Coleman Community Schools

PROJECT MANUAL

Coleman Community Schools

2025 Junior High/High School Renovations

November 11, 2025

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

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

Bidding Requirements, Contract Forms, and Conditions of the Contract

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END OF SECTION 00005

Coleman Community Schools will receive sealed bid proposals for construction trade work from qualified contractors for the **Coleman Community Schools, 2025 Junior High/High School Renovations.** A pre-bid meeting and project walk-through will be conducted by the Construction Manager, Wolgast Corporation, and the Architect, **Integrated Designs, Inc.**, on **Thursday, November 20, 2025,** at **3:00 PM** (local time) at **Coleman High School Cafeteria** located at 4951 North Lewis Road, Coleman, Michigan 48618.

Proposals may be mailed or delivered in person to **Jennifer McCormack, Superintendent**, c/o **Coleman Community Schools, 4823 North Coleman Schools Drive, Coleman, MI 48618** or by **ELECTRONIC SEALED BIDDING via Building Connected.** Proposals must be received prior to **3:00 PM** (local time) on **Friday, December 5, 2025**, at the **Coleman Community Schools Administration Building or via Building Connected** https://app.buildingconnected.com/login?retUrl=%2F). Proposals will be publicly opened and read aloud at **3:05 PM** in the **Coleman High School Cafeteria** located at 4951 North Lewis Road, Coleman, Michigan 48618 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 **December 15, 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: **Coleman Community 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: **Coleman Community Schools, 2025 Junior High/High School Renovations.**

F. Work is any portion of the Project.

G. The Bidding Documents include (as applicable to the Project):

1. The Notice to Bidders.
2. The Instructions to Bidders.
3. Bid Division Descriptions.
4. Proposal Forms.
5. Sample Contract Forms.
6. The Specifications for the Project.
7. The Drawings for the Project.
8. All Addenda issued for the Project.
9. The Preliminary Milestone Schedule.

H. Addenda are written and/or graphic instruments issued by the Architect, which add to, delete from, clarify, or correct the Bidding Documents.

I. Bids are sums stipulated in Proposals for which Bidders propose to perform the Work of Bid Divisions.

J. Base Bids are sums stipulated in Proposals for which Bidders offer to perform the Work of Bid Divisions, and which Alternate Bids may be added to or deleted from.

K. Alternate Bids are sums that may be added to or deleted from Base Bids for the performance of Alternate Work, as delineated in the Bidding Documents.

L. Unit Prices are sums included in 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, at 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. Coleman High School Cafeteria
4951 North Lewis Road
Coleman, Michigan 48618
Thursday, November 20, 2025 at 3:00 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:

Coleman Community Schools, Jennifer McCormack, Superintendent, 4823 North Coleman Schools Drive, Coleman, MI 48618 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 **Friday, December 5, 2025**.

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

C. **Bidders shall bear full responsibility for delivering Proposals to the required location by the time and date established.**

3.03 MODIFICATION OR WITHDRAWAL OF PROPOSALS

A. A Proposal may not be modified, withdrawn, or cancelled by the Bidder within sixty (60) days following the time and date designated for the receipt of Proposals and the Bidder so agrees in submitting their Proposals.

B. Prior to the time and date designated for receipt of Proposals, Proposals may be modified or withdrawn. Modifications and withdrawals shall be in writing or by telegram. If by telegram, written confirmation shall have been mailed and postmarked before the date and time set for receipt of Proposals. Telegraphic communications shall be worded so that the amounts of the original Proposals are not revealed.

C. Withdrawn Proposals may be resubmitted up to the time and date designated for receipt of Proposals.

3.04 BIDDERS' REPRESENTATION AND ACKNOWLEDGEMENTS

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

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

B. In submitting their Proposal each bidder acknowledges:

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

3.05 OTHER INFORMATION

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

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

END OF SECTION 00100

PART 1 – GENERAL

1.01 PROPOSAL FORMS

A. A separate set of Proposal Forms, Bid Division Descriptions, Drawings, Contract Conditions, Specifications, and Preliminary Milestone Schedule(s).

B. Bidders shall use the copies of Proposal Forms included in the separate sets of Bidding Documents. Copies of the Proposal Forms are acceptable.

1.02 BID DIVISION DESCRIPTIONS

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

PART 2 – PROPOSAL FORMAT

2.01 BID PROPOSALS

A. Bidders are required to use the Proposal Forms provided by the Owner.

B. A complete Proposal consists of:

1. **Submit 1 complete copy of your proposal on the Proposal Form – Section 00305.**
2. Alternate Pricing forms (if applicable to this Project).

C. Each Proposal shall have a Bid Security in the amount of five percent (5%) attached to the proposal.

D. All spaces provided on the Proposal Form(s) shall be filled in. If any space provided is not utilized by the Bidder, that space shall be filled in with the notation "N/A" (Not Applicable).

E. The Proposal Form(s) shall be filled in by typewriter or printed manually in ink.

F. Where indicated, all sums shall be expressed in words and figures.
In case of discrepancy, the words shall govern.

G. **Bidders shall not make unsolicited notations or statements on the Proposal Form(s). Alteration of the Proposal Form(s) is not permitted.**

H. All changes to and erasures of the Bidder's entries shall be initialed by the signer of the Proposal.

I. Each Proposal shall include the legal name of the Bidder and a statement regarding whether the Bidder is a sole proprietor, a partnership, a corporation, or other type of legal entity. Proposals submitted by corporations shall have the state of incorporation noted, and shall have corporate seals affixed. Any Bid submitted by an agent shall have a current Power of Attorney attached, certifying the agent's power to bind the Bidder.

2.02 ALTERNATES

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

PROPOSAL FOR MULTIPLE BID DIVISIONS

A. Each Bidder shall submit only one (1) Proposal for each Bid Division the Contractor is bidding. There is no limit to the number of Bid Divisions a Bidder may bid.

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: **Coleman Community Schools**
Attn: Jennifer McCormack
4823 North Coleman Schools Drive
Coleman, MI 48618

SEALED BID FOR:

Coleman Community Schools
2025 Junior High/High School Renovations

Bid Division No:_____

END OF SECTION 00300

Project: **Coleman Community Schools**
2025 Junior High/High School Renovations

Submitted By: _____
(Bidder's Company Name)

Address: _____

City / State / Zip: _____

Phone: _____

Contact Name: _____

Email: _____

Bid Proposal Deadline: **Prior to Friday, December 5, 2025 at 3:00 PM (local time) to:**

Coleman Community Schools
Jennifer McCormack, Superintendent
4823 North Coleman Schools Drive
Coleman, MI 48618

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 Coleman Community Schools – 2025 Junior High/High School Renovations (not including Labor Bond, Material Bond, and/or Performance Bond Costs):

_____ Dollars and 00/100ths

$ _____

BOND COST for Coleman Community Schools – 2025 Junior High/High School Renovations (Cost to provide Labor Bond, Material Bond, and/or Performance Bonds on Base Bid):

_____ Dollars and 00/100ths

$ _____

COMBINED BID DEDUCT

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

Bid Divisions Combined	Deduct from each Bid Division:
_____	_____
_____	_____
_____	_____
_____	_____

ALTERNATES

Alternate No. 1: New main corridor acoustical ceiling.

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

Bond: □ Add □ Deduct $ _____

Alternate No. 1 Total $ _____

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 **September 4, 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: 024200 – Selective Demolition

Bid to Include: Mandatory to have (2) shifts: Work hours 7 am – 11 pm Monday thru Friday, weekends as needed

Total Responsibility for Specification Sections:

Section 024119 – Selective Demolition

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

Proper removal, cleanup, shoring and protection of Coleman Middle/High School.

General Inclusions:

1. There is no general contractor associated with this project; any and all reference to a "general contractor" related to the work of this bid division shall be understood to mean the contractor of this bid division.
2. The contractor for this bid division work is required to include but is not limited to all items, services, tasks, materials, personnel, equipment, etc. identified in this bid division description regardless of the presence of language in other bid division descriptions that is the same or is similar to that found in this contractor's bid division description.
3. Coordination of the work of this bid division with any and all work of other bid division contractors for the scheduling and integration of the work of this contractor.
4. All contractors are responsible for the entire set of plans and specifications, including tables, schedules, and notes.
5. Provide continuous housekeeping and clean-up, and proper legal off-site disposal of any debris generated by this Bid Division's work.
6. The contractor is responsible for own dumpster(s) and all removal and disposal charges thereof. (Use of the Owner's dumpsters is strictly prohibited.)
7. All Contractors are required to inspect the existing project components and are to include all work necessary to complete the work to deliver a fully operational system in compliance with all governing codes.
8. This Contractor shall be responsible for performing all work in full compliance with all health and safety standards including Asbestos Awareness and Notification, Lead Paint Abatement, and all MIOSHA Standards. This Contractor shall also be responsible for satisfying all safety violations and/or fines resulting from the actions or lack of action by this Contractor at the sole expense of this Contractor.
9. Any contractor who makes a mistake by installing their product on another Contractor's obvious faulty work will assume responsibility for repair of said work.
10. This contractor shall repair and restores 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, performance labor and material bonds as required, and schedule of values, within (2) two weeks of contract award.
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 the Construction Manager (48 hours) in advance of the delivery and provide proper personnel and equipment to perform the unloading.
16. Contractor shall submit to the field construction manager a complete written daily field report stating the work being done on site and the number of employees performing the work for each day the Contractor has representatives on site.
17. Contractors shall have a supervisor on site at all times when a crew is present on the job.

Bid Division: 024200 – Selective Demolition

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. Provide all required permits.
3. Notify and correspond with Miss Dig before work commences and throughout the project.
4. All temporary shoring.
5. All temporary bracing and shoring required to support roof.
6. Responsible for all building demolition. (Please review all Bid Divisions so as not to overlap work).
7. All demolition of building structure and within the building structure & footings outside within 5 feet of the structure is to be by Selective Demolition Contractor. All the demolition of slabs, etc, outside of the existing building line to be done by Sitework Contractor.
8. Demolition package includes but is not limited to the following:
    a. All selective building demolition
    b. All drywall, masonry or other walls
    c. Ceilings
    d. Flooring (excluding asbestos)
    e. Exterior window wall framing, aluminum doors and frames.
    f. Casework and lockers, including locker bases.
    g. Masonry door, window, or passage openings. (Coordinate toothing of masonry with Bid Division 040000)
    h. Framed partition walls, door, or passage openings in framed partition walls and footings.
    i. Doors, frames, tack, chalk and marker boards.
    j. Saw cut floor and remove concrete – as indicated on drawings.
    k. Toilet partitions.
    l. Demo contractor is responsible to salvage brick for re-use; the brick must be stacked and ready for use by bid division 040000, if required.
9. Provide all legal off-site disposal of all construction debris generated by the described work.
10. All demolition work required is not necessarily limited to what is shown on the demolition plans. The intent is to remove all mechanical, electrical, and architectural items as required to facilitate new construction.
11. This Contractor shall protect all existing surfaces in rooms, walls, floors, windows, etc. to prevent damage during the execution of work required.
12. This Contractor shall continuously maintain all means of egress and all fire protection features for portions of the building that remain occupied during construction.
13. Provide complete dust & flying debris control plan to Construction Manager prior to start of Demolition.
14. Remove masonry block walls to one row of block below the existing floor.
15. Protect any flooring during demolition that will remain.

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.

Bid Division: 024200 – Selective Demolition

2. Coordinate demolition with abatement contractor. Simultaneous demolition to take place.
3. This bid division responsible for temp protection of the entrance terrazzo- include layer of Ram Board and ½" plywood. This protection to be put down prior to start of project.
4. Demolition to include lockers and locker bases.
5. Contractor responsible for (2) shifts of work: Work hours 7 am – 11 pm, Monday-Friday.
6. This contractor expected to have daily shift supervisors meeting at shift change for continuity of work.
7. Mandatory attendance at weekly superintendent's meetings, as it relates to scope of work and schedule.
8. This contractor responsible for grinding of ALL floors to an acceptable level for flooring to be installed.
9. Mandatory attendance at pre-construction meeting.
10. Must provide submittals within 15 working days of contract award, to include a detailed plan of demolition.
11. This contractor responsible to have job site clean upon completion of demolition, to allow for a smooth transition into renovations.
12. Project Inclusions are provided as assistance for contractors that are bidding and are not an all-inclusive scope of work. It is every contractor's responsibility to review all the construction documents and prepare their bid accordingly.
13. **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**

Excludes:

1. All demolition of conduits, ducts, pipes, fixtures, etc. (demolition required for all mechanical, plumbing, and electrical work) is to be performed by specific mechanical, plumbing and electrical contractors.
2. All demolition of slabs, etc., outside of the existing building line to be done by Sitework Contractor.

ALTERNATE #1 INCLUDE on BID FORM

Consideration for award:

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

END OF BID DIVISION 024200

BID DIVISION 024200 - SELECTIVE DEMOLITION

Package #	Package	Number	Spec #	Spec	Title
024200 PA-001	Selective Demolition - Start Ups	024200-01			Signed Post Bid Interview Form
024200 PA-001	Selective Demolition - Start Ups	024200-02			Schedule of Values
024200 PA-001	Selective Demolition - Start Ups	024200-03			Signed Contracts Returned
024200 PA-001	Selective Demolition - Start Ups	024200-04			Payment/Performance Bonds
024200 PA-001	Selective Demolition - Start Ups	024200-05			Certificate of Insurance
024200 PA-001	Selective Demolition - Start Ups	024200-06			Employee List
024200 PA-001	Selective Demolition - Start Ups	024200-07			Safety Policy
024200 PA-001	Selective Demolition - Start Ups	024200-08			SDS Sheets
024200 PA-001	Selective Demolition - Start Ups	024200-09			Certificate of Subcontractor & Supplier
024200 PA-001	Selective Demolition - Start Ups	024200-10			AHERA Notification and Contractor Compliance Affidavit
024200 PACO-001	Selective Demolition - Close Outs	024200-11			Contractor (2) Year Guarantee
024200 PACO-001	Selective Demolition - Close Outs	024200-12			Consent of Surety
024200 PACO-001	Selective Demolition - Close Outs	024200-13			Certificate of Substantial Completion
024200 PACO-001	Selective Demolition - Close Outs	024200-14			Completed Punch List
024200 PACO-001	Selective Demolition - Close Outs	024200-15			As Built Drawings
024200 PACO-001	Selective Demolition - Close Outs	024200-16			All Processed Change Orders Returned
024200 PACO-001	Selective Demolition - Close Outs	024200-17			Current Certificate of Insurance
024200 PACO-001	Selective Demolition - Close Outs	024200-18			Signed Hazardous Materials Compliance Affidavit
024200 PACO-001	Selective Demolition - Close Outs	024200-19			Signed Asbestos Free Affidavit
024200 PACO-001	Selective Demolition - Close Outs	024200-20			All Other Warranties Required
024200 PACO-001	Selective Demolition - Close Outs	024200-21			Operations & Maintenance Manuals
024200 PACO-001	Selective Demolition - Close Outs	024200-22			Replacement Parts turned over to Owner
024200 PACO-001	Selective Demolition - Close Outs	024200-23			Inspections & Certificates

Bid Division: 030100 – Concrete

Bid to Include:

Total Responsibility for Specification Sections:

Section 033000 – Cast In Place Concrete
Section 072100 – Thermal Insulation

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

Section 311000 – Earth Moving (As it relates to fine grading, final compaction & footing excavation and backfill)
Section 315000 – Excavation Support and Protection (As it relates to excavation for footings/foundations)

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.

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.

Bid Division: 030100 – Concrete

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 SHEETS 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, as necessary.
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. Excavate and backfill all interior footings.
17. 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.
18. 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.
19. 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 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.

Bid Division: 030100 – Concrete

2. 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. Infills to be within ½" below existing concrete slabs.
3. Furnish and install all required re-steel/rebar as it relates to concrete slab construction.
4. Furnish and install all required exterior and interior concrete work.
5. Provide all concrete footings and foundation walls.
6. Perform all excavating, backfill, and compaction required for footings and foundations.
7. Furnish and install all horizontal and vertical rigid insulation below slabs.
8. Provide reinforcing steel shop drawings and mix designs with the first submittals.
9. Furnish and install all concrete at supported slabs, including installation of metal deck furnished by others where noted.
10. Provide all interior and exterior housekeeping pads for mechanical and electrical work.
11. Provide all required sand fill and required compaction at interior depressed slab areas.
12. Provide all step footings as required.
13. Furnish and install all required vapor barriers, expansion joint materials and all interior and exterior joint sealants.
14. Furnish and install all required dowels at new to existing concrete slabs, sidewalks, curbs, footings, foundations, etc.
15. This bid division responsible for locker bases, per drawings.
16. Daily clean-up as required for this bid division.
17. Mandatory response to ALL Bulletins issued within time frame given, to include "no cost change".
18. Must provide all submittals within 15 working days of contract award or sooner, unless specifically clarified with the construction manager prior to contract award.
19. Work hours for this project will be from 7 am – 11 pm. Coordinate work accordingly.
20. This contractor expected to have daily shift supervisors meeting at shift change for continuity of work, if applicable.
21. Mandatory attendance at weekly superintendent's meetings, as it relates to scope of work and schedule.
22. Mandatory attendance at pre-construction meeting.
23. 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.
24. Project Inclusions are provided as assistance for contractors that are bidding and are not an all-inclusive scope of work. It is every contractor's responsibility to review all the construction documents and prepare their bid accordingly.
25. **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.**

Excludes:

1. Concrete Testing
2. Floor patching for mechanical and electrical trades, beyond what is required on the demolition drawings.

Consideration for award:

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

END OF BID DIVISION 030100

BID DIVISION 030100 - CONCRETE

Package #	Package	Number	Spec #	Spec	Title
030100 PA-001	Concrete - Start Ups	030100-01			Signed Post Bid Interview Form
030100 PA-001	Concrete - Start Ups	030100-02			Schedule of Values
030100 PA-001	Concrete - Start Ups	030100-03			Signed Contracts Returned
030100 PA-001	Concrete - Start Ups	030100-04			Payment/Performance Bonds
030100 PA-001	Concrete - Start Ups	030100-05			Certificate of Insurance
030100 PA-001	Concrete - Start Ups	030100-06			Employee List
030100 PA-001	Concrete - Start Ups	030100-07			Safety Policy
030100 PA-001	Concrete - Start Ups	030100-08			SDS Sheets
030100 PA-001	Concrete - Start Ups	030100-09			Certificate of Subcontractor & Supplier
030100 PA-001	Concrete - Start Ups	030100-10			AHERA Notification and Contractor Compliance Affidavit
030100 PACO-001	Concrete - Close Outs	030100-11			Contractor (2) Year Guarantee
030100 PACO-001	Concrete - Close Outs	030100-12			Consent of Surety
030100 PACO-001	Concrete - Close Outs	030100-13			Certificate of Substantial Completion
030100 PACO-001	Concrete - Close Outs	030100-14			Completed Punch List
030100 PACO-001	Concrete - Close Outs	030100-15			As Built Drawings
030100 PACO-001	Concrete - Close Outs	030100-16			All Processed Change Orders Returned
030100 PACO-001	Concrete - Close Outs	030100-17			Current Certificate of Insurance
030100 PACO-001	Concrete - Close Outs	030100-18			Signed Hazardous Materials Compliance Affidavit
030100 PACO-001	Concrete - Close Outs	030100-19			Signed Asbestos Free Affidavit
030100 PACO-001	Concrete - Close Outs	030100-20			All Other Warranties Required
030100 PACO-001	Concrete - Close Outs	030100-21			Operations & Maintenance Manuals
030100 PACO-001	Concrete - Close Outs	030100-22			Replacement Parts turned over to Owner
030100 PACO-001	Concrete - Close Outs	030100-23			Inspections & Certificates
030100-001	Concrete - Submittals	030100-24	033000	Cast-In-Place Concrete	Shop drawings on cast-in-place concrete (reinforcing steel).
030100-001	Concrete - Submittals	030100-25	033000	Cast-In-Place Concrete	Mix designs on concrete.
030100-001	Concrete - Submittals	030100-26	072100	Thermal Insulation	Product data on thermal insulation.

Bid Division: 040000 – Masonry

Bid to Include: Mandatory to have (2) shifts: Work hours 7 am – 11 pm Monday thru Friday, weekends as needed

Total Responsibility for Specification Sections:

Section 042200 – Concrete Unit Masonry
Section 072119 – Foamed-in-Place Insulation

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

Section 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:

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

General Inclusions:

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

Bid Division: 040000 – Masonry

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. All Contractors shall have a company supervisor on site at all times when a crew is present on the job. Sub-contractors are to be supervised by the contractor company that holds the contract while on site at all times.
18. On Friday, or the last workday of each week, the Contractor must update the Master Copy of As-Builts, as it applies to the work of their Bid Division.
19. **Wolgast uses Web based construction software. Please note: We will upload all drawings, and drawing revisions as they are approved, to the SHEETS 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/interior 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 per manufacturer's recommendation.
13. The brick and block is the responsibility of the masonry contractor, to purchase and install.
14. The mason contractor is responsible for removing all excess mortar from salvaged brick if required 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 must 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.

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 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. Furnish and install all required masonry materials.
3. Furnish and install any and all CMU as required.
4. Furnish and install cap if required.
5. Install all steel bearing plates on new and existing masonry as documented.
6. Install all lintels, provided by Bid Division 050000, as documented.
7. Furnish and install all required anchors for new masonry to existing materials.
8. Provide complete cavity wall drainage system with all required weeps, grout, vents, drainage material, etc.
9. Provide all required masonry patching and toothing to existing at finished locations if any. 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. Any and all toothing and new work is by the masonry contractor.
10. Furnish and install all required cavity wall insulation and rigid insulation against masonry construction, as documented.
11. Install all hollow metal frames, provide all required grouting of all hollow metal frames in masonry work. Any additional cost incurred by another bid division contractor required to correct a frame that is not plumb due to lack of proper installation, will be the responsibility of this contractor.
12. Provide all caulking of all exterior control joints. The first caulk joint 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.
13. Furnish and install all required masonry for interior and exterior columns.
14. Provide weekly update of as-built information on the Construction Manager's record set of drawings when working on site.
15. Daily clean-up is required by this bid division.
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. Contractor responsible for (2) shifts of work: Work hours 7 am – 11 pm, Monday-Friday.
18. This contractor expected to have daily shift supervisors meeting at shift change for continuity of work.
19. Mandatory attendance at weekly superintendent's meetings, as it relates to scope of work and schedule.
20. Mandatory attendance at pre-construction meeting.
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.
22. Project Inclusions are provided as assistance for contractors that are bidding and are not an all-inclusive scope of work. It is every contractor's responsibility to review all the construction documents and prepare their bid accordingly.
23. **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: 040000 – Masonry

Excludes:

1. Foundation perimeter slab insulation.
2. Steel door frames provided 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

BID DIVISION 040000 - MASONRY

Package #	Package	Number	Spec #	Spec	Title
040000 PA-001	Masonry - Start Ups	040000-01			Signed Post Bid Interview Form
040000 PA-001	Masonry - Start Ups	040000-02			Schedule of Values
040000 PA-001	Masonry - Start Ups	040000-03			Signed Contracts Returned
040000 PA-001	Masonry - Start Ups	040000-04			Payment/Performance Bonds
040000 PA-001	Masonry - Start Ups	040000-05			Certificate of Insurance
040000 PA-001	Masonry - Start Ups	040000-06			Employee List
040000 PA-001	Masonry - Start Ups	040000-07			Safety Policy
040000 PA-001	Masonry - Start Ups	040000-08			SDS Sheets
040000 PA-001	Masonry - Start Ups	040000-09			Certificate of Subcontractor & Supplier
040000 PA-001	Masonry - Start Ups	040000-10			AHERA Notification and Contractor Compliance Affidavit
040000 PACO-001	Masonry - Close Outs	040000-11			Contractor (2) Year Guarantee
040000 PACO-001	Masonry - Close Outs	040000-12			Consent of Surety
040000 PACO-001	Masonry - Close Outs	040000-13			Certificate of Substantial Completion
040000 PACO-001	Masonry - Close Outs	040000-14			Completed Punch List
040000 PACO-001	Masonry - Close Outs	040000-15			As Built Drawings
040000 PACO-001	Masonry - Close Outs	040000-16			All Processed Change Orders Returned
040000 PACO-001	Masonry - Close Outs	040000-17			Current Certificate of Insurance
040000 PACO-001	Masonry - Close Outs	040000-18			Signed Hazardous Materials Compliance Affidavit
040000 PACO-001	Masonry - Close Outs	040000-19			Signed Asbestos Free Affidavit
040000 PACO-001	Masonry - Close Outs	040000-20			All Other Warranties Required
040000 PACO-001	Masonry - Close Outs	040000-21			Operations & Maintenance Manuals
040000 PACO-001	Masonry - Close Outs	040000-22			Replacement Parts turned over to Owner
040000 PACO-001	Masonry - Close Outs	040000-23			Inspections & Certificates
040000-001	Masonry - Submittals	040000-24	042200	Concrete Unit Masonry	Shop drawings on concrete unit masonry.
040000-001	Masonry - Submittals	040000-25	042200	Concrete Unit Masonry	Samples on each type of mortar and grout.
040000-001	Masonry - Submittals	040000-26	072119	Foamed-In-Place Insulation	Product data and certificates on foamed-in-place insulatoin.
040000-001	Masonry - Submittals	040000-27	079200	Joint Sealants	Product data on joint sealants.

Bid Division: 050000 – Metals

Bid to Include: Mandatory to have (2) shifts: Work hours 7 am – 11 pm Monday thru Friday, weekends as needed

Total Responsibility for Specification Sections:

Section 051200 – Structural Steel Framing
Section 055000 – Metal Fabrications

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

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

Bid Division: 050000 – Metals

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. All Contractors shall have a company supervisor on site at all times when a crew is present on the job. Sub-contractors are to be supervised by the contractor company that holds the contract while on site at all times.
18. On Friday, or the last workday of each week, the Contractor must update the Master Copy of As-Builts, as it applies to the work of their Bid Division.
19. **Wolgast uses web-based construction software. Please note: We will upload all drawings, and drawing revisions as they are approved, to the SHEETS 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 welding with primer.
13. Furnish & Install bridging, fasteners, and 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 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. Provide all required temporary shoring of any new steel structural framing.
3. Furnish and install all required structural and miscellaneous steel.
4. Furnish and install all required roof opening frames.
5. Coordinate opening locations with Bid Division 230000.
6. Furnish and install all steel angles for supporting metal decking.
7. Furnish and install all steel angles for concrete pour stops.
8. Furnish all steel lintels. Installation by bid division 040000.
9. Furnish and install all required steel reinforcements for operable partitions.
10. Furnish and install angles for fire-rated walls as documented.
11. Furnish and install any roof screen system as specified within the construction documents. Coordinate with roofing contractor as required.

BID DIVISION 050000 - METALS

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

Bid Division: 050000 – Metals

12. Daily clean-up required by this bid division.
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. Mandatory attendance at all required pre-installation meetings.
15. Contractor responsible for (2) shifts of work: Work hours 7 am – 11 pm, Monday-Friday.
16. This contractor expected to have daily shift supervisors meeting at shift change for continuity of work.
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.
18. Project Inclusions are provided as assistance for contractors that are bidding and are not an all-inclusive scope of work. It is every contractor's responsibility to review all the construction documents and prepare their bid accordingly.
19. **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.**

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

Bid Division: 060000 – General Trades

Bid to Include: Mandatory to have (2) shifts: Work hours 7 am – 11 pm Monday thru Friday, weekends as needed

Total Responsibility for Specification Sections:

Section 061000 – Rough Carpentry
Section 061600 – Sheathing
Section 062023 – Interior Finish Carpentry
Section 079200 – Joint Sealants
Section 081113 – Hollow Metal Frames
Section 081416 – Flush Wood Doors
Section 083113 – Access Doors and Frames
Section 083310 – Rolling Fire Doors
Section 087100 – Door Hardware (as it relates to HM Frames/Wood Doors)
Section 101100 – Visual Display Units
Section 101400 – Signage
Section 102113.19 – Plastic Toilet Compartments
Section 102800 – Toilet Accessories
Section 104416 – Fire Extinguishers
Section 111320 – Projection Screens
Section 122413 – Roller Window Shades

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

Section 078413 – Penetration Firestopping (As it relates to work in this bid division)
Section 078416 – Through Penetration Firestopping (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 20 working days of contract award or sooner, unless specifically clarified with the construction manager prior to contract award.
13. Provide all layout and measurements required to perform the work of this Bid Division.
14. The Owner reserves the right to salvage any materials removed from the site during the duration of the project.
15. Coordinate delivery of materials with Construction Manager (48 hours) in advance of the delivery, and provide proper personnel and equipment to perform the unloading.
16. Contractor shall submit to the field construction manager a complete written daily field report stating the work being done on site and the number of employees performing the work for each day the Contractor has representatives on site.
17. Contractor shall have a supervisor on site at all times when a crew is present on the job.
18. On Friday, or last workday of each week, the Contractor must update the Master Copy of As-Builts, as it applies to the work of their Bid Division.
19. **Wolgast uses 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 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. Furnish and install all hollow metal frames, doors, and finish hardware for these doors. Provide hollow metal frames to bid division 040000 to be installed in CMU. This contractor to ensure frames are set plumb and square.
3. Furnish and install Fire Protection Cabinets, coordinate location with Bid Division 040000.
4. Furnish and install all caulking and sealants associated with the work of this Bid Division after adjacent finish materials have been installed and approved. All unsatisfactory caulking will be required to be removed and reinstalled.
5. Furnish and install all solid surface windowsills.
6. Furnish and install all specified materials per drawings.
7. **Include in bid proposal additional 80-man hours of general clean-up, at the direction of the CMs Field Manager.**
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. Contractor responsible for (2) shifts of work: Work hours 7 am – 11 pm, Monday-Friday.
10. This contractor expected to have daily shift supervisors meeting at shift change for continuity of work.
11. Mandatory attendance at weekly superintendent's meetings, as it relates to scope of work and schedule.
12. Mandatory attendance at pre-construction meeting.
13. 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.
14. Project Inclusions are provided as assistance for contractors that are bidding and are not an all-inclusive scope of work. It is every contractor's responsibility to review all the construction documents and prepare their bid accordingly.

Bid Division: 060000 – General Trades

15. **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.**

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.

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

BID DIVISION 060000 - GENERAL TRADES

Package #	Package	Number	Spec #	Spec	Title
060000 PA-001	General Trades - Start Ups	060000-01			Signed Post Bid Interview Form
060000 PA-001	General Trades - Start Ups	060000-02			Schedule of Values
060000 PA-001	General Trades - Start Ups	060000-03			Signed Contracts Returned
060000 PA-001	General Trades - Start Ups	060000-04			Payment/Performance Bonds
060000 PA-001	General Trades - Start Ups	060000-05			Certificate of Insurance
060000 PA-001	General Trades - Start Ups	060000-06			Employee List
060000 PA-001	General Trades - Start Ups	060000-07			Safety Policy
060000 PA-001	General Trades - Start Ups	060000-08			SDS Sheets
060000 PA-001	General Trades - Start Ups	060000-09			Certificate of Subcontractor & Supplier
060000 PA-001	General Trades - Start Ups	060000-10			AHERA Notification and Contractor Compliance Affidavit
060000 PACO-001	General Trades - Close Outs	060000-11			Contractor (2) Year Guarantee
060000 PACO-001	General Trades - Close Outs	060000-12			Consent of Surety
060000 PACO-001	General Trades - Close Outs	060000-13			Certificate of Substantial Completion
060000 PACO-001	General Trades - Close Outs	060000-14			Completed Punch List
060000 PACO-001	General Trades - Close Outs	060000-15			As Built Drawings
060000 PACO-001	General Trades - Close Outs	060000-16			All Processed Change Orders Returned
060000 PACO-001	General Trades - Close Outs	060000-17			Current Certificate of Insurance
060000 PACO-001	General Trades - Close Outs	060000-18			Signed Hazardous Materials Compliance Affidavit
060000 PACO-001	General Trades - Close Outs	060000-19			Signed Asbestos Free Affidavit
060000 PACO-001	General Trades - Close Outs	060000-20			All Other Warranties Required
060000 PACO-001	General Trades - Close Outs	060000-21			Operations & Maintenance Manuals
060000 PACO-001	General Trades - Close Outs	060000-22			Replacement Parts turned over to Owner
060000 PACO-001	General Trades - Close Outs	060000-23			Inspections & Certificates
060000 PACO-001	General Trades - Close Outs	060000-24	081113	Hollow Metal Doors and Frames	Record Documents for fire-rated door and frames regarding flush wood doors. List of door numbers and room name.
060000 PACO-001	General Trades - Close Outs	060000-25	081416	Flush Wood Doors	Record Documents for fire-rated door and frames regarding hollow metal doors and frames. List of door numbers and room name.
060000 PACO-001	General Trades - Close Outs	060000-26	081416	Flush Wood Doors	Lifetime warranty on flush wood doors.
060000 PACO-001	General Trades - Close Outs	060000-27	083113	Access Doors and Frames	Record Documents for fire-rated door and frames regarding access doors and frames. List of door numbers and room name.
060000 PACO-001	General Trades - Close Outs	060000-28	083310	Rolling Fire Doors	Operation and maintenance data on rolling fire doors.
060000 PACO-001	General Trades - Close Outs	060000-29	083310	Rolling Fire Doors	Manufacturer's 2 year warranty on rolling fire doors.
060000 PACO-001	General Trades - Close Outs	060000-30	083310	Rolling Fire Doors	3 year warranty on doors and operators system of all parts and components.
060000 PACO-001	General Trades - Close Outs	060000-31	083310	Rolling Fire Doors	PowerGuard Finish Warranties. Please see technical specifications for more details.
060000 PACO-001	General Trades - Close Outs	060000-32	087100	Door Hardware	Operating and maintenance manuals on door hardware.
060000 PACO-001	General Trades - Close Outs	060000-33	087100	Door Hardware	Warranties on door hardware.
060000 PACO-001	General Trades - Close Outs	060000-34	087100	Door Hardware	Extra Materials: Special Tools for adjustment of hardware and changing of cylinders.
060000 PACO-001	General Trades - Close Outs	060000-35	101100	Visual Display Units	Operation and maintenance data on visual display units.
060000 PACO-001	General Trades - Close Outs	060000-36	101100	Visual Display Units	Life of the Building Warranty on Markerboards.
060000 PACO-001	General Trades - Close Outs	060000-37	101100	Visual Display Units	10 year warranty on writing surfaces.
060000 PACO-001	General Trades - Close Outs	060000-38	102113.19	Plastic Toilet Compartments	Maintenance data on plastic toilet compartments.
060000 PACO-001	General Trades - Close Outs	060000-39	102113.19	Plastic Toilet Compartments	Extra Materials: Door Hinges. Two hinge(s) with associated fasteners.
060000 PACO-001	General Trades - Close Outs	060000-40	102113.19	Plastic Toilet Compartments	Extra Materials: Latch and Keeper. Twp latch(es) and keeper(s) with associated fasteners.
060000 PACO-001	General Trades - Close Outs	060000-41	102113.19	Plastic Toilet Compartments	Extra Materials: Door Bumper. Twp bumper(s) with associated fasteners
060000 PACO-001	General Trades - Close Outs	060000-42	102113.19	Plastic Toilet Compartments	Extra Materials: Door Pull. Twp door pull(s) with associated fasteners.
060000 PACO-001	General Trades - Close Outs	060000-43	102113.19	Plastic Toilet Compartments	Extra Materials: Fasteners. Ten fasteners of ecah size and type.
060000 PACO-001	General Trades - Close Outs	060000-44	104416	Fire Extinguishers	Operation and maintenance data on fire extinguishers.
060000 PACO-001	General Trades - Close Outs	060000-45	104416	Fire Extinguishers	Six year warranty on fire extinguishers.
060000 PACO-001	General Trades - Close Outs	060000-46	111320	Projection Screens	Operation and maintenance data on projection screens.
060000 PACO-001	General Trades - Close Outs	060000-47	111320	Projection Screens	Warranty on projection screens.
060000 PACO-001	General Trades - Close Outs	060000-48	111320	Projection Screens	Owner's Training on Projection Screens.
060000 PACO-001	General Trades - Close Outs	060000-49	122413	Roller Window Shades	Operation and maintenance manuals on roller window shades.
060000 PACO-001	General Trades - Close Outs	060000-50	122413	Roller Window Shades	Warranty on roller window shades.

