psi. This is the target test pressure. If the pressure remains steady (within 5% of the target test pressure) for an hour, leakage is not indicated.
9. Test pressure shall be maintained at 150 psi at the point of highest elevation in the test section.
10. Leakage:
    a. If testing of pipe indicates leakage greater than allowed, locate source of leakage, make corrections, and retest until leakage is within allowable limits.
    b. If leaks are discovered, depressurize the test section before repairing leaks. Correctly made fusion joints do not leak. Leakage at a butt fusion joint may indicate imminent catastrophic rupture. Depressurize the test section immediately if butt fusion leakage is discovered. Leaks at fusion joints require the fusion joint to be cut out and redone.
    c. Correct visible leaks regardless of quantity of leakage.
11. If the pressure leak test is not completed due to leakage, equipment failure, etc., the test section should be de-pressurized and repairs made. Allow the test section to remain depressurized for at least eight (8) hours before retesting.
12. The testing equipment capacity and the pipeline test section should be such that the test section can be pressurized and examined for leaks within test duration time limits. Lower capacity testing and pressurizing equipment may require a shorter test section.
13. Pressure gauge shall read in one (1) pound increments. Any faulty pipe, fittings, gate valves or other accessories disclosed by testing shall be replaced with sound materials and the test shall be repeated as often as necessary until the specified requirements have been met.

END OF SECTION 331416

SECTION 333100
SANITARY SEWERS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:
   1. Pipe and fittings.
   2. Nonpressure and pressure couplings.
   3. Expansion joints and deflection fittings.
   4. Cleanouts.
   5. Encasement for piping.
   6. Manholes.

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 SUBMITTALS

A. Product Data for the following:
   1. Pipe and fittings.
   2. Non-pressure and pressure couplings
   3. Cleanouts.

B. Shop Drawings:
   1. For manholes. Include plans, elevations, sections, details, and frames and covers.

1.4 QUALITY ASSURANCE

A. Comply with standards requirements of authorities having jurisdiction.

B. Comply with the Recommended Standards for Wastewater Facilities (Ten States Standard) Great Lakes - Upper Mississippi River Board of State and Provincial Public Health and Environmental Managers.

C. Piping materials shall bear label, stamp, or other markings of specified testing agency.

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 according to manufacturer's written rigging instructions.

1.6 FIELD CONDITIONS

A. Interruption of Existing Sanitary Sewerage 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 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 ABS PIPE AND FITTINGS

A. ABS Sewer Pipe and Fittings: ASTM D 2751, 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.

2.2 PVC PIPE AND FITTINGS

A. PVC Type PSM Sewer Piping:
   1. Pipe: ASTM D 3034, SDR 26, PVC Type PSM sewer pipe with bell-and-spigot end for gasketed joints.
   2. Fittings: ASTM D 3034, PVC with bell ends.
   3. Gaskets: ASTM F 477, elastomeric seals.

B. PVC Gravity Sewer Piping (NPS 18 to NPS 36):
   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.

C. PVC Pressure Piping:
   1. Pipe: AWWA C900, Class 200 PVC pipe with bell-and-spigot ends for gasketed joints.
   2. Fittings: AWWA C900, Class 200 PVC pipe with bell ends.
   3. Gaskets: ASTM F 477, elastomeric seals.

2.3 HDPE PIPE AND FITTINGS

A. High density polyethylene pipe conforming to ASTM D1598 and D3350, AWWA C906 and ANSI/NSF-14 and 61, material shall be comprised of PE 3408 Resin with a cell classification of PE334434C.
   1. Pipe shall have a wall thickness of DR-11 and a working pressure rating of 160 psi.
   2. Materials and workmanship shall be as required by AWWA M55, PE Pipe Design and Installation Manual and ASTM F714 Manufacturing requirements.
   3. HDPE pipe, appurtenances, and installation methods shall conform to the latest addition of AWWA C906. The AWWA Standard Code C906 identification must appear on the exterior wall print line of the HDPE pipe proposed for potable use and installation. All DDPE materials must be listed and approved for use with potable water under ANSI/NSF Standard 14. ANSI/NSF Standard 14 meets the requirements of ANSI/NSD Standard 61.

The exterior wall print lines of all HDPE pipe proposed for installation and potable use must bear the NSF-pw identification.

4. Pipe shall be furnished in Ductile Iron pipe sizes.
5. Pipe shall be handled and installed in accordance with manufacturer's recommendations.
6. Pipe shall be furnished with continuous, permanent print line identifying pipe size, pressure rating, trade name, material classification, ASTM and NSF standards, pipe test category, plant location and shift, date of manufacture, operator and extruder numbers, and supplier of raw materials.
7. Exterior wall print line must bear NSF – PW identification.
8. No installations shall exceed ten feet (10') of cover unless approved by the Engineer or as directed by the plans and specifications. The City Engineer must approve the use of HDPE pipe in any water main project within the City.

B. Fittings and Couplings; Fittings and specials shall be of the same construction and design as the pipe. The manufacturer of the pipe shall be the same as the manufacturer of the fittings and other fabrications.

C. Joints; Joints shall be thermally butt-fused according to the recommendations of the manufacturer.

D. HDPE Restraint Methods;
1. Restrained joints include butt fusions, electro-fusions, socket fusions, bolted flange connections, MJ Adapter connections or other restrained mechanical connections.
2. Provide joint restraints on long string of butt fused HDPE to bell and spigot or mechanical sleeve joint.
    a. Wall Anchor;
        1) Restrain the transition connection by butt fusing a Wall Anchor in the HDPE pipeline close to the connection and pouring a concrete anchor around it as shown in Details. Refer to the pipe manufacturer’s recommendations on anchor size and pull out loads.
    b. Mechanical Joint.
        1) Restrain the transition connection and several non-PE bell and spigot joints down line from the transition connection.
        2) Distance of pipe restraint needs to be identified on the drawings and noted in the HDPE to DIP Connection Detail. At minimum the Contractor shall provide pipe restraint per the requirements of a “Dead End” pipe as noted in the “Pipe Restraint Schedule” or 3 Pipe Lengths, whichever is greater

E. HDPE Pipe Connection to PVC Bell End;
1. Flex restraint pieces are electro-fused to the HDPE pipe to achieve the proper stab depth in the PVC bell and the restraint harness plate is attached behind them. The opposite end of the restraint harness is attached behind the PVC hub.
2. Install the HDPE pipe in the PVC bell until it bottoms out on the flex restraints and tighten the tie rods to prevent the assembly from pulling apart.
3. A stiffener is to be installed in the HDPE pipe end.
4. Contractor is to follow manufacturer’s recommended procedures for this assembly.

F. Mechanical Connection – HPDE to PVC;
1. Provide coupling on plain-end PVC pipe to plain-end HDPE pipe without special adapters.
2. When connecting HDPE pipe to a mechanical coupling, the fitting unless otherwise stated by the coupling manufacturer.

2.4 NONPRESSURE-TYPE 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 include corrosion-resistant-metal tension band and tightening mechanism on each end.

B. Sleeve Materials:
   1. For Plastic Pipes: ASTM F 477, elastomeric seal or ASTM D 5926, PVC.
   2. 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

2.5 EXPANSION JOINTS AND DEFLECTION FITTINGS

A. Ductile-Iron, Flexible Expansion Joints:
   1. Joints for Ductile Iron Pipe to be Tyton, Bell Tite, Fast Tite or equal.
   2. Description: Compound fitting with combination of flanged and mechanical-joint ends complying with AWWA C110 or AWWA C153. Include two gasketed balljoint sections and one or more gasketed sleeve sections, rated for 250-psig minimum working pressure and for offset and expansion indicated.

B. CLEANOUTS
   1. PVC Cleanouts:
      a. Description: PVC body with PVC threaded plug. Include PVC sewer pipe fitting and riser to cleanout of same material as sewer piping.
      b. Cleanout to be constructed as noted in the Details.
      c. PVC to meet ASTM D-3034.
      d. Cleanout lid per plans.

2.6 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: Co-polymer polypropylene and plastic, 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.
   10. Adjusting Rings: Interlocking HDPE rings with level or sloped edge in thickness and diameter matching manhole frame and cover, and of height required to adjust manhole

frame and cover to indicated elevation and slope. Include sealant recommended by ring manufacturer.

11. 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.

B. Manhole Frames and Covers:
   1. Description: Ferrous; 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 "SANITARY SEWER."
   2. Material: ASTM A 536, Grade 60-40-18 ductile iron unless otherwise indicated.

2.7 CONCRETE

A. General: Cast-in-place concrete in accordance with ACI 318, ACI 350, and the following:
   1. Cement: ASTM C 150/C 150M, Type II.
   2. Fine Aggregate: ASTM C 33/C 33M, sand.
   3. Coarse Aggregate: ASTM C 33/C 33M, 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 1064/A 1064M, 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.