BID DIVISION 060000 - GENERAL TRADES

060000-001	General Trades - Submittals	060000-51	061000	Rough Carpentry	Product data and material certificates on rough carpentry.
060000-001	General Trades - Submittals	060000-52	061600	Sheathing	Product data on sheathing.
060000-001	General Trades - Submittals	060000-53	062023	Interior Finish Carpentry	Shop drawings on interior finish carpentry.
060000-001	General Trades - Submittals	060000-54	062023	Interior Finish Carpentry	Samples on interior finish carpentry.
060000-001	General Trades - Submittals	060000-55	079200	Joint Sealants	Product data on joint sealants.
060000-001	General Trades - Submittals	060000-56	081113	Hollow Metal Doors and Frames	Product data and door schedule on hollow metal doors and frames.
060000-001	General Trades - Submittals	060000-57	081113	Hollow Metal Doors and Frames	Shop drawings on hollow metal doors and frames.
060000-001	General Trades - Submittals	060000-58	081416	Flush Wood Doors	Product data on flush wood doors.
060000-001	General Trades - Submittals	060000-59	081416	Flush Wood Doors	Shop drawings on flush wood doors.
060000-001	General Trades - Submittals	060000-60	081416	Flush Wood Doors	Samples on flush wood doors.
060000-001	General Trades - Submittals	060000-61	083113	Access Doors and Frames	Product data and product schedule on access doors and frames.
060000-001	General Trades - Submittals	060000-62	083310	Rolling Fire Doors	Product data on rolling fire doors.
060000-001	General Trades - Submittals	060000-63	083310	Rolling Fire Doors	Shop drawings on rolling fire doors.
060000-001	General Trades - Submittals	060000-64	083310	Rolling Fire Doors	Samples on rolling fire doors.
060000-001	General Trades - Submittals	060000-65	087100	Door Hardware	Product data and riser and wiring diagrams on door hardware.
060000-001	General Trades - Submittals	060000-66	087100	Door Hardware	Samples on door hardware.
060000-001	General Trades - Submittals	060000-67	087100	Door Hardware	Door hardware schedule regarding door hardware.
060000-001	General Trades - Submittals	060000-68	087100	Door Hardware	Keying schedule regarding door hardware.
060000-001	General Trades - Submittals	060000-69	101100	Visual Display Units	Product data on visual display units.
060000-001	General Trades - Submittals	060000-70	101100	Visual Display Units	Shop drawings on visual display units.
060000-001	General Trades - Submittals	060000-71	101100	Visual Display Units	Samples on visual display units.
060000-001	General Trades - Submittals	060000-72	101400	Signage	Product data and shop drawings on signage.
060000-001	General Trades - Submittals	060000-73	101400	Signage	Samples on signage.
060000-001	General Trades - Submittals	060000-74	102113.19	Plastic Toilet Compartments	Product data and product schedule on solid plastic toilet compartments
060000-001	General Trades - Submittals	060000-75	102113.19	Plastic Toilet Compartments	Shop drawings on solid plastic toilet compartments.
060000-001	General Trades - Submittals	060000-76	102113.19	Plastic Toilet Compartments	Samples on solid plastic toilet compartments.
060000-001	General Trades - Submittals	060000-77	102800	Toilet Accessories	Product data on toilet accessories.
060000-001	General Trades - Submittals	060000-78	102800	Toilet Accessories	Samples on toilet accessories.
060000-001	General Trades - Submittals	060000-79	104416	Fire Extinguishers	Product data on fire extinguishers.
060000-001	General Trades - Submittals	060000-80	111320	Projection Screens	Product data on projection screens.
060000-001	General Trades - Submittals	060000-81	111320	Projection Screens	Samples of projection screens.
060000-001	General Trades - Submittals	060000-82	122413	Roller Window Shades	Product data on roller window shades.
060000-001	General Trades - Submittals	060000-83	122413	Roller Window Shades	Shop drawings on roller window shades.
060000-001	General Trades - Submittals	060000-84	122413	Roller Window Shades	Samples on roller window shades.

Bid Division: 075000 – Roofing

Bid to Include:

Total Responsibility for Specification Sections:

Section 072100 – Thermal Insulation
Section 075419 – Polyvinyl-Chloride (PVC) Roofing - New Roof
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 this bid division)
Section 079200 – Joint Sealants (As it pertains to roofing)

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

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

General Inclusions:

1. There is no general contractor associated with this project; any and all reference to a "general contractor" related to the work of this bid division shall be understood to mean the contractor of this bid division.
2. The contractor for this bid division work is required to include but is not limited to all items, services, tasks, materials, personnel, equipment, etc. identified in this bid division description regardless of the presence of language in other bid division descriptions that is the same or is similar to that found in this contractor's bid division description.
3. Coordination of the work of this bid division with any and all work of other bid division contractors for the scheduling and integration of the work of this contractor.
4. All contractors are responsible for the entire set of plans and specifications; including tables, schedules, and notes.
5. Provide continuous housekeeping and clean-up, and proper legal off-site disposal of any debris generated by this Bid Division's work.
6. 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: 075000 – Roofing

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 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. 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. Work hours for this project will be from 7 am – 11 pm. Coordinate work accordingly.
10. This contractor expected to have daily shift supervisors meeting at shift change for continuity of work, if applicable.
11. Mandatory attendance at weekly superintendent's meetings, as it relates to scope of work and schedule.
12. Mandatory attendance at required pre-construction meeting.
13. 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.
14. Project Inclusions are provided as assistance for contractors that are bidding and are not an all-inclusive scope of work. It is every contractor's responsibility to review all the construction documents and prepare their bid accordingly.
15. **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 075000

BID DIVISION 075000 - ROOFING

Package #	Package	Number	Spec #	Spec	Title
075000 PA-001	Roofing - Start Ups	075000-01			Signed Post Bid Interview Form
075000 PA-001	Roofing - Start Ups	075000-02			Schedule of Values
075000 PA-001	Roofing - Start Ups	075000-03			Signed Contracts Returned
075000 PA-001	Roofing - Start Ups	075000-04			Payment/Performance Bonds
075000 PA-001	Roofing - Start Ups	075000-05			Certificate of Insurance
075000 PA-001	Roofing - Start Ups	075000-06			Employee List
075000 PA-001	Roofing - Start Ups	075000-07			Safety Policy
075000 PA-001	Roofing - Start Ups	075000-08			SDS Sheets
075000 PA-001	Roofing - Start Ups	075000-09			Certificate of Subcontractor & Supplier
075000 PA-001	Roofing - Start Ups	075000-10			AHERA Notification and Contractor Compliance Affidavit
075000 PACO-001	Roofing - Close Outs	075000-11			Contractor (2) Year Guarantee
075000 PACO-001	Roofing - Close Outs	075000-12			Consent of Surety
075000 PACO-001	Roofing - Close Outs	075000-13			Certificate of Substantial Completion
075000 PACO-001	Roofing - Close Outs	075000-14			Completed Punch List
075000 PACO-001	Roofing - Close Outs	075000-15			As Built Drawings
075000 PACO-001	Roofing - Close Outs	075000-16			All Processed Change Orders Returned
075000 PACO-001	Roofing - Close Outs	075000-17			Current Certificate of Insurance
075000 PACO-001	Roofing - Close Outs	075000-18			Signed Hazardous Materials Compliance Affidavit
075000 PACO-001	Roofing - Close Outs	075000-19			Signed Asbestos Free Affidavit
075000 PACO-001	Roofing - Close Outs	075000-20			All Other Warranties Required
075000 PACO-001	Roofing - Close Outs	075000-21			Operations & Maintenance Manuals
075000 PACO-001	Roofing - Close Outs	075000-22			Replacement Parts turned over to Owner
075000 PACO-001	Roofing - Close Outs	075000-23			Roofing Inspection Report
075000 PACO-001	Roofing - Close Outs	075000-24	075419	Polyvinyl-Chloride Roofing	Maintenance data on PVC roofing.
075000 PACO-001	Roofing - Close Outs	075000-25	075419	Polyvinyl-Chloride Roofing	20 Year No Dollar Manufacturer Warranty on PVC Roofing.
075000 PACO-001	Roofing - Close Outs	075000-26	076200	Sheet Metal Flashing and Trim	Warranty for prefinished sheet metal materials regarding sheet metal flashing and trim.
075000-001	Roofing - Submittals	075000-27	072100	Thermal Insulation	Product data on thermal insulation.
075000-001	Roofing - Submittals	075000-28	075419	Polyvinyl-Chloride Roofing	Product data on polyvinyl-chloride (PVC) roofing.
075000-001	Roofing - Submittals	075000-29	075419	Polyvinyl-Chloride Roofing	Shop drawings on polyvinyl-chloride (PVC) roofing.
075000-001	Roofing - Submittals	075000-30	076200	Sheet Metal Flashing and Trim	Product data and shop drawings on sheet metal flashing and trim.
075000-001	Roofing - Submittals	075000-31	076200	Sheet Metal Flashing and Trim	Samples on sheet metal flashing and trim.

Bid Division: 084000 – Glass & Glazing

Bid to Include:

Total Responsibility for Specification Sections:

Section 082200 – Fiberglass Doors and Frames
Section 084113 – Aluminum Framed Entrances & Storefronts
Section 085113 – Aluminum Windows
Section 087100 – Door Hardware (As it relates to this Bid Division)
Section 088000 – Glazing
Section 088813 – Fire-Rated Glass

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 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. 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. Provide and install all glass for wood doors and hollow metal frames, per drawings.
5. Furnish and install all caulking and sealants as it pertains to this bid division.
6. When installing door frames, this contractor must consider floor finish thickness such as ceramic tile and install accordingly to ensure doors do not rub on floors.
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 pre-construction meeting.
9. Work hours for this project will be from 7 am – 11 pm. Coordinate work accordingly.
10. This contractor expected to have daily shift supervisors meeting at shift change for continuity of work, if applicable.

Bid Division: 084000 – Glass & Glazing

11. 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.
12. Project Inclusions are provided as assistance for contractors that are bidding and are not an all-inclusive scope of work. It is every contractor's responsibility to review all the construction documents and prepare their bid accordingly.
13. **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 084000

BID DIVISION 084000 - GLASS GLAZING

Package #	Package	Number	Spec #	Spec	Title
084000 PA-001	Glass & Glazing - Start Ups	084000-01			Signed Post Bid Interview Form
084000 PA-001	Glass & Glazing - Start Ups	084000-02			Schedule of Values
084000 PA-001	Glass & Glazing - Start Ups	084000-03			Signed Contracts Returned
084000 PA-001	Glass & Glazing - Start Ups	084000-04			Payment/Performance Bonds
084000 PA-001	Glass & Glazing - Start Ups	084000-05			Certificate of Insurance
084000 PA-001	Glass & Glazing - Start Ups	084000-06			Employee List
084000 PA-001	Glass & Glazing - Start Ups	084000-07			Safety Policy
084000 PA-001	Glass & Glazing - Start Ups	084000-08			SDS Sheets
084000 PA-001	Glass & Glazing - Start Ups	084000-09			Certificate of Subcontractor & Supplier
084000 PA-001	Glass & Glazing - Start Ups	084000-10			AHERA Notification and Contractor Compliance Affidavit
084000 PACO-001	Glass & Glazing - Close Outs	084000-11			Contractor (2) Year Guarantee
084000 PACO-001	Glass & Glazing - Close Outs	084000-12			Consent of Surety
084000 PACO-001	Glass & Glazing - Close Outs	084000-13			Certificate of Substantial Completion
084000 PACO-001	Glass & Glazing - Close Outs	084000-14			Completed Punch List
084000 PACO-001	Glass & Glazing - Close Outs	084000-15			As Built Drawings
084000 PACO-001	Glass & Glazing - Close Outs	084000-16			All Processed Change Orders Returned
084000 PACO-001	Glass & Glazing - Close Outs	084000-17			Current Certificate of Insurance
084000 PACO-001	Glass & Glazing - Close Outs	084000-18			Signed Hazardous Materials Compliance Affidavit
084000 PACO-001	Glass & Glazing - Close Outs	084000-19			Signed Asbestos Free Affidavit
084000 PACO-001	Glass & Glazing - Close Outs	084000-20			All Other Warranties Required
084000 PACO-001	Glass & Glazing - Close Outs	084000-21			Operations & Maintenance Manuals
084000 PACO-001	Glass & Glazing - Close Outs	084000-22			Replacement Parts turned over to Owner
084000 PACO-001	Glass & Glazing - Close Outs	084000-23			Inspections & Certificates
084000 PACO-001	Glass & Glazing - Close Outs	084000-24	082200	Fiberglass Doors and Frames	Manufacturer's lifetime warranty on fiberglass doors and frames.
084000 PACO-001	Glass & Glazing - Close Outs	084000-25	084113	Aluminum Framed Entrances and Storefronts.	10 year warranty on aluminum framed entrances and storefronts.
084000 PACO-001	Glass & Glazing - Close Outs	084000-26	085113	Aluminum Windows	10 year warranty aluminum wndows.
084000 PACO-001	Glass & Glazing - Close Outs	084000-27	085113	Aluminum Windows	10 year warranty on glazing units regarding aluminum windows.
084000 PACO-001	Glass & Glazing - Close Outs	084000-28	085113	Aluminum Windows	10 year warranty on aluminum finish regarding aluminum windows.
084000 PACO-001	Glass & Glazing - Close Outs	084000-29	087100	Door Hardware	Operating and maintenance manuals on door hardware.
084000 PACO-001	Glass & Glazing - Close Outs	084000-30	087100	Door Hardware	Warranties on door hardware.
084000 PACO-001	Glass & Glazing - Close Outs	084000-31	087100	Door Hardware	Extra Materials: Special Tools for adjustment of hardware and changing of cylinders.
084000 PACO-001	Glass & Glazing - Close Outs	084000-32	087100	Door Hardware	Operating and maintenance manuals on door hardware.
084000 PACO-001	Glass & Glazing - Close Outs	084000-33	087100	Door Hardware	Project Record Documents: As-Builts on Door Hardware Sets.
084000 PACO-001	Glass & Glazing - Close Outs	084000-34	087100	Door Hardware	Warranties on door hardware.
084000 PACO-001	Glass & Glazing - Close Outs	084000-35	088000	Glazing	10 year warranty on coated-glass products (glazing).
084000 PACO-001	Glass & Glazing - Close Outs	084000-36	088000	Glazing	10 year manufacturer warranty on insulating glass units (glazing).
084000 PACO-001	Glass & Glazing - Close Outs	084000-37	088000	Glazing	Special warranty on laminated glass (glazing).
084000 PACO-001	Glass & Glazing - Close Outs	084000-38	088813	Fire-Rated Glazing	10 year warranty on laminated glass (fire-rated glazing).
084000-001	Glass & Glazing - Submittals	084000-39	079200	Joint Sealants	Product data on joint sealants.
084000-001	Glass & Glazing - Submittals	084000-40	082200	Fiberglass Doors and Frames	Product data on fiberglass doors and frames.
084000-001	Glass & Glazing - Submittals	084000-41	082200	Fiberglass Doors and Frames	Shop drawings on fiberglass doors and frames.
084000-001	Glass & Glazing - Submittals	084000-42	082200	Fiberglass Doors and Frames	Samples on fiberglass doors and frames.
084000-001	Glass & Glazing - Submittals	084000-43	084113	Aluminum Framed Entrances and Storefronts.	Product data drawings on aluminum framed entrances and storefronts.
084000-001	Glass & Glazing - Submittals	084000-44	084113	Aluminum Framed Entrances and Storefronts.	Shop drawings on aluminum framed entrances and storefronts.
084000-001	Glass & Glazing - Submittals	084000-45	084113	Aluminum Framed Entrances and Storefronts.	Samples on aluminum-framed entrances and storefronts.
084000-001	Glass & Glazing - Submittals	084000-46	085113	Aluminum Windows	Product data and product schedule on aluminum windows.
084000-001	Glass & Glazing - Submittals	084000-47	085113	Aluminum Windows	Shop drawings on aluminum windows.
084000-001	Glass & Glazing - Submittals	084000-48	087100	Door Hardware	Product data and riser and wiring diagrams on door hardware.
084000-001	Glass & Glazing - Submittals	084000-49	087100	Door Hardware	Samples on door hardware.
084000-001	Glass & Glazing - Submittals	084000-50	087100	Door Hardware	Door hardware schedule regarding door hardware.
084000-001	Glass & Glazing - Submittals	084000-51	087100	Door Hardware	Keying schedule regarding door hardware.
084000-001	Glass & Glazing - Submittals	084000-52	088000	Glazing	Product data and glazing schedule on glazing.
084000-001	Glass & Glazing - Submittals	084000-53	088000	Glazing	Samples on glazing (glass).
084000-001	Glass & Glazing - Submittals	084000-54	088813	Fire-Rated Glazing	Product data and glazing schedule on fire-rated glazing.
084000-001	Glass & Glazing - Submittals	084000-55	088813	Fire-Rated Glazing	Samples on fire-rated glazing (glass).

Bid Division: 091000 – Drywall, Insulation & Acoustical

Bid to Include: Mandatory to have (2) shifts: Work hours 7 am – 11 pm Monday thru Friday, weekends as needed

Total Responsibility for Specification Sections:

Section 024119 – Selective Demolition (If alternate No. 1 isn't accepted by District)
Section 092116.23 – Gypsum Board Shaft Wall Assembly
Section 092216 – Non-Structural Metal Framing
Section 092900 – Gypsum Board
Section 095100 – Acoustical Ceilings

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

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 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 removal, storage and re-installation of ceiling panels as coordinated by CMs Field Manager for the installation of the shaft wall in main corridor. Will be approximately 4' wide x corridor length.
3. Furnish and install all required light-gage metal framing material and drywall, glass mat sheathing, etc. at all walls, ceilings, bulkheads, parapets, etc.
4. Provide all metal framing, drywall and insulation at all walls, as documented.
5. Furnish and install all acoustical ceiling systems, as documented.
6. Furnish and install all materials for the bulkheads as documented.
7. Particular attention to Drawing A6.2- details 1, 2, 3. This shaft wall included in your bid division, to include the fire caulk sealant per drawings. This bid division responsible to fire caulk any existing MEP that may be existing.
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. Contractor responsible for (2) shifts of work: Work hours 7 am – 11 pm, Monday-Friday.
10. This contractor expected to have daily shift supervisors meeting at shift change for continuity of work.
11. Mandatory attendance at pre-construction meeting.
12. 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.
13. Project Inclusions are provided as assistance for contractors that are bidding and are not an all-inclusive scope of work. It is every contractor's responsibility to review all the construction documents and prepare their bid accordingly.
14. **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.**

ALTERNATE #1 on Bid Proposal

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

BID DIVISION 091000 - DRYWALL, INSULATION ACOUSTICAL

Package #	Package	Number	Spec #	Spec	Title
091000 PA-001	Drywall, Insulation & Acoustical - Start Ups	091000-01			Signed Post Bid Interview Form
091000 PA-001	Drywall, Insulation & Acoustical - Start Ups	091000-02			Schedule of Values
091000 PA-001	Drywall, Insulation & Acoustical - Start Ups	091000-03			Signed Contracts Returned
091000 PA-001	Drywall, Insulation & Acoustical - Start Ups	091000-04			Payment/Performance Bonds
091000 PA-001	Drywall, Insulation & Acoustical - Start Ups	091000-05			Certificate of Insurance
091000 PA-001	Drywall, Insulation & Acoustical - Start Ups	091000-06			Employee List
091000 PA-001	Drywall, Insulation & Acoustical - Start Ups	091000-07			Safety Policy
091000 PA-001	Drywall, Insulation & Acoustical - Start Ups	091000-08			SDS Sheets
091000 PA-001	Drywall, Insulation & Acoustical - Start Ups	091000-09			Certificate of Subcontractor & Supplier
091000 PA-001	Drywall, Insulation & Acoustical - Start Ups	091000-10			AHERA Notification and Contractor Compliance Affidavit
091000 PACO-001	Drywall, Insulation & Acoustical - Close Outs	091000-11			Contractor (2) Year Guarantee
091000 PACO-001	Drywall, Insulation & Acoustical - Close Outs	091000-12			Consent of Surety
091000 PACO-001	Drywall, Insulation & Acoustical - Close Outs	091000-13			Certificate of Substantial Completion
091000 PACO-001	Drywall, Insulation & Acoustical - Close Outs	091000-14			Completed Punch List
091000 PACO-001	Drywall, Insulation & Acoustical - Close Outs	091000-15			As Built Drawings
091000 PACO-001	Drywall, Insulation & Acoustical - Close Outs	091000-16			All Processed Change Orders Returned
091000 PACO-001	Drywall, Insulation & Acoustical - Close Outs	091000-17			Current Certificate of Insurance
091000 PACO-001	Drywall, Insulation & Acoustical - Close Outs	091000-18			Signed Hazardous Materials Compliance Affidavit
091000 PACO-001	Drywall, Insulation & Acoustical - Close Outs	091000-19			Signed Asbestos Free Affidavit
091000 PACO-001	Drywall, Insulation & Acoustical - Close Outs	091000-20			All Other Warranties Required
091000 PACO-001	Drywall, Insulation & Acoustical - Close Outs	091000-21			Operations & Maintenance Manuals
091000 PACO-001	Drywall, Insulation & Acoustical - Close Outs	091000-22			Replacement Parts turned over to Owner
091000 PACO-001	Drywall, Insulation & Acoustical - Close Outs	091000-23			Inspections & Certificates
091000 PACO-001	Drywall, Insulation & Acoustical - Close Outs	091000-24	095100	Acoustical Panel Ceilings	Maintenance manuals on acoustical panel celiings.
091000 PACO-001	Drywall, Insulation & Acoustical - Close Outs	091000-25	095100	Acoustical Panel Ceilings	10 year warranty on acoustical panels.
091000 PACO-001	Drywall, Insulation & Acoustical - Close Outs	091000-26	095100	Acoustical Panel Ceilings	10 year warranty on suspension.
091000 PACO-001	Drywall, Insulation & Acoustical - Close Outs	091000-27	095100	Acoustical Panel Ceilings	30 year warranty on ceiling system.
091000 PACO-001	Drywall, Insulation & Acoustical - Close Outs	091000-28	095100	Acoustical Panel Ceilings	Extra Materials on Acoustical Units. Quantity equal to 5 percent of total installed.
091000 PACO-001	Drywall, Insulation & Acoustical - Close Outs	091000-29	095100	Acoustical Panel Ceilings	Extra Materials on Exposed Suspension System Components. Furnish quantity of each exposed suspension component equal to 2 percent of amount installed.
091000-001	Drywall, Insulation & Acoustical - Submittals	091000-30	078413	Penetration Firestopping	Product data on penetration firestopping.
091000-001	Drywall, Insulation & Acoustical - Submittals	091000-31	079200	Joint Sealants	Product data on joint sealants.
091000-001	Drywall, Insulation & Acoustical - Submittals	091000-32	092116.23	Gypsum Board Shaft Wall Assembly	Product data on gypsum board shaft wall assemblies.
091000-001	Drywall, Insulation & Acoustical - Submittals	091000-33	092900	Gypsum Board	Product data on gypsum board.
091000-001	Drywall, Insulation & Acoustical - Submittals	091000-34	095100	Acoustical Panel Ceilings	Product data on acoustical panel ceilings.
091000-001	Drywall, Insulation & Acoustical - Submittals	091000-35	095100	Acoustical Panel Ceilings	Shop drawings on acoustical ceilings.
091000-001	Drywall, Insulation & Acoustical - Submittals	091000-36	095100	Acoustical Panel Ceilings	Samples on acoustical panel ceilings.

Bid Division: 093000 – Tile

Bid to Include:

Total Responsibility for Specification Sections:

Section 093013 – Ceramic Tiling

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

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

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

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

General Inclusions:

1. There is no general contractor associated with this project; any and all reference to a "general contractor" related to the work of this bid division shall be understood to mean the contractor of this bid division.
2. The contractor for this bid division work is required to include but is not limited to all items, services, tasks, materials, personnel, equipment, etc. identified in this bid division description regardless of the presence of language in other bid division descriptions that is the same or is similar to that found in this contractor's bid division description.
3. Coordination of the work of this bid division with any and all work of other bid division contractors for the scheduling and integration of the work of this contractor.
4. All contractors are responsible for the entire set of plans and specifications; including tables, schedules, and notes.
5. Provide continuous housekeeping and clean-up, and proper legal off-site disposal of any debris generated by this Bid Division's work.
6. Contractor is responsible for own dumpster(s) and all removal and disposal charges thereof. (Use of the Owner's dumpsters is strictly prohibited.)
7. All Contractors are required to inspect the existing project components and are to include all work necessary to complete the work to deliver a fully operational system in compliance with all governing codes.
8. This Contractor shall be responsible for performing all work in full compliance with all health and safety standards including Asbestos Awareness and Notification, Lead Paint Abatement, and all MIOSHA Standards. This Contractor shall also be responsible for satisfying all safety violations and/or fines resulting from the actions or lack of action by this Contractor at the sole expense of this Contractor.
9. Any contractor who compounds a mistake by installing their product on another Contractor's obvious faulty work will assume responsibility for repair of said work.
10. This contractor shall repair and restore any damaged area to an original or better condition with no detectable evidence that the area has been repaired. Repairs must be done by personnel qualified in the execution of the work skilled and licensed in that trade. Whenever possible, repairs to work shall be done by the original installer of the work.
11. Submittal of all insurance, unit pricing, schedule of values, required product data and shop drawings within (2) two weeks of Owner's Notice to commence work.
12. Must provide all submittals within 20 working days of contract award or sooner, unless specifically clarified with the construction manager prior to contract award.
13. Provide all layout and measurements required to perform the work of this Bid Division.
14. The Owner reserves the right to salvage any materials removed from the site during the duration of the project.
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: 093000 – Tile

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

Project Inclusions:

1. Review the milestone schedules. This bid division's work will 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. Furnish and install all tile per Drawings, as indicated on Finish Schedule.
3. Final preparation of existing floor is responsibility of this bid division, to include floor leveling.
4. Must provide all submittals within 15 working days of contract award or sooner, unless specifically clarified with the construction manager prior to contract award.
5. Work hours for this project will be from 7 am – 11 pm. Coordinate work accordingly.
6. Mandatory attendance at pre-construction meeting.
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. Project Inclusions are provided as assistance for contractors that are bidding and are not an all-inclusive scope of work. It is every contractor's responsibility to review all the construction documents and prepare their bid accordingly.
9. **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: 093000 – Tile

Excludes:

1. Floor Demo (Carpet, terrazzo and tile by Demo Contractor)

Consideration for award:

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

END OF BID DIVISION 093000

BID DIVISION 093000 - TILE

Package #	Package	Number	Spec #	Spec	Title
093000 PA-001	Tile - Start Ups	093000-01			Signed Post Bid Interview Form
093000 PA-001	Tile - Start Ups	093000-02			Schedule of Values
093000 PA-001	Tile - Start Ups	093000-03			Signed Contracts Returned
093000 PA-001	Tile - Start Ups	093000-04			Payment/Performance Bonds
093000 PA-001	Tile - Start Ups	093000-05			Certificate of Insurance
093000 PA-001	Tile - Start Ups	093000-06			Employee List
093000 PA-001	Tile - Start Ups	093000-07			Safety Policy
093000 PA-001	Tile - Start Ups	093000-08			SDS Sheets
093000 PA-001	Tile - Start Ups	093000-09			Certificate of Subcontractor & Supplier
093000 PA-001	Tile - Start Ups	093000-10			AHERA Notification and Contractor Compliance Affidavit
093000 PACO-001	Tile - Close Outs	093000-11			Contractor (2) Year Guarantee
093000 PACO-001	Tile - Close Outs	093000-12			Consent of Surety
093000 PACO-001	Tile - Close Outs	093000-13			Certificate of Substantial Completion
093000 PACO-001	Tile - Close Outs	093000-14			Completed Punch List
093000 PACO-001	Tile - Close Outs	093000-15			As Built Drawings
093000 PACO-001	Tile - Close Outs	093000-16			All Processed Change Orders Returned
093000 PACO-001	Tile - Close Outs	093000-17			Current Certificate of Insurance
093000 PACO-001	Tile - Close Outs	093000-18			Signed Hazardous Materials Compliance Affidavit
093000 PACO-001	Tile - Close Outs	093000-19			Signed Asbestos Free Affidavit
093000 PACO-001	Tile - Close Outs	093000-20			All Other Warranties Required
093000 PACO-001	Tile - Close Outs	093000-21			Operations & Maintenance Manuals
093000 PACO-001	Tile - Close Outs	093000-22			Replacement Parts turned over to Owner
093000 PACO-001	Tile - Close Outs	093000-23			Inspections & Certificates
093000 PACO-001	Tile - Close Outs	093000-24	093013	Ceramic Tiling	Maintenance data on tile.
093000 PACO-001	Tile - Close Outs	093000-25	093013	Ceramic Tiling	Extra Materials on Tile and Trim Units. Furnish quantity of full-size units equal to 3 percent of amount installed for each type, composition, color, pattern and size.
093000 PACO-001	Tile - Close Outs	093000-26	093013	Ceramic Tiling	Extra Materials on Grout. Furnish quantity of grout equal to 3 percent of amount installed for each type, composition and tile.
093000 PACO-001	Tile - Close Outs	093000-27	093013	Ceramic Tiling	Waranty on ceramic tile.
093000-001	Tile - Submittals	093000-28	079200	Joint Sealants	Product data on joint sealants.
093000-001	Tile - Submittals	093000-29	093013	Ceramic Tiling	Product data on ceramic tiling.
093000-001	Tile - Submittals	093000-30	093013	Ceramic Tiling	Shop drawings on tile.
093000-001	Tile - Submittals	093000-31	093013	Ceramic Tiling	Samples on tile.

Bid Division: 096500 – Flooring

Bid to Include: Mandatory to have (2) shifts: Work hours 7 am – 11 pm Monday thru Friday, weekends as needed

Total Responsibility for Specification Sections:

Section 096513 – Resilient Base and Accessories
Section 096519 – Resilient Tile Flooring
Section 096813 – Tile Carpeting

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

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

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 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. Grind, 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 all required transition strips.
4. Furnish and install all flooring and base per Finish Schedule.
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. Contractor responsible for (2) shifts of work: Work hours 7 am – 11 pm, Monday-Friday.
7. This contractor expected to have daily shift supervisors meeting at shift change for continuity of work.
8. Mandatory attendance at pre-construction meeting.