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 sanitary 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, at minimum slope of 1 percent unless otherwise indicated.
   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 66 inch minimum cover.
   4. Install ductile-iron, gravity sewer piping according to ASTM A 746.
   5. Install ABS sewer piping according to ASTM D 2321 and ASTM F 1668.
   6. Install PVC Type PSM sewer piping according to ASTM D 2321 and ASTM F 1668.
   7. Install PVC gravity sewer piping according to ASTM D 2321 and ASTM F 1668.

F. Clear interior of piping and manholes of dirt and superfluous material as work progresses. Maintain swab or drag in piping, and pull past each joint as it is completed. Place plug in end of incomplete piping at end of day and when work stops.

3.3 PIPE JOINT CONSTRUCTION

A. Join gravity-flow, nonpressure, drainage piping according to the following:
   1. Join ductile-iron, gravity sewer piping according to AWWA C600 for push-on joints.
   2. Join ABS sewer piping according to ASTM D 2321 and ASTM D 2751 for elastomeric-seal joints.
   3. Join PVC Type PSM sewer piping according to ASTM D 2321 and ASTM D 3034 for elastomeric-seal joints or ASTM D 3034 for elastomeric-gasket joints.
   4. Join PVC gravity sewer piping according to ASTM D 2321 and ASTM D 3034 for elastomeric-seal joints or ASTM D 3034 for elastomeric-gasket joints.
   5. Join dissimilar pipe materials with nonpressure-type, flexible couplings.

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 flexible couplings where required to join gravity-flow, nonpressure sewer piping unless otherwise indicated.
      a. Ring-type flexible couplings for piping of different sizes where annular space between smaller piping's OD and larger piping's ID permits installation.

3.4 MANHOLE INSTALLATION

A. General: Install manholes complete with appurtenances and accessories indicated.

B. Install precast concrete manhole sections with sealants according to ASTM C 891.

C. Form continuous concrete channels and benches between inlets and outlet.

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.

3.5 CONCRETE PLACEMENT

A. Place cast-in-place concrete in accordance with ACI 318.

3.6 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.

3.7 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.

3.8 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.

3.9 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. Re-inspect 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.

C. Manholes: Perform hydraulic test according to ASTM C 969.

D. Leaks and loss in test pressure constitute defects that must be repaired.

E. Replace leaking piping using new materials, and repeat testing until leakage is within allowances specified.

3.10 CLEANING

A. A. Clean dirt and superfluous material from interior of piping.

END OF SECTION 333100

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

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CONSULTING GROUP

Report of Geotechnical Investigation

Beal City Public Schools
Bond Project
Beal City High School
3180 West Beal City Road
Mt. Pleasant,
Michigan 48858

Latitude 43.671377˚ N
Longitude 84.913231˚ W

Prepared for:

Beal City Public Schools
3180 West Beal City Road
Mt. Pleasant, Michigan 48858

G2 Project No. 203580
December 30, 2020

g2consultinggroup.com

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CONSULTING GROUP

December 30, 2020

Mr. William C. Chilman IV Ed.S.
Superintendent
Beal City Public Schools
3180 W. Beal City Road
Mt. Pleasant, Michigan 48858

Re: Report on Geotechnical Investigation
Beal City Public Schools Bond Project
Beal City High School
3180 West Beal City Road
Mt. Pleasant, Michigan 48858
G2 Project No. 203580

Dear Mr. Chilman:

We have completed the geotechnical investigation for the proposed Beal City High School additions at the above referenced address in Mt. Pleasant, Michigan. This report presents the results of our observations and analyses and our recommendations for earthwork operations, foundation and pavement design, and construction considerations as they relate to the geotechnical conditions on site.

As always, we appreciate the opportunity to be of service to Plante Moran Cresa and Beal City Public Schools and look forward to discussing the recommendations presented. In the meantime, if you have any questions regarding our report or any other matter pertaining to the project, please contact us.

Sincerely,

G2 Consulting Group, LLC

Grant M. Beahlen, P.E.
Project Engineer

Noel J. Hargrave-Thomas, P.E.
Principal

Jason B. Stoops, P.E.
Project Manager/Associate

GMB/NJHT/JBS/ljv

Enclosures

STATE OF MICHIGAN
JASON B. STOOPS
ENGINEER
No. 50982
LICENSED PROFESSIONAL ENGINEER

12/30/2020

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Chicagoland	1186 Heather Dr	Lake Zurich, IL 60047	P 847.353.8740	F 847.353.8742

EXECUTIVE SUMMARY

We understand the project consists of two proposed additions and pavement improvements to Beal City High School in Mt. Pleasant, Michigan. The proposed project will include the construction of two single-story slab-on-grade additions to the northeast and northwest sides of the existing school building. The project will also include the reconstruction of the existing parking lot and bus drive. Existing septic tanks located within the parking lot will be removed and backfilled with engineered fill.

Approximately 1 to 3-1/2 inches of silty sand topsoil are present at soil borings B-1 through B-5. Approximately 2-1/2 to 7 inches of bituminous concrete underlain by 3-1/2 to 9 inches of sandy gravel and sand and gravel aggregate base are present at soil borings B-6 through B-12. Medium to hard silty clay fill and medium compact sand fill underlie the topsoil within boring B-4 and pavement section at borings B-6, B-7, B-8, and B-11 and extend to depths ranging from 1-1/2 to 3-1/2 feet. Native stiff to hard silty clay underlies topsoil within borings B-1, B-2, B-3, and B-5, pavement sections within borings B-9, B-10, and B-12, and fill soils at the remaining boring locations and extends to the explored depths of 5 and 20 feet. Groundwater was encountered within soil boring B-1 at a depth of 17-1/2 feet during and upon completion of drilling operations. No measurable groundwater was encountered at the remaining boring locations during or upon completion of drilling operations.

We anticipate proposed finished floor elevations will match existing finished floor elevations and the reconstructed parking lot elevations will remain unchanged. As such, we anticipate earthwork operations will consist of stripping vegetation and topsoil within building addition areas, removing the existing bituminous concrete and septic tank within the parking lot, removing any existing utilities within the additions and proof rolling the exposed subgrade soils, placing engineered fill after satisfactory proof rolling operations to achieve proposed finished grades, excavating for foundations, and reconstructing the bituminous concrete parking lot.

Based on the existing subgrade conditions and anticipated loading conditions, we recommend the proposed building additions be supported on conventional strip and spread footing foundations. The foundations must extend through any existing fill soils and bear on the underlying hard silty clay. We recommend a net allowable bearing pressure of 4,000 psf be used for design of foundations supported on the aforementioned hard silty clay.

Based on the results of our analyses, we recommend a standard duty pavement section consisting of 2 inches of MDOT 5E1 bituminous concrete wearing course, 2 inches of MDOT 4E1 bituminous concrete leveling course supported on the existing MDOT 21AA dense-graded aggregate base. We recommend a minimum heavy duty pavement design section consisting of 2 inches of MDOT 5E1 bituminous concrete wearing course, two 2 inch lifts of MDOT 4E1 bituminous concrete leveling courses supported on the existing MDOT 21AA dense-graded aggregate base.

We do not anticipate significant groundwater accumulations will occur in the footing or utility excavations. In general, we expect accumulations of groundwater or surface runoff water in such excavations can be controlled with normal pumping from properly constructed sumps.

This summary is not to be considered separate from the entire text of this report with all the conclusions and qualifications mentioned herein. Details of our analysis and recommendations are discussed in the following sections and in the Appendix of this report.

PROJECT DESCRIPTION

We understand the project consists of two proposed additions and pavement improvements to Beal City High School in Mt. Pleasant, Michigan. The proposed project will include the construction of two single-story slab-on-grade additions to the northeast and northwest sides of the existing school building. The project will also include the reconstruction of the existing parking lot and bus drive. Existing septic tanks located within the parking lot will be removed and backfilled with engineered fill.

The purpose of our exploration is to determine and evaluate the general subsurface conditions at the site and to develop related foundation recommendations for the support of the proposed additions, pavement and floor slab design, site preparation, and construction considerations as they relate to the project.

SCOPE OF SERVICES

The field operations, laboratory testing, and engineering report preparation were performed under the direction and supervision of a licensed professional engineer. Our services were performed according to generally accepted standards and procedures in the practice of geotechnical engineering. Our scope of services for this project is as follows:

1. We drilled a total of twelve (12) soil borings throughout the existing property. Soil borings B-1 through B-5 were performed within the footprint of the proposed addition areas extending to a depth of 20 feet each below existing grades. Soil borings B-6 through B-12 were performed within existing pavement areas extending to a depth of 5 feet each.

2. We performed laboratory testing on representative samples obtained from the soil borings. Laboratory testing included visual engineering classification, natural moisture content, Atterberg Limits, grain size distribution, and unconfined compressive strength determinations.

3. We prepared this engineering report. The report includes recommendations regarding foundation types suitable for the soil conditions encountered, allowable bearing capacities of the anticipated bearing soil layers, estimated settlement, and construction considerations related to site preparation and foundation and pavement construction.

FIELD OPERATIONS

G2 Consulting Group, LLC selected the number, depth, and location of the soil borings. The soil boring locations were determined in the field by measuring from known surface features using conventional taping methods by a G2 engineer. The approximate soil boring locations are shown on the Soil Boring Location Plan, Plate No. 1. Ground surface elevations were not available at the time of this report. We recommend soil boring locations be surveyed for elevations prior to any earthwork operations. This will allow soil stratigraphy to be referenced to elevations during construction.

The soil borings were drilled using an all-terrain-vehicle (ATV) drill rig. Continuous flight, 3-1/4-inch inside diameter, hollow-stem augers were used to advance the boreholes to the explored depths. Soil samples were obtained at intervals of 2-1/2 feet within the upper 10 feet and at 5 foot intervals thereafter. These samples were obtained by the Standard Penetration Test method (ASTM D 1586), which involves driving a 2-inch diameter split-spoon sampler into the soil with a 140-pound weight falling 30 inches. The sampler is generally driven three successive 6-inch increments with the number of blows for each increment recorded. The number of blows required to advance the sampler the last 12 inches is termed the Standard Penetration Resistance (N). Blow counts for each 6-inch increment and the resulting N-values are presented on the individual soil boring logs.

Soil samples were placed in sealed containers in the field and brought to our laboratory for testing and classification. During field operations, the drilling crew maintained logs of the encountered subsurface conditions, including changes in stratigraphy and observed groundwater levels. The final boring logs are based on the field logs supplemented by laboratory soil classification and test results. After completion of drilling operations, the boreholes were backfilled with auger cuttings and capped with cold patch, where applicable.

LABORATORY TESTING

Representative soil samples were subjected to laboratory testing to determine soil parameters pertinent to foundation design and site preparation. An experienced geotechnical engineer classified the samples in general conformance with the Unified Soil Classification System.

Laboratory testing included Atterberg Limits, natural moisture content, grain size distribution, and unconfined compressive strength determinations. Atterberg limits were determined in accordance with ASTM D 4318 "Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils". Grain size distribution was determined in general conformance with ASTM C 136 method of testing. The unconfined compressive strengths were determined by a spring-loaded hand penetrometer. The hand penetrometer estimates the unconfined compressive strength to a maximum of 4-1/2 tons per square foot (tsf), which is converted to psf, by measuring the resistance of the soil sample to the penetration of a spring loaded cylinder.

The results of the organic content, moisture content, and unconfined compressive strength laboratory tests are indicated on the soil boring logs at the depths the samples were obtained. We will hold the soil samples until further notice. If you would like the samples, please let us know.

SITE DESCRIPTION

Beal City High School is located at 3180 West Beal City Road in Mt. Pleasant, Michigan. Immediate properties along W. Beal City Road are residential. Further surrounding properties are used for agricultural purposes. Wind turbines are present within the surrounding agricultural fields.

SOIL CONDITIONS

Approximately 1 to 3-1/2 inches of silty sand topsoil are present at soil borings B-1 through B-5. Approximately 2-1/2 to 7 inches of bituminous concrete underlain by 3-1/2 to 9 inches of sandy gravel and sand and gravel aggregate base are present at soil borings B-6 through B-12. Grain size analyses were performed on the aggregate base from soil borings B-8 and B-11. Based on the results of the grain size distribution the existing aggregate base meets gradation requirements for MDOT 21AA. Silty clay and sand fill underlie the topsoil within boring B-4 and pavement section at borings B-6, B-7, B-8, and B-11 and extend to depths ranging from 1-1/2 to 3-1/2 feet. Native silty clay underlies topsoil within borings B-1, B-2, B-3, and B-5, pavement sections within borings B-9, B-10, and B-12, and fill soils at the remaining boring locations and extends to the explored depths of 5 and 20 feet.

The silty clay fill is medium to hard in consistency with a moisture content of 17 percent and unconfined compressive strengths of 1,500 and 9,000 psf. The sand fill is medium compact with a Standard Penetration Test N-value of 13 blows per foot. The native silty clay is stiff to hard in consistency with natural moisture contents ranging from 12 to 25 percent, a liquid limit of 43 percent and plasticity index of 24 percent, and unconfined compressive strengths ranging from 2,000 to 9,000 psf.

The stratification depths shown on the soil boring logs represent the soil conditions at the boring locations. Variations may occur between borings. Additionally, the stratigraphic lines represent the

approximate boundaries between soil types. The transition may be more gradual than what is shown. We have prepared the boring logs on the basis of laboratory classification and testing, as well as field logs of the soils encountered.

The Soil Boring Location Plan, Plate No. 1, Soil Boring Logs, Figure Nos. 1 through 12, Grain Size Distribution, Figure No. 13, and Atterberg Limits Results, Figure No. 14 are presented in the Appendix. The soil profiles described above are generalized descriptions of the conditions encountered at the boring locations. General Notes Terminology defining the nomenclature used on the boring logs and elsewhere in this report are presented on Figure No. 15.

GROUNDWATER CONDITIONS

Groundwater observations were made during and upon completion for the drilling operations. Groundwater was encountered within soil boring B-1 at a depth of 17-1/2 feet during and upon completion of drilling operations. No measurable groundwater was encountered at the remaining boring locations during or upon completion of drilling operations.

Fluctuations in perched and long term groundwater levels should be anticipated due to seasonal variations and following periods of prolonged precipitation. It should also be noted that groundwater observations made during drilling operations in predominantly cohesive soils are not necessarily indicative of the static groundwater level. This is due to the low permeability of such soils and the tendency of drilling operations to seal off the natural paths of groundwater flow.

SITE PREPARATION

We anticipate proposed finished floor elevations will match existing finished floor elevations and the reconstructed parking lot elevations will remain unchanged. As such, we anticipate earthwork operations will consist of stripping vegetation and topsoil within building addition areas, removing the existing bituminous concrete and septic tank within the parking lot, removing any existing utilities within the building addition areas, proof rolling the exposed subgrade soils, placing engineered fill after satisfactory proof rolling operations to achieve proposed finished grades, excavating for foundations, and reconstructing the bituminous concrete parking lot.

At the start of earthwork operations, the existing vegetation, topsoil, bituminous concrete, septic tank, and any remaining utilities should be completely removed. After removal of the vegetation, topsoil, bituminous concrete, septic tank, and any utilities and prior to engineered fill placement the exposed subgrade should be thoroughly proof rolled with a heavily loaded tandem axle dump truck. Any unstable or unsuitable areas noted should be removed and replaced with engineered fill. We recommend construction operations occur during summer months to minimize undercut costs.

Engineered fill should be free of organic matter, frozen soil, clods, or other harmful material. The fill should be placed in uniform horizontal layers, not more than 9 inches in loose thickness. The engineered fill should be compacted to achieve a density of at least 95 percent of the maximum dry density as determined by the Modified Proctor compaction test (ASTM D 1557). All engineered fill material should be placed and compacted at approximately the optimum moisture content. Frozen material should not be used as fill, nor should fill be placed on a frozen subgrade. We recommend the use of granular non-cohesive engineered fill for use as backfill for utilities where smaller compaction equipment will be required due to the confined space conditions.

FOUNDATION RECOMMENDATIONS

Based on the existing subgrade conditions and anticipated loading conditions, we recommend the proposed building additions be supported on conventional strip and spread footing foundations. The

foundations must extend through any existing fill soils and bear on the underlying hard silty clay. We recommend a net allowable bearing pressure of 4,000 psf be used for design of foundations supported on the aforementioned hard silty clay.

Exterior foundations should bear at a minimum depth of 3-1/2 feet below finished grade for protection against frost heave. Interior foundations may bear at shallower depths provided suitable native bearing soils are present and foundations are protected from frost penetration during construction operations. A G2 engineer should be on site during construction to observe the excavations, measure the bearing depths, and verify the adequacy of the bearing soils.

Continuous wall or strip footings should be at least 12 inches in width and isolated spread footings should be at least 30 inches in their least dimension. Any foundations installed immediately adjacent to an existing foundation or column line should bear at the same elevation as the adjacent foundation. We recommend the existing building footings bearing elevation be investigated to determine the bearing elevation prior to construction. We recommend all strip footings be suitably reinforced to minimize the effects of differential settlements associated with local variations in subsoil conditions.

If the recommendations outlined in this report are adhered to, total and differential settlements for the completed structures should be within 1 inch and 1/2 inch, respectively. We expect settlements of these magnitudes are within tolerable limits for the type of structure proposed.

FLOOR SLAB RECOMMENDATIONS

We anticipate the subgrade soils will consist of native hard silty clay and existing fill soils. Provided some floor slab settlement can be tolerated, the fill soils may be left in place for support of floor slabs following satisfactory completion of the proof rolling operations as described within the site preparation section of this report. If floor slab settlement cannot be tolerated, the existing fill will need to be completely removed and replaced with engineered fill. A modulus of subgrade reaction value (k) of 100 pounds per cubic inch (pci) may be used in design of floor slabs supported on the existing fill soils. A modulus of subgrade reaction value (k) of 125 pounds per cubic inch (pci) may be used in design of floor slabs supported on engineered fill and native silty clay. We recommend all concrete floor slabs be suitably reinforced and separated from the foundation system to allow for independent movement.