Bid Division: 096500 – Flooring

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. Project Inclusions are provided as assistance for contractors that are bidding and are not an all-inclusive scope of work. It is every contractor's responsibility to review all the construction documents and prepare their bid accordingly.
11. **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 091000

BID DIVISION 096500 - FLOORING

Package #	Package	Number	Spec #	Spec	Title
096500 PA-001	Flooring - Start Ups	096500-01			Signed Post Bid Interview Form
096500 PA-001	Flooring - Start Ups	096500-02			Schedule of Values
096500 PA-001	Flooring - Start Ups	096500-03			Signed Contracts Returned
096500 PA-001	Flooring - Start Ups	096500-04			Payment/Performance Bonds
096500 PA-001	Flooring - Start Ups	096500-05			Certificate of Insurance
096500 PA-001	Flooring - Start Ups	096500-06			Employee List
096500 PA-001	Flooring - Start Ups	096500-07			Safety Policy
096500 PA-001	Flooring - Start Ups	096500-08			SDS Sheets
096500 PA-001	Flooring - Start Ups	096500-09			Certificate of Subcontractor & Supplier
096500 PA-001	Flooring - Start Ups	096500-10			AHERA Notification and Contractor Compliance Affidavit
096500 PACO-001	Flooring - Close Outs	096500-11			Contractor (2) Year Guarantee
096500 PACO-001	Flooring - Close Outs	096500-12			Consent of Surety
096500 PACO-001	Flooring - Close Outs	096500-13			Certificate of Substantial Completion
096500 PACO-001	Flooring - Close Outs	096500-14			Completed Punch List
096500 PACO-001	Flooring - Close Outs	096500-15			As Built Drawings
096500 PACO-001	Flooring - Close Outs	096500-16			All Processed Change Orders Returned
096500 PACO-001	Flooring - Close Outs	096500-17			Current Certificate of Insurance
096500 PACO-001	Flooring - Close Outs	096500-18			Signed Hazardous Materials Compliance Affidavit
096500 PACO-001	Flooring - Close Outs	096500-19			Signed Asbestos Free Affidavit
096500 PACO-001	Flooring - Close Outs	096500-20			All Other Warranties Required
096500 PACO-001	Flooring - Close Outs	096500-21			Operations & Maintenance Manuals
096500 PACO-001	Flooring - Close Outs	096500-22			Replacement Parts turned over to Owner
096500 PACO-001	Flooring - Close Outs	096500-23			Inspections & Certificates
096500 PACO-001	Flooring - Close Outs	096500-24	096513	Resilient Base and Accessories	Maintenance manuals on resilient wall base and accessories.
096500 PACO-001	Flooring - Close Outs	096500-25	096513	Resilient Base and Accessories	Extra Materials on Resilient Base and Accessories. Furnish not less than 10 linear feet for every 500 linear feet or fraction thereof, of each type, color, pattern, and size.
096500 PACO-001	Flooring - Close Outs	096500-26	096519	Resilient Tile Flooring	Maintenance data for each type of floor tile.
096500 PACO-001	Flooring - Close Outs	096500-27	096519	Resilient Tile Flooring	Extra Materials on Floor Tile. Furnish one box for every 20 boxes or fraction thereof, of each type, color and pattern of floor tile installed.
096500 PACO-001	Flooring - Close Outs	096500-28	096813	Tile Carpeting	Maintenance data on tile carpeting.
096500 PACO-001	Flooring - Close Outs	096500-29	096813	Tile Carpeting	Lifetime limited warranty on tile carpeting.
096500-001	Flooring - Submittals	096500-30	079200	Joint Sealants	Product data on joint sealants.
096500-001	Flooring - Submittals	096500-31	096513	Resilient Base and Accessories	Product data on resilient base and accessories.
096500-001	Flooring - Submittals	096500-32	096513	Resilient Base and Accessories	Samples on resilient base and accessories.
096500-001	Flooring - Submittals	096500-33	096519	Resilient Tile Flooring	Product data and product schedule on resilient tile flooring.
096500-001	Flooring - Submittals	096500-34	096519	Resilient Tile Flooring	Samples on resilient tile flooring.
096500-001	Flooring - Submittals	096500-35	096813	Tile Carpeting	Product data on tile carpeting.
096500-001	Flooring - Submittals	096500-36	096813	Tile Carpeting	Shop drawings on tile carpeting.
096500-001	Flooring - Submittals	096500-37	096813	Tile Carpeting	Samples on tile carpeting.

Bid Division: 099000 – Painting

Bid to Include: Mandatory to have (2) shifts: Work hours 7 am – 11 pm Monday thru Friday, weekends as needed

Total Responsibility for Specification Sections:

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 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. 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.

Bid Division: 099000 – Painting

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.
7. Paint all exposed drywall and CMU as documented.
8. Paint all hollow metal frames and doors as documented.
9. Paint all bulkheads.
10. This contractor to stencil paint or install signs / stickers indicating firewalls above ceilings per code. See fire safety plan for firewall locations and ratings.
11. Provide all caulking of interior control joints in masonry, drywall, and drywall to dissimilar materials and inside masonry corners.
12. Contractor responsible for (2) shifts of work: Work hours 7 am – 11 pm, Monday-Friday.
13. This contractor expected to have daily shift supervisors meeting at shift change for continuity of work.
14. Mandatory attendance at pre-construction meeting.
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. 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.
17. Project Inclusions are provided as assistance for contractors that are bidding and are not an all-inclusive scope of work. It is every contractor's responsibility to review all the construction documents and prepare their bid accordingly.
18. **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 099000

BID DIVISION 099000 - PAINTING

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

Bid Division: 105100 – Metal Lockers

Bid to Include: Mandatory to have (2) shifts: Work hours 7 am – 11 pm Monday thru Friday, weekends as needed

Total Responsibility for Specification Sections:

Section 105113 – Metal Lockers

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

General Inclusions:

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

Bid Division: 105100 – Metal Lockers

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

Project Inclusions:

1. Review the milestone schedules. This bid division's work will 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. Protection of floor during installation.
3. Supply and install fillers as required.
4. Provide and install all lockers.
5. Locker bases by Bid Division 030100.
6. Provide all number plates, and coordinate numbering with the Owner.
7. Master key to existing system if possible.
8. Clean, prep, and adjust all equipment immediately prior to Owner occupancy.
9. Contractor responsible for (2) shifts of work: Work hours 7 am – 11 pm, Monday-Friday.
10. This contractor expected to have daily shift supervisors meeting at shift change for continuity of work.
11. Mandatory attendance at pre-construction meeting.
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. 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.
14. Project Inclusions are provided as assistance for contractors that are bidding and are not an all-inclusive scope of work. It is every contractor's responsibility to review all the construction documents and prepare their bid accordingly.
15. **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 105100

BID DIVISION 105100 - METAL LOCKERS

Package #	Package	Number	Spec #	Spec	Title
105100 PA-001	Metal Lockers - Start Ups	105100-01			Signed Post Bid Interview Form
105100 PA-001	Metal Lockers - Start Ups	105100-02			Schedule of Values
105100 PA-001	Metal Lockers - Start Ups	105100-03			Signed Contracts Returned
105100 PA-001	Metal Lockers - Start Ups	105100-04			Payment/Performance Bonds
105100 PA-001	Metal Lockers - Start Ups	105100-05			Certificate of Insurance
105100 PA-001	Metal Lockers - Start Ups	105100-06			Employee List
105100 PA-001	Metal Lockers - Start Ups	105100-07			Safety Policy
105100 PA-001	Metal Lockers - Start Ups	105100-08			SDS Sheets
105100 PA-001	Metal Lockers - Start Ups	105100-09			Certificate of Subcontractor & Supplier
105100 PA-001	Metal Lockers - Start Ups	105100-10			AHERA Notification and Contractor Compliance Affidavit
105100 PACO-001	Metal Lockers - Close Outs	105100-11			Contractor (2) Year Guarantee
105100 PACO-001	Metal Lockers - Close Outs	105100-12			Consent of Surety
105100 PACO-001	Metal Lockers - Close Outs	105100-13			Certificate of Substantial Completion
105100 PACO-001	Metal Lockers - Close Outs	105100-14			Completed Punch List
105100 PACO-001	Metal Lockers - Close Outs	105100-15			As Built Drawings
105100 PACO-001	Metal Lockers - Close Outs	105100-16			All Processed Change Orders Returned
105100 PACO-001	Metal Lockers - Close Outs	105100-17			Current Certificate of Insurance
105100 PACO-001	Metal Lockers - Close Outs	105100-18			Signed Hazardous Materials Compliance Affidavit
105100 PACO-001	Metal Lockers - Close Outs	105100-19			Signed Asbestos Free Affidavit
105100 PACO-001	Metal Lockers - Close Outs	105100-20			All Other Warranties Required
105100 PACO-001	Metal Lockers - Close Outs	105100-21			Operations & Maintenance Manuals
105100 PACO-001	Metal Lockers - Close Outs	105100-22			Replacement Parts turned over to Owner
105100 PACO-001	Metal Lockers - Close Outs	105100-23			Inspections & Certificates
105100 PACO-001	Metal Lockers - Close Outs	105100-24	105113	Metal Lockers	2 year warranty on knocked-down metal lockers.
105100 PACO-001	Metal Lockers - Close Outs	105100-25	105113	Metal Lockers	Maintenance data on metal lockers.
105100-001	Metal Lockers - Submittals	105100-26	105113	Metal Lockers	Product data on metal lockers.
105100-001	Metal Lockers - Submittals	105100-27	105113	Metal Lockers	Shop drawings on metal lockers.
105100-001	Metal Lockers - Submittals	105100-28	105113	Metal Lockers	Samples on metal lockers.

Bid Division: 123000 – Casework

Bid to Include: Mandatory to have (2) shifts: Work hours 7 am – 11 pm Monday thru Friday, weekends as needed

Total Responsibility for Specification Sections:

Section 064116 – Plastic-Laminate-Clad Architectural Cabinets
Section 123553.19 – Wood Laboratory Casework
Section 123623.13 – Plastic Laminate Clad Countertops
Section 123661.16 – Solid Surface Countertops

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

General Inclusions:

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

Bid Division: 123000 – Casework

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

Project Inclusions:

1. Review the milestone schedules. This bid division's work will 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. Only final connections are provided by other trade contractors.
3. Provide prep for installation.
4. Protection of floor during installation.
5. Verify all power requirements and coordinate with other Bid Divisions.
6. Provide and completely install all science equipment and casework to allow for final plumbing, mechanical, and electrical connection by others (coordinate installation of plumbing & electrical during installation).
7. Supply and install fillers as required.
8. Supply and install all epoxy resin top and sinks.
9. Supply and install new Fume Hoods.
10. All tops shall be pre-drilled to accept accessories and mounted fixtures.
11. Provide all filler panels to match cabinets and/or countertops.
12. Contractor responsible for (2) shifts of work: Work hours 7 am – 11 pm, Monday-Friday.
13. This contractor expected to have daily shift supervisors meeting at shift change for continuity of work.
14. Mandatory attendance at pre-construction meeting.
15. Clean, prep, and adjust all equipment immediately prior to Owner occupancy.
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. 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: 123000 – Casework

18. Project Inclusions are provided as assistance for contractors that are bidding and are not an all-inclusive scope of work. It is every contractor's responsibility to review all the construction documents and prepare their bid accordingly.
19. **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.**

Excludes:

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

Consideration for award:

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

END OF BID DIVISION 123000

BID DIVISION 123000 - CASEWORK

Package #	Package	Number	Spec #	Spec	Title
123000 PA-001	Casework - Start Ups	123000-01			Signed Post Bid Interview Form
123000 PA-001	Casework - Start Ups	123000-02			Schedule of Values
123000 PA-001	Casework - Start Ups	123000-03			Signed Contracts Returned
123000 PA-001	Casework - Start Ups	123000-04			Payment/Performance Bonds
123000 PA-001	Casework - Start Ups	123000-05			Certificate of Insurance
123000 PA-001	Casework - Start Ups	123000-06			Employee List
123000 PA-001	Casework - Start Ups	123000-07			Safety Policy
123000 PA-001	Casework - Start Ups	123000-08			SDS Sheets
123000 PA-001	Casework - Start Ups	123000-09			Certificate of Subcontractor & Supplier
123000 PA-001	Casework - Start Ups	123000-10			AHERA Notification and Contractor Compliance Affidavit
123000 PACO-001	Casework - Close Outs	123000-11			Contractor (2) Year Guarantee
123000 PACO-001	Casework - Close Outs	123000-12			Consent of Surety
123000 PACO-001	Casework - Close Outs	123000-13			Certificate of Substantial Completion
123000 PACO-001	Casework - Close Outs	123000-14			Completed Punch List
123000 PACO-001	Casework - Close Outs	123000-15			As Built Drawings
123000 PACO-001	Casework - Close Outs	123000-16			All Processed Change Orders Returned
123000 PACO-001	Casework - Close Outs	123000-17			Current Certificate of Insurance
123000 PACO-001	Casework - Close Outs	123000-18			Signed Hazardous Materials Compliance Affidavit
123000 PACO-001	Casework - Close Outs	123000-19			Signed Asbestos Free Affidavit
123000 PACO-001	Casework - Close Outs	123000-20			All Other Warranties Required
123000 PACO-001	Casework - Close Outs	123000-21			Operations & Maintenance Manuals
123000 PACO-001	Casework - Close Outs	123000-22			Replacement Parts turned over to Owner
123000 PACO-001	Casework - Close Outs	123000-23			Inspections & Certificates
123000-001	Casework - Submittals	123000-24	064116	Plastic-Laminate-Clad Architectural Cabinets	Product data on plastic-laminate-clad architectural cabinets.
123000-001	Casework - Submittals	123000-25	064116	Plastic-Laminate-Clad Architectural Cabinets	Shop drawings on plastic-laminate-clad architectural cabinets.
123000-001	Casework - Submittals	123000-26	064116	Plastic-Laminate-Clad Architectural Cabinets	Samples on plastic laminates and cabinet hardware and accessories.
123000-001	Casework - Submittals	123000-27	123553.19	Wood Laboratory Casework	Product data and shop drawings on wood laboratory casework.
123000-001	Casework - Submittals	123000-28	123553.19	Wood Laboratory Casework	Samples on wood laboratory casework.
123000-001	Casework - Submittals	123000-29	123623.13	Plastic-Laminate-Clad Countertops	Product data and product certificates on plastic-laminate-clad countertops.
123000-001	Casework - Submittals	123000-30	123623.13	Plastic-Laminate-Clad Countertops	Shop drawings on plastic-laminate-clad countertops.
123000-001	Casework - Submittals	123000-31	123623.13	Plastic-Laminate-Clad Countertops	Samples on plastic-laminate-clad countertops.
123000-001	Casework - Submittals	123000-32	123661.16	Solid Surfacing Countertops	Product data for countertop materials.
123000-001	Casework - Submittals	123000-33	123661.16	Solid Surfacing Countertops	Shop drawings on countertops.
123000-001	Casework - Submittals	123000-34	123661.16	Solid Surfacing Countertops	Samples on countertops.

Bid Division: 211300 – Fire Protection

Bid to Include: Mandatory to have (2) shifts: Work hours 7 am – 11 pm Monday thru Friday, weekends as needed

Total Responsibility for Specification Sections:

Section 078413 – Penetration Firestopping
Section 078416 – Through Penetration Firestopping
Section 211313 – Wet Pipe Sprinkler Systems

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 material and labor 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.
12. Must provide all submittals within 20 working days of contract award or sooner, unless specifically clarified with the construction manager prior to contract award.
13. Provide all layout and measurements required to perform the work of this Bid Division.
14. The Owner reserves the right to salvage any materials removed from the site during the duration of the project.
15. Coordinate delivery of materials with Construction Manager (48 hours) in advance of the delivery, and provide proper personnel and equipment to perform the unloading.

Bid Division: 211300 – Fire Protection

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. All work to in complete compliance with all current and governing building & safety codes.
2. Provide all blocking required for fixture mounting.
3. Perform all connections between site utilities and building.
4. Provide proper repair of all ceilings, walls, floors, etc., when installing new piping fixtures and hangers.
5. Furnish and install a cabinet with necessary spare sprinkler heads.
6. 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).
7. Perform all excavating, backfill, and compaction required for the work of this bid division.
8. Maintain fire rating in all walls penetrated.
9. Remove spoils from site.
10. Provide all required layout and verify that no conflict occurs with other trades.
11. Furnish operating and maintenance manuals.
12. Provide record and as-built drawings.
13. Provide all permits required.
14. Provide Owner with training of new equipment.
15. Provide full written instruction for Owner operation.
16. Furnish and install K rated extinguisher for kitchen area.

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. Provide proper permits, to include shop drawings to State Fire Marshall for Plan review, 12A documents, etc
3. This bid division responsible to maintain ALL fire ratings in walls penetrated, fire caulk accordingly.
4. Contractor responsible for (2) shifts of work: Work hours 7 am – 11 pm, Monday-Friday.
5. This contractor expected to have daily shift supervisors meeting at shift change for continuity of work.
6. Mandatory attendance at pre-construction meeting.
7. Clean, prep, and adjust all equipment immediately prior to Owner occupancy.
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.
10. Project Inclusions are provided as assistance for contractors that are bidding and are not an all-inclusive scope of work. It is every contractor's responsibility to review all the construction documents and prepare their bid accordingly.

Bid Division: 211300 – Fire Protection

11. **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 211300

BID DIVISION 211300 - FIRE PROTECTION

Package #	Package	Number	Spec #	Spec	Title
211300 PA-001	Fire Protection - Start	211300-01			Signed Post Bid Interview Form
211300 PA-001	Fire Protection - Start	211300-02			Schedule of Values
211300 PA-001	Fire Protection - Start	211300-03			Signed Contracts Returned
211300 PA-001	Fire Protection - Start	211300-04			Payment/Performance Bonds
211300 PA-001	Fire Protection - Start	211300-05			Certificate of Insurance
211300 PA-001	Fire Protection - Start	211300-06			Employee List
211300 PA-001	Fire Protection - Start	211300-07			Safety Policy
211300 PA-001	Fire Protection - Start	211300-08			SDS Sheets
211300 PA-001	Fire Protection - Start	211300-09			Certificate of Subcontractor & Supplier
211300 PA-001	Fire Protection - Start	211300-10			AHERA Notification and Contractor Compliance Affidavit
211300 PACO-001	Fire Protection - Close	211300-11			Contractor (2) Year Guarantee
211300 PACO-001	Fire Protection - Close	211300-12			Consent of Surety
211300 PACO-001	Fire Protection - Close	211300-13			Certificate of Substantial Completion
211300 PACO-001	Fire Protection - Close	211300-14			Completed Punch List
211300 PACO-001	Fire Protection - Close	211300-15			As Built Drawings
211300 PACO-001	Fire Protection - Close	211300-16			All Processed Change Orders Returned
211300 PACO-001	Fire Protection - Close	211300-17			Current Certificate of Insurance
211300 PACO-001	Fire Protection - Close	211300-18			Signed Hazardous Materials Compliance Affidavit
211300 PACO-001	Fire Protection - Close	211300-19			Signed Asbestos Free Affidavit
211300 PACO-001	Fire Protection - Close	211300-20			All Other Warranties Required
211300 PACO-001	Fire Protection - Close	211300-21			Operations & Maintenance Manuals
211300 PACO-001	Fire Protection - Close	211300-22			Replacement Parts turned over to Owner
211300 PACO-001	Fire Protection - Close	211300-23			Inspections & Certificates
211300 PACO-001	Fire Protection - Close	211300-24	211313	Wet-Pipe Sprinkler Systems	Operation and maintenance data on wet-pipe sprinkler systems
211300-001	Fire Protection - Subm	211300-25	078413	Penetration Firestopping	Product data on penetration firestopping.
211300-001	Fire Protection - Subm	211300-26	078416	Through Penetration Firestopping	Product data on through penetration firestopping.
211300-001	Fire Protection - Subm	211300-27	211313	Wet-Pipe Sprinkler Systems	Product data on wet-pipe sprinkler systems.
211300-001	Fire Protection - Subm	211300-28	211313	Wet-Pipe Sprinkler Systems	Shop drawings on wet-pipe sprinkler systems.

Bid Division: 222300 – Plumbing & HVAC Systems

Bid to Include: Mandatory to have (2) shifts: Work hours 7 am – 11 pm Monday thru Friday, weekends as needed

Total Responsibility for Specification Sections:

Section 220500 – Common Work Results for Plumbing
Section 220553 – Identification For Plumbing Piping and Equipment
Section 220719 – Plumbing Piping Insulation
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 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 226600 – Chemical-Waste Systems for Laboratory and Healthcare Facilities
Section 230100 – General Mechanical Provisions
Section 230500 – Common Work Results for HVAC
Section 230553 – Identification for HVAC Piping and Equipment
Section 230593 – Testing, Adjusting and Balancing for HVAC
Section 230713 – Duct Insulation
Section 230719 – HAC Piping Insulation
Section 230900 – Building Management System
Section 232123 – Facility Natural-Gas Piping
Section 232113 – Hydronic Piping
Section 232116 – Hydronic Piping Specialties
Section 232123 – Hydronic Pumps
Section 232300 – Refrigerant Piping
Section 233113 – Metal Ducts
Section 233300 – Air Duct Accessories
Section 233346 – Flexible Ducts
Section 233423 – HVAC Power Ventilators
Section 233600 – Air Terminal Units
Section 233713.13 – Air Diffusers
Section 233723 – HVAC Gravity Ventilators
Section 236200 – Packaged Compressor and Condenser Units
Section 237223.29 – Packaged, Outdoor, Fixed Plate Energy Recovery Units
Section 237416 – Packaged Rooftop Air-Conditioning Units
Section 238126 – Split-System Air-Conditioners
Section 238216.11 – Hydronic Air Coils
Section 238223 – Unit Ventilators
Section 238236 – Finned-Tube Radiation Heaters
Section 238239.13 – Cabinet Unit Heaters
Section 238239.16 – Propeller Unit Heaters

Bid Division: 222300 – Plumbing & HVAC Systems

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

Section 024119 – Selective Demolition
Section 078413 – Penetration Firestopping
Section 078416 – Through 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.

General Inclusions:

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

Bid Division: 222300 – Plumbing & HVAC Systems

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

Bid Division: 222300 – Plumbing & HVAC Systems

35. Contractor shall furnish and install temporary insulated weather-tight closures of openings created as a result of the work in this scope in exterior surfaces to provide acceptable working conditions and protection for materials, to allow temporary heating, and building security.
36. Remove, clean and reinstall all existing grids, vents, registers and diffusers including those mounted in metal ceiling grid systems.
37. All HVAC equipment is to be completed with all motor starters, disconnects or other items to allow for the proper operation of the system.
38. Disconnect all roof top units to allow roofing contractor to raise and replace flashings as required.
39. Provide start-up training with Owner Representative, Architect and Construction Manager for all equipment installed.
40. Final installation and all work by this bid division must comply with governing building and life safety codes.
41. Provide water test approval two weeks prior to Owner Occupancy.

Project Inclusions:

1. Review the milestone schedules. This bid division's work will 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. 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. Furnish and install all new and temporary water and gas piping and connections as required by this project.
5. All plumbing and HVAC installations to meet all required governing requirements.
6. Furnish and install all pre-fabricated curbs and/or wood material as required for mechanical equipment curbing
7. Coordinate all access panel locations with Bid Division 060000.
8. Furnish and install all required gas piping.
9. Furnish and install all required hydronic piping.
10. Furnish and install all required refrigerant lines.
11. Furnish and install all required waste, water supply and vent piping.
12. Responsible for sanitary hook-up within 5' of exterior of building.
13. Furnish and install all new hose bibs as indicated.
14. Final installation of all casework gas, domestic water and sanitary hook-ups.
15. Provide all required plumbing and HVAC insulation.
16. Provide all required test and balance work.
17. Furnish and install duct detectors. Final connection and certification will be by fire alarm contractor under bid division 260000 contractor.
18. Fire seal any penetrations to maintain wall integrity. All corridor walls shall be considered rated walls.
19. Furnish and install all required fire dampers.
20. Provide all required temperature control work for a complete operational system.
21. Provide complete Owner's Training of Temperature Control System.
22. This contractor will be required to provide information pertaining to the energy incentive program of the utility company.
23. Coordinate with Bid Division 050000 for location of ALL roof mounted units.
24. Contractor responsible for (2) shifts of work: Work hours 7 am – 11 pm, Monday-Friday.
25. This contractor expected to have daily shift supervisors meeting at shift change for continuity of work.
26. Daily clean-up is required, as it pertains to this bid division.
27. Must provide all submittals within 20 working days of contract award or sooner, unless specifically clarified with the construction manager prior to contract award.

Bid Division: 222300 – Plumbing & HVAC Systems

28. Mandatory attendance at pre-Construction meeting.
29. 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.
30. Project Inclusions are provided as assistance for contractors that are bidding and are not an all-inclusive scope of work. It is every contractor's responsibility to review all the construction documents and prepare their bid accordingly.
31. **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 222300

BID DIVISION 222300 - PLUMBING HVAC SYSTEMS

Package #	Package	Number	Spec #	Spec	Title
222300 PA-001	Plumbing & HVAC Systems - Start Ups	222300-01	222300-01		Signed Post Bid Interview Form
222300 PA-001	Plumbing & HVAC Systems - Start Ups	222300-02	222300-02		Schedule of Values
222300 PA-001	Plumbing & HVAC Systems - Start Ups	222300-03	222300-03		Signed Contracts Returned
222300 PA-001	Plumbing & HVAC Systems - Start Ups	222300-04	222300-04		Payment/Performance Bonds
222300 PA-001	Plumbing & HVAC Systems - Start Ups	222300-05	222300-05		Certificate of Insurance
222300 PA-001	Plumbing & HVAC Systems - Start Ups	222300-06	222300-06		Employee List
222300 PA-001	Plumbing & HVAC Systems - Start Ups	222300-07	222300-07		Safety Policy
222300 PA-001	Plumbing & HVAC Systems - Start Ups	222300-08	222300-08		SDS Sheets
222300 PA-001	Plumbing & HVAC Systems - Start Ups	222300-09	222300-09		Certificate of Subcontractor & Supplier
222300 PA-001	Plumbing & HVAC Systems - Start Ups	222300-10	222300-10		AHERA Notification and Contractor Compliance Affidavit
222300 PA-001	Plumbing & HVAC Systems - Start Ups	222300-11	222300-11		Plumbing Permit
222300 PA-001	Plumbing & HVAC Systems - Start Ups	222300-12	222300-12		Mechanical Permit
222300 PACO-001	Plumbing & HVAC Systems - Close Outs	222300-13	222300-13		Contractor (2) Year Guarantee
222300 PACO-001	Plumbing & HVAC Systems - Close Outs	222300-14	222300-14		Consent of Surety
222300 PACO-001	Plumbing & HVAC Systems - Close Outs	222300-15	222300-15		Certificate of Substantial Completion
222300 PACO-001	Plumbing & HVAC Systems - Close Outs	222300-16	222300-16		Completed Punch List
222300 PACO-001	Plumbing & HVAC Systems - Close Outs	222300-17	222300-17		As Built Drawings
222300 PACO-001	Plumbing & HVAC Systems - Close Outs	222300-18	222300-18		All Processed Change Orders Returned
222300 PACO-001	Plumbing & HVAC Systems - Close Outs	222300-19	222300-19		Current Certificate of Insurance
222300 PACO-001	Plumbing & HVAC Systems - Close Outs	222300-20	222300-20		Signed Hazardous Materials Compliance Affidavit
222300 PACO-001	Plumbing & HVAC Systems - Close Outs	222300-21	222300-21		Signed Asbestos Free Affidavit
222300 PACO-001	Plumbing & HVAC Systems - Close Outs	222300-22	222300-22		All Other Warranties Required
222300 PACO-001	Plumbing & HVAC Systems - Close Outs	222300-23	222300-23		Operations & Maintenance Manuals
222300 PACO-001	Plumbing & HVAC Systems - Close Outs	222300-24	222300-24		Replacement Parts turned over to Owner
222300 PACO-001	Plumbing & HVAC Systems - Close Outs	222300-25	222300-25		Inspections & Certificates
222300 PACO-001	Plumbing & HVAC Systems - Close Outs	222300-26	222300-26		Plumbing Certificate of Acceptance
222300 PACO-001	Plumbing & HVAC Systems - Close Outs	222300-27	222300-27		Mechanical Certificate of Acceptance
222300 PACO-001	Plumbing & HVAC Systems - Close Outs	222300-28	222300-28		Final/Certified TAB Report
222300 PACO-001	Plumbing & HVAC Systems - Close Outs	222300-29	221119	Domestic Water Piping Specialties	Operation and maintenance data on domestic water piping specialties.
222300 PACO-001	Plumbing & HVAC Systems - Close Outs	222300-30	221316	Sanitary Waste and Vent Piping	Warranty on sanitary waste and vent piping.
222300 PACO-001	Plumbing & HVAC Systems - Close Outs	222300-31	221319	Sanitary Waste Piping Specialties	Operation and maintenance data on sanitary waste piping specialties.
222300 PACO-001	Plumbing & HVAC Systems - Close Outs	222300-32	224213.13	Commercial Water Closets	Operation and maintenance data on commercial water closets.
222300 PACO-001	Plumbing & HVAC Systems - Close Outs	222300-33	224213.16	Commercial Urinals	Operation and maintenance data on commercial urinals.
222300 PACO-001	Plumbing & HVAC Systems - Close Outs	222300-34	224216.13	Commercial Lavatories	Operation and maintenance data on commercial lavatories.
222300 PACO-001	Plumbing & HVAC Systems - Close Outs	222300-35	224216.16	Commercial Sinks	Maintenance data on commercial sinks.
222300 PACO-001	Plumbing & HVAC Systems - Close Outs	222300-36	224500	Emergency Plumbing Fixtures	Operation and maintenance data on emergency plumbing fixtures.
222300 PACO-001	Plumbing & HVAC Systems - Close Outs	222300-37	224716	Pressure Water Coolers	Maintenance data on pressure water coolers.
222300 PACO-001	Plumbing & HVAC Systems - Close Outs	222300-38	226600	Chemical-Waste Systems for Laboratory and Healthcare Facilities	Operation and maintenance data on chemical-waste systems for laboratory and healthcare facilities.
222300 PACO-001	Plumbing & HVAC Systems - Close Outs	222300-39	226600	Chemical-Waste Systems for Laboratory and Healthcare Facilities	Extra Materials on Neutralization-System Limestone and Chemicals. For each neutralization system.
222300 PACO-001	Plumbing & HVAC Systems - Close Outs	222300-40	226600	Chemical-Waste Systems for Laboratory and Healthcare Facilities	Owner's Training on Chemical-Waste Systems for Laboratory and Healthcare Facilities.
222300 PACO-001	Plumbing & HVAC Systems - Close Outs	222300-41	230900	Building Management System	Owner's Training on Building Management System.
222300 PACO-001	Plumbing & HVAC Systems - Close Outs	222300-42	230900	Building Management System	Warranty on Building Management System. Please see technical specifications for more details.
222300 PACO-001	Plumbing & HVAC Systems - Close Outs	222300-43	230900	Building Management System	Operation and maintenance data on building management system.
222300 PACO-001	Plumbing & HVAC Systems - Close Outs	222300-44	230900	Building Management System	As-Builts on Building Management System
222300 PACO-001	Plumbing & HVAC Systems - Close Outs	222300-45	231123	Facility Natural-Gas Piping	Operation and maintenance data on facility natural-gas piping.
222300 PACO-001	Plumbing & HVAC Systems - Close Outs	222300-46	232116	Hydronic Piping Specialties	Operation and maintenance data for hydronic piping specialties.
222300 PACO-001	Plumbing & HVAC Systems - Close Outs	222300-47	232123	Hydronic Pumps	Operation and maintenance data for hydronic pumps.
222300 PACO-001	Plumbing & HVAC Systems - Close Outs	222300-48	232300	Refrigerant Piping	Operation and maintenance data for refrigerant valves and piping specialties.
222300 PACO-001	Plumbing & HVAC Systems - Close Outs	222300-49	233300	Air Duct Accessories	Operation and maintenance data on air duct accessories.
222300 PACO-001	Plumbing & HVAC Systems - Close Outs	222300-50	233423	HVAC Power Ventilators	Operation and maintenance data on HVAC power ventilators.
222300 PACO-001	Plumbing & HVAC Systems - Close Outs	222300-51	233600	Air Terminal Units	Operation and maintenance data on air terminal units.
222300 PACO-001	Plumbing & HVAC Systems - Close Outs	222300-52	236200	Packaged Compressor and Condenser Units	Operation and maintenance data on packaged compressor and condenser units.
222300 PACO-001	Plumbing & HVAC Systems - Close Outs	222300-53	236200	Packaged Compressor and Condenser Units	Special 5 year warranty on packaged compressor and condenser units. Please see technical specifications for more details.
222300 PACO-001	Plumbing & HVAC Systems - Close Outs	222300-54	237223.29	Packaged, Outdoor, Fixed Plate Energy Recovery Units	Operation and maintenance data on packaged, outdoor, fixed, plate energy recovery units.
222300 PACO-001	Plumbing & HVAC Systems - Close Outs	222300-55	237223.29	Packaged, Outdoor, Fixed Plate Energy Recovery Units	Warranty on packaged energy recovery units. One year from date of substantial completion.
222300 PACO-001	Plumbing & HVAC Systems - Close Outs	222300-56	237223.29	Packaged, Outdoor, Fixed Plate Energy Recovery Units	10 year warranty on fixed-plate heat exchangers.
222300 PACO-001	Plumbing & HVAC Systems - Close Outs	222300-57	237416	Packaged Rooftop Air-Conditioning Units	Operation and maintenance data on packaged rooftop air-conditioning units.
222300 PACO-001	Plumbing & HVAC Systems - Close Outs	222300-58	237416	Packaged Rooftop Air-Conditioning Units	Extra Materials on Filters regarding Packaged Rooftop Air-Conditioning Units. One set of filters for each unit.
222300 PACO-001	Plumbing & HVAC Systems - Close Outs	222300-59	237416	Packaged Rooftop Air-Conditioning Units	5 year warranty on compressor regarding packaged rooftop air-conditioning units. One year warranty for parts.
222300 PACO-001	Plumbing & HVAC Systems - Close Outs	222300-60	238126	Split-System Air-Conditioners	Operation and maintenance data on split-system air-conditioning units.
222300 PACO-001	Plumbing & HVAC Systems - Close Outs	222300-61	238126	Split-System Air-Conditioners	5 year warranty on compressor regarding split system air conditioners along with 5 years for parts and 1 year for labor.
222300 PACO-001	Plumbing & HVAC Systems - Close Outs	222300-62	238216.11	Hydronic Air Coils	Operation and maintenance data on hydronic air coils.
222300 PACO-001	Plumbing & HVAC Systems - Close Outs	222300-63	238223	Unit Ventilators	Operation and maintenance data on unit ventilators.
222300 PACO-001	Plumbing & HVAC Systems - Close Outs	222300-64	238223	Unit Ventilators	Extra Materials on Unit Ventilator Filters. Furnish one spare filter for each filter installed.
222300 PACO-001	Plumbing & HVAC Systems - Close Outs	222300-65	238223	Unit Ventilators	Warranty on Unit Ventilators.
222300 PACO-001	Plumbing & HVAC Systems - Close Outs	222300-66	238223	Unit Ventilators	Owner's Training on Unit Ventilators.
222300 PACO-001	Plumbing & HVAC Systems - Close Outs	222300-67	238239.13	Cabinet Unit Heaters	Operation and maintenance data on cabinet unit heaters.
222300 PACO-001	Plumbing & HVAC Systems - Close Outs	222300-68	238239.16	Propeller Unit Heaters	Operation and maintenance data on propeller unit heaters.