We recommend that at least 4 inches of clean coarse sand or pea gravel be placed between the subgrade and the bottom of floor slabs for use as a capillary break to reduce moisture transmission through the concrete floors and to reduce the potential for concrete curling. The floor slabs should be isolated from the foundation system to allow for independent movement.

PAVEMENT RECOMMENDATIONS

The existing parking lot and bus drive has high severity alligator cracking within approximately 30 percent of the surface. Based on visual observations previous maintenance included seal coating. Based on the severity of the existing alligator cracking we recommend the pavement be reconstructed. The existing bituminous concrete should be completely removed. Following removal of the existing bituminous pavement and septic tanks and grading operations and prior new pavement construction, the exposed aggregate base and subgrade should be thoroughly proof rolled with a heavily loaded tandem axle dump truck and evaluated for stability. After proof rolling, the existing aggregate base should be compacted with a vibratory roller making a minimum of 10 passes.

Subgrade undercuts, where required, should be evaluated by a qualified engineering technician to determine if subgrade stabilization is necessary. We recommend that undercut excavations be backfilled with MDOT 21AA aggregate base placed in an engineered manner. Lift thicknesses should not exceed 9 inches. All engineered fill should be compacted to a density of at least 95 percent of the maximum

density determined by the Modified Proctor (ASTM D 1557) method of testing. All engineered fill material should be placed and compacted at approximately the optimum moisture content. Frozen material should not be used as fill, nor should fill be placed on a frozen subgrade.

We performed pavement design analyses in accordance with the "AASHTO Guide for Design of Pavement Structures". The subgrade soils will consist of native silty clay. Based on the existing subgrade soils, we have provided design pavement sections based on an effective subgrade resilient modulus of 7,000 pounds per square inch (psi).

For evaluation purposes, we have designed the new standard duty pavement section based on 50,000 18-kip Equivalent Single Axle Load (ESALS) and the heavy duty bus drive section based on 250,000 ESALs over a 20 year design life. We have utilized a serviceability loss of 2.0, a standard deviation of 0.49 for flexible pavements, and a reliability factor of 0.95 in the design. If any actual traffic volume information becomes available, G2 should be notified so we can re-evaluate our recommendations. Based on the results of our analyses, we recommend the following pavement sections for Beal City High School:

Beal City High School - Standard Duty Minimum Flexible Pavement Section		
Material	**Thickness**	**Structural Coefficient**
MDOT 5E1 Bituminous Wearing Course	2 inches	0.42
MDOT 4E1 Bituminous Leveling Course	2 inches	0.42
Existing MDOT 21AA Aggregate Base (Average)	7 inches	0.10

Beal City High School – Heavy-Duty Minimum Flexible Pavement Section		
Material	**Thickness**	**Structural Coefficient**
MDOT 5E1 Bituminous Wearing Course	2 inches	0.42
MDOT 4E1 Bituminous Leveling Course (2 lifts)	4 inches	0.42
Existing MDOT 21AA Aggregate Base (Average)	7 inches	0.10

General

All pavement materials are specified within the 2012 Standard Specifications for Construction from the Michigan Department of Transportation. The bituminous pavement materials are described in Sections 400 through 448. The aggregate materials for dense-graded base and asphalt are described in Section 902. Per MDOT specifications, the asphalt pavement materials can be assigned a structural coefficient number of 0.42 and newly installed dense-graded aggregate base material can be assigned a structural coefficient number of 0.14. The existing MDOT 21AA aggregate base can be assigned a structural coefficient number of 0.10.

Drainage

Proper drainage is considered to be an important consideration for pavement design, especially in consideration of the native cohesive soils. The pavement and subgrade should be properly sloped to promote effective surface and subsurface drainage and prevent water ponding. Improper subgrade grading can lead to trapped water in "bathtubs" below the pavement and within undercut areas which results in premature failure as the pavement ages and cracks develop. We recommend finger drains be installed at catch basin locations and any undercuts within the cohesive soils extending outward a minimum of 15 feet.

Based on the predominately cohesive subgrade, we recommend the subgrade not be exposed to prolonged periods of precipitation. This may result in the subgrade soils becoming unstable. We recommend the proposed reconstruction be performed during the summer months during dry, warm weather conditions.

Maintenance

Regular timely maintenance should be performed on the pavement to reduce the potential deterioration associated with moisture infiltration through surface cracks. The owner should be prepared to seal the cracks with a hot-applied elastic crack filler as soon as possible after cracking develops and as often as necessary to block the passage of water to the subgrade soils. We recommend that crack sealing be performed on a yearly basis for pavements that are in good and fair condition to extend the life of the pavements.

CONSTRUCTION CONSIDERATIONS

Based on the existing hard silty clay fill soils and native hard silty clay soils, we anticipate proposed footings can be earth formed. The side of the spread and/or strip footing foundations should be constructed straight and vertical to reduce the risk of frozen soil adhering to the concrete and raising the foundations.

We do not anticipate significant groundwater accumulations will occur in the footing excavations. In general, we expect accumulations of groundwater or surface runoff water in such excavations can be controlled with normal pumping from properly constructed sumps.

Where excavations extend deeper than 5 feet, we recommend maximum slopes of 2 horizontal unit to 1 vertical unit (2H:1V) for sloped excavations within any engineered fill granular soils and 1 horizontal unit to 1 vertical unit (1H:1V) in the silty clay. All excavations should be safely sheeted, shored, sloped, or braced in accordance with MI-OSHA requirements. If material is stored or equipment is operated near an excavation, stronger shoring must be used to resist the extra pressure due to the superimposed loads.

We recommend the existing building foundation bearing elevation be determined at the addition locations prior to construction. Care should always be exercised when excavating near existing roadways, utilities, and existing foundations to avoid undermining. In no case should excavations extend below the level of adjacent roadways, utilities, or foundations unless underpinning is planned.

GENERAL COMMENTS

We have formulated the evaluations and recommendations presented in this report relative to site preparation and foundations on the basis of data provided to us relating to the project location, type of structure, and anticipated surface grades for the proposed additions. Once proposed grades and loading conditions have been determined, G2 must be notified so we can review the recommendations presented within our report. Any significant changes in scope to this project should be brought to our attention for review and evaluation with respect to the prevailing subsurface conditions.

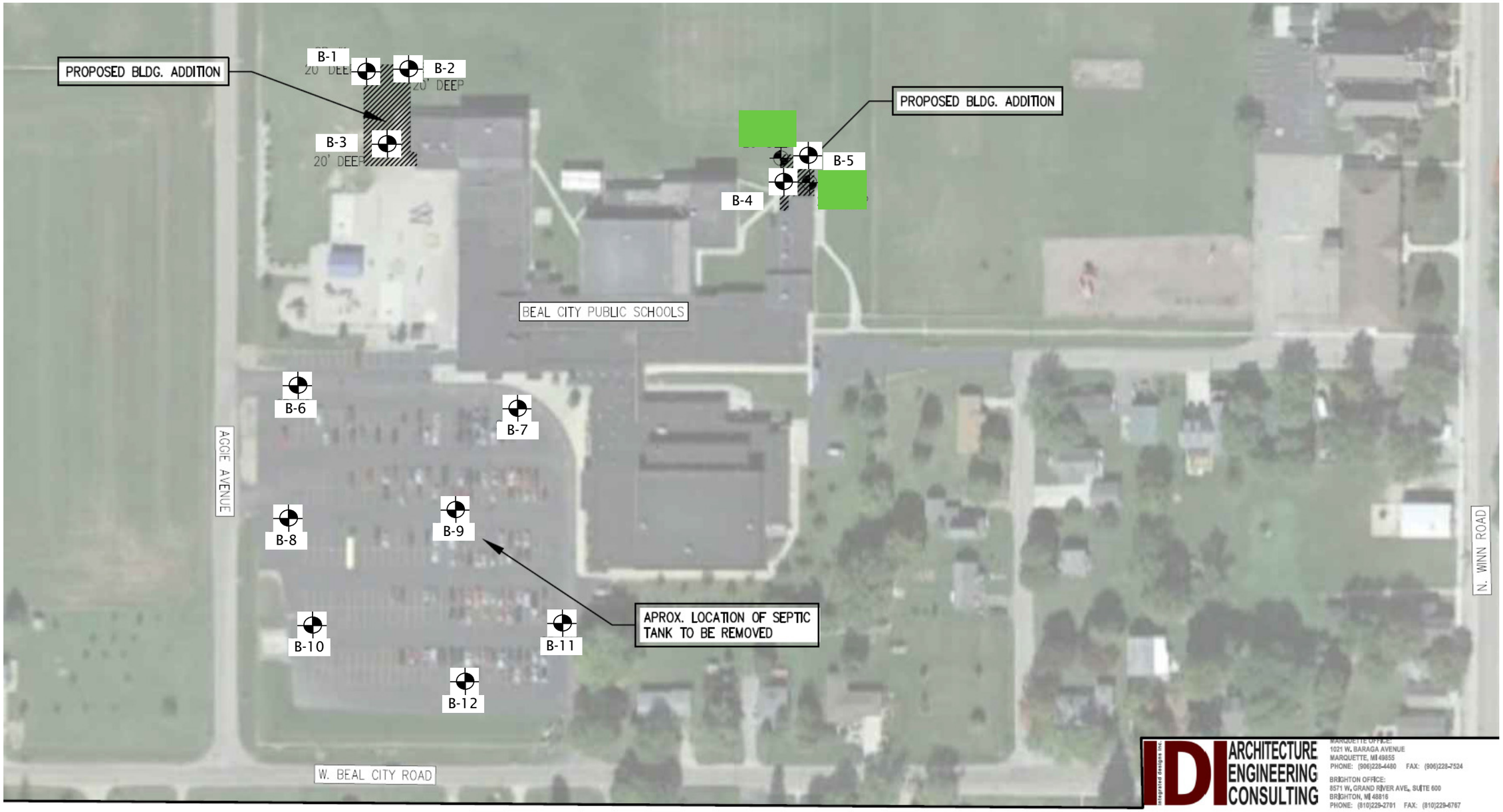
The scope of the present investigation was limited to evaluation of subsurface conditions for the support of the building addition foundations, and other related aspects of the development. No chemical, environmental, or hydrogeological testing or analyses were included in the scope of this investigation. If changes occur in the design, location, or concept of the project, the conclusions and recommendations contained in this report are not valid unless G2 Consulting Group, LLC reviews the changes. G2 Consulting Group, LLC will then confirm the recommendations presented herein or make changes in writing.

We have based the analyses and recommendations submitted in this report upon the data from soil borings performed at the approximate locations shown on the Soil Boring Location Plan, Plate No. 1. This report does not reflect variations that may occur between the actual boring locations and the actual structure locations. The nature and extent of any such variations may not become clear until the time of construction. If significant variations then become evident, it may be necessary for us to re-evaluate our report recommendations.

Soil conditions at the site could vary from those generalized on the basis of soil borings made at specific locations. It is, therefore, recommended that G2 Consulting Group, LLC be retained to provide soil engineering services during site preparation, excavation, and foundation construction phases of the proposed project. This is to observe compliance with the design concepts, specifications, and recommendations. Also, this allows design changes to be made in the event that subsurface conditions differ from those anticipated prior to the start of construction.

APPENDIX

Soil Boring Location Plan	Plate No. 1
Soil Boring Logs	Figure Nos. 1 through 12
Grain Size Distribution	Figure No. 13
Atterberg Limits Results	Figure No. 14
General Notes Terminology	Figure No. 15



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Legend

Soil Borings Performed by Pearson Drilling Company on December 11, 2020

Soil Boring Location Plan

Beal City Public Schools
3180 West Beal City Road
Mt. Pleasant, Michigan 48858

2G CONSULTING GROUP

Project No. 203580	
Drawn by: GMB	
Date: 12/21/20	Plate No. 1
Scale: NTS	

Project Name: Beal City High School

Project Location: 3180 West Beal City Road
Mt. Pleasant, Michigan 48858

G2 Project No. 203580

Latitude: N/A Longitude: N/A

Soil Boring No. B-1

CONSULTING GROUP

SUBSURFACE PROFILE				SOIL SAMPLE DATA					
DEPTH (ft)	PRO-FILE	GROUND SURFACE ELEVATION: N/A	DEPTH (ft)	SAMPLE TYPE-NO.	BLOWS/ 6-INCHES	STD. PEN. RESISTANCE (N)	MOISTURE CONTENT (%)	DRY DENSITY (PCF)	UNCONF. COMP. STR. (PSF)
		Topsoil: Dark Brown Silty Sand (1 inch) 0.2							
		Hard Dark Brown and Brown Silty Clay with trace sand and gravel		S-1	2 6 6	12	16.2		9000*
		3.5							
5		Hard Brown Silty Clay with trace sand and gravel	5	S-2	6 9 12	21	14.2		9000*
		6.0							
		Hard Mottled Brown and Gray Silty Clay with trace sand and gravel		S-3	4 7 10	17	14.4		9000*
		8.0							
10			10	S-4	5 9 13	22	14.7		8000*
		Very Stiff Brown Silty Clay with trace sand and gravel with occasional sand seams							
15			15	S-5	6 7 6	13	15.7		9000*
20		20.0	20	S-6	5 6 8	14	18.6		5000*
		End of Boring @ 20 ft							
25			25						

Total Depth: 20 ft
Drilling Date: December 11, 2020
Inspector:
Contractor: Pearson Drilling Company
Driller: W.P

Drilling Method:
3-1/4 inch inside diameter hollow stem augers

Water Level Observation:
17-1/2 feet during and upon completion

Notes:
* Calibrated Hand Penetrometer

Excavation Backfilling Procedure:
Auger cuttings

Figure No. 1

SOIL / PAVEMENT BORING 203580.GPJ 20150116 G2 CONSULTING DATA TEMPLATE.GDT 1/5/21

Project Name: Beal City High School

Project Location: 3180 West Beal City Road
Mt. Pleasant, Michigan 48858

G2 Project No. 203580

Latitude: N/A Longitude: N/A

Soil Boring No. B-2

CONSULTING GROUP

SUBSURFACE PROFILE				SOIL SAMPLE DATA					
DEPTH (ft)	PRO-FILE	GROUND SURFACE ELEVATION: N/A	DEPTH (ft)	SAMPLE TYPE-NO.	BLOWS/ 6-INCHES	STD. PEN. RESISTANCE (N)	MOISTURE CONTENT (%)	DRY DENSITY (PCF)	UNCONF. COMP. STR. (PSF)
		Topsoil: Dark Brown Silty Sand (2 inches) 0.2							
		Stiff Dark Brown and Brown Silty Clay with trace sand and gravel		S-1	4 6 5	11	17.5		4000*
		3.5							
5			5	S-2	5 5 8	13	16.2		9000*
				S-3	5 10 13	23	14.1		9000*
10		Hard Brown Silty Clay with trace sand and gravel	10	S-4	3 6 10	16	15.3		9000*
		14.0							
15			15	S-5	4 6 7	13	16.7		6000*
		Stiff to Very Stiff Brown Silty Clay with trace sand and gravel							
20		20.0	20	S-6	5 4 5	9	18.0		3000*
		End of Boring @ 20 ft							
25			25						

Total Depth: 20 ft
Drilling Date: December 11, 2020
Inspector:
Contractor: Pearson Drilling Company
Driller: W.P

Drilling Method:
3-1/4 inch inside diameter hollow stem augers

Water Level Observation:
Dry during and upon completion

Notes:
* Calibrated Hand Penetrometer

Excavation Backfilling Procedure:
Auger cuttings

Figure No. 2

SOIL / PAVEMENT BORING 203580.GPJ 20150116 G2 CONSULTING DATA TEMPLATE.GDT 1/5/21

Project Name: Beal City High School

Project Location: 3180 West Beal City Road
Mt. Pleasant, Michigan 48858

G2 Project No. 203580

Latitude: N/A Longitude: N/A

Soil Boring No. B-3

CONSULTING GROUP

SUBSURFACE PROFILE				SOIL SAMPLE DATA					
DEPTH (ft)	PRO-FILE	GROUND SURFACE ELEVATION: N/A	DEPTH (ft)	SAMPLE TYPE-NO.	BLOWS/ 6-INCHES	STD. PEN. RESISTANCE (N)	MOISTURE CONTENT (%)	DRY DENSITY (PCF)	UNCONF. COMP. STR. (PSF)
		Topsoil: Dark Brown Silty Sand (3-1/2 inches) 0.3							
				S-1	5 6 7	13	16.6		9000*
5			5	S-2	4 9 10	19	14.5		9000*
				S-3	6 11 15	26	14.4		9000*
		Hard Brown Silty Clay with trace sand and gravel							
10			10	S-4	6 9 13	22	15.5		9000*
15			15	S-5	4 6 8	14	15.6		90000*
		17.0							
		Very Stiff Brown Silty Clay with trace sand and gravel							
20		20.0	20	S-6	6 5 7	12	16.6		7000*
		End of Boring @ 20 ft							
25			25						

Total Depth: 20 ft
Drilling Date: December 11, 2020
Inspector:
Contractor: Pearson Drilling Company
Driller: W.P

Drilling Method:
3-1/4 inch inside diameter hollow stem augers

Water Level Observation:
Dry during and upon completion

Notes:
* Calibrated Hand Penetrometer

Excavation Backfilling Procedure:
Auger cuttings

Figure No. 3

SOIL / PAVEMENT BORING 203580.GPJ 20150116 G2 CONSULTING DATA TEMPLATE.GDT 1/5/21

Project Name: Beal City High School

Project Location: 3180 West Beal City Road
Mt. Pleasant, Michigan 48858

G2 Project No. 203580

Latitude: N/A Longitude: N/A

Soil Boring No. B-4

CONSULTING GROUP

SUBSURFACE PROFILE

GROUND SURFACE ELEVATION: N/A

Topsoil: Dark Brown Silty Sand (1 inch) — 0.2

Fill: Hard Brown, Dark Brown, and Gray Silty Clay with trace sand, gravel, and cobbles — 3.5