BID DIVISION 222300 - PLUMBING HVAC SYSTEMS

222300-001	Plumbing & HVAC Systems - Submittals	222300-69	078413	Penetration Firestopping	Product data on penetration firestopping.
222300-001	Plumbing & HVAC Systems - Submittals	222300-70	078416	Through Penetration Firestopping	Product data on through penetration firestopping.
222300-001	Plumbing & HVAC Systems - Submittals	222300-71	220553	Identification for Plumbing Piping and Equipment	Product data, equipment label schedule, valve numbering scheme, and valves schedules regarding ID for plumbing piping and equipment.
222300-001	Plumbing & HVAC Systems - Submittals	222300-72	220719	Plumbing Piping Insulation	Product data on plumbing piping insulation.
222300-001	Plumbing & HVAC Systems - Submittals	222300-73	221116	Domestic Water Piping	Product data on domestic water piping.
222300-001	Plumbing & HVAC Systems - Submittals	222300-74	221119	Domestic Water Piping Specialties	Product data and shop drawings on domestic water piping specialties.
222300-001	Plumbing & HVAC Systems - Submittals	222300-75	221316	Sanitary Waste and Vent Piping	Product data on sanitary waste and vent piping.
222300-001	Plumbing & HVAC Systems - Submittals	222300-76	221319	Sanitary Waste Piping Specialties	Product data on sanitary waste piping specialties.
222300-001	Plumbing & HVAC Systems - Submittals	222300-77	221319.13	Sanitary Drains	Product data on sanitary drains.
222300-001	Plumbing & HVAC Systems - Submittals	222300-78	221413	Facility Storm Drainage Piping	Product data on facility storm drainage piping.
222300-001	Plumbing & HVAC Systems - Submittals	222300-79	221423	Storm Drainage Piping Specialties	Product data on storm drainage piping specialties.
222300-001	Plumbing & HVAC Systems - Submittals	222300-80	224213.13	Commercial Water Closets	Product data on commercial water closets.
222300-001	Plumbing & HVAC Systems - Submittals	222300-81	224213.16	Commercial Urinals	Product data on commercial urinals.
222300-001	Plumbing & HVAC Systems - Submittals	222300-82	224216.13	Commercial Lavatories	Product data and shop drawings on commercial lavatories.
222300-001	Plumbing & HVAC Systems - Submittals	222300-83	224216.16	Commercial Sinks	Product data on commercial sinks.
222300-001	Plumbing & HVAC Systems - Submittals	222300-84	224500	Emergency Plumbing Fixtures	Product data on emergency plumbing fixtures.
222300-001	Plumbing & HVAC Systems - Submittals	222300-85	224716	Pressure Water Coolers	Product data and shop drawings on pressure water coolers.
222300-001	Plumbing & HVAC Systems - Submittals	222300-86	226600	Chemical-Waste Systems for Laboratory and Healthcare Facilities	Product data and shop drawings on chemical-waste systems for laboratory and healthcare facilities.
222300-001	Plumbing & HVAC Systems - Submittals	222300-87	230553	Identification for HVAC Piping and Equipment	Product data, equipment label schedule, valve numbering scheme, and valves schedules regarding ID for HVAC piping and equipment.
222300-001	Plumbing & HVAC Systems - Submittals	222300-88	230713	Duct Insulation	Product data on duct insulation.
222300-001	Plumbing & HVAC Systems - Submittals	222300-89	230719	HVAC Piping Insulation	Product data on HVAC piping insulation.
222300-001	Plumbing & HVAC Systems - Submittals	222300-90	230900	Building Management System	Product data on building management system.
222300-001	Plumbing & HVAC Systems - Submittals	222300-91	230900	Building Management System	Shop drawings on building management system.
222300-001	Plumbing & HVAC Systems - Submittals	222300-92	231123	Facility Natural-Gas Piping	Product data on facility natural-gas piping.
222300-001	Plumbing & HVAC Systems - Submittals	222300-93	232113	Hydronic Piping	Product data on hydronic piping.
222300-001	Plumbing & HVAC Systems - Submittals	222300-94	232116	Hydronic Piping Specialties	Product data on hydronic piping specialties.
222300-001	Plumbing & HVAC Systems - Submittals	222300-95	232123	Hydronic Pumps	Product data and shop drawings on hydronic pumps.
222300-001	Plumbing & HVAC Systems - Submittals	222300-96	232300	Refrigerant Piping	Product data and shop drawings on refrigerant piping.
222300-001	Plumbing & HVAC Systems - Submittals	222300-97	233113	Metal Ducts	Shop drawings on metal ducts.
222300-001	Plumbing & HVAC Systems - Submittals	222300-98	233300	Air Duct Accessories	Product data and shop drawings on air duct accessories.
222300-001	Plumbing & HVAC Systems - Submittals	222300-99	233346	Flexible Ducts	Product data on flexible ducts.
222300-001	Plumbing & HVAC Systems - Submittals	222300-100	233423	HVAC Power Ventilators	Product data on HVAC power ventilators.
222300-001	Plumbing & HVAC Systems - Submittals	222300-101	233423	HVAC Power Ventilators	Shop drawings on HVAC power ventilators.
222300-001	Plumbing & HVAC Systems - Submittals	222300-102	233600	Air Terminal Units	Product data and shop drawings on air terminal units.
222300-001	Plumbing & HVAC Systems - Submittals	222300-103	233713.13	Air Diffusers	Product data on air diffusers.
222300-001	Plumbing & HVAC Systems - Submittals	222300-104	233723	HVAC Gravity Ventilators	Product data and shop drawings on HVAC gravity ventilators.
222300-001	Plumbing & HVAC Systems - Submittals	222300-105	236200	Packaged Compressor and Condenser Units	Product data on packaged compressor and condenser units.
222300-001	Plumbing & HVAC Systems - Submittals	222300-106	236200	Packaged Compressor and Condenser Units	Shop drawings on packaged compressor and condenser units.
222300-001	Plumbing & HVAC Systems - Submittals	222300-107	237223.29	Packaged, Outdoor, Fixed Plate Energy Recovery Units	Product data on packaged, outdoor, fixed plate energy recovery units.
222300-001	Plumbing & HVAC Systems - Submittals	222300-108	237223.29	Packaged, Outdoor, Fixed Plate Energy Recovery Units	Shop drawings on packaged, outdoor, fixed plate energy recovery units.
222300-001	Plumbing & HVAC Systems - Submittals	222300-109	237416	Packaged Rooftop Air-Conditioning Units	Product data on packaged rooftop air conditioning units.
222300-001	Plumbing & HVAC Systems - Submittals	222300-110	237416	Packaged Rooftop Air-Conditioning Units	Shop drawings on packaged rooftop air conditioning units.
222300-001	Plumbing & HVAC Systems - Submittals	222300-111	238126	Split-System Air-Conditioners	Product data and shop drawings on split system air conditioners.
222300-001	Plumbing & HVAC Systems - Submittals	222300-112	238216.11	Hydronic Air Coils	Product data on hydronic air coils.
222300-001	Plumbing & HVAC Systems - Submittals	222300-113	238223	Unit Ventilators	Product data on unit ventilators.
222300-001	Plumbing & HVAC Systems - Submittals	222300-114	238223	Unit Ventilators	Shop drawings on unit ventilators
222300-001	Plumbing & HVAC Systems - Submittals	222300-115	238236	Finned-Tube Radiation Heaters	Product data on finned-tube radiation heaters.
222300-001	Plumbing & HVAC Systems - Submittals	222300-116	238239.13	Cabinet Unit Heaters	Product data and shop drawings on cabinet unit heaters.
222300-001	Plumbing & HVAC Systems - Submittals	222300-117	238239.16	Propeller Unit Heaters	Product data and shop drawings on propeller unit heaters.

Bid Division: 260000 – Electrical

Bid to Include: Mandatory to have (2) shifts: Work hours 7 am – 11 pm Monday thru Friday, weekends as needed

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 263213 – Packaged Engine Generator System
Section 263653 – Transfer Switches
Section 264313 – Surge Protection
Section 265100 – Interior Lighting
Section 265600 – Exterior Lighting
Section 271501 – Basic Cabling Requirements
Section 271513 – Network and Communications Cabling

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

Section 024116 – Selective Demolition (Demolition of electrical components)
Section 078413 – Penetration Firestopping
Section 078416 – Through 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.

Bid Division: 260000 – Electrical

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

Bid Division: 260000 – Electrical

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

Project Inclusions:

1. Review the milestone schedules. This bid division's work will 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. Include costs for all required permits in bid proposal. This bid division will be in Elementary as well as HS/MS.
3. Provide all required electrical demolition work as documented and for the completion of the new work.
4. Provide all required temporary power and lighting.
5. Provide all required power disconnection at existing mechanical equipment and new power connections for new mechanical equipment.
6. This bid division responsible for Fire Alarm System, as noted on Drawings. Please pay attention to these details.
7. Provide final electrical connection for all equipment.
8. Contractor responsible for ALL firestopping, as it pertains to this bid divisions work.
9. This bid division responsible for Fire Alarm System, as documented on Drawings.

Bid Division: 260000 – Electrical

10. Contractor responsible for (2) shifts of work: Work hours 7 am – 11 pm, Monday-Friday.
11. This contractor expected to have daily shift supervisors meeting at shift change for continuity of work.
12. Daily clean-up is required, as it pertains to this bid division.
13. Must provide all submittals within 20 working days of contract award or sooner, unless specifically clarified with the construction manager prior to contract award.
14. Mandatory attendance at pre-construction meeting.
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.
16. Project Inclusions are provided as assistance for contractors that are bidding and are not an all-inclusive scope of work. It is every contractor's responsibility to review all the construction documents and prepare their bid accordingly.
17. **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 260000

BID DIVISION 260000 - ELECTRICAL

Package #	Package	Number	Spec #	Spec	Title
260000 PA-001	Electrical - Start Ups	260000-01			Signed Post Bid Interview Form
260000 PA-001	Electrical - Start Ups	260000-02			Schedule of Values
260000 PA-001	Electrical - Start Ups	260000-03			Signed Contracts Returned
260000 PA-001	Electrical - Start Ups	260000-04			Payment/Performance Bonds
260000 PA-001	Electrical - Start Ups	260000-05			Certificate of Insurance
260000 PA-001	Electrical - Start Ups	260000-06			Employee List
260000 PA-001	Electrical - Start Ups	260000-07			Safety Policy
260000 PA-001	Electrical - Start Ups	260000-08			SDS Sheets
260000 PA-001	Electrical - Start Ups	260000-09			Certificate of Subcontractor & Supplier
260000 PA-001	Electrical - Start Ups	260000-10			AHERA Notification and Contractor Compliance Affidavit
260000 PA-001	Electrical - Start Ups	260000-11			Electrical Permit
260000 PACO-001	Electrical - Close Outs	260000-12			Contractor (2) Year Guarantee
260000 PACO-001	Electrical - Close Outs	260000-13			Consent of Surety
260000 PACO-001	Electrical - Close Outs	260000-14			Certificate of Substantial Completion
260000 PACO-001	Electrical - Close Outs	260000-15			Completed Punch List
260000 PACO-001	Electrical - Close Outs	260000-16			As Built Drawings
260000 PACO-001	Electrical - Close Outs	260000-17			All Processed Change Orders Returned
260000 PACO-001	Electrical - Close Outs	260000-18			Current Certificate of Insurance
260000 PACO-001	Electrical - Close Outs	260000-19			Signed Hazardous Materials Compliance Affidavit
260000 PACO-001	Electrical - Close Outs	260000-20			Signed Asbestos Free Affidavit
260000 PACO-001	Electrical - Close Outs	260000-21			All Other Warranties Required
260000 PACO-001	Electrical - Close Outs	260000-22			Operations & Maintenance Manuals
260000 PACO-001	Electrical - Close Outs	260000-23			Replacement Parts turned over to Owner
260000 PACO-001	Electrical - Close Outs	260000-24			Inspections & Certificates
260000 PACO-001	Electrical - Close Outs	260000-25			Electrical Certificate of Acceptance
260000 PACO-001	Electrical - Close Outs	260000-26	262416	Panelboards	Extra Materials on Keys regarding Panelboard. Furnish 2 of each to Owner.
260000 PACO-001	Electrical - Close Outs	260000-27	262419	Motor Control	Operation and maintenance data on motor control.
260000 PACO-001	Electrical - Close Outs	260000-28	262419	Motor Control	Extra Materials on Fuses. Furnish 3 of each type used on project.
260000 PACO-001	Electrical - Close Outs	260000-29	263213	Packaged Engine Generator Systems	Project Record Documents: Accurately record location of engine generator and mechanical and electrical connections.
260000 PACO-001	Electrical - Close Outs	260000-30	263213	Packaged Engine Generator Systems	Operation and maintenance data on packaged engine generator systems.
260000 PACO-001	Electrical - Close Outs	260000-31	263213	Packaged Engine Generator Systems	1 year warranty on packaged engine generator systems.
260000 PACO-001	Electrical - Close Outs	260000-32	263213	Packaged Engine Generator Systems	Extra Materials on Engine Generator System: Furnish tools. Please see technical specifications for more details.
260000 PACO-001	Electrical - Close Outs	260000-33	263653	Transfer Switches	Operation and maintenance data on transfer switch.
260000 PACO-001	Electrical - Close Outs	260000-34	271513	Network and Communication Cabling	Project Record Documents: Accurately record all cable routing, cable numbers/identification and destinations.
260000 PACO-001	Electrical - Close Outs	260000-35	271513	Network and Communication Cabling	Product warranty on network and communication cabling.
260000-001	Electrical - Submittals	260000-36	260526	Grounding and Bonding for Electrical Systems	Product data and test reports on grounding and bonding for electrical systems.
260000-001	Electrical - Submittals	260000-37	262416	Panelboards	Shop drawings on panelboards.
260000-001	Electrical - Submittals	260000-38	262419	Motor Control	Product data and shop drawings on motor control.
260000-001	Electrical - Submittals	260000-39	262726	Wiring Devices	Product data on wiring devices.
260000-001	Electrical - Submittals	260000-40	262816	Enclosed Switches and Circuit Breakers	Product data and shop drawings on enclosed switches and circuit breakers.
260000-001	Electrical - Submittals	260000-41	263213	Packaged Engine Generator Systems	Product data and shop drawings on packaged engine generator systems.
260000-001	Electrical - Submittals	260000-42	263653	Transfer Switches	Product data on transfer switch.
260000-001	Electrical - Submittals	260000-43	264313	Surge Protection Device	Product data and shop drawings on surge protection devices.
260000-001	Electrical - Submittals	260000-44	265100	Interior Lighting	Product data and shop drawings on interior lighting.
260000-001	Electrical - Submittals	260000-45	265600	Exterior Lighting	Product data and shop drawings on exterior lighting.
260000-001	Electrical - Submittals	260000-46	271501	Basic Cabling Requirements	Shop drawings on basic cabling.
260000-001	Electrical - Submittals	260000-47	271513	Network and Communication Cabling	Product data and test reports on network and communication cabling.

Bid Division: 310000 – Site Work

Bid to Include:

Total Responsibility for Specification Sections:

Total Responsibility for Specification Sections:

Section 311000 – Site Clearing
Section 312000 – Earth Moving
Section 312319 – Dewatering
Section 315000 – Excavation Support and Protection
Section 321216 – Asphalt Paving
Section 321313 – Concrete Paving
Section 321373 – Concrete Paving Joint Sealants
Section 329200 – Turf Restoration
Section 333100 – Sanitary Sewer

Limited Responsibility for Specification Sections (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:

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 code
8. This Contractor shall be responsible for performing all work in full compliance with all health and safety standards including Asbestos Awareness and Notification, Lead Paint Abatement, and all MIOSHA Standards. This Contractor shall also be responsible for satisfying all safety violations and/or fines resulting from the actions or lack of action by this Contractor at the sole expense of this Contractor.
9. Any contractor who compounds a mistake by installing their product on another Contractor's obvious faulty work will assume responsibility for repair of said work.

Bid Division: 310000 – Site Work

10. This contractor shall repair and restore any damaged area to an original or better condition with no detectable evidence that the area has been repaired. Repairs must be done by personnel qualified in the execution of the work skilled and licensed in that trade. Whenever possible, repairs to work shall be done by the original installer of the work.
11. Submittal of all insurance, unit pricing, schedule of values, required product data and shop drawings within (2) two weeks of Owner's Notice to commence work.
12. Must provide all submittals within 20 working days of contract award or sooner, unless specifically clarified with the construction manager prior to contract award.
13. Provide all layout and measurements required to perform the work of this Bid Division.
14. The Owner reserves the right to salvage any materials removed from the site during the duration of the project.
15. Coordinate delivery of materials with Construction Manager (48 hours) in advance of the delivery, and provide proper personnel and equipment to perform the unloading.
16. Contractor shall submit to the field construction manager a complete written daily field report stating the work being done on site and the number of employees performing the work for each day the Contractor has representatives on site.
17. Contractor shall have a supervisor on site at all times when a crew is present on the job.
18. On Friday, or last workday of each week, the Contractor must update the Master Copy of As-Builts, as it applies to the work of their Bid Division.
19. **Wolgast uses 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. Furnish and install all under drainage with filter sock.
3. Furnish and install (collector piping) storm piping into storm structures.
4. Barricade trees to protect from construction.
5. Excavation for foundation is by the Concrete Contractor - Bid Division 030100.
6. 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.
7. Provide de-watering for work in your Bid Division.
8. Furnish and install all gravel base material; finish grading of gravel, compaction and preparation for all placement of asphalt paving.
9. 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.
10. 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.
11. 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.
12. All site demolition required for installation of asphalt work and final site work.
13. 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.
14. Responsible for all required permit for erosion and sedimentation control.
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. All seeding required for all areas affected by construction.

Bid Division: 310000 – Site Work

17. Aggregate base course to be finished graded after placement and also immediately prior to lay down of asphaltic concrete paving.
18. All required topsoil. Topsoil to be graded to + .1 feet of designed finish grade after placement and also immediately prior to landscaping activities.
19. All site utilities as it relates to water, storm, sanitary, and gas to within 5 feet of building.
20. 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.
21. Provide temporary fencing around all additions during construction.
22. Provide all required permits.
23. Patching of asphalt on parking lot disturbed during construction if caused by this Bid Division.
24. Provide all import fill soils and export of all spoil or unusable soils necessary to complete all work or required by the construction documents.
25. Temporary care & maintenance of all plants and lawns until final completion of all work and acceptance by Owner.
26. Notify and correspond with Miss Dig before work commences and throughout the project.
27. All saw cutting of asphalt and concrete as required on site.
28. Tie into all downspouts within 5 feet of the buildings. (Coordinate with Bid Division 222300 – Mechanical)
29. Furnish and install irrigation sleeves as required.
30. 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 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. Patching of existing asphalt drive disturbed during construction if caused by this Bid Division.
3. Temporary care & maintenance of all plants and wetland areas until final completion of all work and acceptance by owner.
4. Provide all required permits. Soil Erosion permit will be provided by the Site 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.
5. Provide all required stone and sand fill and compaction as required for temporary entrance drive, per drawing.
6. Provide all required re-grading with fill and removal as necessary to achieve revised grades as documented.
7. Provide all required topsoil and fine grading as necessary for the installation of seeding.
8. Provide and install vehicle access gate as shown on Drawings.
9. Restore drive area back to green space once construction is complete.
10. Responsible for sanitary hook-up, outside of 5' from building.
11. Daily clean up as required, as it relates to this bid division.
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. Mandatory attendance at pre-construction meeting.
14. 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.
15. Project Inclusions are provided as assistance for contractors that are bidding and are not an all-inclusive scope of work. It is every contractor's responsibility to review all the construction documents and prepare their bid accordingly.

Bid Division: 310000 – Site Work

16. **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.**

Excludes:

1. Concrete Testing
2. Temporary Bracing.
3. Soil Density Testing

Consideration for award:

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

END OF BID DIVISION 310000

BID DIVISION 310000 - SITE WORK

Package #	Package	Number	Spec #	Spec	Title
310000 PA-001	Site Work - Start Ups	310000-01			Signed Post Bid Interview Form
310000 PA-001	Site Work - Start Ups	310000-02			Schedule of Values
310000 PA-001	Site Work - Start Ups	310000-03			Signed Contracts Returned
310000 PA-001	Site Work - Start Ups	310000-04			Payment/Performance Bonds
310000 PA-001	Site Work - Start Ups	310000-05			Certificate of Insurance
310000 PA-001	Site Work - Start Ups	310000-06			Employee List
310000 PA-001	Site Work - Start Ups	310000-07			Safety Policy
310000 PA-001	Site Work - Start Ups	310000-08			SDS Sheets
310000 PA-001	Site Work - Start Ups	310000-09			Certificate of Subcontractor & Supplier
310000 PA-001	Site Work - Start Ups	310000-10			AHERA Notification and Contractor Compliance Affidavit
310000 PACO-001	Site Work - Close Outs	310000-11			Contractor (2) Year Guarantee
310000 PACO-001	Site Work - Close Outs	310000-12			Consent of Surety
310000 PACO-001	Site Work - Close Outs	310000-13			Certificate of Substantial Completion
310000 PACO-001	Site Work - Close Outs	310000-14			Completed Punch List
310000 PACO-001	Site Work - Close Outs	310000-15			As Built Drawings
310000 PACO-001	Site Work - Close Outs	310000-16			All Processed Change Orders Returned
310000 PACO-001	Site Work - Close Outs	310000-17			Current Certificate of Insurance
310000 PACO-001	Site Work - Close Outs	310000-18			Signed Hazardous Materials Compliance Affidavit
310000 PACO-001	Site Work - Close Outs	310000-19			Signed Asbestos Free Affidavit
310000 PACO-001	Site Work - Close Outs	310000-20			All Other Warranties Required
310000 PACO-001	Site Work - Close Outs	310000-21			Operations & Maintenance Manuals
310000 PACO-001	Site Work - Close Outs	310000-22			Replacement Parts turned over to Owner
310000 PACO-001	Site Work - Close Outs	310000-23			Inspections & Certificates
310000-001	Site Work - Submittals	310000-24	312000	Earth Moving	Materials Source for Earth Moving: Submit name of imported fill materials suppliers.
310000-001	Site Work - Submittals	310000-25	312319	Dewatering	Shop drawings on dewatering system.
310000-001	Site Work - Submittals	310000-26	315000	Excavation Support an	Shop drawings on excavation support and protection.
310000-001	Site Work - Submittals	310000-27	321216	Asphalt Paving	Asphalt and Concrete Mix Designs.
310000-001	Site Work - Submittals	310000-28	321216	Asphalt Paving	Certification of quality for the following: aggregates, asphalt cement, pavement marking material, prime coat and bond coat.
310000-001	Site Work - Submittals	310000-29	321313	Concrete Paving	Concrete Mix Designs (Concrete Paving)
310000-001	Site Work - Submittals	310000-30	321313	Concrete Paving	Certification of quality for the following: cementitious materials, admixtures and aggregates.
310000-001	Site Work - Submittals	310000-31	321374	Concrete Paving Joint	Product data and test reports on concrete paving joint sealants.
310000-001	Site Work - Submittals	310000-32	321374	Concrete Paving Joint	Samples on concrete paving joint sealants.
310000-001	Site Work - Submittals	310000-33	329200	Turf Restoration	Product data on topsoil, grass seed, mulch and fertilizer.
310000-001	Site Work - Submittals	310000-34	333100	Sanitary Sewers	Product data and shop drawings on sanitary sewers.

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: **2025 Junior High/High School Renovations**

Site Location: **Coleman Community Schools – Junior High/High School**

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)

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

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

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

BETWEEN the Owner:
(Name, legal status, address and other information)
«Owner_Name»
«Owner_Address»
«Owner_CSZ»
Telephone:
Facsimile:

and the Contractor:
(Name, legal status, address and other information)
«Contractor»
«Address»
«CSZ»
Telephone:
Facsimile:

for the following Project:
(Name, legal status, address and other information)
«Project_Description»
«Project_Name»
«Project_Address»
«Project_CSZ»

«Bid_Division» - «Description»

The Construction Manager is:
(Name, legal status, address and other information)
Wolgast Corporation
4835 Towne Centre Road, Suite 203
Saginaw, MI 48604
Telephone: (989) 790-9120
Facsimile: (989) 790-9063

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.

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TABLE OF ARTICLES

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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: **Coleman Community Schools**
4823 North Coleman Schools Drive
Coleman, MI 48618

D. Certificates must show as 'additional insured' the Owner, **Coleman Community 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:

Coleman Community Schools

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

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

CERTIFICATE OF LIABILITY INSURANCE

DATE (MM/DD/YYYY) (1)

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

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

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

INSURED	INSURER(S) AFFORDING COVERAGE	NAIC #
(3)	INSURER A : (4)	
	INSURER B :	
	INSURER C :	
	INSURER D :	
	INSURER E :	
	INSURER F :	

COVERAGES **CERTIFICATE NUMBER:** **REVISION NUMBER:**

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

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

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

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

CERTIFICATE HOLDER

(11) INSERT THE OWNER'S NAME HERE

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

CANCELLATION

(12)
SHOULD ANY OF THE ABOVE DESCRIBED POLICIES BE CANCELLED BEFORE THE EXPIRATION DATE THEREOF, NOTICE WILL BE DELIVERED IN ACCORDANCE WITH THE POLICY PROVISIONS.

AUTHORIZED REPRESENTATIVE

(13)

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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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CG 20 10 04 13

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

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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)

Coleman Community Schools, 2024 School Bond Construction Program – including remodeling, furnishing and refurnishing, and equipping and re-equipping the Coleman Junior/Senior High School building; acquiring, installing and equipping ore re-equipping school buildings for instructional technology; all in accordance with the relevant application for preliminary qualifications of bonds, the approved project scopes, applicable laws, the applicable plans and specifications, the Owner's fixed budget, and as otherwise approved by the Owner.

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)

Coleman Community Schools
4823 North Coleman Schools Drive
Coleman, Michigan 48618
Telephone: (989) 465-6060
Facsimile: (989) 465-9853

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

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

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

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

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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 also include the advertisement or invitation to bid, Instructions to Bidders, other information furnished by the Owner in anticipation of receiving bids or proposals, Owner-accepted portions of the Contractor's bid or proposal, and portions of addenda relating to bidding or proposal 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 be liable for results of interpretations or decisions rendered in good 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 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 may agree upon protocols governing the transmission and use of, and reliance on, Instruments of Service or any other information or documentation in digital form.

(Paragraphs deleted)

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 subject to

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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.

(Paragraph deleted)

§ 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'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, but not limited to, those required under Section 3.7.1, the Owner shall secure and pay for necessary approvals, easements, assessments and charges required for construction, use or occupancy of permanent structures or for permanent changes in existing facilities. Unless otherwise provided under the Contract Documents, the Owner, assisted by the Construction Manager, shall secure and pay for the building permit.

§ 2.3.2 The Architect is the person lawfully licensed to practice architecture, or an entity lawfully practicing architecture, in the jurisdiction where the Project 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 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 whose status under the Contract Documents shall be that of the Construction Manager or Architect, respectively.

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§ 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. 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 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 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 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 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, including any claim against the Contractor's Performance Bond, correct such default or neglect. In such case, the Owner may deduct from payments then or thereafter due the Contractor the reasonable cost of correcting such deficiencies, including Owner's expenses, including any and all legal expenses incurred to effectuate and enforce this provision and compensation for the Construction Manager's and Architect's and their respective consultants' additional services made necessary by such default, neglect, or failure. If current and future payments are not sufficient to cover such amounts, the Contractor shall pay the difference to the Owner. If the Contractor disagrees with the actions of the Owner or the Architect, or the amounts claimed as costs to the Owner, the Contractor may file a Claim pursuant to Article 15.

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

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

ARTICLE 3 CONTRACTOR

§ 3.1 General

§ 3.1.1 The Contractor is the person or entity identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number. The Contractor shall be lawfully licensed, if required in the jurisdiction

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where the Project is located. The Contractor shall designate in writing a representative who shall have express authority to bind the Contractor with respect to all matters under this Contract. The term "Contractor" means the Contractor or the Contractor's authorized representative.

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

§ 3.1.2 The Contractor shall perform the Work in accordance with the Contract Documents.

§ 3.1.3 The Contractor shall not be relieved of its obligations to perform the Work in accordance with the Contract Documents either by activities or duties of the Construction Manager or Architect in their administration of the Contract, or by tests, inspections or approvals required or performed by persons or entities other than the Contractor.

§ 3.2 Review of Contract Documents and Field Conditions by Contractor

§ 3.2.1 Execution of the Contract by the Contractor is a representation that the Contractor has visited the site, become generally familiar with local conditions under which the Work is to be performed, and correlated personal observations with requirements of the Contract Documents.

§ 3.2.2 Because the Contract Documents are complementary, the Contractor shall, before starting each portion of the Work, carefully study and compare the various Contract Documents relative to that portion of the Work, as well as the information furnished by the Owner pursuant to Section 2.3.5, shall take field measurements of any existing conditions related to that portion of the Work, and shall observe any conditions at the site affecting it. These obligations are for the purpose of facilitating coordination and construction by the Contractor and are not for the purpose of discovering errors, omissions, or inconsistencies in the Contract Documents; however, the Contractor shall promptly report to the Construction Manager and Architect any errors, inconsistencies or omissions discovered by or made known to the Contractor as a request for information submitted to the Construction Manager in such form as the Construction Manager and Architect may require. It is recognized that the Contractor's review is made in the Contractor's capacity as a contractor and not as a licensed design professional, unless otherwise specifically provided in the Contract Documents.

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

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

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

§ 3.3 Supervision and Construction Procedures

§ 3.3.1 The Contractor shall supervise and direct the Work, using the Contractor's best skill and attention. The Contractor shall be solely responsible for, and have control over, construction means, methods, techniques, sequences, and procedures, and for coordinating all portions of the Work under the Contract. If the Contract Documents give

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

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

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

§ 3.4 Labor and Materials

§ 3.4.1 Unless otherwise provided in the Contract Documents, the Contractor shall provide and pay for labor, materials, equipment, tools, construction equipment and machinery, water, heat, utilities, transportation, and other facilities and services necessary for proper execution and completion of the Work, whether temporary or permanent and whether or not incorporated or to be incorporated in the Work. Such provision of labor and materials shall occur in sufficient time to satisfy the existing Project schedule. The Contractor bears the risk of any failure to timely provide such labor and materials for any reason. The Contractor agrees to execute the appropriate UCC forms to effectuate the Owner's ownership of the material and equipment furnished pursuant to this Agreement.

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

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

§ 3.4.4 The Contractor, Construction Manager, and Architect each respectively agree that neither they nor their subcontractors will discriminate against any employee or applicant for employment, to be employed in the performance of this contract, with respect to hire, tenure, conditions or privilege of employment, or any matter directly or indirectly related to employment, because of race, age, sex, color, religion, national origin, ancestry or physical disability. Breach of this covenant may be regarded as a material breach of this contract.

§ 3.4.5 Asbestos-Free Product Installation

§ 3.4.5.1 Asbestos may be present within the construction areas. The Contractor is required to obtain, review, and understand the Owner's hazardous material report and/or asbestos management plan prior to performing construction work that disturbs the site. The Contractor is not to disturb any in-place hazardous materials, except as required to perform the Contractor's authorized scope of work and only as permitted by law, available hazardous materials information, and the Owner or its authorized agents. The Contractor must immediately stop all Work and notify the Owner if they reasonably suspect the presence of unknown hazardous materials and/or have unwittingly disturbed any materials reasonably suspected to be hazardous materials.

§ 3.4.5.2 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

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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.

§ 3.4.5.3 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.

§ 3.4.5.4 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

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.

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

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

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

§ 3.6 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

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

§ 3.7.4 **Concealed or Unknown Conditions.** If the Contractor encounters conditions at the site that are (1) subsurface or otherwise concealed physical conditions that differ materially from those indicated in the Contract Documents or (2) unknown physical conditions of an unusual nature that differ materially from those ordinarily found to exist and generally recognized as inherent in construction activities of the character provided for in the Contract Documents, the Contractor shall promptly provide written and dated notice to the Owner, Construction Manager, and the Architect before conditions are disturbed and in no event later than 14 days after first observance of the conditions. The Architect and Construction Manager will promptly investigate such conditions and, if the Owner and the Architect, in consultation with the Construction Manager, determines that they differ materially and cause an increase or decrease in the Contractor's cost of, or time required for, performance of any part of the Work, they will recommend that an equitable adjustment be made in the Contract Sum or Contract Time, or both. If the Owner and the Architect, in consultation with the Construction Manager, determines that the conditions at the site are not materially different from those indicated in the Contract Documents and that no change in the terms of the Contract is justified, the Architect shall promptly notify the Owner, Construction Manager, and Contractor, stating the reasons. If the Contractor disputes the Architect's determination or recommendation, 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 provide written and dated notification to the Owner, Construction Manager, and Architect. Upon receipt of such notice, the Owner shall promptly take any action necessary to obtain governmental authorization required to resume the operations. The Contractor shall continue to suspend such operations until otherwise instructed by the Owner but shall continue with all other operations that do not affect those remains or features. Requests for adjustments in the Contract Sum and Contract Time arising from the existence of such remains or features 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 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.

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§ 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. The Owner and/or the Construction Manager may reply within 14 days of receipt of the information, 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.

§ 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.

§ 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 which approval shall not be unreasonably delayed or withheld. The submittal schedule shall (1) be coordinated with the Contractor's construction schedule, (2) allow the Construction Manager and Architect reasonable time to review 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 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.

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

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

§ 3.11 Documents and Samples at the Site

The Contractor shall make available, at the Project site, the Contract Documents, including Change Orders, Construction Change Directives, and other Modifications, in good order and marked currently to indicate field changes and selections made during construction, and the approved Shop Drawings, Product Data, Samples, and similar required submittals. These shall be in electronic form or paper copy, available to the Construction Manager, Architect, and Owner, and delivered to the Construction Manager for submittal to the Owner upon completion of the Work as a record of the Work as constructed.

§ 3.12 Shop Drawings, Product Data, and Samples

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

§ 3.12.2 Product Data are illustrations, standard schedules, performance charts, instructions, brochures, diagrams, and other information furnished by the Contractor for submittal to and review by the Architect to illustrate materials or equipment for some portion of the Work. All Work shall be furnished and installed in accordance with the Drawings, Specifications and as additionally required by the manufacturer's printed instructions. The Contractor shall review the manufacturer's instructions, and where conflict occurs between the Drawings or Specifications and the manufacturer's instructions, the Contractor shall request clarification from the Architect prior to commencing the Work.