Hard Brown Silty Clay with trace sand and gravel — 17.0

Stiff Brown Silty Clay with trace sand and gravel — 20.0

End of Boring @ 20 ft

SOIL SAMPLE DATA

DEPTH (ft)	SAMPLE TYPE-NO.	BLOWS/ 6-INCHES	STD. PEN. RESISTANCE (N)	MOISTURE CONTENT (%)	DRY DENSITY (PCF)	UNCONF. COMP. STR. (PSF)
	S-1	5 5 8	13	17.3		9000*
5	S-2	4 7 11	18			
	S-3	6 9 13	22	15.8		9000*
10	S-4	6 8 12	20	15.8		9000*
15	S-5	4 7 8	15	17.8		9000*
20	S-6	4 5 6	11	17.2		2500*
25						

Total Depth: 20 ft
Drilling Date: December 11, 2020
Inspector:
Contractor: Pearson Drilling Company
Driller: W.P

Drilling Method:
3-1/4 inch inside diameter hollow stem augers

Water Level Observation:
Dry during and upon completion

Notes:
* Calibrated Hand Penetrometer

Excavation Backfilling Procedure:
Auger cuttings

Figure No. 4

SOIL / PAVEMENT BORING 203580.GPJ 20150116 G2 CONSULTING DATA TEMPLATE.GDT 1/5/21

Project Name: Beal City High School

Project Location: 3180 West Beal City Road
Mt. Pleasant, Michigan 48858

G2 Project No. 203580

Latitude: N/A Longitude: N/A

Soil Boring No. B-5

CONSULTING GROUP

SUBSURFACE PROFILE				SOIL SAMPLE DATA					
DEPTH (ft)	PRO-FILE	GROUND SURFACE ELEVATION: N/A	DEPTH (ft)	SAMPLE TYPE-NO.	BLOWS/ 6-INCHES	STD. PEN. RESISTANCE (N)	MOISTURE CONTENT (%)	DRY DENSITY (PCF)	UNCONF. COMP. STR. (PSF)
		Topsoil: Dark Brown Silty Sand (1 inch) 0.2							
				S-1	3 6 7	13	12.2		9000*
		Hard Brown Silty Clay with trace sand and gravel							
5			5	S-2	4 7 10	17	16.1		9000*
				S-3	3 6 10	16	16.0		9000*
		8.0							
10			10	S-4	4 7 10	17	16.5		6500*
		Very Stiff Brown Silty Clay with trace sand and gravel							
15			15	S-5	4 7 9	16	16.8		7500*
		16.0							
		Stiff Brown Silty Clay with trace sand and gravel							
20		20.0	20	S-6	4 3 6	9	16.4		2000*
		End of Boring @ 20 ft							
25			25						

Total Depth: 20 ft
Drilling Date: December 11, 2020
Inspector:
Contractor: Pearson Drilling Company
Driller: W.P

Drilling Method:
3-1/4 inch inside diameter hollow stem augers

Water Level Observation:
Dry during and upon completion

Notes:
* Calibrated Hand Penetrometer

Excavation Backfilling Procedure:
Auger cuttings

Figure No. 5

SOIL / PAVEMENT BORING 203580.GPJ 20150116 G2 CONSULTING DATA TEMPLATE.GDT 1/5/21

Project Name: Beal City High School

Project Location: 3180 West Beal City Road
Mt. Pleasant, Michigan 48858

G2 Project No. 203580

Latitude: N/A Longitude: N/A

Soil Boring No. B-6

CONSULTING GROUP

SUBSURFACE PROFILE

SOIL SAMPLE DATA

DEPTH (ft)	PRO-FILE	GROUND SURFACE ELEVATION: N/A	DEPTH (ft)	SAMPLE TYPE-NO.	BLOWS/ 6-INCHES	STD. PEN. RESISTANCE (N)	MOISTURE CONTENT (%)	DRY DENSITY (PCF)	UNCONF. COMP. STR. (PSF)
		Bituminous Concrete (7 inches) 0.5							
		Aggregate Base: Gray Sandy Gravel (6 inches) 1.0							
		Fill: Brown Sand 1.5			5				
		Stiff Brown Silty Clay with trace sand and gravel		S-1	4 4	8	25.2		4000*
		3.5							
5		Hard Brown Silty Clay with trace sand and gravel 5.0	5	S-2	4 6 9	15	14.7		9000*
		End of Boring @ 5 ft							
10			10						
15			15						
20			20						
25			25						

Total Depth: 5 ft
Drilling Date: December 11, 2020
Inspector:
Contractor: Pearson Drilling Company
Driller: W.P

Drilling Method:
3-1/4 inch inside diameter hollow stem augers

Water Level Observation:
Dry during and upon completion

Notes:
* Calibrated Hand Penetrometer

Excavation Backfilling Procedure:
Auger cuttings and cold patch

Figure No. 6

SOIL / PAVEMENT BORING 203580.GPJ 20150116 G2 CONSULTING DATA TEMPLATE.GDT 1/5/21

Project Name: Beal City High School

Project Location: 3180 West Beal City Road
Mt. Pleasant, Michigan 48858

G2 Project No. 203580

Latitude: N/A Longitude: N/A

Soil Boring No. B-7

CONSULTING GROUP

SUBSURFACE PROFILE

SOIL SAMPLE DATA

DEPTH (ft)	PRO-FILE	GROUND SURFACE ELEVATION: N/A	DEPTH (ft)	SAMPLE TYPE-NO.	BLOWS/ 6-INCHES	STD. PEN. RESISTANCE (N)	MOISTURE CONTENT (%)	DRY DENSITY (PCF)	UNCONF. COMP. STR. (PSF)
		Bituminous Concrete (4-1/2 inches) 0.5							
		Aggregate Base: Gray Sandy Gravel with trace silt (7-1/2 inches) 1.0							
		Fill: Brown Sand 1.5							
		Fill: Stiff Brown Silty Clay with trace sand and gravel 2.0		S-1	6 4 5	9	19.5		3000*
5		Hard Brown Silty Clay with trace sand and gravel 5.0	5	S-2	10 5 8	13	14.9		9000*
		End of Boring @ 5 ft							
10			10						
15			15						
20			20						
25			25						

Total Depth: 5 ft
Drilling Date: December 11, 2020
Inspector:
Contractor: Pearson Drilling Company
Driller: W.P

Drilling Method:
3-1/4 inch inside diameter hollow stem augers

Water Level Observation:
Dry during and upon completion

Notes:
* Calibrated Hand Penetrometer

Excavation Backfilling Procedure:
Auger cuttings and cold patch

Figure No. 7

SOIL / PAVEMENT BORING 203580.GPJ 20150116 G2 CONSULTING DATA TEMPLATE.GDT 1/5/21

Project Name: Beal City High School

Project Location: 3180 West Beal City Road
Mt. Pleasant, Michigan 48858

G2 Project No. 203580

Latitude: N/A Longitude: N/A

Soil Boring No. **B-8**

CONSULTING GROUP

SUBSURFACE PROFILE				SOIL SAMPLE DATA					
DEPTH (ft)	PRO-FILE	GROUND SURFACE ELEVATION: N/A	DEPTH (ft)	SAMPLE TYPE-NO.	BLOWS/ 6-INCHES	STD. PEN. RESISTANCE (N)	MOISTURE CONTENT (%)	DRY DENSITY (PCF)	UNCONF. COMP. STR. (PSF)
		Bituminous Concrete (3 inches) 0.3							
		Aggregate Base: Gray Sand and Gravel with trace silt (9 inches) 1.0							
		Fill: Medium Brown and Gray Silty Clay with trace sand and gravel		S-1	5 3 3	6	16.6		1500*
		3.0							
5		Hard Brown Silty Clay with trace sand and gravel 5.0	5	S-2	6 4 10	14	15.4		9000*
		End of Boring @ 5 ft							
10			10						
15			15						
20			20						
25			25						

Total Depth: 5 ft
Drilling Date: December 11, 2020
Inspector:
Contractor: Pearson Drilling Company
Driller: W.P

Drilling Method:
3-1/4 inch inside diameter hollow stem augers

Water Level Observation:
Dry during and upon completion

Notes:
* Calibrated Hand Penetrometer

Excavation Backfilling Procedure:
Auger cuttings and cold patch

Figure No. 8

SOIL / PAVEMENT BORING 203580.GPJ 20150116 G2 CONSULTING DATA TEMPLATE.GDT 1/5/21

Project Name: Beal City High School

Project Location: 3180 West Beal City Road
Mt. Pleasant, Michigan 48858

G2 Project No. 203580

Latitude: N/A Longitude: N/A

Soil Boring No. B-9

CONSULTING GROUP

SUBSURFACE PROFILE				SOIL SAMPLE DATA					
DEPTH (ft)	PRO-FILE	GROUND SURFACE ELEVATION: N/A	DEPTH (ft)	SAMPLE TYPE-NO.	BLOWS/ 6-INCHES	STD. PEN. RESISTANCE (N)	MOISTURE CONTENT (%)	DRY DENSITY (PCF)	UNCONF. COMP. STR. (PSF)
		Bituminous Concrete (5 inches) 0.3							
		Aggregate Base: Gray Sandy Gravel with trace silt (7 inches) 1.0							
		Very Stiff Brown Silty Clay with trace sand and gravel		S-1	4 3 4	7	21.2		4500*
		3.0							
		Hard Mottled Brown and Gray Silty Clay with trace sand and gravel		S-2	6 8 13	21	15.6		9000*
5		5.0	5						
		End of Boring @ 5 ft							
10			10						
15			15						
20			20						
25			25						

Total Depth: 5 ft
Drilling Date: December 11, 2020
Inspector:
Contractor: Pearson Drilling Company
Driller: W.P

Drilling Method:
3-1/4 inch inside diameter hollow stem augers

Water Level Observation:
Dry during and upon completion

Notes:
* Calibrated Hand Penetrometer

Excavation Backfilling Procedure:
Auger cuttings and cold patch

Figure No. 9

SOIL / PAVEMENT BORING 203580.GPJ 20150116 G2 CONSULTING DATA TEMPLATE.GDT 1/5/21

Project Name: Beal City High School

Project Location: 3180 West Beal City Road
Mt. Pleasant, Michigan 48858

G2 Project No. 203580

Latitude: N/A Longitude: N/A

Soil Boring No. B-10

CONSULTING GROUP

SUBSURFACE PROFILE				SOIL SAMPLE DATA					
DEPTH (ft)	PRO-FILE	GROUND SURFACE ELEVATION: N/A	DEPTH (ft)	SAMPLE TYPE-NO.	BLOWS/ 6-INCHES	STD. PEN. RESISTANCE (N)	MOISTURE CONTENT (%)	DRY DENSITY (PCF)	UNCONF. COMP. STR. (PSF)
		Bituminous Concrete (3-1/2 inches) 0.3							
		Aggregate Base: Gray Sandy Gravel with trace silt (8-1/2 inches) 1.0							
				S-1	5 3 6	9	15.3		9000*
		Hard Mottled Brown and Gray Silty Clay with trace sand and gravel							
5		5.0	5	S-2	7 7 11	18	14.9		9000*
		End of Boring @ 5 ft							
10			10						
15			15						
20			20						
25			25						

Total Depth: 5 ft
Drilling Date: December 11, 2020
Inspector:
Contractor: Pearson Drilling Company
Driller: W.P

Drilling Method:
3-1/4 inch inside diameter hollow stem augers

Water Level Observation:
Dry during and upon completion

Notes:
* Calibrated Hand Penetrometer

Excavation Backfilling Procedure:
Auger cuttings and cold patch

Figure No. 10

SOIL / PAVEMENT BORING 203580.GPJ 20150116 G2 CONSULTING DATA TEMPLATE.GDT 1/5/21

Project Name: Beal City High School

Project Location: 3180 West Beal City Road
Mt. Pleasant, Michigan 48858

G2 Project No. 203580

Latitude: N/A Longitude: N/A

Soil Boring No. B-11

CONSULTING GROUP

SUBSURFACE PROFILE

SOIL SAMPLE DATA

DEPTH (ft)	PRO-FILE	GROUND SURFACE ELEVATION: N/A	DEPTH (ft)	SAMPLE TYPE-NO.	BLOWS/ 6-INCHES	STD. PEN. RESISTANCE (N)	MOISTURE CONTENT (%)	DRY DENSITY (PCF)	UNCONF. COMP. STR. (PSF)
		Bituminous Concrete (2-1/2 inches) 0.2							
		Aggregate Base: Gray Sandy Gravel with trace silt (3-1/2 inches) 0.5							
		Fill: Medium Compact Brown Sand		S-1	8 6 7	13			
		3.5							
5		Hard Mottled Brown and Gray Silty Clay with trace sand and gravel 5.0	5	S-2	4 6 8	14	16.2		9000*
		End of Boring @ 5 ft							
10			10						
15			15						
20			20						
25			25						

Total Depth: 5 ft
Drilling Date: December 11, 2020
Inspector:
Contractor: Pearson Drilling Company
Driller: W.P

Drilling Method:
3-1/4 inch inside diameter hollow stem augers

Water Level Observation:
Dry during and upon completion

Notes:
* Calibrated Hand Penetrometer

Excavation Backfilling Procedure:
Auger cuttings and cold patch

Figure No. 11

SOIL / PAVEMENT BORING 203580.GPJ 20150116 G2 CONSULTING DATA TEMPLATE.GDT 1/5/21

Project Name: Beal City High School

Project Location: 3180 West Beal City Road
Mt. Pleasant, Michigan 48858

G2 Project No. 203580

Latitude: N/A Longitude: N/A

Soil Boring No. B-12

CONSULTING GROUP

SUBSURFACE PROFILE				SOIL SAMPLE DATA					
DEPTH (ft)	PRO-FILE	GROUND SURFACE ELEVATION: N/A	DEPTH (ft)	SAMPLE TYPE-NO.	BLOWS/ 6-INCHES	STD. PEN. RESISTANCE (N)	MOISTURE CONTENT (%)	DRY DENSITY (PCF)	UNCONF. COMP. STR. (PSF)
		Bituminous Concrete (4-1/2 inches) 0.4							
		Aggregate Base: Gray Sandy Gravel with trace silt (6 inches) 0.9							
		Very Stiff to Hard Mottled Brown and Gray Silty Clay with trace sand and gravel		S-1	4 3 3	6	22.5		5500*
5		5.0	5	S-2	3 3 6	9	17.1		9000*
		End of Boring @ 5 ft							
10			10						
15			15						
20			20						
25			25						

Total Depth: 5 ft
Drilling Date: December 11, 2020
Inspector:
Contractor: Pearson Drilling Company
Driller: W.P

Drilling Method:
3-1/4 inch inside diameter hollow stem augers

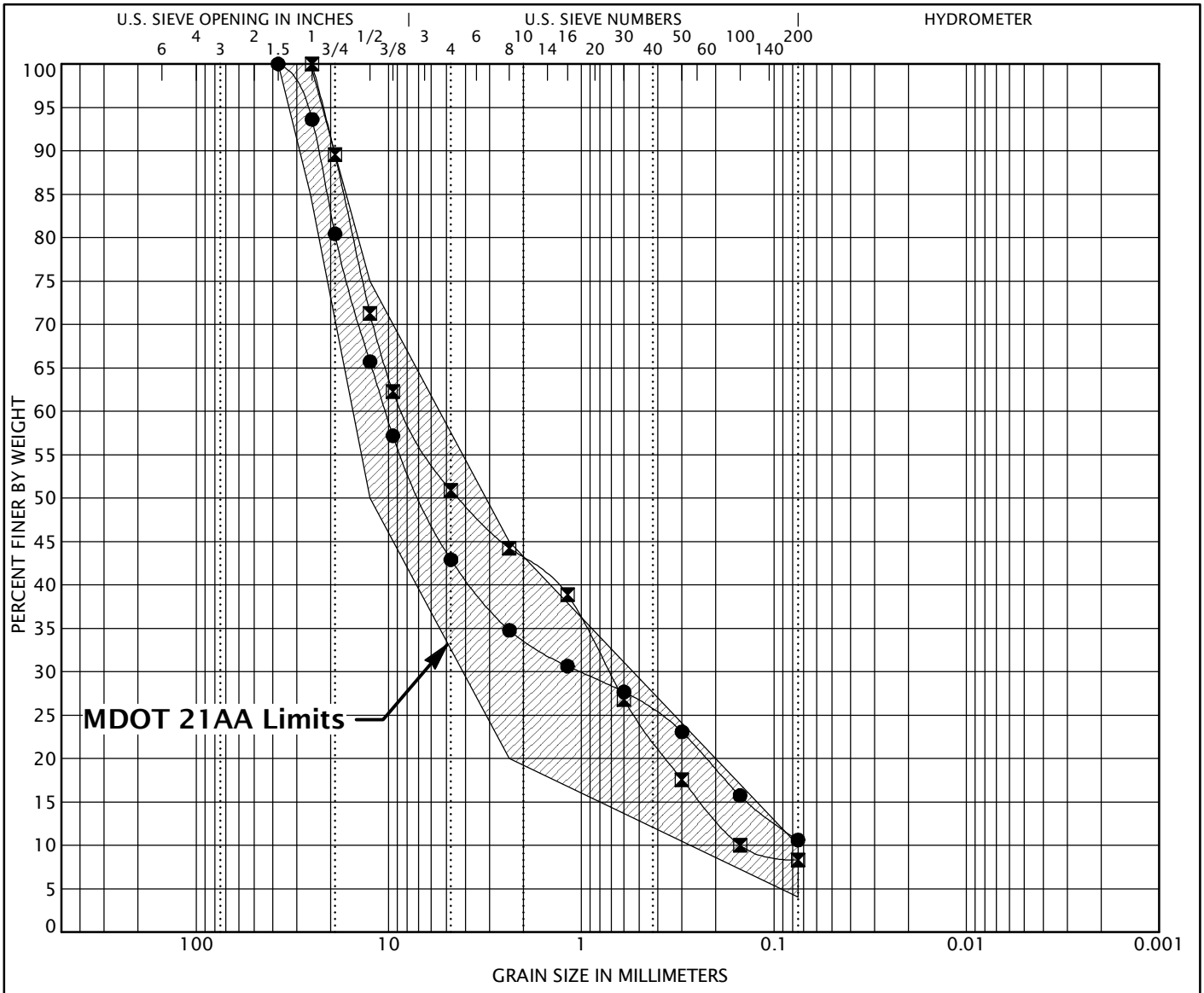
Water Level Observation:
Dry during and upon completion