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

§ 3.12.4 Shop Drawings, Product Data, Samples, and similar submittals are not Contract Documents. Their purpose is to demonstrate how the Contractor proposes to conform to the information given and the design concept expressed in the Contract Documents for those portions of the Work for which the Contract Documents require submittals. Review by the Architect and Construction Manager is subject to the limitations of Sections 4.2.10 through 4.2.12. Informational submittals upon which the Construction Manager and Architect are not expected to take responsive action may be so identified in the Contract Documents. Submittals that are not required by the Contract Documents may be returned by the Construction Manager or Architect without action.

§ 3.12.5 The Contractor shall review for compliance with the Contract Documents, approve, and submit to the Construction Manager, Shop Drawings, Product Data, Samples, and similar submittals required by the Contract Documents, in accordance with the Project submittal schedule approved by the Construction Manager and Architect

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

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

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

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

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

§ 3.12.10 The Contractor shall not be required to provide professional services that constitute the practice of architecture or engineering unless such services are specifically required by the Contract Documents for a portion of the Work or unless the Contractor needs to provide such services in order to carry out the Contractor's responsibilities for construction means, methods, techniques, sequences, and procedures. The Contractor shall not be required to provide professional services in violation of applicable law.

§ 3.12.10.1 If professional design services or certifications by a design professional related to systems, materials, or equipment are specifically required of the Contractor by the Contract Documents, the Owner and the Architect will specify all performance and design criteria that such services must satisfy. The Contractor shall be entitled to reasonably rely upon the adequacy and accuracy of the performance and design criteria provided in the Contract Documents 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 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, 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.

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§ 3.13 Use of Site

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

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

§ 3.14 Cutting and Patching

§ 3.14.1 The Contractor shall be responsible for cutting, fitting, or patching required to complete the Work or to make its parts fit together properly. All areas requiring cutting, fitting, or patching shall be restored to the condition existing prior to the cutting, fitting, or patching, unless otherwise required by the Contract Documents.

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

§ 3.15 Cleaning Up

§ 3.15.1 The Contractor and its Subcontractors shall keep the premises and surrounding area free from accumulation of waste materials and rubbish caused by operations under the Contract. At completion of the Work, the Contractor shall remove waste materials, rubbish, the Contractor's tools, construction equipment, machinery, and surplus materials from and about the Project.

§ 3.15.2 If the Contractor fails to clean up as provided in the Contract Documents, the Owner, or Construction Manager with the Owner's approval, may do so and the Owner shall be entitled to reimbursement from the Contractor.

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

§ 3.16 Access to Work

The Contractor shall provide the Owner, Construction Manager, and Architect with access to the Work in preparation and progress wherever located.

§ 3.17 Royalties, Patents and Copyrights

The Contractor shall pay all royalties and license fees. The Contractor shall defend suits or claims for infringement of copyrights and patent rights and shall indemnify and hold harmless the Owner, Construction Manager, and Architect 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

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any of them from and against claims, damages, losses, and expenses, including but not limited to attorneys' fees, arising out of or 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 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 or reduce any other rights or obligations of indemnity 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 addition to and not in limitation of the Contractor's other indemnity obligations, the Contractor hereby accepts and assumes exclusive liability for and shall indemnify and save harmless the Owner, Construction Manager and Architect from and against the payment of the following:

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

All sales, use, personal property and other taxes (including interest and penalties thereon) required by any federal, state, county, municipal or other law to be paid or collected by the Contractor or any of its Subcontractors or vendors or any other person or persons acting for, through or under it or any of them, by reason of the performance of the Work or the acquisition, ownership, furnishing, or use of any materials, equipment, supplies, labor, services or other items for or in connection with the Work;

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

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

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

ARTICLE 4 ARCHITECT AND CONSTRUCTION MANAGER

§ 4.1 General

§ 4.1.1 The Architect is the person or entity retained by the Owner pursuant to Section 2.3.2 and identified as such in the Agreement. The term "Architect," "Architect/Engineer," "Engineer," or "Design Professional" as used herein means the Architect or the Architect's authorized representative.

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

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§ 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 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 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 agreed with the 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. 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, the Project schedule and defects and deficiencies observed in the Work.

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

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

§ 4.2.5 The Construction Manager and Architect, except to the extent required by Section 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. 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 and neither will have control over or charge of, or be responsible for acts or omissions of, the Contractor, Subcontractors, or their agents or employees, or of any other persons or entities performing portions of the Work. The Construction Manager will schedule and coordinate the work of all Contractors on the Project, including the Contractors' use of the site. The Construction Manager will keep the Contractors informed of the Project Construction Schedule to enable the Contractors to plan and perform the Work in a timely manner.

§ 4.2.6 Communications. The Owner shall endeavor to communicate with the Contractor and the Construction Manager's consultants through the Construction Manager about matters arising out of or relating to the Contract Documents. The Owner and Construction Manager shall endeavor to include the Architect in all communications that relate to or affect the Architect's services or professional responsibilities. The Owner shall endeavor to promptly notify the Architect of the substance of any direct communications between the Owner and the Construction Manager otherwise relating to the Project. Communications by and with the Architect's consultants shall be through the Architect. Communications by and with Subcontractors and suppliers 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.

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

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

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

§ 4.2.11 The Architect will review and approve, or take other appropriate action upon, the Contractor's submittals such as Shop Drawings, Product Data, and Samples, but only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents. The Architect's action will be taken in accordance with the submittal schedule approved by the Architect or, in the absence of an approved submittal schedule, with reasonable promptness while allowing sufficient time in the Architect's professional judgment to permit adequate review. Upon the Architect's completed review, the Architect shall transmit its submittal review to the Construction Manager.

§ 4.2.12 Review of the Contractor's submittals by the Construction Manager and Architect is not conducted for the purpose of determining the accuracy and completeness of other details such as dimensions and quantities, or for substantiating instructions for installation or performance of equipment or systems, all of which remain the responsibility of the Contractor as required by the Contract Documents. The Construction Manager and Architect's review of the Contractor's submittals shall not relieve the Contractor of the obligations under Sections 3.3, 3.5, and 3.12. The Construction Manager and Architect's review shall not constitute approval of safety precautions or of any construction means, methods, techniques, sequences, or procedures. The Architect's approval of a specific item shall not indicate approval of an assembly of which the item is a component. However, should the Construction Manager or Architect discover during the course of such review any inaccuracies, incompleteness, or other irregularities, they shall immediately notify the Owner of the same to determine an appropriate corrective course of action or notify the Contractor of the same to correct the irregularities.

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

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

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§ 4.2.15 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 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 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 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, the Architect will endeavor to secure faithful performance by Contractor, and will not be liable for results of interpretations or decisions so rendered in good faith and without negligence.

§ 4.2.20 The Architect's interpretations on matters relating to aesthetic effect will be final if consistent with the intent expressed in the Contract 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 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, including those fabricated to a special design. Within 14 days of receipt of the information, the Construction Manager 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. The

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Contractor shall remain, in all instances, jointly and severally liable to the Owner for all acts or omissions of its Subcontractor. All contractual agreements with additional persons or entities serving as a subcontractor shall incorporate the Contract Documents, expressly identify the Owner as a third-party beneficiary, give the Owner all rights against the Subcontractor that it would have against the Contractor and state that the Owner shall enjoy all third-party beneficiary rights not prohibited by law.

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

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

§ 5.2.4 The Contractor shall not substitute a Subcontractor, person, or entity for one previously selected if the Owner, Construction Manager or Architect makes reasonable objection to such substitution. The Contractor shall notify the Owner, the Architect, and the Construction Manager of any proposed subcontractor substitution a minimum of 10 days prior to such proposed change.

§ 5.3 Subcontractual Relations

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

§ 5.4 Contingent Assignment of Subcontracts

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

.1 assignment is effective only after termination of the Contract by the Owner for cause pursuant to Section 14.2 and only for those subcontract agreements that the Owner accepts by notifying the Subcontractor and Contractor; and

.2 assignment is subject to the prior rights of the surety, if any, obligated under bond relating to the Contract.

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

§ 5.4.2 Upon such assignment, if the Work has been suspended for more than 30 days, the Subcontractor's compensation 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.

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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. 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.

(Paragraph deleted)

§ 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.

§ 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 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.

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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, written contract amendment, or order for a minor change in the Work, subject to the limitations stated in this Article 7 and elsewhere in the Contract Documents.

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

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

§ 7.2 Change Orders

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

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

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

§ 7.3 Construction Change Directives

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

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

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

.1 Mutual acceptance of a lump sum properly itemized and supported by sufficient substantiating data to permit evaluation;
.2 Unit prices stated in the Contract Documents or subsequently agreed upon;
.3 Cost to be determined in a manner agreed upon by the parties and a mutually acceptable fixed or percentage fee; or
.4 As provided in Section 7.3.4.

§ 7.3.4 If the Contractor does not respond promptly or disagrees with the method for adjustment in the Contract Sum, the Construction Manager shall determine, 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;

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.2 Costs of materials, supplies, and equipment, including cost of transportation, whether incorporated or consumed;

.3 Rental costs of machinery and equipment, exclusive of hand tools, whether rented from the Contractor or others;

.4 Costs of premiums for all bonds and insurance, permit fees, and sales, use, or similar taxes, directly related to the change; and

.5 Costs of supervision and field office personnel directly attributable to the change.

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

§ 7.3.6 Upon receipt of a Construction Change Directive, the Contractor shall promptly proceed with the change in the Work involved and advise the Construction Manager of the Contractor's agreement or disagreement with the method, if any, provided in the Construction Change Directive for determining the proposed adjustment in the Contract Sum or Contract Time. Contractor agreements to a Construction Change Directive shall require a follow-up writing or signature as contemplated in Section 7.3.7.

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

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

§ 7.3.9 Pending final determination of the total cost of a Construction Change Directive to the Owner, the Contractor may request payment for undisputed Work completed under the Construction Change Directive in Applications for Payment. 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, 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 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.

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

§ 8.2 Progress and Completion

§ 8.2.1 Time limits stated in the Contract Documents are of the essence of the Contract. By executing the Agreement, the Contractor confirms that the Contract Time is a reasonable period for obtaining all supplies, materials, tools and equipment necessary to perform the Work and for properly performing the Work.

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

§ 8.2.3 The Contractor shall proceed expeditiously with adequate forces and shall achieve Substantial Completion within the Contract Time. All work shall be completed in sufficient time to allow for clean-up and preparation for Owner move-in prior to the date of Substantial Completion.

§ 8.3 Delays and Extensions of Time

§ 8.3.1 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 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 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 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.

(Paragraph deleted)

§ 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.

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ARTICLE 9 PAYMENTS AND COMPLETION

§ 9.1 Contract Sum

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

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

§ 9.2 Schedule of Values

Before the first Application for Payment, the Contractor shall submit a schedule of values 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 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 arising 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:

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.1 A list of the fabricated materials consigned to the Project (which shall be clearly identified, giving the place of storage, together with copies of invoices and reasons why materials cannot be delivered to the site.

.2 Certification that items have been tagged for delivery to the Project and that they will not be used for another purpose.

.3 A letter from the Contractor's Surety indicating agreement to the arrangements and that payment to the Contractor shall not relieve either party of their responsibility to complete the Work.

.4 Evidence of adequate insurance covering the material in storage, which shall name the Owner as additionally insured.

.5 Costs incurred by the Owner, Construction Manager and Architect to inspect material in off-site storage shall be paid by the Contractor.

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

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

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

§ 9.4 Certificates for Payment

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

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

§ 9.4.2.1 Within seven days after the Architect receives the Project Application and Project Certificate for Payment and the Summary of Contractors' Applications for Payment from the Construction Manager, the Architect will either (1) issue to the Owner a Project Certificate for Payment, with a copy to the Construction Manager; or (2) issue to the Owner a Project Certificate for Payment for such amount as the Architect determines is properly due, and notify the Construction Manager and Owner of the Architect's reasons for withholding certification in part as provided in Section 9.5.1; or (3) withhold certification of the entire Project Application for Payment, and notify the Construction Manager and Owner of the Architect's reason for withholding certification in whole as provided in Section 9.5.1. The Construction Manager will promptly forward the Architect's notice of withholding certification to the Contractors. As between the Owner and the Contractor, the failure of the Architect or Construction Manager to notify the Contractor or

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the Owner of a withheld certification does not render such withholding ineffective, and the Owner shall have no obligation to pay a Contractor for uncertified amounts or amounts for which no Certificate for Payment has been issued. If the Contractor does not receive notice of a withheld certification, it shall proceed as provided in Section 9.7.

§ 9.4.3 The Construction Manager's certification of an Application for Payment or, in the case of more than one Contractor, a Project Application and Certificate for Payment, shall be based upon the Construction Manager's evaluation of the Work and the data in the Application or Applications for Payment. The Construction Manager's certification will constitute a representation that, to the best of the Construction Manager's knowledge, information, and belief, the Work has progressed to the point indicated, the quality of the Work is in accordance with the Contract Documents, and that the Contractor is, or Contractors are, entitled to payment in the amount certified.

§ 9.4.4 The Architect's issuance of a Certificate for Payment or, in the case of more than one Contractor, Project Application and Certificate for Payment, shall be based upon the Architect's evaluation of the Work, the recommendation of the Construction Manager, and data in the Application for Payment or Project Application for Payment. The Architect's certification will constitute a representation that, to the best of the Architect's knowledge, information, and belief, the Work has progressed to the point indicated, the quality of the Work is in accordance with the Contract Documents, and that the Contractor is, or Contractors are, entitled to payment in the amount certified.

§ 9.4.5 The representations made pursuant to Sections 9.4.3 and 9.4.4 are subject to an evaluation of the Work for conformance with the Contract Documents upon Substantial Completion, to results of subsequent tests and inspections, to correction of minor deviations from the Contract Documents prior to completion, and to specific qualifications expressed by the Construction Manager or Architect, 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, 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 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;
.7 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.

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

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

§ 9.5.4 If the Architect or Construction Manager withholds certification for payment under Section 9.5.1, the Owner may, at its sole option, issue joint checks to the Contractor and to any Subcontractor or supplier to whom the Contractor failed to make payment for Work properly performed or material or equipment suitably delivered. If the Owner makes payments by joint check, the Owner shall notify the Architect and the Construction Manager, and both will reflect such payment on the next Certificate for Payment.

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

§ 9.6 Progress Payments

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

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

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

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

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

§ 9.6.5 The 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.

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

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

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

§ 9.7 Failure of Payment

If the Construction Manager and Architect do not issue a Certificate for Payment or a Project Certificate for Payment, through no fault of the Contractor 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, 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 (1) the Contractor receives payment of the amount owing, or (2) the Contractor receives notice from the Architect, Construction Manager, or Owner or a full or partial withheld certification as provided herein. The Contract Time shall be extended appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable costs of shutdown, delay and start-up, plus interest as provided for in the Contract Documents. The Owner shall have no obligation to pay the Contractor unless it receives a Certificate for Payment for the amount certified. The Owner may withhold payment from a non-performing Contractor irrespective of the issuance of a Certificate for Payment.

§ 9.8 Substantial Completion

§ 9.8.1 Substantial Completion is the stage in the progress of the Work when the Work or designated portion thereof is sufficiently complete in accordance with the Contract Documents and when all required occupancy permits, if any, have been issues, 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 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.

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

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

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

§ 9.9 Partial Occupancy or Use

§ 9.9.1 The Owner may occupy or use any completed or partially completed portion of the Work at any stage when such portion is designated by separate agreement with the Contractor, provided such occupancy or use is consented to by the insurer and authorized by public authorities having jurisdiction over the Project. Such partial occupancy or use may commence whether or not the portion is substantially complete. The Contractor shall proceed with the work in such a manner as reasonably directed and shall cooperate with the Owner to limit interruptions.

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

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

§ 9.10 Final Completion and Final Payment

§ 9.10.1 Upon completion of the Work, the Contractor shall forward to the Construction Manager a notice that the Work is ready for final inspection and acceptance, and shall also forward to the Construction Manager a final Contractor's Application for Payment. Upon receipt, the Construction Manager shall perform an inspection to confirm the completion of Work of the Contractor. The Construction Manager shall make recommendations to the Architect when the Work of all of the Contractors is ready for final inspection, and shall then forward the Contractors' notices and Application for Payment or Project Application for Payment, to the Architect, who will promptly make such inspection. When the Architect finds the Work acceptable under the Contract Documents and the Contract fully performed, the Construction Manager and Architect will promptly issue a final Certificate for Payment or Project Certificate for Payment stating that to the best of their knowledge, information and belief, and on the basis of their on-site visits and inspections, the Work has been completed in accordance with the Contract Documents and that the entire balance found to be due the Contractor and noted in the final Certificate is due and payable. The Construction Manager's and Architect's final Certificate for Payment or Project Certificate for Payment will constitute a further representation that conditions listed in Section 9.10.2 as precedent to the Contractor's being entitled to final payment have been fulfilled.

§ 9.10.2 Neither final payment nor any remaining retained percentage shall become due until the Contractor submits to the Architect through the Construction Manager (1) an affidavit that payrolls, bills for materials and equipment, and other indebtedness connected with the Work for which the Owner or the Owner's property might be responsible or encumbered (less amounts withheld by Owner) have been paid or otherwise satisfied, (2) a certificate evidencing that insurance required by the Contract Documents to remain in force after final payment is currently in effect, (3) a written

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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) 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 (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 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
(Paragraphs deleted)
not constitute a waiver of any Claims by the Owner.

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

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

ARTICLE 10 PROTECTION OF PERSONS AND PROPERTY

§ 10.1 Safety Precautions and Programs

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

§ 10.2 Safety of Persons and Property

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

.1 employees on the Work and other persons who may be affected thereby;

.2 the Work and materials and equipment to be incorporated therein, whether in storage on or off the site, under care, custody, or control of the Contractor, a Subcontractor, or a Sub-subcontractor;

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.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, 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 to property referred to in Sections 10.2.1.2, 10.2.1.3 and 10.2.1.4 caused in whole or in part by the Contractor, a Subcontractor, a Sub-subcontractor, or anyone directly or indirectly employed by any of them, or by anyone for whose acts they may be liable and for which the Contractor is responsible under Sections 10.2.1.2, 10.2.1.3 and 10.2.1.4. The Contractor may make a Claim for the cost to remedy the damage or loss to the extent such damage or loss is attributable to acts or omissions of the Owner, Construction Manager or Architect or anyone directly or indirectly employed by any of them, or by anyone for whose acts any of them may be liable, and not attributable to the fault or negligence of the Contractor. The foregoing obligations of the Contractor are in addition to the Contractor's obligations under Section 3.18.

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

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

§ 10.2.8 Injury or Damage to Person or Property

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

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§ 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, 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. 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 to address shutdown, delay, and start-up.

(Paragraph deleted)

§ 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. 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.

(Paragraph deleted)

§ 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.

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§ 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, as described elsewhere in the Contract Documents, as required by law, or as reasonably required by the Owner in light of the nature of services performed and insurance obligations of its other contractors and consultants. The Contractor shall purchase and maintain the required insurance from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located. The Owner, Construction Manager and Construction Manager's consultants, and the Architect and Architect's consultants, shall be named as additional insureds under the Contractor's commercial general liability policy or as otherwise described in the Contract Documents. On all insurance contracts under which the Contractor is obligated to have its insurance company name the Owner as additional insured, the Contractor shall require such insurance company to add to the policy the following clause: "The insurance afforded to the Additional Insured is primary insurance. If the Additional Insureds have other insurance which is applicable to the loss on an excess or contingent basis, the amount of the insurance company's liability under this policy shall not be reduced by the existence of such other insurance." Certificates of insurance acceptable to the Owner shall be submitted by Contractor to the Owner and Construction Manager prior to commencement of Work and thereafter upon renewal or replacement of each required policy of insurance.

§ 11.1.2 The Contractor shall provide bonds covering faithful performance of 100% of the Contract and payment of 100% of the obligations arising thereunder as stipulated in bidding requirements or specifically required by the Contract Documents or 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 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.

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§ 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. The cost of the insurance shall be charged to the Owner by a Change Order.

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

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

§ 11.2.3 Notice of Cancellation or Expiration of Owner's Required Property Insurance. Within three (3) business days of the date the Owner becomes aware of an impending or actual cancellation or expiration of any property insurance required by the Contract Documents, the Owner shall provide notice directly to the Contractor, and separately to the Construction Manager, of such impending or actual cancellation or expiration. Unless the lapse in coverage arises from an act or omission of the Contractor: (1) the Contractor, upon receipt of notice from the Owner, shall have the right to stop the Work until the lapse in coverage has been cured by the procurement of replacement coverage by either the Owner or the Contractor; and (2) the Contract Time and Contract Sum may be adjusted negotiation between the parties. If the Contractor purchases replacement coverage, the cost of the insurance shall be charged to the Owner by an appropriate Change Order. The furnishing of notice by the Owner shall not relieve the Owner of any contractual obligation to provide required insurance.

§ 11.3 Waivers of Subrogation

§ 11.3.1 The Owner 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.

(Paragraph deleted)

§ 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.

§ 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. 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.

(Paragraph deleted)

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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 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, 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 Owner shall reasonably adjust the Contract Sum and Contract Time as 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. If the Contractor fails to correct nonconforming Work within a reasonable time during that period after receipt of notice from the Owner, Construction Manager or Architect, the Owner may correct it in accordance with Section 2.5.

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

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

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

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

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

§ 13.2 Successors and Assigns

§ 13.2.1 The Owner and Contractor respectively bind themselves, their partners, successors, assigns, and legal representatives to covenants, agreements, and obligations contained in the Contract Documents. Except as provided in Section 13.2.2, neither party to the Contract shall assign the Contract as a whole without written consent of the other. If either party attempts to make an assignment without such consent, that party shall nevertheless remain legally responsible for all obligations under the Contract.

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

§ 13.3 Rights and Remedies

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

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

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§ 13.4 Tests and Inspections

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

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

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

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

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

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

§ 13.5 Interest

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

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

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

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

ARTICLE 14 TERMINATION OR SUSPENSION OF THE CONTRACT

§ 14.1 Termination by the Contractor

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

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.1 Issuance of an order of a court or other public authority having jurisdiction that requires all Work to be stopped;

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.3 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 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, 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 refuses or fails to supply enough properly skilled workers or proper materials to the point of negatively impacting the Project and/or the related schedule;

.2 fails to make payment to Subcontractors or suppliers in accordance with the respective agreements between the Contractor and the Subcontractors or suppliers;

.3 disregards applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of a public authority;

.4 otherwise is guilty of substantial breach of a provision of the Contract 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, 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).

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

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

§ 14.2.4 If the unpaid balance of the Contract Sum exceeds costs of finishing the Work, including compensation for the Construction Manager's and Architect's services and expenses made necessary thereby, and other damages incurred by the Owner in pursuing termination and completion of the Work, including actual attorney and legal fees and costs, and not expressly waived, such excess shall be paid to the Contractor. If such costs and damages exceed the unpaid balance, the Contractor shall pay the difference to the Owner. The amount to be paid to the Contractor or Owner, as the case may be, shall, upon application, be certified by the Initial Decision Maker after consultation with the Construction Manager, and this obligation for payment shall survive termination of the Contract.

§ 14.3 Suspension by the Owner for Convenience

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

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

.1 that performance is, was, or would have been, so suspended, delayed, or interrupted, by another cause for which the Contractor is responsible; or

.2 that an equitable adjustment is made or denied under another provision of this Contract.

§ 14.4 Termination by the Owner for Convenience

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

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

.1 cease operations as directed by the Owner in the notice;

.2 take actions necessary, or that the Owner may direct, for the protection and preservation of the Work; and

.3 except for Work directed to be performed prior to the effective date of termination stated in the notice, terminate all existing subcontracts and purchase orders and enter into no further subcontracts and purchase orders.

§ 14.4.3 In case of such termination for the Owner's convenience, the Owner shall pay the Contractor for Work properly executed; costs incurred by reason of the termination.

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, 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.

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

§ 15.1.3 Notice of Claims

§ 15.1.3.1 Claims by the 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 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 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 Contractor first recognizes the condition giving rise to the Claim, whichever is later. Failure to timely and properly initiate a claim shall be an irrevocable waiver of such claim. Claims by the Owner shall be governed by the applicable statute of limitations period, except as such time frame may be longer in accordance with Section 13.1 and Section 15.1.2.1.

§ 15.1.3.2 Claims by 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 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 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 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 waives Claims against the Owner for consequential damages arising out of or relating to this Contract. This waiver includes

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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 waiver is applicable, without limitation, to all consequential damages due to 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 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 interpretation. The Architect will serve as the Initial Decision Maker. Except for those Claims excluded by this Section 15.2.1, an initial interpretation shall be required as a condition precedent to mediation 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 an interpretation having been rendered. Unless the Initial Decision Maker and all affected parties agree, the Initial Decision Maker will not 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 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, 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 interpretation approving or rejecting the Claim, or indicating that the Initial Decision Maker is unable to resolve the Claim. This initial 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 interpretation shall be subject to the parties' agreed upon binding dispute resolution process.

§ 15.2.6 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.

(Paragraph deleted)

§ 15.2.7 SURETY NOTICE AND PRIOR APPROVAL

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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.

(Paragraph deleted)

§ 15.3 Mediation

§ 15.3.1 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 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.

§ 15.3.3

§ 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.

(Paragraphs deleted)

§ 15.4.4 Consolidation or Joinder

§ 15.4.4.1 The Owner, at is sole discretion, may consolidate mediation conducted under this Agreement with any other mediation to which it is a party provided that (1) the mediation agreement governing the other mediation permits consolidation, (2) the mediations to be consolidated substantially involve common questions of law or fact, and (3) the mediations employ materially similar procedural rules and methods for selecting mediator(s).

§ 15.4.4.2 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 inmediation, provided that the party sought to be joined consents in writing to such joinder. Consent to 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 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

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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.

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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

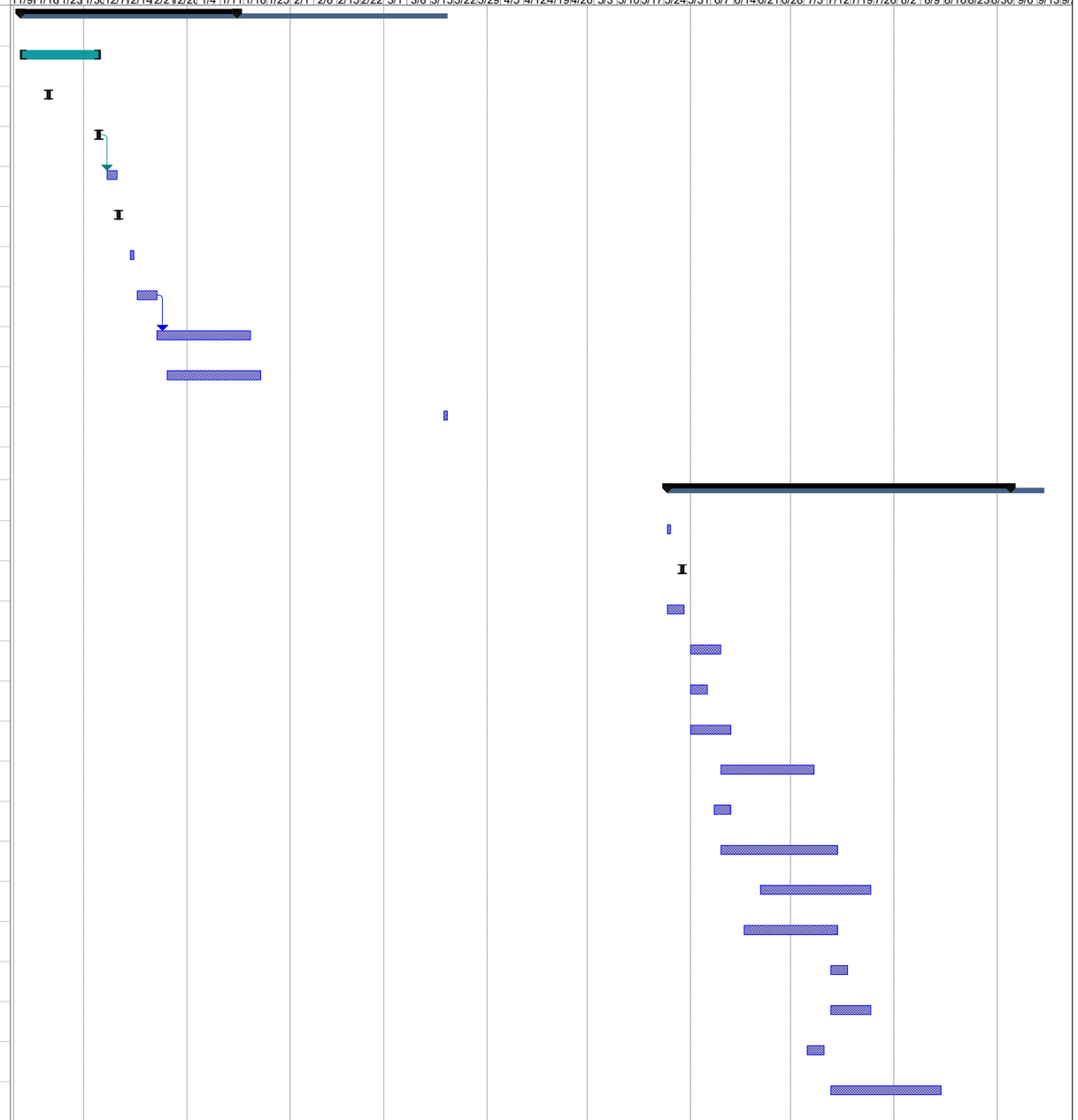
MILESTONE SCHEDULE ON FOLLOWING PAGE(S)

END OF SECTION 00999

Coleman Community Schools
2025 HS/MS Renovations
Milestone Schedule 2026

Mon 11/10/25

ID	Task Name	Duration	Start	Finish	Pred	R N	Text1
1	**Bidding**	**47 days?**	**Wed 11/12/25**	**Thu 1/15/26**			
2	Bid Period	18 days	Wed 11/12/25	Fri 12/5/25			
3	Pre-Bid Meeting	1 day	Thu 11/20/25	Thu 11/20/25			
4	Bid Due Date	1 day	Fri 12/5/25	Fri 12/5/25			
5	Post Bid Interviews	3 days	Mon 12/8/25	Wed 12/10/25	4		
6	Award Recommendation	1 day	Thu 12/11/25	Thu 12/11/25			
7	Owner Approval of Contracts	1 day	Mon 12/15/25	Mon 12/15/25			
8	Prepare and Issue Contracts	4 days	Wed 12/17/25	Mon 12/22/25			
9	Submittal Process	20 days	Tue 12/23/25	Mon 1/19/26	8		
10	Material Ordered	20 days	Fri 12/26/25	Thu 1/22/26			
11	Pre-Construction Meeting (Tentative)	1 day	Thu 3/19/26	Thu 3/19/26			
12							
13	**HS/MS Renovations**	**75 days**	**Mon 5/25/26**	**Fri 9/4/26**			
14	Site utility identification	1 day	Mon 5/25/26	Mon 5/25/26			
15	Mobilize	1 day	Fri 5/29/26	Fri 5/29/26			
16	Driveway for construction work	5 days	Mon 5/25/26	Fri 5/29/26			
17	Interior Demolition	7 days	Mon 6/1/26	Tue 6/9/26			2 shifts
18	Electrical Demolition	5 days	Mon 6/1/26	Fri 6/5/26			2 shifts
19	Mechanical Demolition	10 days	Mon 6/1/26	Fri 6/12/26			2 shifts
20	CMU Walls	20 days	Wed 6/10/26	Tue 7/7/26			2 shifts
21	2 Hour Fire Wall	5 days	Mon 6/8/26	Fri 6/12/26			2 shifts
22	Rough In Electrical for in wall	25 days	Wed 6/10/26	Tue 7/14/26			2 shifts
23	Rough in Mechanical	25 days	Mon 6/22/26	Fri 7/24/26			2 shifts
24	Above grid drywall to complete walls to deck	20 days	Wed 6/17/26	Tue 7/14/26			2 shifts
25	Tiling	5 days	Mon 7/13/26	Fri 7/17/26			2 shifts
26	Ceiling Grid	10 days	Mon 7/13/26	Fri 7/24/26			2 shifts
27	Windows/Doors	5 days	Mon 7/6/26	Fri 7/10/26			2 shifts
28	Mechanical Work	25 days	Mon 7/13/26	Fri 8/14/26			2 shifts

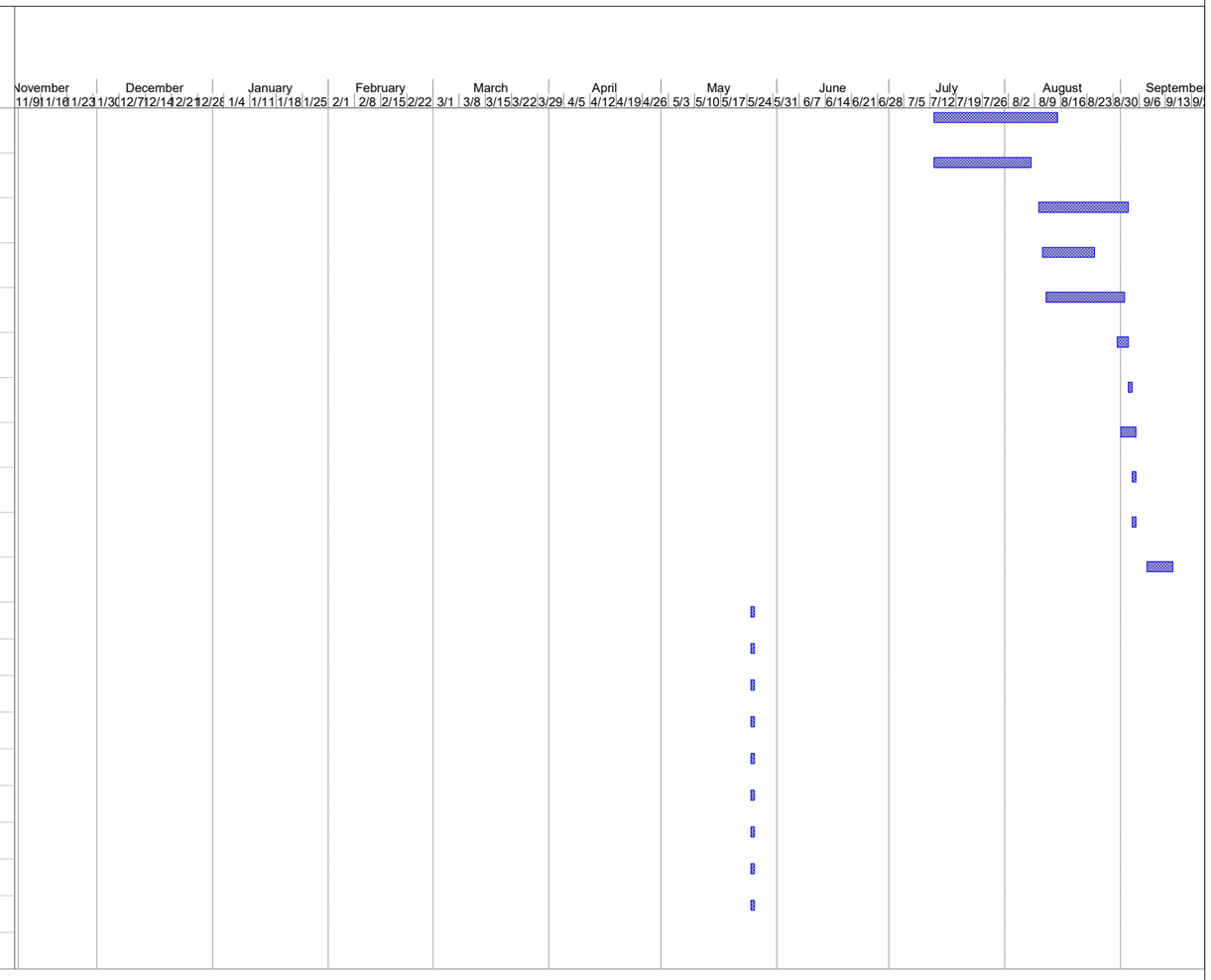


Wolgast Corporation reserves the right to make changes to this construction schedule as the project progress warrants.

Coleman Community Schools
2025 HS/MS Renovations
Milestone Schedule 2026

Mon 11/10/25

ID	Task Name	Duration	Start	Finish	Pred	R N	Text1
29	Electrical Work	25 days	Mon 7/13/26	Fri 8/14/26			2 shifts
30	Paint	20 days	Mon 7/13/26	Fri 8/7/26			2 shifts
31	Casework	18 days	Mon 8/10/26	Wed 9/2/26			2 shifts
32	Ceiling Tiles	10 days	Tue 8/11/26	Mon 8/24/26			2 shifts
33	Flooring	15 days	Wed 8/12/26	Tue 9/1/26			2 shifts
34	Site Restoration	3 days	Mon 8/31/26	Wed 9/2/26			
35	Final Inspections	1 day	Thu 9/3/26	Thu 9/3/26			
36	Final Cleaning	4 days	Tue 9/1/26	Fri 9/4/26			
37	Punch List by Architect/Owner	1 day	Fri 9/4/26	Fri 9/4/26			
38	Turnover to Owner	1 day	Fri 9/4/26	Fri 9/4/26			
39	Punch List Work by All Contractors	5 days	Tue 9/8/26	Mon 9/14/26			
40							
41							
42							
43							
44							
45							
46							
47							
48							
49							



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. Coleman Community Schools – 2025 Junior High/High School Renovations

1.02 CONTRACTORS USE OF PREMISES

A. Contractors shall limit their use of the Project site for Work and for storage, to allow for:

1. Work by other Contractors.

B. Contractors shall coordinate their use of the Project site under the direction of the Construction Manager.

C. Contractors shall assume full responsibility for the protection and safekeeping of materials and equipment stored on the site. No security will be employed.

D. Each Contractor shall move any stored material or equipment under their control if it interferes with 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 **September 4, 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. Mandatory to have (2) shifts per Bid Division Description: 7 a.m. to 11 p.m., Monday through Friday. Weekend as NEEDED.

1.02 EXCEPTIONS

A. Necessary variations of normal work hours shall only occur with the express approval of the Construction Manager on the Owner's behalf.

B. As a condition to the contract, the Contractor agrees that no premium-time, over-time or other special rate shall be charged for the scheduled completion of the project for any reason or cause.

C. It will be the responsibility of each Contractor to provide an adequate work force to assure the timely completion of all Work.

D. The Contractor will work whatever hours required (overtime, weekends, holidays) to complete their work and allow for the completion of all other work to achieve final completion in the time frames required by the Owner.

END OF SECTION 01030

PART 1 – GENERAL

1.01 CONSTRUCTION MANAGEMENT

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

1.02 WORK ASSIGNMENTS

A. Nothing contained on the Contract Documents, and especially in the work scope of any Bid Division, shall be construed as a Work assignment to any construction trade industry. Each Contractor is responsible for their own decisions on Work assignments, and shall make them in accord with the prevailing practice in the areas of the Project, and in such a way that neither their progress nor the progress of others will be adversely affected.

B. Disputes that may arise over improper assignments or over assignments claimed by more than one Contractor shall be settled immediately by the Contractors and shall in no case result in a 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 **Coleman Community Schools – 2025 Junior High/High School Renovations** to provide _____for the improvement of the property described as **Coleman Community 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 **Coleman Community Schools – 2025 Junior High/High School Renovations** to provide _____for the improvement of the property described as **Coleman Community Schools,** having been fully paid and satisfied, all my/our construction lien rights against such property and hereby waived and released.

_____
(Name of Lien Claimant)

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

Address: _____

_____

_____

Telephone: _____

END OF SECTION 01050

PART 1 – GENERAL

1.01 DESCRIPTION

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

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

1.02 PROCESSING OF CHANGE EVENT FORMS

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

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

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

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

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

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

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

PART 1 – GENERAL

1.01 PREVAILING WAGE

A. There is No Prevailing Wages 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

Alternate No. 1: New main corridor acoustical ceiling.

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 **Coleman Community Schools** as they pertain to hazardous materials.

The SDS's are attached for all hazardous materials which will be brought to **Coleman Community Schools.**

There are _____ SDS's attached.

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

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

_____ 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 **Coleman Community Schools**.

1.02 DESCRIPTION

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

AHERA Notification and
Contractor Compliance Affidavit

Project Name: **Coleman Community Schools – 2025 Junior High/High School Renovations**
Project #: **A25903**
Owner: **Coleman Community Schools**
Address: **4823 North Coleman Schools Drive, Coleman, Michigan 48618**

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: Coleman Community Schools.**

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

I / We _____doing business as _____ acknowledge receipt of the Three Year Re-Inspection Asbestos plan for the above mentioned project(s) as provided by Coleman Community Schools and certify that all employees of this contractor shall have been trained in the MIOSHA Two-Hour Asbestos Awareness program. It is this Contractor's responsibility to inform any subcontractors or suppliers of this information and assume all responsibility for such notification.

_____
Company

_____
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

Limited Asbestos Containing Building Material Survey of Coleman Jr/Sr High School

Prepared for:

Coleman Community Schools
4923 North Coleman Schools Drive
Coleman, Michigan 48618

Completed by:

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

Project No.: 250226
Report Date: October 24, 2025

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

VIEW THIS REPORT ONLINE

This report can be reviewed online through our interactive Site Asbestos Manager, or what we like to call SAM. SAM is our proprietary web application where you can not only store your PDF reports, but also quickly access your inspection information from any web enabled device.

Your maintenance team, outside contractors, or anyone with site access can quickly pull up the building floor plan, select the room they are interested in and quickly see the list of suspect asbestos containing materials we have discovered. Photographs, lab results, sample location, and asbestos content are instantly accessible.

No more looking through the old 3 ring binder only to find confusing or incomplete records. We can even update your records as things change, keeping your report current and applicable.

For access, please contact john@northernas.com for a quick tutorial and to set up your login credentials. Access is free for 1 year with every inspection.

Limited Asbestos Containing Building Material Survey Report of Coleman Jr/Sr High School

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1.0 EXECUTIVE SUMMARY

Coleman Community Schools retained Northern Analytical Services, LLC. (NAS) to conduct a limited asbestos containing building material survey of areas that will be impacted during an upcoming renovation. NAS only inspected areas and sampled SACM identified in the renovation plans dated July 26, 2025 from Integrated Designs Inc. and provided by Wolgast Corporation. Building information is as follows:

Coleman Jr/Sr High School
Approximate Size: 67,115 square feet
Number of Levels: 1
Year Constructed: 1975
Number of Additions: 0
Date(s) of Inspection: 10/13/25 & 10/14/2025
Inspector's Name: Joshua Christie
Inspector's Accreditation Number: A60272

This limited survey was intended to identify suspect asbestos containing building materials (SACM) found within specified areas of the building. In accordance with asbestos building inspection procedures defined in 40 CFR, Chapter 1, Part 61-National Emission Standards for Hazardous Air Pollutants (NESHAP), 1926.1101-Asbestos Standards for Construction, and 1910.1001-Asbestos Standards for General Industry, building owners and their contractors are responsible for having building materials tested for asbestos content prior to disturbance. This limited survey satisfies the NESHAP requirements only for the building materials and locations identified in this report. Additional inspections and testing will be necessary before performing renovations or other activities that will disturb building materials not included in this report.

A summary of our findings is provided in the Findings section of this report. A more detailed description of the SACMs identified during this survey is provided in the section titled Material Report. Also attached are sections titled Inspection Report and Sample Location Report. The Inspection Report will show what SACMs were found in each room and the Sample Location Report will describe where bulk samples were collected.

Materials identified as asbestos containing or that are assumed to contain asbestos should be maintained in good condition through a detailed operations and maintenance program. Those ACMs that would otherwise be damaged or disturbed during a planned renovation or maintenance activity should be remediated by properly trained personnel.

2.0 FINDINGS

2.1 Asbestos

The following table provides a summary of the SACMs that were identified during this survey:

Material Number	Homogeneous Material Description	Asbestos Detected	Percent Asbestos	Asbestos Type
1	Pipe Insulation - Pipe Wrap	Yes	---	Assumed
2	Pipe Insulation-Mudded Fitting - Elbows	Yes	4%	Chrysotile
3	- Intentionally Left Blank			
4	- Intentionally Left Blank			
5	- Intentionally Left Blank			
6	Drywall - Media Center	No	---	None Detected
7	- Intentionally Left Blank			
8	Laboratory Counter Top -	Yes	12%	Chrysotile
9	- Intentionally Left Blank			
10	- Intentionally Left Blank			
11	Fire Rated Door -	Yes	---	Assumed
12	Flooring-Carpet Glue -	No	---	None Detected
13	Cove Base - 4in Tan	No	---	None Detected
14	Caulk - On Interior Steel Transom Frame	No	---	None Detected
15	Glazing - On Interior Steel Transom Frame	Yes	6%	Chrysotile
16	Glue - Assumed Behind Visual Display Board	Yes	---	Assumed
17	Flooring - Assumed Under Casework	Yes	---	Assumed
18	Caulk - On Exterior Aluminum Window Frame	No	---	None Detected
19	Ceiling Tile - 2ft x 2ft White With Pinholes and Gouges	No	---	None Detected
20	Caulk - On Exterior Steel Storefront Frame	No	---	None Detected
21	Glazing - On Exterior Steel Storefront Frame	Yes	3%	Chrysotile
22	Floor Tile & Mastic - 12in x 12in White With Light and Dark Grey Flecks, Yellow Mastic	No	---	None Detected
23	Floor Tile & Mastic - 12in x 12in Tan With Dark Tan Flecks, Black Mastic	Yes	T-3% M-6%	Chrysotile
24	Flooring Layer Assumed Under Surface Layer -	Yes	---	Assumed
25	Fume Hood -	Yes	---	Assumed
26	Pipe Insulation-Assumed in Walls/Ceiling Cavities -	Yes	---	Assumed
27	Cove Base - 4in Black	No	---	None Detected
28	Sink Undercoating - Black	Yes	2%	Chrysotile
29	Caulk - On Interior Steel Door Frame	No	---	None Detected
30	Sink Undercoating - Cream	No	---	None Detected
31	Drywall & Joint Compound -	No	---	None Detected
32	Ceramic Tile & Grout - 1in Tan/Yellow	No	---	None Detected
33	Miscellaneous - Terrazzo - Tan	No	---	None Detected
34	Ceramic Tile & Grout - 4in Tan	No	---	None Detected
35	Plaster - Cementious Drywall Firestop	No	---	None Detected
36	Ceiling Tile - 2ft x 2ft White With Random Pinholes	No	---	None Detected
37	Vinyl Sheet Flooring - Grey	No	---	None Detected
38	Boiler Material (inside) - Lochinvar 2018 Build	Yes	---	Assumed
39	Miscellaneous - Material Assumed Inside Electrical Box	Yes	---	Assumed
40	Caulk - On New Steel Sidelight Frame	No	---	None Detected
41	Cove Base - 6in Tan	No	---	None Detected

Material Number	Homogeneous Material Description	Asbestos Detected	Percent Asbestos	Asbestos Type
42	Miscellaneous - Brick and Mortar	No	---	None Detected
43	Caulk - On Louver	No	---	None Detected
44	Caulk - Expansion Joint	No	---	None Detected
45	Vermiculite - Assumed Inside Walls	Yes	---	Assumed
46	Transite - Assumed Behind Soffit and Fascia	Yes	---	Assumed
47	Roofing -	Yes	---	Assumed

Although NAS has provided estimated quantities and locations for each of the materials we found to contain asbestos, it should be noted that materials fitting the above descriptions should be treated as asbestos containing if found elsewhere in the building. Additionally, any material not described in the attached Material Report should be assumed to contain asbestos until testing proves otherwise.

2.2 Other Potentially Hazardous Materials

Due to the age of the building, all paint and coatings, including ceramic tile glazing, are assumed to contain lead, cadmium and/or chromium.

All refrigeration devices such as air conditioners, drinking fountains, coolers, and refrigerators likely contain refrigerant gas/liquid. Refrigerants should be removed from the unit by a licensed technician prior to opening any of the interior components that would otherwise release the refrigerant.

Fluorescent lights have bulbs that likely contain mercury and should not be broken during handling. These light bulbs should be disposed of as mercury containing or recycled after they burn out.

Fluorescent lights also have electrical ballasts that may contain PCBs. Ballasts that were manufactured after 1979 were legally required to be free of PCBs and were required to indicate this on the label. Ballasts that do not have a “PCB Free” label must be assumed to contain PCBs.

Other pre-1979 building materials that may contain PCBs include electrical transformers, elevator pumps, and automatic door closers. Any of these components, if present, should either be tested or assumed to contain PCBs. Those components that are either known or assumed to contain PCBs should be removed if leaking or removed prior to a building renovation or demolition project.

3.0 ASBESTOS BACKGROUND

The United States Environmental Protection Agency (USEPA) and the State of Michigan both define asbestos containing materials (ACM) as those materials that are found to contain more than 1% asbestos (Chrysotile, Amosite, Tremolite, Crocidolite, Anthophyllite, or Actinolite). ACMs are classified into one of three categories which include: Thermal System Insulation, Surfacing materials, and Miscellaneous Materials. ACMs are further divided as either friable or non-friable; friable materials are those that can be crushed, crumbled, or pulverized with hand pressure when dry.

According to the National Emissions Standards for Hazardous Air Pollutants (NESHAP, 40 CFR Part 61) friable ACM or non-friable ACMs that will likely become friable during renovation/demolition activities must be properly removed prior to the material being disturbed.

The Michigan Department of Licensing and Economic Opportunity (MDLEO) requires asbestos abatement activities be conducted by licensed asbestos abatement contractors and that the work be conducted by accredited Asbestos Workers (32-hour minimum) and overseen by an accredited Asbestos Contractor Supervisor (40-hour) for all materials found to contain more than 1% asbestos. Should non-friable ACMs be left in place for demolition, MDLEO regulations would require the demolition work be conducted by a licensed asbestos abatement contractor with properly accredited workers.

Materials that contain 1% or less asbestos fiber as determined through point count analysis can be removed by properly trained individuals; MDLEO does not require asbestos worker accreditation for this type of work. Air monitoring, respiratory protection and training are required.

4.0 SURVEY PROCEDURES

NAS accredited Asbestos Building Inspector visited the site to perform the survey work. The areas included in the survey were visually and physically inspected for suspect asbestos containing materials. The attached drawing shows the areas that were included in this survey. During the survey the building was divided into functional spaces (FS) that represent a particular use area or room. Each FS was provided a unique room number or name and surveyed for the presence and quantity of SACMs. Functional spaces that appear on the attached drawing that are not labeled with a room number or name have not been included in this survey and must be inspected by NAS prior to performing any work that would otherwise disturb any of the materials present.

Once identified, each SACM was assigned a unique identifying number, called a material number, and provided a written description (material description). Each material was then categorized as thermal, surfacing, or miscellaneous; then quantified and classified as either

friable or non-friable. Please keep in mind that materials classified as non-friable at the time of the survey may become friable overtime or during renovation/demolition activities; plaster and drywall are examples of non-friable materials that will likely become friable during renovation or demolition.

Identified SACMs were then either sampled for the presence of asbestos or assumed to contain asbestos.

Samples from each identified material were collected in random locations. A unique sample number was assigned to each sample collected to link it to the corresponding material. Sample numbers begin with the material number, and then two figures starting with 01 were added to the end. For example, sample number 101 was collected from material number 1. If additional samples were collected from the same material, sample numbers increased consecutively, therefore sample numbers 101, 102, 103 would all be from material number 1.

The number of samples collected from each material was determined by regulatory requirements and the Inspector's findings. Regulatory requirements for each of the three material classifications are as follows:

- Friable surfacing materials require either 3, 5, or 7 samples depending on the amount of material present. (3 for <1,000 sq.ft., 5 for 1,000 to 5,000 sq.ft., and 7 for >5,000 sq.ft.)
- Thermal system insulation requires a minimum of 3 samples.
- Miscellaneous and non-friable materials require a minimum of 2 samples.

Once collected, samples were properly packaged and shipped via United Parcel Service to an independent, properly accredited laboratory for analysis. Analytical results have been included at the end of the Survey Report section.

A description of each of the suspect materials identified during this survey is attached to this report in a section titled Material Report. Also attached are sections titled Inspection Report and Sample Location Report. The Inspection Report will show what suspect materials were found in each room/area and the Sample Location Report will describe where bulk samples were collected.

Prior to disturbing any of the materials found in these buildings, one should carefully match each building material that is going to be disturbed with the materials listed in this report, should a material be discovered that is not clearly identified in this report, that material should be assumed to contain asbestos until testing can be performed. Materials not described in this report have not been tested for asbestos and should be treated as asbestos containing until testing can prove otherwise.

The materials that are either known or assumed to contain asbestos should not be disturbed except by an accredited abatement contractor during the removal process.

The Material Report also identifies which materials are currently considered to be Regulated Asbestos Containing Materials (RACM) by the MDEGLE and the US EPA. According to these agencies, RACMs are asbestos containing materials that are either friable or will likely become friable with the forces expected to be acted upon them. Materials that are currently RACM or would likely become RACM if otherwise left in place must be properly removed by an accredited asbestos abatement contractor prior to the renovation or demolition work being performed. Please note NAS made the RACM determination for each ACM described in this report based on its current condition; future renovations were not considered in this determination. Materials not listed as RACM in this report could become RACM; an accredited Asbestos Contractor Supervisor must determine which materials will become RACM during the course of any renovation or demolition activity.

5.0 LIMITATIONS

5.1 NAS made a reasonable attempt to investigate all spaces within the building covered under this report. Destructive inspection measures however were not performed, and it is likely that hidden layers or cavities were not identified by our inspector. The Client Responsibilities section of this report must be reviewed, and each listed action performed to help prevent asbestos exposure.

5.2 NAS only inspected areas and sampled SACM identified in the renovation plans dated July 26, 2025, from Integrated Designs Inc. and provided by Wolgast Corporation.

5.3 Boilers were operational at time of survey and therefore were not sampled. We recommend that the boilers either be tested by an accredited asbestos inspector just prior to the start of any renovation or demolition work or assumed to contain asbestos and removed as such.

5.4 Fire rated/solid doors were not sampled to avoid damaging the material and losing its fire rating.

5.5 Mudded pipe insulation/fittings were assumed to be located inside wall/ceiling cavities. We recommend these areas be more thoroughly inspected by an accredited asbestos building inspector prior to the start of any renovation/demolition work.

5.6 The roofing was not inspected or sampled to avoid causing roof leaks in an occupied building. Roofing materials should be inspected and sampled by an accredited asbestos inspector prior to the start of any renovation or demolition work.

5.7 Materials that are assumed to contain asbestos were not sampled to avoid damaging the material.

6.0 CLIENT RESPONSIBILITIES

NAS believes the following actions are required to be carried out by our Client to prevent unnecessary exposure to asbestos:

6.1 Review this report in its entirety and provide a signature on the Client Section of the included Signature Page.

6.2 All materials that are assumed to contain asbestos or assumed to be present must be tested prior to the start of any renovation or demolition work.

6.3 If our Client is not the building owner or manager, our Client shall share this report with the building owner and manager.

6.4 Provide written notification to all building occupants, including tenants, employees, contractors, vendors, or visitors, of the presence, location, and quantity of ACM or PACM at this site.

6.5 Ensure all known or assumed friable ACM or RACM is properly labeled with the following information:

DANGER
CONTAINS ASBESTOS FIBERS
MAY CAUSE CANCER
CAUSES DAMAGE TO LUNGS
DO NOT BREATHE DUST
AVOID CREATING DUST

6.6 Ensure all building occupants, who are likely to impact these materials, have received at least 2 hours of awareness training that is specific to this site and in accordance with the Michigan Construction Safety and Health Standards, including, but not limited to: Parts 602-Asbetos in Construction, 603-Lead Exposure in Construction, 604-Chromium (VI) in Construction, 609-Cadmium in Construction, and 690-Silica in Construction.

6.7 A recommended Awareness Training Certification and Acknowledgement is attached to this report and should be signed by all building occupants who are likely to work in close proximity of materials that are either known or are assumed to contain asbestos.

6.8 If destructive testing measures were not used by NAS during the asbestos survey (see limitation), contract NAS to further inspect areas where renovation or demolition work is to take place using destructive testing measures to better inspect covered layers or inaccessible cavities for potentially hidden suspect materials before any materials are disturbed at this site.

6.9 Contract with NAS to prepare a written asbestos abatement work plan prior to disturbing any building materials at this site. The work plan must be prepared by a State of Michigan accredited Asbestos Project Designer in accordance with 40 CFR Part 763.

6.10 Contract a State of Michigan licensed Asbestos Abatement Contractor to properly abate all materials that are either known or assumed to contain asbestos before the disturbance of said material occurs.

6.11 Ensure the asbestos abatement contractor and/or demolition contractor file the required 10-day permits with MDLEO and MDEGLE prior to disturbing any friable ACM, any RACM, or demolition of a load bearing structure. Demolition contractors are required to file this permit with MDEGLE even if no asbestos is present.

6.12 Contract NAS to perform third party perimeter air monitoring and post abatement clearance testing for all abatement activities.

6.13 Contract a State of Michigan licensed Asbestos Abatement Contractor to oversee all building demolition activities with an accredited 40-hour Asbestos Abatement Contractor Supervisor.

6.14 Immediately stop all site work if a material is discovered that does not clearly match the materials identified in this report and contact NAS for testing; assume newly identified materials contain asbestos until laboratory testing can prove otherwise.

7.0 SIGNATURE PAGE

7.1 Building Inspector

The person listed below herby attest that he/she/they did inspect, assess and perform sampling of suspect asbestos containing materials at Coleman Jr/Sr High School.

Name	Accreditation Number	Signature	Date
Joshua Christie	A60272		10/24/2025

7.2 Client

The person listed below herby attests that he/she/they have read this report in its entirety and understands the information provided. Furthermore, they agree that all the items listed under Client Responsibilities must be carried out by the Client and releases Northern Analytical Services, LLC. and their employees of any liability associated with this should the Client not complete every item.

Client Name: Coleman Community Schools
Client Address: 4923 North Coleman Schools Drive, Coleman, Michigan 48618

Client Authorized Agent Name	Signature	Date

This report is not valid unless all the above signatures are present.

Survey Data

Material Report

Northern Analytical Services

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

Customer: Coleman Community Schools
Building: Coleman Jr/Sr High School
Address: 4951 North Lewis Road
Coleman, MI 48618
Printed: October 24, 2025

Material Report

Material Number	*Homogeneous Material Description*	*Category*	*Friability**	*RACM***	*Asbestos Detected*	*Percent Asbestos*	*Asbestos Type*	*Quantity*	*Units*
1	Pipe Insulation - Pipe Wrap	Thermal	Yes	Yes	Yes	---	Assumed	28	Ln.Ft.
2	Pipe Insulation-Mudded Fitting - Elbows	Thermal	Yes	Yes	Yes	4%	Chrysotile	368	Ln.Ft.
3	- Intentionally Left Blank								
4	- Intentionally Left Blank								
5	- Intentionally Left Blank								
6	Drywall - Media Center	Misc.	No	No	No	---	None Detected	760	Sq.Ft.
7	- Intentionally Left Blank								
8	Laboratory Counter Top -	Misc.	Category II Non-Friable	Yes	Yes	12%	Chrysotile	952	Sq.Ft.
9	- Intentionally Left Blank								
10	- Intentionally Left Blank								
11	Fire Rated Door -	Misc.	Category II Non-Friable	No	Yes	---	Assumed	87	Each
12	Flooring-Carpet Glue -	Misc.	No	No	No	---	None Detected	Not Quantified	Sq.Ft.
13	Cove Base - 4in Tan	Misc.	No	No	No	---	None Detected	790	Sq.Ft.
14	Caulk - On Interior Steel Transom Frame	Misc.	No	No	No	---	None Detected	7	Sq.Ft.
15	Glazing - On Interior Steel Transom Frame	Misc.	Category II Non-Friable	No	Yes	6%	Chrysotile	7	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

Northern Analytical Services

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Customer: Coleman Community Schools
Building: Coleman Jr/Sr High School
Address: 4951 North Lewis Road
Coleman, MI 48618

Printed: October 24, 2025

Material Report

Material Number	*Homogeneous Material Description*	*Category*	*Friability**	*RACM***	*Asbestos Detected*	*Percent Asbestos*	*Asbestos Type*	*Quantity*	*Units*
16	Glue - Assumed Behind Visual Display Board	Misc.	Category II Non-Friable	No	Yes	---	Assumed	3912	Sq.Ft.
17	Flooring - Assumed Under Casework	Misc.	Category I Non-Friable	No	Yes	---	Assumed	1561	Sq.Ft.
18	Caulk - On Exterior Aluminum Window Frame	Misc.	No	No	No	---	None Detected	Not Quantified	Sq.Ft.
19	Ceiling Tile - 2ft x 2ft White With Pinholes and Gouges	Misc.	No	No	No	---	None Detected	Not Quantified	Sq.Ft.
20	Caulk - On Exterior Steel Storefront Frame	Misc.	No	No	No	---	None Detected	28	Sq.Ft.
21	Glazing - On Exterior Steel Storefront Frame	Misc.	Category II Non-Friable	No	Yes	3%	Chrysotile	28	Sq.Ft.
22	Floor Tile & Mastic - 12in x 12in White With Light and Dark Grey Flecks, Yellow Mastic	Misc.	No	No	No	---	None Detected	1290	Sq.Ft.
23	Floor Tile & Mastic - 12in x 12in Tan With Dark Tan Flecks, Black Mastic	Misc.	Category I Non-Friable	No	Yes	T-3% M-6%	Chrysotile	5390	Sq.Ft.
24	Flooring Layer Assumed Under Surface Layer -	Misc.	Category I Non-Friable	No	Yes	---	Assumed	29950	Sq.Ft.
25	Fume Hood -	Misc.	Category II Non-Friable	No	Yes	---	Assumed	30	Sq.Ft.
26	Pipe Insulation-Assumed in Walls/Ceiling Cavities -	Thermal	Yes	Yes	Yes	---	Assumed	120	Ln.Ft.
27	Cove Base - 4in Black	Misc.	No	No	No	---	None Detected	230	Sq.Ft.
28	Sink Undercoating - Black	Surfacing	Category II Non-Friable	No	Yes	2%	Chrysotile	5	Sq.Ft.
29	Caulk - On Interior Steel Door Frame	Misc.	No	No	No	---	None Detected	14	Sq.Ft.
30	Sink Undercoating - Cream	Surfacing	No	No	No	---	None Detected	2	Sq.Ft.

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Customer: Coleman Community Schools
Building: Coleman Jr/Sr High School
Address: 4951 North Lewis Road
Coleman, MI 48618

Printed: October 24, 2025

Material Report

Material Number	*Homogeneous Material Description*	*Category*	*Friability**	*RACM***	*Asbestos Detected*	*Percent Asbestos*	*Asbestos Type*	*Quantity*	*Units*
31	Drywall & Joint Compound -	Misc.	No	No	No	---	None Detected	6800	Sq.Ft.
32	Ceramic Tile & Grout - 1in Tan/Yellow	Misc.	No	No	No	---	None Detected	500	Sq.Ft.
33	Miscellaneous - Terrazzo - Tan	Misc.	No	No	No	---	None Detected	Not Quantified	Sq.Ft.
34	Ceramic Tile & Grout - 4in Tan	Misc.	No	No	No	---	None Detected	100	Sq.Ft.
35	Plaster - Cementious Drywall Firestop	Surfacing	No	No	No	---	None Detected	300	Sq.Ft.
36	Ceiling Tile - 2ft x 2ft White With Random Pinholes	Misc.	No	No	No	---	None Detected	Not Quantified	Sq.Ft.
37	Vinyl Sheet Flooring - Grey	Misc.	No	No	No	---	None Detected	1230	Sq.Ft.
38	Boiler Material (inside) - Lochinvar 2018 Build	Thermal	Yes	Yes	Yes	---	Assumed	50	Sq.Ft.
39	Miscellaneous - Material Assumed Inside Electrical Box	Misc.	Category II Non-Friable	No	Yes	---	Assumed	4	Sq.Ft.
40	Caulk - On New Steel Sidelight Frame	Misc.	No	No	No	---	None Detected	20	Sq.Ft.
41	Cove Base - 6in Tan	Misc.	No	No	No	---	None Detected	20	Sq.Ft.
42	Miscellaneous - Brick and Mortar	Misc.	No	No	No	---	None Detected	Not Quantified	Sq.Ft.
43	Caulk - On Louver	Misc.	No	No	No	---	None Detected	1	Sq.Ft.
44	Caulk - Expansion Joint	Misc.	No	No	No	---	None Detected	1	Sq.Ft.
45	Vermiculite - Assumed Inside Walls	Misc.	Yes	Yes	Yes	---	Assumed	20000	Sq.Ft.

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Customer: Coleman Community Schools
Building: Coleman Jr/Sr High School
Address: 4951 North Lewis Road
Coleman, MI 48618

Printed: October 24, 2025

Material Report

Material Number	*Homogeneous Material Description*	*Category*	*Friability**	*RACM***	*Asbestos Detected*	*Percent Asbestos*	*Asbestos Type*	*Quantity*	*Units*
46	Transite - Assumed Behind Soffit and Fascia	Misc.	Category II Non-Friable	No	Yes	---	Assumed	10000	Sq.Ft.
47	Roofing -	Misc.	Category I Non-Friable	Yes	Yes	---	Assumed	67115	Sq.Ft.