Notes:
* Calibrated Hand Penetrometer

Excavation Backfilling Procedure:
Auger cuttings and cold patch

Figure No. 12

SOIL / PAVEMENT BORING 203580.GPJ 20150116 G2 CONSULTING DATA TEMPLATE.GDT 1/5/21



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen ID	Description	LL	PL	PI	Cc	Cu
●	B-11	Gray Sandy Gravel with trace silt				1.45	150.49
⊠	B-8	Gray Sand and Gravel with trace silt				0.42	55.17

	Specimen ID	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	B-11	37.5	10.409	1.022		57.1	32.3	10.6	
⊠	B-8	25	8.281	0.719	0.15	49.1	42.6	8.3	

CONSULTING GROUP

GRAIN SIZE DISTRIBUTION

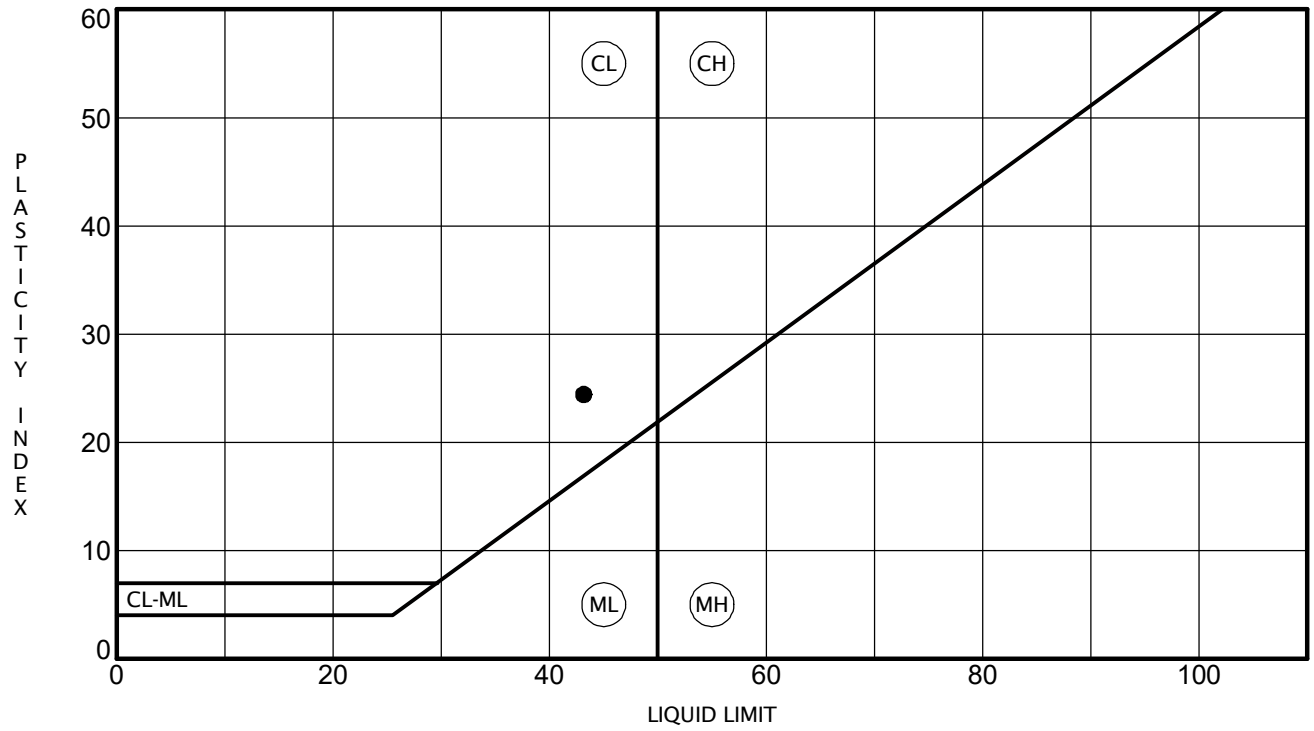
Project Name: Beal City High School

Project Location: 3180 West Beal City Road
Mt. Pleasant, Michigan 48858

G2 Project No.: 203580

Figure No. 13

US_GRAIN_SIZE_MDOT_21AA 203580.GPJ 20140820 G2 CONSULTING DATA TEMPLATE.GDT 1/5/21



	Specimen Identification		LL	PL	PI	Fines	M %	Classification
●	B-12	S-1	43	19	24		23	Mottled Brown and Gray Silty Clay

CONSULTING GROUP

ATTERBERG LIMITS RESULTS

Project Name: Beal City High School

Project Location: 3180 West Beal City Road
Mt. Pleasant, Michigan 48858

G2 Project No.: 203580

Figure No. 14

US_ATTERBERG_LIMITS 203580.GPJ 20140820 G2 CONSULTING DATA TEMPLATE.GDT 1/5/21

GENERAL NOTES TERMINOLOGY

Unless otherwise noted, all terms herein refer to the Standard Definitions presented in ASTM 653.

PARTICLE SIZE

Boulders		- greater than 12 inches
Cobbles		- 3 inches to 12 inches
Gravel	- Coarse	- 3/4 inches to 3 inches
	- Fine	- No. 4 to 3/4 inches
Sand	- Coarse	- No. 10 to No. 4
	- Medium	- No. 40 to No. 10
	- Fine	- No. 200 to No. 40
Silt		- 0.005mm to 0.074mm
Clay		- Less than 0.005mm

CLASSIFICATION

The major soil constituent is the principal noun, i.e. clay, silt, sand, gravel. The second major soil constituent and other minor constituents are reported as follows:

Second Major Constituent (percent by weight)	Minor Constituent (percent by weight)
Trace - 1 to 12%	Trace - 1 to 12%
Adjective - 12 to 35%	Little - 12 to 23%
And - over 35%	Some - 23 to 33%

COHESIVE SOILS

If clay content is sufficient so that clay dominates soil properties, clay becomes the principal noun with the other major soil constituent as modifier, i.e. sandy clay. Other minor soil constituents may be included in accordance with the classification breakdown for cohesionless soils, i.e. silty clay, trace sand, little gravel.

Consistency	Unconfined Compressive Strength (psf)	Approximate Range of (N)
Very Soft	Below 500	0 - 2
Soft	500 - 1,000	3 - 4
Medium	1,000 - 2,000	5 - 8
Stiff	2,000 - 4,000	9 - 15
Very Stiff	4,000 - 8,000	16 - 30
Hard	8,000 - 16,000	31 - 50
Very Hard	Over 16,000	Over 50

Consistency of cohesive soils is based upon an evaluation of the observed resistance to deformation under load and not upon the Standard Penetration Resistance (N).

COHESIONLESS SOILS

Density Classification	Relative Density %	Approximate Range of (N)
Very Loose	0 - 15	0 - 4
Loose	16 - 35	5 - 10
Medium Compact	36 - 65	11 - 30
Compact	66 - 85	31 - 50
Very Compact	86 - 100	Over 50

Relative Density of cohesionless soils is based upon the evaluation of the Standard Penetration Resistance (N), modified as required for depth effects, sampling effects, etc.

SAMPLE DESIGNATIONS

AS - Auger Sample – Cuttings directly from auger flight
BS - Bottle or Bag Samples
S - Split Spoon Sample - ASTM D 1586
LS - Liner Sample with liner insert 3 inches in length
ST - Shelby Tube sample - 3 inch diameter unless otherwise noted
PS - Piston Sample - 3 inch diameter unless otherwise noted
RC - Rock Core - NX core unless otherwise noted

STANDARD PENETRATION TEST (ASTM D 1586) - A 2.0 inch outside-diameter, 1-3/8 inch inside-diameter split barrel sampler is driven into undisturbed soil by means of a 140-pound weight falling freely through a vertical distance of 30 inches. The sampler is normally driven three successive 6-inch increments. The total number of blows required for the final 12 inches of penetration is the Standard Penetration Resistance (N).