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

Coleman Community Schools
Coleman Jr/Sr High School
Limited Asbestos Containing Building Material Survey
Project No.: 250226
Report Date: October 24, 2025

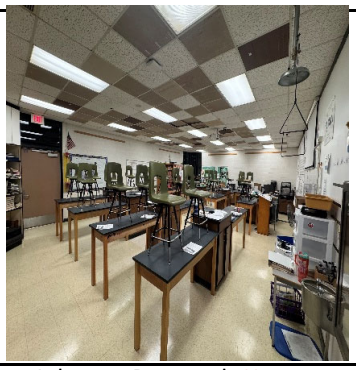
Material # 1	Material # 2
Pipe Insulation - Pipe Wrap	Pipe Insulation-Mudded Fitting - Elbows
	
Asbestos Detected: Yes Asbestos Type: Assumed Percent Asbestos: ---	Asbestos Detected: Yes Asbestos Type: Chrysotile Percent Asbestos: 4%

Material # 3	Material # 4
- Intentionally Left Blank	- Intentionally Left Blank
	

Material # 5	Material # 6
- Intentionally Left Blank	Drywall - Media Center
	
	Asbestos Detected: No Asbestos Type: None Detected Percent Asbestos: ---

Coleman Community Schools
Coleman Jr/Sr High School
Limited Asbestos Containing Building Material Survey
Project No.: 250226
Report Date: October 24, 2025

Material # 7
- Intentionally Left Blank

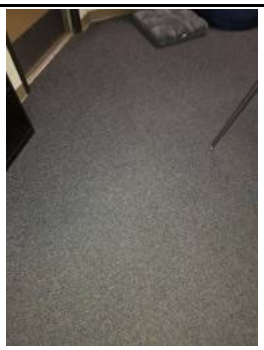
Material # 8
Laboratory Counter Top -

Asbestos Detected: Yes Asbestos Type: Chrysotile Percent Asbestos: 12%

Material # 9
- Intentionally Left Blank

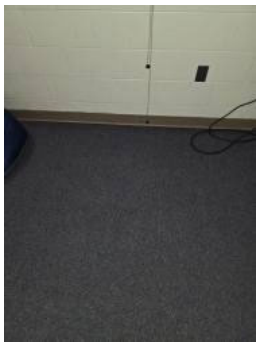
Material # 10
- Intentionally Left Blank

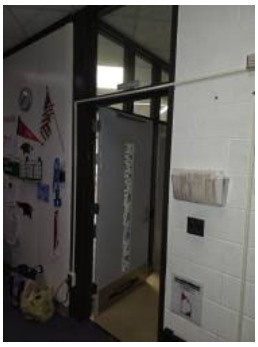
Material # 11
Fire Rated Door -

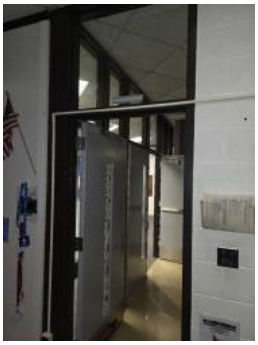
Asbestos Detected: Yes Asbestos Type: Assumed Percent Asbestos: ---

Material # 12
Flooring-Carpet Glue -

Asbestos Detected: No Asbestos Type: None Detected Percent Asbestos: ---

Coleman Community Schools
Coleman Jr/Sr High School
Limited Asbestos Containing Building Material Survey
Project No.: 250226
Report Date: October 24, 2025

Material # 13
Cove Base - 4in Tan

Asbestos Detected: No Asbestos Type: None Detected Percent Asbestos: ---

Material # 14
Caulk - On Interior Steel Transom Frame

Asbestos Detected: No Asbestos Type: None Detected Percent Asbestos: ---

Material # 15
Glazing - On Interior Steel Transom Frame

Asbestos Detected: Yes Asbestos Type: Chrysotile Percent Asbestos: 6%

Material # 16
Glue - Assumed Behind Visual Display Board

Asbestos Detected: Yes Asbestos Type: Assumed Percent Asbestos: ---

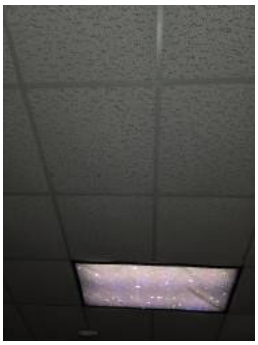
Material # 17
Flooring - Assumed Under Casework

Asbestos Detected: Yes Asbestos Type: Assumed Percent Asbestos: ---

Material # 18
Caulk - On Exterior Aluminum Window Frame

Asbestos Detected: No Asbestos Type: None Detected Percent Asbestos: ---

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Material # 19
Ceiling Tile - 2ft x 2ft White With Pinholes and Gouges

Asbestos Detected: No Asbestos Type: None Detected Percent Asbestos: ---

Material # 20
Caulk - On Exterior Steel Storefront Frame

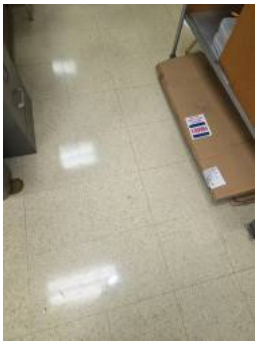
Asbestos Detected: No Asbestos Type: None Detected Percent Asbestos: ---

Material # 21
Glazing - On Exterior Steel Storefront Frame

Asbestos Detected: Yes Asbestos Type: Chrysotile Percent Asbestos: 3%

Material # 22
Floor Tile & Mastic - 12in x 12in White With Light and Dark Grey Flecks, Yellow Mastic

Asbestos Detected: No Asbestos Type: None Detected Percent Asbestos: ---

Material # 23
Floor Tile & Mastic - 12in x 12in Tan With Dark Tan Flecks, Black Mastic

Asbestos Detected: Yes Asbestos Type: Chrysotile Percent Asbestos: T-3% M-6%

Material # 24
Flooring Layer Assumed Under Surface Layer -

Asbestos Detected: Yes Asbestos Type: Assumed Percent Asbestos: ---

Coleman Community Schools
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Material # 25
Fume Hood -

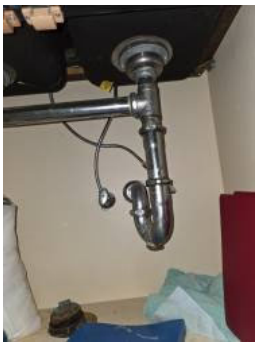
Asbestos Detected: Yes Asbestos Type: Assumed Percent Asbestos: ---

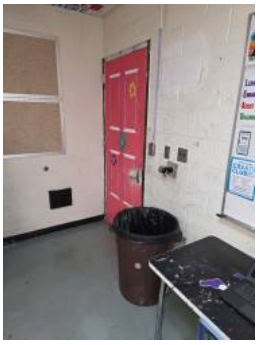
Material # 26
Pipe Insulation-Assumed in Walls/Ceiling Cavities -

Asbestos Detected: Yes Asbestos Type: Assumed Percent Asbestos: ---

Material # 27
Cove Base - 4in Black

Asbestos Detected: No Asbestos Type: None Detected Percent Asbestos: ---

Material # 28
Sink Undercoating - Black

Asbestos Detected: Yes Asbestos Type: Chrysotile Percent Asbestos: 2%

Material # 29
Caulk - On Interior Steel Door Frame

Asbestos Detected: No Asbestos Type: None Detected Percent Asbestos: ---

Material # 30
Sink Undercoating - Cream

Asbestos Detected: No Asbestos Type: None Detected Percent Asbestos: ---

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Material # 31
Drywall & Joint Compound -

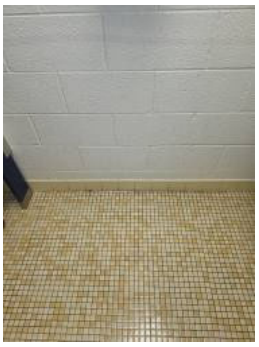
Asbestos Detected: No Asbestos Type: None Detected Percent Asbestos: ---

Material # 32
Ceramic Tile & Grout - 1in Tan/Yellow

Asbestos Detected: No Asbestos Type: None Detected Percent Asbestos: ---

Material # 33
Miscellaneous - Terrazzo - Tan

Asbestos Detected: No Asbestos Type: None Detected Percent Asbestos: ---

Material # 34
Ceramic Tile & Grout - 4in Tan

Asbestos Detected: No Asbestos Type: None Detected Percent Asbestos: ---

Material # 35
Plaster - Cementious Drywall Firestop

Asbestos Detected: No Asbestos Type: None Detected Percent Asbestos: ---

Material # 36
Ceiling Tile - 2ft x 2ft White With Random Pinholes

Asbestos Detected: No Asbestos Type: None Detected Percent Asbestos: ---

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Material # 37
Vinyl Sheet Flooring - Grey

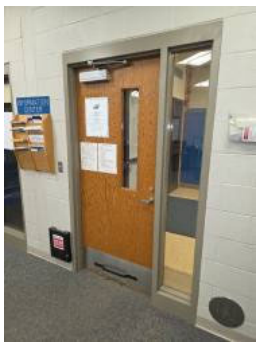
Asbestos Detected: No Asbestos Type: None Detected Percent Asbestos: ---

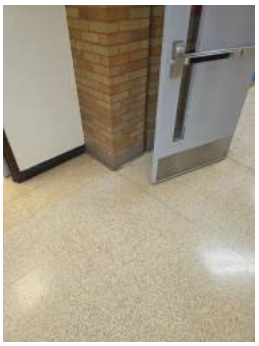
Material # 38
Boiler Material (inside) - Lochinvar 2018 Build

Asbestos Detected: Yes Asbestos Type: Assumed Percent Asbestos: ---

Material # 39
Miscellaneous - Material Assumed Inside Electrical Box

Asbestos Detected: Yes Asbestos Type: Assumed Percent Asbestos: ---

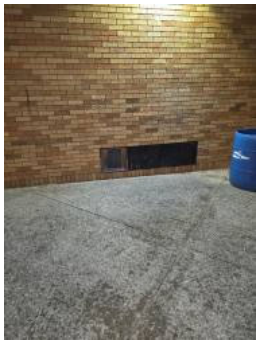
Material # 40
Caulk - On New Steel Sidelight Frame

Asbestos Detected: No Asbestos Type: None Detected Percent Asbestos: ---

Material # 41
Cove Base - 6in Tan

Asbestos Detected: No Asbestos Type: None Detected Percent Asbestos: ---

Material # 42
Miscellaneous - Brick and Mortar

Asbestos Detected: No Asbestos Type: None Detected Percent Asbestos: ---

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Material # 43
Caulk - On Louver

Asbestos Detected: No Asbestos Type: None Detected Percent Asbestos: ---

Material # 44
Caulk - Expansion Joint

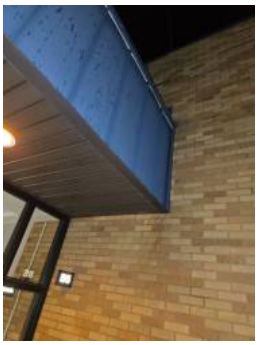
Asbestos Detected: No Asbestos Type: None Detected Percent Asbestos: ---

Material # 45
Vermiculite - Assumed Inside Walls

Asbestos Detected: Yes Asbestos Type: Assumed Percent Asbestos: ---

Material # 46
Transite - Assumed Behind Soffit and Fascia

Asbestos Detected: Yes Asbestos Type: Assumed Percent Asbestos: ---

Material # 47
Roofing -

Asbestos Detected: Yes Asbestos Type: Assumed Percent Asbestos: ---

Inspection Report

Northern Analytical Services

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

Customer: Coleman Community Schools
Building: Coleman Jr/Sr High School
Address: 4951 North Lewis Road
Coleman, MI 48618

Printed: October 24, 2025

Inspection Report

Room Number	*Material Number*	*Homogeneous Material Description*	*Asbestos Detected*	*Asbestos Type*	*Quantity*	*Units*	*Comments*
001	11	Fire Rated Door -	Yes	Assumed	4	Each	Steel
001	13	Cove Base - 4in Tan	No	None Detected	10	Sq.Ft.	
001	19	Ceiling Tile - 2ft x 2ft White With Pinholes and Gouges	No	None Detected	0	Sq.Ft.	Not Quantified
001	20	Caulk - On Exterior Steel Storefront Frame	No	None Detected	2	Sq.Ft.	
001	21	Glazing - On Exterior Steel Storefront Frame	Yes	Chrysotile	2	Sq.Ft.	
001	33	Miscellaneous - Terrazzo - Tan	No	None Detected	0	Sq.Ft.	Not Quantified
001	35	Plaster - Cementious Drywall Firestop	No	None Detected	100	Sq.Ft.	
002	11	Fire Rated Door -	Yes	Assumed	4	Each	
002	12	Flooring-Carpet Glue -	No	None Detected	0	Sq.Ft.	Not Quantified
002	13	Cove Base - 4in Tan	No	None Detected	40	Sq.Ft.	
002	17	Flooring - Assumed Under Casework	Yes	Assumed	120	Sq.Ft.	East Wall and Center Desk
002	18	Caulk - On Exterior Aluminum Window Frame	No	None Detected	0	Sq.Ft.	Not Quantified
002	24	Flooring Layer Assumed Under Surface Layer -	Yes	Assumed	1000	Sq.Ft.	No Flooring Found
002	31	Drywall & Joint Compound -	No	None Detected	600	Sq.Ft.	Walls
002	36	Ceiling Tile - 2ft x 2ft White With Random Pinholes	No	None Detected	0	Sq.Ft.	Not Quantified
002	40	Caulk - On New Steel Sidelight Frame	No	None Detected	0	Sq.Ft.	Not Quantified

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003	11	Fire Rated Door -	Yes	Assumed	1	Each	
003	12	Flooring-Carpet Glue -	No	None Detected	0	Sq.Ft.	Not Quantified
003	13	Cove Base - 4in Tan	No	None Detected	20	Sq.Ft.	
003	18	Caulk - On Exterior Aluminum Window Frame	No	None Detected	0	Sq.Ft.	Not Quantified
003	24	Flooring Layer Assumed Under Surface Layer -	Yes	Assumed	250	Sq.Ft.	No Flooring Found
003	31	Drywall & Joint Compound -	No	None Detected	600	Sq.Ft.	Walls
003	36	Ceiling Tile - 2ft x 2ft White With Random Pinholes	No	None Detected	0	Sq.Ft.	Not Quantified
003	40	Caulk - On New Steel Sidelight Frame	No	None Detected	0	Sq.Ft.	Not Quantified
004	11	Fire Rated Door -	Yes	Assumed	1	Each	
004	12	Flooring-Carpet Glue -	No	None Detected	0	Sq.Ft.	Not Quantified
004	13	Cove Base - 4in Tan	No	None Detected	20	Sq.Ft.	
004	18	Caulk - On Exterior Aluminum Window Frame	No	None Detected	0	Sq.Ft.	Not Quantified
004	24	Flooring Layer Assumed Under Surface Layer -	Yes	Assumed	250	Sq.Ft.	No Flooring Found
004	31	Drywall & Joint Compound -	No	None Detected	600	Sq.Ft.	Walls
004	36	Ceiling Tile - 2ft x 2ft White With Random Pinholes	No	None Detected	0	Sq.Ft.	Not Quantified
004	40	Caulk - On New Steel Sidelight Frame	No	None Detected	0	Sq.Ft.	Not Quantified

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005	11	Fire Rated Door -	Yes	Assumed	1	Each	
005	12	Flooring-Carpet Glue -	No	None Detected	0	Sq.Ft.	Not Quantified
005	13	Cove Base - 4in Tan	No	None Detected	20	Sq.Ft.	
005	18	Caulk - On Exterior Aluminum Window Frame	No	None Detected	0	Sq.Ft.	Not Quantified
005	24	Flooring Layer Assumed Under Surface Layer -	Yes	Assumed	160	Sq.Ft.	No Flooring Found
005	31	Drywall & Joint Compound -	No	None Detected	400	Sq.Ft.	Walls
005	36	Ceiling Tile - 2ft x 2ft White With Random Pinholes	No	None Detected	0	Sq.Ft.	Not Quantified
005	40	Caulk - On New Steel Sidelight Frame	No	None Detected	0	Sq.Ft.	Not Quantified
006	11	Fire Rated Door -	Yes	Assumed	2	Each	1 Wood 1 Steel With Tall Window
006	12	Flooring-Carpet Glue -	No	None Detected	0	Sq.Ft.	Not Quantified
006	13	Cove Base - 4in Tan	No	None Detected	20	Sq.Ft.	
006	18	Caulk - On Exterior Aluminum Window Frame	No	None Detected	0	Sq.Ft.	Not Quantified
006	24	Flooring Layer Assumed Under Surface Layer -	Yes	Assumed	160	Sq.Ft.	No Flooring Found
006	36	Ceiling Tile - 2ft x 2ft White With Random Pinholes	No	None Detected	0	Sq.Ft.	Not Quantified
006	40	Caulk - On New Steel Sidelight Frame	No	None Detected	0	Sq.Ft.	Not Quantified
007	11	Fire Rated Door -	Yes	Assumed	1	Each	

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007	12	Flooring-Carpet Glue -	No	None Detected	0	Sq.Ft.	Not Quantified
007	13	Cove Base - 4in Tan	No	None Detected	20	Sq.Ft.	
007	18	Caulk - On Exterior Aluminum Window Frame	No	None Detected	0	Sq.Ft.	Not Quantified
007	24	Flooring Layer Assumed Under Surface Layer -	Yes	Assumed	200	Sq.Ft.	No Flooring Found
007	31	Drywall & Joint Compound -	No	None Detected	400	Sq.Ft.	Walls
007	36	Ceiling Tile - 2ft x 2ft White With Random Pinholes	No	None Detected	0	Sq.Ft.	Not Quantified
007	40	Caulk - On New Steel Sidelight Frame	No	None Detected	0	Sq.Ft.	Not Quantified
008	11	Fire Rated Door -	Yes	Assumed	1	Each	
008	12	Flooring-Carpet Glue -	No	None Detected	0	Sq.Ft.	Not Quantified
008	13	Cove Base - 4in Tan	No	None Detected	20	Sq.Ft.	
008	18	Caulk - On Exterior Aluminum Window Frame	No	None Detected	0	Sq.Ft.	Not Quantified
008	24	Flooring Layer Assumed Under Surface Layer -	Yes	Assumed	200	Sq.Ft.	No Flooring Found
008	31	Drywall & Joint Compound -	No	None Detected	400	Sq.Ft.	Walls
008	36	Ceiling Tile - 2ft x 2ft White With Random Pinholes	No	None Detected	0	Sq.Ft.	Not Quantified
008	40	Caulk - On New Steel Sidelight Frame	No	None Detected	0	Sq.Ft.	Not Quantified
010	11	Fire Rated Door -	Yes	Assumed	1	Each	

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010	12	Flooring-Carpet Glue -	No	None Detected	0	Sq.Ft.	Not Quantified
010	13	Cove Base - 4in Tan	No	None Detected	20	Sq.Ft.	
010	24	Flooring Layer Assumed Under Surface Layer -	Yes	Assumed	100	Sq.Ft.	No Flooring Found
010	31	Drywall & Joint Compound -	No	None Detected	200	Sq.Ft.	Walls
010	36	Ceiling Tile - 2ft x 2ft White With Random Pinholes	No	None Detected	0	Sq.Ft.	Not Quantified
010	37	Vinyl Sheet Flooring - Grey	No	None Detected	100	Sq.Ft.	
011	11	Fire Rated Door -	Yes	Assumed	1	Each	
011	12	Flooring-Carpet Glue -	No	None Detected	0	Sq.Ft.	Not Quantified
011	13	Cove Base - 4in Tan	No	None Detected	20	Sq.Ft.	
011	24	Flooring Layer Assumed Under Surface Layer -	Yes	Assumed	100	Sq.Ft.	No Flooring Found
011	31	Drywall & Joint Compound -	No	None Detected	200	Sq.Ft.	Walls
011	36	Ceiling Tile - 2ft x 2ft White With Random Pinholes	No	None Detected	0	Sq.Ft.	Not Quantified
011	37	Vinyl Sheet Flooring - Grey	No	None Detected	100	Sq.Ft.	
012	11	Fire Rated Door -	Yes	Assumed	2	Each	Solid Steel
012	36	Ceiling Tile - 2ft x 2ft White With Random Pinholes	No	None Detected	0	Sq.Ft.	Not Quantified
012	37	Vinyl Sheet Flooring - Grey	No	None Detected	30	Sq.Ft.	

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013	11	Fire Rated Door -	Yes	Assumed	2	Each	Wood With 6in x 3ft Window
013	13	Cove Base - 4in Tan	No	None Detected	20	Sq.Ft.	
013	24	Flooring Layer Assumed Under Surface Layer -	Yes	Assumed	1000	Sq.Ft.	
013	31	Drywall & Joint Compound -	No	None Detected	600	Sq.Ft.	Walls
013	36	Ceiling Tile - 2ft x 2ft White With Random Pinholes	No	None Detected	0	Sq.Ft.	Not Quantified
013	37	Vinyl Sheet Flooring - Grey	No	None Detected	1000	Sq.Ft.	
100	6	Drywall - Media Center	No	None Detected	160	Sq.Ft.	West Wall of Room 136
100	12	Flooring-Carpet Glue -	No	None Detected	0	Sq.Ft.	Not Quantified
100	13	Cove Base - 4in Tan	No	None Detected	75	Sq.Ft.	
100	17	Flooring - Assumed Under Casework	Yes	Assumed	200	Sq.Ft.	Lockers and Under Bookshelves In Middle of Room
100	19	Ceiling Tile - 2ft x 2ft White With Pinholes and Gouges	No	None Detected	0	Sq.Ft.	Not Quantified
100	24	Flooring Layer Assumed Under Surface Layer -	Yes	Assumed	5000	Sq.Ft.	No Flooring Found
102	11	Fire Rated Door -	Yes	Assumed	2	Each	Steel
102	17	Flooring - Assumed Under Casework	Yes	Assumed	80	Sq.Ft.	All Walls
102	19	Ceiling Tile - 2ft x 2ft White With Pinholes and Gouges	No	None Detected	0	Sq.Ft.	Not Quantified
102	23	Floor Tile & Mastic - 12in x 12in Tan With Dark Tan Flecks, Black Mastic	Yes	Chrysotile	350	Sq.Ft.	

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102	24	Flooring Layer Assumed Under Surface Layer -	Yes	Assumed	350	Sq.Ft.	
102	27	Cove Base - 4in Black	No	None Detected	20	Sq.Ft.	
102	28	Sink Undercoating - Black	Yes	Chrysotile	1	Sq.Ft.	
102	29	Caulk - On Interior Steel Door Frame	No	None Detected	2	Sq.Ft.	
106	2	Pipe Insulation-Mudded Fitting - Elbows	Yes	Chrysotile	20	Ln.Ft.	
106	13	Cove Base - 4in Tan	No	None Detected	30	Sq.Ft.	
106	17	Flooring - Assumed Under Casework	Yes	Assumed	30	Sq.Ft.	West Wall
106	19	Ceiling Tile - 2ft x 2ft White With Pinholes and Gouges	No	None Detected	0	Sq.Ft.	Not Quantified
106	33	Miscellaneous - Terrazzo - Tan	No	None Detected	0	Sq.Ft.	Not Quantified
107	11	Fire Rated Door -	Yes	Assumed	1	Each	Steel With Tall Window
107	16	Glue - Assumed Behind Visual Display Board	Yes	Assumed	50	Sq.Ft.	East Wall
107	17	Flooring - Assumed Under Casework	Yes	Assumed	30	Sq.Ft.	East Wall
107	19	Ceiling Tile - 2ft x 2ft White With Pinholes and Gouges	No	None Detected	0	Sq.Ft.	Not Quantified
107	22	Floor Tile & Mastic - 12in x 12in White With Light and Dark Grey Flecks, Yellow Mastic	No	None Detected	420	Sq.Ft.	
107	24	Flooring Layer Assumed Under Surface Layer -	Yes	Assumed	420	Sq.Ft.	
107	27	Cove Base - 4in Black	No	None Detected	20	Sq.Ft.	

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107	29	Caulk - On Interior Steel Door Frame	No	None Detected	1	Sq.Ft.	
108	11	Fire Rated Door -	Yes	Assumed	1	Each	Steel
108	19	Ceiling Tile - 2ft x 2ft White With Pinholes and Gouges	No	None Detected	0	Sq.Ft.	Not Quantified
108	24	Flooring Layer Assumed Under Surface Layer -	Yes	Assumed	50	Sq.Ft.	
108	32	Ceramic Tile & Grout - 1in Tan/Yellow	No	None Detected	50	Sq.Ft.	
109	11	Fire Rated Door -	Yes	Assumed	1	Each	Steel
109	19	Ceiling Tile - 2ft x 2ft White With Pinholes and Gouges	No	None Detected	0	Sq.Ft.	Not Quantified
109	24	Flooring Layer Assumed Under Surface Layer -	Yes	Assumed	50	Sq.Ft.	
109	32	Ceramic Tile & Grout - 1in Tan/Yellow	No	None Detected	50	Sq.Ft.	
110	11	Fire Rated Door -	Yes	Assumed	1	Each	Steel
110	19	Ceiling Tile - 2ft x 2ft White With Pinholes and Gouges	No	None Detected	0	Sq.Ft.	Not Quantified
110	23	Floor Tile & Mastic - 12in x 12in Tan With Dark Tan Flecks, Black Mastic	Yes	Chrysotile	70	Sq.Ft.	
110	24	Flooring Layer Assumed Under Surface Layer -	Yes	Assumed	70	Sq.Ft.	
110	27	Cove Base - 4in Black	No	None Detected	20	Sq.Ft.	
111A	11	Fire Rated Door -	Yes	Assumed	2	Each	Steel With Tall Window
111A	12	Flooring-Carpet Glue -	No	None Detected	0	Sq.Ft.	Not Quantified

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Room Number	*Material Number*	*Homogeneous Material Description*	*Asbestos Detected*	*Asbestos Type*	*Quantity*	*Units*	*Comments*
111A	13	Cove Base - 4in Tan	No	None Detected	20	Sq.Ft.	
111A	16	Glue - Assumed Behind Visual Display Board	Yes	Assumed	180	Sq.Ft.	All Walls
111A	17	Flooring - Assumed Under Casework	Yes	Assumed	120	Sq.Ft.	All Walls
111A	19	Ceiling Tile - 2ft x 2ft White With Pinholes and Gouges	No	None Detected	0	Sq.Ft.	Not Quantified
111A	24	Flooring Layer Assumed Under Surface Layer -	Yes	Assumed	900	Sq.Ft.	No Flooring Found
111A	29	Caulk - On Interior Steel Door Frame	No	None Detected	2	Sq.Ft.	
111B	2	Pipe Insulation-Mudded Fitting - Elbows	Yes	Chrysotile	15	Ln.Ft.	
111B	11	Fire Rated Door -	Yes	Assumed	1	Each	Steel With Tall Window
111B	17	Flooring - Assumed Under Casework	Yes	Assumed	50	Sq.Ft.	North Wall
111B	19	Ceiling Tile - 2ft x 2ft White With Pinholes and Gouges	No	None Detected	0	Sq.Ft.	Not Quantified
111B	23	Floor Tile & Mastic - 12in x 12in Tan With Dark Tan Flecks, Black Mastic	Yes	Chrysotile	550	Sq.Ft.	
111B	24	Flooring Layer Assumed Under Surface Layer -	Yes	Assumed	550	Sq.Ft.	
111B	27	Cove Base - 4in Black	No	None Detected	20	Sq.Ft.	
111B	28	Sink Undercoating - Black	Yes	Chrysotile	2	Sq.Ft.	Double Sinks
112	12	Flooring-Carpet Glue -	No	None Detected	0	Sq.Ft.	Not Quantified
112	13	Cove Base - 4in Tan	No	None Detected	50	Sq.Ft.	

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Customer: Coleman Community Schools
Building: Coleman Jr/Sr High School
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Room Number	*Material Number*	*Homogeneous Material Description*	*Asbestos Detected*	*Asbestos Type*	*Quantity*	*Units*	*Comments*
112	17	Flooring - Assumed Under Casework	Yes	Assumed	100	Sq.Ft.	Wall Lockers
112	19	Ceiling Tile - 2ft x 2ft White With Pinholes and Gouges	No	None Detected	0	Sq.Ft.	Not Quantified
112	24	Flooring Layer Assumed Under Surface Layer -	Yes	Assumed	1600	Sq.Ft.	
113	26	Pipe Insulation-Assumed in Walls/Ceiling Cavities -	Yes	Assumed	50	Ln.Ft.	At Sinks, Toilets, and Above Ceiling
113	31	Drywall & Joint Compound -	No	None Detected	200	Sq.Ft.	Ceiling
113	32	Ceramic Tile & Grout - 1in Tan/Yellow	No	None Detected	200	Sq.Ft.	
113	34	Ceramic Tile & Grout - 4in Tan	No	None Detected	50	Sq.Ft.	
114	26	Pipe Insulation-Assumed in Walls/Ceiling Cavities -	Yes	Assumed	50	Ln.Ft.	At Sinks, Toilets, and Above Ceiling
114	31	Drywall & Joint Compound -	No	None Detected	200	Sq.Ft.	Ceiling
114	32	Ceramic Tile & Grout - 1in Tan/Yellow	No	None Detected	200	Sq.Ft.	
114	34	Ceramic Tile & Grout - 4in Tan	No	None Detected	50	Sq.Ft.	
117	11	Fire Rated Door -	Yes	Assumed	1	Each	Steel With Tall Window
117	12	Flooring-Carpet Glue -	No	None Detected	0	Sq.Ft.	Not Quantified
117	16	Glue - Assumed Behind Visual Display Board	Yes	Assumed	250	Sq.Ft.	150 East Wall 100 West Wall
117	18	Caulk - On Exterior Aluminum Window Frame	No	None Detected	0	Sq.Ft.	Not Quantified
117	19	Ceiling Tile - 2ft x 2ft White With Pinholes and Gouges	No	None Detected	0	Sq.Ft.	Not Quantified

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117	20	Caulk - On Exterior Steel Storefront Frame	No	None Detected	1	Sq.Ft.	
117	21	Glazing - On Exterior Steel Storefront Frame	Yes	Chrysotile	1	Sq.Ft.	
117	24	Flooring Layer Assumed Under Surface Layer -	Yes	Assumed	760	Sq.Ft.	
117	27	Cove Base - 4in Black	No	None Detected	20	Sq.Ft.	
117	29	Caulk - On Interior Steel Door Frame	No	None Detected	1	Sq.Ft.	
117	31	Drywall & Joint Compound -	No	None Detected	600	Sq.Ft.	Walls
117A	11	Fire Rated Door -	Yes	Assumed	2	Each	Steel
117A	19	Ceiling Tile - 2ft x 2ft White With Pinholes and Gouges	No	None Detected	0	Sq.Ft.	Not Quantified
117A	23	Floor Tile & Mastic - 12in x 12in Tan With Dark Tan Flecks, Black Mastic	Yes	Chrysotile	70	Sq.Ft.	
117A	24	Flooring Layer Assumed Under Surface Layer -	Yes	Assumed	70	Sq.Ft.	
117A	27	Cove Base - 4in Black	No	None Detected	20	Sq.Ft.	
117A	31	Drywall & Joint Compound -	No	None Detected	200	Sq.Ft.	Walls
117B	19	Ceiling Tile - 2ft x 2ft White With Pinholes and Gouges	No	None Detected	0	Sq.Ft.	Not Quantified
117B	23	Floor Tile & Mastic - 12in x 12in Tan With Dark Tan Flecks, Black Mastic	Yes	Chrysotile	150	Sq.Ft.	
117B	24	Flooring Layer Assumed Under Surface Layer -	Yes	Assumed	150	Sq.Ft.	
117B	27	Cove Base - 4in Black	No	None Detected	20	Sq.Ft.	

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117B	29	Caulk - On Interior Steel Door Frame	No	None Detected	1	Sq.Ft.	
118	11	Fire Rated Door -	Yes	Assumed	3	Each	Steel With Tall Window
118	16	Glue - Assumed Behind Visual Display Board	Yes	Assumed	250	Sq.Ft.	150 East Wall 100 West Wall
118	17	Flooring - Assumed Under Casework	Yes	Assumed	20	Sq.Ft.	South Wall
118	19	Ceiling Tile - 2ft x 2ft White With Pinholes and Gouges	No	None Detected	0	Sq.Ft.	Not Quantified
118	20	Caulk - On Exterior Steel Storefront Frame	No	None Detected	1	Sq.Ft.	
118	21	Glazing - On Exterior Steel Storefront Frame	Yes	Chrysotile	1	Sq.Ft.	
118	23	Floor Tile & Mastic - 12in x 12in Tan With Dark Tan Flecks, Black Mastic	Yes	Chrysotile	760	Sq.Ft.	
118	24	Flooring Layer Assumed Under Surface Layer -	Yes	Assumed	760	Sq.Ft.	
118	27	Cove Base - 4in Black	No	None Detected	20	Sq.Ft.	
118	29	Caulk - On Interior Steel Door Frame	No	None Detected	3	Sq.Ft.	
118	31	Drywall & Joint Compound -	No	None Detected	600	Sq.Ft.	Walls
119	2	Pipe Insulation-Mudded Fitting - Elbows	Yes	Chrysotile	5	Ln.Ft.	
119	2	Pipe Insulation-Mudded Fitting - Elbows	Yes	Chrysotile	8	Ln.Ft.	
119	8	Laboratory Counter Top -	Yes	Chrysotile	192	Sq.Ft.	16 Mobile Tables
119	11	Fire Rated Door -	Yes	Assumed	1	Each	Solid Steel

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119	16	Glue - Assumed Behind Visual Display Board	Yes	Assumed	100	Sq.Ft.	50 West Wall 50 South Wall
119	17	Flooring - Assumed Under Casework	Yes	Assumed	70	Sq.Ft.	South Wall
119	19	Ceiling Tile - 2ft x 2ft White With Pinholes and Gouges	No	None Detected	0	Sq.Ft.	Not Quantified
119	20	Caulk - On Exterior Steel Storefront Frame	No	None Detected	1	Sq.Ft.	
119	21	Glazing - On Exterior Steel Storefront Frame	Yes	Chrysotile	1	Sq.Ft.	
119	26	Pipe Insulation-Assumed in Walls/Ceiling Cavities -	Yes	Assumed	10	Ln.Ft.	At Sinks
119	27	Cove Base - 4in Black	No	None Detected	30	Sq.Ft.	
119	29	Caulk - On Interior Steel Door Frame	No	None Detected	1	Sq.Ft.	
119	30	Sink Undercoating - Cream	No	None Detected	2	Sq.Ft.	Large Art Sinks
120	2	Pipe Insulation-Mudded Fitting - Elbows	Yes	Chrysotile	8	Ln.Ft.	
120	11	Fire Rated Door -	Yes	Assumed	2	Each	1 Steel With Tall Window
120	16	Glue - Assumed Behind Visual Display Board	Yes	Assumed	250	Sq.Ft.	West Wall
120	19	Ceiling Tile - 2ft x 2ft White With Pinholes and Gouges	No	None Detected	0	Sq.Ft.	Not Quantified
120	20	Caulk - On Exterior Steel Storefront Frame	No	None Detected	1	Sq.Ft.	
120	21	Glazing - On Exterior Steel Storefront Frame	Yes	Chrysotile	1	Sq.Ft.	
120	23	Floor Tile & Mastic - 12in x 12in Tan With Dark Tan Flecks, Black Mastic	Yes	Chrysotile	900	Sq.Ft.	

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120	24	Flooring Layer Assumed Under Surface Layer -	Yes	Assumed	900	Sq.Ft.	
120	27	Cove Base - 4in Black	No	None Detected	20	Sq.Ft.	
121	2	Pipe Insulation-Mudded Fitting - Elbows	Yes	Chrysotile	12	Ln.Ft.	
121	11	Fire Rated Door -	Yes	Assumed	1	Each	1 Steel With Tall Window
121	12	Flooring-Carpet Glue -	No	None Detected	0	Sq.Ft.	Not Quantified
121	13	Cove Base - 4in Tan	No	None Detected	20	Sq.Ft.	
121	16	Glue - Assumed Behind Visual Display Board	Yes	Assumed	400	Sq.Ft.	200 North Wall 200 South Wall
121	17	Flooring - Assumed Under Casework	Yes	Assumed	110	Sq.Ft.	30 East and North Wall Heaters 50 South Wall
121	18	Caulk - On Exterior Aluminum Window Frame	No	None Detected	0	Sq.Ft.	Not Quantified
121	19	Ceiling Tile - 2ft x 2ft White With Pinholes and Gouges	No	None Detected	0	Sq.Ft.	Not Quantified
121	20	Caulk - On Exterior Steel Storefront Frame	No	None Detected	1	Sq.Ft.	
121	21	Glazing - On Exterior Steel Storefront Frame	Yes	Chrysotile	1	Sq.Ft.	
121	24	Flooring Layer Assumed Under Surface Layer -	Yes	Assumed	1600	Sq.Ft.	Tile Found
121	28	Sink Undercoating - Black	Yes	Chrysotile	1	Sq.Ft.	Double Sink
122	2	Pipe Insulation-Mudded Fitting - Elbows	Yes	Chrysotile	15	Ln.Ft.	
122	11	Fire Rated Door -	Yes	Assumed	1	Each	1 Steel With Tall Window

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122	12	Flooring-Carpet Glue -	No	None Detected	0	Sq.Ft.	Not Quantified
122	13	Cove Base - 4in Tan	No	None Detected	20	Sq.Ft.	
122	16	Glue - Assumed Behind Visual Display Board	Yes	Assumed	100	Sq.Ft.	South Wall
122	17	Flooring - Assumed Under Casework	Yes	Assumed	30	Sq.Ft.	North Wall Heater
122	19	Ceiling Tile - 2ft x 2ft White With Pinholes and Gouges	No	None Detected	0	Sq.Ft.	Not Quantified
122	20	Caulk - On Exterior Steel Storefront Frame	No	None Detected	1	Sq.Ft.	
122	21	Glazing - On Exterior Steel Storefront Frame	Yes	Chrysotile	1	Sq.Ft.	
122	24	Flooring Layer Assumed Under Surface Layer -	Yes	Assumed	900	Sq.Ft.	No Flooring Found
123	2	Pipe Insulation-Mudded Fitting - Elbows	Yes	Chrysotile	6	Ln.Ft.	
123	11	Fire Rated Door -	Yes	Assumed	1	Each	Steel With Tall Window
123	17	Flooring - Assumed Under Casework	Yes	Assumed	20	Sq.Ft.	South Wall
123	19	Ceiling Tile - 2ft x 2ft White With Pinholes and Gouges	No	None Detected	0	Sq.Ft.	Not Quantified
123	23	Floor Tile & Mastic - 12in x 12in Tan With Dark Tan Flecks, Black Mastic	Yes	Chrysotile	120	Sq.Ft.	
123	24	Flooring Layer Assumed Under Surface Layer -	Yes	Assumed	120	Sq.Ft.	
123	28	Sink Undercoating - Black	Yes	Chrysotile	1	Sq.Ft.	Double Sink
124	2	Pipe Insulation-Mudded Fitting - Elbows	Yes	Chrysotile	5	Ln.Ft.	

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124	11	Fire Rated Door -	Yes	Assumed	1	Each	1 Steel With Tall Window
124	12	Flooring-Carpet Glue -	No	None Detected	0	Sq.Ft.	Not Quantified
124	13	Cove Base - 4in Tan	No	None Detected	20	Sq.Ft.	
124	16	Glue - Assumed Behind Visual Display Board	Yes	Assumed	150	Sq.Ft.	50 West Wall 100 South Wall
124	19	Ceiling Tile - 2ft x 2ft White With Pinholes and Gouges	No	None Detected	0	Sq.Ft.	Not Quantified
124	20	Caulk - On Exterior Steel Storefront Frame	No	None Detected	1	Sq.Ft.	
124	21	Glazing - On Exterior Steel Storefront Frame	Yes	Chrysotile	1	Sq.Ft.	
124	24	Flooring Layer Assumed Under Surface Layer -	Yes	Assumed	800	Sq.Ft.	No Flooring Found
125	11	Fire Rated Door -	Yes	Assumed	1	Each	Solid Steel
125	19	Ceiling Tile - 2ft x 2ft White With Pinholes and Gouges	No	None Detected	0	Sq.Ft.	Not Quantified
125	23	Floor Tile & Mastic - 12in x 12in Tan With Dark Tan Flecks, Black Mastic	Yes	Chrysotile	60	Sq.Ft.	
126	8	Laboratory Counter Top -	Yes	Chrysotile	330	Sq.Ft.	24 Mobile Table Top and One Casework Countertop
126	11	Fire Rated Door -	Yes	Assumed	1	Each	Steel With Tall Window
126	16	Glue - Assumed Behind Visual Display Board	Yes	Assumed	150	Sq.Ft.	100 North Wall 50 South Wall
126	17	Flooring - Assumed Under Casework	Yes	Assumed	1	Sq.Ft.	50 North Wall 50 Under Middle of Room Sink Stands 50 South Wall
126	19	Ceiling Tile - 2ft x 2ft White With Pinholes and Gouges	No	None Detected	0	Sq.Ft.	Not Quantified

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126	20	Caulk - On Exterior Steel Storefront Frame	No	None Detected	1	Sq.Ft.	
126	21	Glazing - On Exterior Steel Storefront Frame	Yes	Chrysotile	1	Sq.Ft.	
126	23	Floor Tile & Mastic - 12in x 12in Tan With Dark Tan Flecks, Black Mastic	Yes	Chrysotile	1000	Sq.Ft.	
126	24	Flooring Layer Assumed Under Surface Layer -	Yes	Assumed	1000	Sq.Ft.	
126	26	Pipe Insulation-Assumed in Walls/Ceiling Cavities -	Yes	Assumed	10	Ln.Ft.	At North Sink and Heater
126	27	Cove Base - 4in Black	No	None Detected	20	Sq.Ft.	
127	2	Pipe Insulation-Mudded Fitting - Elbows	Yes	Chrysotile	10	Ln.Ft.	
127	8	Laboratory Counter Top -	Yes	Chrysotile	100	Sq.Ft.	
127	11	Fire Rated Door -	Yes	Assumed	3	Each	Steel With Tall Window
127	17	Flooring - Assumed Under Casework	Yes	Assumed	100	Sq.Ft.	80 West Wall 20 North Wall
127	19	Ceiling Tile - 2ft x 2ft White With Pinholes and Gouges	No	None Detected	0	Sq.Ft.	Not Quantified
127	20	Caulk - On Exterior Steel Storefront Frame	No	None Detected	1	Sq.Ft.	
127	21	Glazing - On Exterior Steel Storefront Frame	Yes	Chrysotile	1	Sq.Ft.	
127	23	Floor Tile & Mastic - 12in x 12in Tan With Dark Tan Flecks, Black Mastic	Yes	Chrysotile	360	Sq.Ft.	
127	24	Flooring Layer Assumed Under Surface Layer -	Yes	Assumed	360	Sq.Ft.	
127	25	Fume Hood -	Yes	Assumed	30	Sq.Ft.	

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128	2	Pipe Insulation-Mudded Fitting - Elbows	Yes	Chrysotile	8	Ln.Ft.	
128	8	Laboratory Counter Top -	Yes	Chrysotile	330	Sq.Ft.	24 Mobile Table Tops and One Casework Counter
128	11	Fire Rated Door -	Yes	Assumed	1	Each	Steel With Tall Window
128	16	Glue - Assumed Behind Visual Display Board	Yes	Assumed	150	Sq.Ft.	100 West Wall 50 South Wall
128	17	Flooring - Assumed Under Casework	Yes	Assumed	200	Sq.Ft.	100 East Wall 50 North Wall 50 Under Middle of Room Sink Stands
128	19	Ceiling Tile - 2ft x 2ft White With Pinholes and Gouges	No	None Detected	0	Sq.Ft.	Not Quantified
128	20	Caulk - On Exterior Steel Storefront Frame	No	None Detected	1	Sq.Ft.	
128	21	Glazing - On Exterior Steel Storefront Frame	Yes	Chrysotile	1	Sq.Ft.	
128	23	Floor Tile & Mastic - 12in x 12in Tan With Dark Tan Flecks, Black Mastic	Yes	Chrysotile	1000	Sq.Ft.	
128	24	Flooring Layer Assumed Under Surface Layer -	Yes	Assumed	1000	Sq.Ft.	
129	2	Pipe Insulation-Mudded Fitting - Elbows	Yes	Chrysotile	5	Ln.Ft.	
129	2	Pipe Insulation-Mudded Fitting - Elbows	Yes	Chrysotile	5	Ln.Ft.	
129	11	Fire Rated Door -	Yes	Assumed	2	Each	1 Solid Steel 1 Steel With Tall Window
129	12	Flooring-Carpet Glue -	No	None Detected	0	Sq.Ft.	Not Quantified
129	13	Cove Base - 4in Tan	No	None Detected	20	Sq.Ft.	
129	14	Caulk - On Interior Steel Transom Frame	No	None Detected	2	Sq.Ft.	

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129	15	Glazing - On Interior Steel Transom Frame	Yes	Chrysotile	2	Sq.Ft.	
129	16	Glue - Assumed Behind Visual Display Board	Yes	Assumed	150	Sq.Ft.	100 North Wall 50 East Wall
129	17	Flooring - Assumed Under Casework	Yes	Assumed	20	Sq.Ft.	East Wall Heater
129	18	Caulk - On Exterior Aluminum Window Frame	No	None Detected	0	Sq.Ft.	Not Quantified
129	19	Ceiling Tile - 2ft x 2ft White With Pinholes and Gouges	No	None Detected	0	Sq.Ft.	Not Quantified
129	24	Flooring Layer Assumed Under Surface Layer -	Yes	Assumed	400	Sq.Ft.	No Flooring Found
130	11	Fire Rated Door -	Yes	Assumed	8	Each	Steel With Tall Window
130	13	Cove Base - 4in Tan	No	None Detected	10	Sq.Ft.	
130	19	Ceiling Tile - 2ft x 2ft White With Pinholes and Gouges	No	None Detected	0	Sq.Ft.	Not Quantified
130	20	Caulk - On Exterior Steel Storefront Frame	No	None Detected	2	Sq.Ft.	2 Units 9ft x 25ft
130	21	Glazing - On Exterior Steel Storefront Frame	Yes	Chrysotile	2	Sq.Ft.	2 Units 9ft x 25ft
130	33	Miscellaneous - Terrazzo - Tan	No	None Detected	0	Sq.Ft.	Not Quantified
130	35	Plaster - Cementious Drywall Firestop	No	None Detected	100	Sq.Ft.	
131	2	Pipe Insulation-Mudded Fitting - Elbows	Yes	Chrysotile	5	Ln.Ft.	
131	11	Fire Rated Door -	Yes	Assumed	2	Each	1 Solid Steel 1 Steel With Tall Window
131	12	Flooring-Carpet Glue -	No	None Detected	0	Sq.Ft.	Not Quantified

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131	13	Cove Base - 4in Tan	No	None Detected	20	Sq.Ft.	
131	14	Caulk - On Interior Steel Transom Frame	No	None Detected	2	Sq.Ft.	
131	15	Glazing - On Interior Steel Transom Frame	Yes	Chrysotile	2	Sq.Ft.	
131	16	Glue - Assumed Behind Visual Display Board	Yes	Assumed	150	Sq.Ft.	100 North Wall 50 East Wall
131	17	Flooring - Assumed Under Casework	Yes	Assumed	20	Sq.Ft.	East Wall Heater
131	18	Caulk - On Exterior Aluminum Window Frame	No	None Detected	0	Sq.Ft.	Not Quantified
131	19	Ceiling Tile - 2ft x 2ft White With Pinholes and Gouges	No	None Detected	0	Sq.Ft.	Not Quantified
131	24	Flooring Layer Assumed Under Surface Layer -	Yes	Assumed	400	Sq.Ft.	No Flooring Found
132	11	Fire Rated Door -	Yes	Assumed	1	Each	1 Steel With Tall Window
132	12	Flooring-Carpet Glue -	No	None Detected	0	Sq.Ft.	Not Quantified
132	13	Cove Base - 4in Tan	No	None Detected	20	Sq.Ft.	
132	16	Glue - Assumed Behind Visual Display Board	Yes	Assumed	150	Sq.Ft.	50 South Wall
132	17	Flooring - Assumed Under Casework	Yes	Assumed	20	Sq.Ft.	East Wall Heater
132	19	Ceiling Tile - 2ft x 2ft White With Pinholes and Gouges	No	None Detected	0	Sq.Ft.	Not Quantified
132	20	Caulk - On Exterior Steel Storefront Frame	No	None Detected	1	Sq.Ft.	
132	21	Glazing - On Exterior Steel Storefront Frame	Yes	Chrysotile	1	Sq.Ft.	

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Coleman, MI 48618

Printed: October 24, 2025

Inspection Report

Room Number	*Material Number*	*Homogeneous Material Description*	*Asbestos Detected*	*Asbestos Type*	*Quantity*	*Units*	*Comments*
132	24	Flooring Layer Assumed Under Surface Layer -	Yes	Assumed	710	Sq.Ft.	No Flooring Found
133	11	Fire Rated Door -	Yes	Assumed	1	Each	1 Steel With Tall Window
133	12	Flooring-Carpet Glue -	No	None Detected	0	Sq.Ft.	Not Quantified
133	13	Cove Base - 4in Tan	No	None Detected	20	Sq.Ft.	
133	16	Glue - Assumed Behind Visual Display Board	Yes	Assumed	150	Sq.Ft.	South Wall
133	17	Flooring - Assumed Under Casework	Yes	Assumed	30	Sq.Ft.	East Wall Heater
133	19	Ceiling Tile - 2ft x 2ft White With Pinholes and Gouges	No	None Detected	0	Sq.Ft.	Not Quantified
133	20	Caulk - On Exterior Steel Storefront Frame	No	None Detected	1	Sq.Ft.	
133	21	Glazing - On Exterior Steel Storefront Frame	Yes	Chrysotile	1	Sq.Ft.	
133	24	Flooring Layer Assumed Under Surface Layer -	Yes	Assumed	900	Sq.Ft.	No Flooring Found
134	11	Fire Rated Door -	Yes	Assumed	2	Each	Steel With Tall Window
134	12	Flooring-Carpet Glue -	No	None Detected	0	Sq.Ft.	Not Quantified
134	13	Cove Base - 4in Tan	No	None Detected	10	Sq.Ft.	
134	16	Glue - Assumed Behind Visual Display Board	Yes	Assumed	180	Sq.Ft.	60 North Wall 60 South Wall 60 East Wall
134	17	Flooring - Assumed Under Casework	Yes	Assumed	30	Sq.Ft.	South Wall Heater
134	18	Caulk - On Exterior Aluminum Window Frame	No	None Detected	0	Sq.Ft.	Not Quantified

Northern Analytical Services

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

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Inspection Report

Room Number	*Material Number*	*Homogeneous Material Description*	*Asbestos Detected*	*Asbestos Type*	*Quantity*	*Units*	*Comments*
134	19	Ceiling Tile - 2ft x 2ft White With Pinholes and Gouges	No	None Detected	0	Sq.Ft.	Not Quantified
134	24	Flooring Layer Assumed Under Surface Layer -	Yes	Assumed	110	Sq.Ft.	No Flooring Found
135	11	Fire Rated Door -	Yes	Assumed	1	Each	1 Steel With Tall Window
135	12	Flooring-Carpet Glue -	No	None Detected	0	Sq.Ft.	Not Quantified
135	13	Cove Base - 4in Tan	No	None Detected	20	Sq.Ft.	
135	16	Glue - Assumed Behind Visual Display Board	Yes	Assumed	180	Sq.Ft.	60 North Wall 60 South Wall 60 East Wall
135	17	Flooring - Assumed Under Casework	Yes	Assumed	30	Sq.Ft.	South Wall Heater
135	19	Ceiling Tile - 2ft x 2ft White With Pinholes and Gouges	No	None Detected	0	Sq.Ft.	Not Quantified
135	20	Caulk - On Exterior Steel Storefront Frame	No	None Detected	1	Sq.Ft.	
135	21	Glazing - On Exterior Steel Storefront Frame	Yes	Chrysotile	1	Sq.Ft.	
135	24	Flooring Layer Assumed Under Surface Layer -	Yes	Assumed	900	Sq.Ft.	No Flooring Found
136	6	Drywall - Media Center	No	None Detected	600	Sq.Ft.	Inside of Room 136
136	11	Fire Rated Door -	Yes	Assumed	2	Each	Steel
136	13	Cove Base - 4in Tan	No	None Detected	20	Sq.Ft.	
136	16	Glue - Assumed Behind Visual Display Board	Yes	Assumed	100	Sq.Ft.	South Wall
136	19	Ceiling Tile - 2ft x 2ft White With Pinholes and Gouges	No	None Detected	0	Sq.Ft.	Not Quantified

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Room Number	*Material Number*	*Homogeneous Material Description*	*Asbestos Detected*	*Asbestos Type*	*Quantity*	*Units*	*Comments*
136	22	Floor Tile & Mastic - 12in x 12in White With Light and Dark Grey Flecks, Yellow Mastic	No	None Detected	870	Sq.Ft.	
137	11	Fire Rated Door -	Yes	Assumed	1	Each	Steel With Tall Window
137	12	Flooring-Carpet Glue -	No	None Detected	0	Sq.Ft.	Not Quantified
137	13	Cove Base - 4in Tan	No	None Detected	10	Sq.Ft.	
137	19	Ceiling Tile - 2ft x 2ft White With Pinholes and Gouges	No	None Detected	0	Sq.Ft.	Not Quantified
137	24	Flooring Layer Assumed Under Surface Layer -	Yes	Assumed	100	Sq.Ft.	No Flooring Found
138	2	Pipe Insulation-Mudded Fitting - Elbows	Yes	Chrysotile	15	Ln.Ft.	
138	11	Fire Rated Door -	Yes	Assumed	1	Each	1 Steel With Tall Window
138	12	Flooring-Carpet Glue -	No	None Detected	0	Sq.Ft.	Not Quantified
138	13	Cove Base - 4in Tan	No	None Detected	20	Sq.Ft.	
138	16	Glue - Assumed Behind Visual Display Board	Yes	Assumed	150	Sq.Ft.	South Wall
138	17	Flooring - Assumed Under Casework	Yes	Assumed	30	Sq.Ft.	East Wall Heater
138	19	Ceiling Tile - 2ft x 2ft White With Pinholes and Gouges	No	None Detected	0	Sq.Ft.	Not Quantified
138	20	Caulk - On Exterior Steel Storefront Frame	No	None Detected	1	Sq.Ft.	
138	21	Glazing - On Exterior Steel Storefront Frame	Yes	Chrysotile	1	Sq.Ft.	
138	24	Flooring Layer Assumed Under Surface Layer -	Yes	Assumed	900	Sq.Ft.	No Flooring Found

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139	2	Pipe Insulation-Mudded Fitting - Elbows	Yes	Chrysotile	7	Ln.Ft.	
139	11	Fire Rated Door -	Yes	Assumed	2	Each	Steel With Tall Window
139	12	Flooring-Carpet Glue -	No	None Detected	0	Sq.Ft.	Not Quantified
139	13	Cove Base - 4in Tan	No	None Detected	10	Sq.Ft.	
139	16	Glue - Assumed Behind Visual Display Board	Yes	Assumed	180	Sq.Ft.	60 North Wall 60 South Wall 60 East Wall
139	17	Flooring - Assumed Under Casework	Yes	Assumed	30	Sq.Ft.	South Wall Heater
139	18	Caulk - On Exterior Aluminum Window Frame	No	None Detected	0	Sq.Ft.	Not Quantified
139	19	Ceiling Tile - 2ft x 2ft White With Pinholes and Gouges	No	None Detected	0	Sq.Ft.	Not Quantified
139	24	Flooring Layer Assumed Under Surface Layer -	Yes	Assumed	900	Sq.Ft.	No Flooring Found
140	2	Pipe Insulation-Mudded Fitting - Elbows	Yes	Chrysotile	5	Ln.Ft.	
140	11	Fire Rated Door -	Yes	Assumed	1	Each	1 Steel With Tall Window
140	12	Flooring-Carpet Glue -	No	None Detected	0	Sq.Ft.	Not Quantified
140	13	Cove Base - 4in Tan	No	None Detected	20	Sq.Ft.	
140	16	Glue - Assumed Behind Visual Display Board	Yes	Assumed	180	Sq.Ft.	60 North Wall 60 South Wall 60 East Wall
140	17	Flooring - Assumed Under Casework	Yes	Assumed	30	Sq.Ft.	South Wall Heater
140	19	Ceiling Tile - 2ft x 2ft White With Pinholes and Gouges	No	None Detected	0	Sq.Ft.	Not Quantified

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140	20	Caulk - On Exterior Steel Storefront Frame	No	None Detected	1	Sq.Ft.	
140	21	Glazing - On Exterior Steel Storefront Frame	Yes	Chrysotile	1	Sq.Ft.	
140	24	Flooring Layer Assumed Under Surface Layer -	Yes	Assumed	900	Sq.Ft.	No Flooring Found
141	2	Pipe Insulation-Mudded Fitting - Elbows	Yes	Chrysotile	8	Ln.Ft.	
141	12	Flooring-Carpet Glue -	No	None Detected	0	Sq.Ft.	Not Quantified
141	13	Cove Base - 4in Tan	No	None Detected	75	Sq.Ft.	
141	19	Ceiling Tile - 2ft x 2ft White With Pinholes and Gouges	No	None Detected	0	Sq.Ft.	Not Quantified
141	24	Flooring Layer Assumed Under Surface Layer -	Yes	Assumed	1200	Sq.Ft.	No Flooring Found
142	2	Pipe Insulation-Mudded Fitting - Elbows	Yes	Chrysotile	5	Ln.Ft.	
142	11	Fire Rated Door -	Yes	Assumed	1	Each	1 Steel With Tall Window
142	12	Flooring-Carpet Glue -	No	None Detected	0	Sq.Ft.	Not Quantified
142	13	Cove Base - 4in Tan	No	None Detected	20	Sq.Ft.	
142	16	Glue - Assumed Behind Visual Display Board	Yes	Assumed	150	Sq.Ft.	50 South Wall
142	17	Flooring - Assumed Under Casework	Yes	Assumed	20	Sq.Ft.	East Wall Heater
142	19	Ceiling Tile - 2ft x 2ft White With Pinholes and Gouges	No	None Detected	0	Sq.Ft.	Not Quantified
142	20	Caulk - On Exterior Steel Storefront Frame	No	None Detected	1	Sq.Ft.	

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142	21	Glazing - On Exterior Steel Storefront Frame	Yes	Chrysotile	1	Sq.Ft.	
142	24	Flooring Layer Assumed Under Surface Layer -	Yes	Assumed	850	Sq.Ft.	No Flooring Found
143	2	Pipe Insulation-Mudded Fitting - Elbows	Yes	Chrysotile	8	Ln.Ft.	
143	11	Fire Rated Door -	Yes	Assumed	1	Each	1 Steel With Tall Window
143	12	Flooring-Carpet Glue -	No	None Detected	0	Sq.Ft.	Not Quantified
143	13	Cove Base - 4in Tan	No	None Detected	20	Sq.Ft.	
143	16	Glue - Assumed Behind Visual Display Board	Yes	Assumed	150	Sq.Ft.	50 South Wall
143	17	Flooring - Assumed Under Casework	Yes	Assumed	20	Sq.Ft.	East Wall Heater
143	19	Ceiling Tile - 2ft x 2ft White With Pinholes and Gouges	No	None Detected	0	Sq.Ft.	Not Quantified
143	20	Caulk - On Exterior Steel Storefront Frame	No	None Detected	1	Sq.Ft.	
143	21	Glazing - On Exterior Steel Storefront Frame	Yes	Chrysotile	1	Sq.Ft.	
143	24	Flooring Layer Assumed Under Surface Layer -	Yes	Assumed	850	Sq.Ft.	No Flooring Found
154	2	Pipe Insulation-Mudded Fitting - Elbows	Yes	Chrysotile	60	Ln.Ft.	
154	20	Caulk - On Exterior Steel Storefront Frame	No	None Detected	2	Sq.Ft.	
154	21	Glazing - On Exterior Steel Storefront Frame	Yes	Chrysotile	2	Sq.Ft.	
154	31	Drywall & Joint Compound -	No	None Detected	1000	Sq.Ft.	Walls

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154	33	Miscellaneous - Terrazzo - Tan	No	None Detected	0	Sq.Ft.	Not Quantified
154	36	Ceiling Tile - 2ft x 2ft White With Random Pinholes	No	None Detected	0	Sq.Ft.	Not Quantified
154	41	Cove Base - 6in Tan	No	None Detected	20	Sq.Ft.	
155	2	Pipe Insulation-Mudded Fitting - Elbows	Yes	Chrysotile	20	Ln.Ft.	
155	2	Pipe Insulation-Mudded Fitting - Elbows	Yes	Chrysotile	40	Ln.Ft.	
155	11	Fire Rated Door -	Yes	Assumed	6	Each	Steel With Tall Window
155	14	Caulk - On Interior Steel Transom Frame	No	None Detected	2	Sq.Ft.	2 Units 7ft x 20ft
155	15	Glazing - On Interior Steel Transom Frame	Yes	Chrysotile	2	Sq.Ft.	2 Units 7ft x 20ft
155	20	Caulk - On Exterior Steel Storefront Frame	No	None Detected	2	Sq.Ft.	
155	21	Glazing - On Exterior Steel Storefront Frame	Yes	Chrysotile	3	Sq.Ft.	Extra 14ft x 7ft Windows - No Caulk
155	33	Miscellaneous - Terrazzo - Tan	No	None Detected	0	Sq.Ft.	Not Quantified
155	40	Caulk - On New Steel Sidelight Frame	No	None Detected	20	Sq.Ft.	
158	2	Pipe Insulation-Mudded Fitting - Elbows	Yes	Chrysotile	20	Ln.Ft.	
158	11	Fire Rated Door -	Yes	Assumed	4	Each	Steel
158	13	Cove Base - 4in Tan	No	None Detected	10	Sq.Ft.	
158	14	Caulk - On Interior Steel Transom Frame	No	None Detected	1	Sq.Ft.	

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158	15	Glazing - On Interior Steel Transom Frame	Yes	Chrysotile	1	Sq.Ft.	
158	20	Caulk - On Exterior Steel Storefront Frame	No	None Detected	2	Sq.Ft.	
158	21	Glazing - On Exterior Steel Storefront Frame	Yes	Chrysotile	2	Sq.Ft.	
158	33	Miscellaneous - Terrazzo - Tan	No	None Detected	0	Sq.Ft.	Not Quantified
158	35	Plaster - Cementious Drywall Firestop	No	None Detected	100	Sq.Ft.	
158	36	Ceiling Tile - 2ft x 2ft White With Random Pinholes	No	None Detected	0	Sq.Ft.	Not Quantified
166	1	Pipe Insulation - Pipe Wrap	Yes	Assumed	28	Ln.Ft.	
166	2	Pipe Insulation-Mudded Fitting - Elbows	Yes	Chrysotile	50	Ln.Ft.	Vary In Size
166	11	Fire Rated Door -	Yes	Assumed	1	Each	Solid Steel
166	16	Glue - Assumed Behind Visual Display Board	Yes	Assumed	6	Sq.Ft.	1 Mirror
166	29	Caulk - On Interior Steel Door Frame	No	None Detected	2	Sq.Ft.	
167	2	Pipe Insulation-Mudded Fitting - Elbows	Yes	Chrysotile	3	Ln.Ft.	2 Fittings and 1 Drain
167	11	Fire Rated Door -	Yes	Assumed	1	Each	42in Steel
167	16	Glue - Assumed Behind Visual Display Board	Yes	Assumed	6	Sq.Ft.	1 Mirror
167	20	Caulk - On Exterior Steel Storefront Frame	No	None Detected	1	Sq.Ft.	
167	29	Caulk - On Interior Steel Door Frame	No	None Detected	1	Sq.Ft.	

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167	38	Boiler Material (inside) - Lochinvar 2018 Build	Yes	Assumed	50	Sq.Ft.	1 Unit
167	39	Miscellaneous - Material Assumed Inside Electrical Box	Yes	Assumed	4	Sq.Ft.	
Exterior	42	Miscellaneous - Brick and Mortar	No	None Detected	0	Sq.Ft.	Not Quantified
Exterior	43	Caulk - On Louver	No	None Detected	1	Sq.Ft.	
Exterior	44	Caulk - Expansion Joint	No	None Detected	1	Sq.Ft.	
Exterior	45	Vermiculite - Assumed Inside Walls	Yes	Assumed	20000	Sq.Ft.	
Exterior	46	Transite - Assumed Behind Soffit and Fascia	Yes	Assumed	10000	Sq.Ft.	
Exterior	47	Roofing -	Yes	Assumed	67115	Sq.Ft.	

Sample Location Report

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201	2	Pipe Insulation-Mudded Fitting - Elbows	119	6ft West of Northeast Corner 9ft From Floor
202	2	Pipe Insulation-Mudded Fitting - Elbows	119	6ft West of Northeast Corner 9ft From Floor
203	2	Pipe Insulation-Mudded Fitting - Elbows	119	6ft West of Northeast Corner 9ft From Floor
204	2	Pipe Insulation-Mudded Fitting - Elbows	122	8ft North 4ft West of Southeast Corner
205	2	Pipe Insulation-Mudded Fitting - Elbows	128	9ft North 4ft East of Southwest Corner
206	2	Pipe Insulation-Mudded Fitting - Elbows	135	Along North Wall 3ft From Northeast Corner
207	2	Pipe Insulation-Mudded Fitting - Elbows	142	At Doorway
208	2	Pipe Insulation-Mudded Fitting - Elbows	166	7ft East 3ft South of Northwest Corner
209	2	Pipe Insulation-Mudded Fitting - Elbows	166	Middle of Room
210	2	Pipe Insulation-Mudded Fitting - Elbows	166	Above Slop Sink
601	6	Drywall - Media Center	136	6ft West of Northeast Corner 7ft From Floor
602	6	Drywall - Media Center	136	5ft West of Northeast Corner 4ft From Floor
801	8	Laboratory Counter Top -	126	At Mobile Table In Classroom
1201	12	Flooring-Carpet Glue -	131	2ft North of Southeast Corner
1202	12	Flooring-Carpet Glue -	138	20ft South 10ft West of Northeast Corner
1301	13	Cove Base - 4in Tan	131	North Side of South Door

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1302	13	Cove Base - 4in Tan	155	At Loose Cove Base At Middle Column
1401	14	Caulk - On Interior Steel Transom Frame	131	North Side of South Door 6ft From Floor
1402	14	Caulk - On Interior Steel Transom Frame	158	Top Of West Side of Frame
1501	15	Glazing - On Interior Steel Transom Frame	131	Bottom of Pane On South Frame
1502	15	Glazing - On Interior Steel Transom Frame	155	Bottom of Southwest Most Pane
1801	18	Caulk - On Exterior Aluminum Window Frame	131	South Corner of South Pane
1802	18	Caulk - On Exterior Aluminum Window Frame	117	West Side of Frame
1901	19	Ceiling Tile - 2ft x 2ft White With Pinholes and Gouges	131	10ft North 8ft East of Southwest Corner
1902	19	Ceiling Tile - 2ft x 2ft White With Pinholes and Gouges	130	Above Doorway
2001	20	Caulk - On Exterior Steel Storefront Frame	132	South Side of Frame Exterior
2002	20	Caulk - On Exterior Steel Storefront Frame	133	South Side of Steel Column
2101	21	Glazing - On Exterior Steel Storefront Frame	132	Bottom of Pane
2102	21	Glazing - On Exterior Steel Storefront Frame	133	Bottom of Side Window Frame
2201	22	Floor Tile & Mastic - 12in x 12in White With Light and Dark Grey Flecks, Yellow Mastic	136	Southwest Corner
2202	22	Floor Tile & Mastic - 12in x 12in White With Light and Dark Grey Flecks, Yellow Mastic	107	At Damage At Threshold
2301	23	Floor Tile & Mastic - 12in x 12in Tan With Dark Tan Flecks, Black Mastic	126	Northwest Corner

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2302	23	Floor Tile & Mastic - 12in x 12in Tan With Dark Tan Flecks, Black Mastic	125	In Front of Sink
2701	27	Cove Base - 4in Black	126	2ft North of Exterior Frame
2702	27	Cove Base - 4in Black	120	East Side of Frame
2801	28	Sink Undercoating - Black	121	Under Sink
2802	28	Sink Undercoating - Black	123	Under Sink
2901	29	Caulk - On Interior Steel Door Frame	119	North Side of Frame
2902	29	Caulk - On Interior Steel Door Frame	166	Top of Frame
3001	30	Sink Undercoating - Cream	119	Under Sink
3002	30	Sink Undercoating - Cream	119	Under Sink
3101	31	Drywall & Joint Compound -	013	Above East Doorway
3102	31	Drywall & Joint Compound -	117A	At Lightswitch
3201	32	Ceramic Tile & Grout - 1in Tan/Yellow	114	At Damage By Sink
3202	32	Ceramic Tile & Grout - 1in Tan/Yellow	113	Southwest Corner
3401	34	Ceramic Tile & Grout - 4in Tan	114	At Damaged Entry Tile
3402	34	Ceramic Tile & Grout - 4in Tan	113	At Damaged Tile
3501	35	Plaster - Cementious Drywall Firestop	130	From Debris On Ceiling

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3502	35	Plaster - Cementious Drywall Firestop	001	From Debris Above Ceiling
3503	35	Plaster - Cementious Drywall Firestop	158	From Debris Above Ceiling
3601	36	Ceiling Tile - 2ft x 2ft White With Random Pinholes	013	Above East Doorway
3602	36	Ceiling Tile - 2ft x 2ft White With Random Pinholes	010	Above Doorway
3701	37	Vinyl Sheet Flooring - Grey	013	Southeast Corner
3702	37	Vinyl Sheet Flooring - Grey	010	Behind Toilet
4001	40	Caulk - On New Steel Sidelight Frame	002	West Side of Frame
4002	40	Caulk - On New Steel Sidelight Frame	003	Top of Frame
4101	41	Cove Base - 6in Tan	155	Southwest Most Strip
4102	41	Cove Base - 6in Tan	112	At West Column
4201	42	Miscellaneous - Brick and Mortar	Exterior	South Wall
4202	42	Miscellaneous - Brick and Mortar	Exterior	South Wall
4301	43	Caulk - On Louver	Exterior	South Wall
4302	43	Caulk - On Louver	Exterior	East Wall
4401	44	Caulk - Expansion Joint	Exterior	North Wall
4402	44	Caulk - Expansion Joint	Exterior	South Wall

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Sample Location Report

Sample Number	*Material Number*	*Homogeneous Material Description*	*Room Number*	*Sample Location*

Laboratory Reports

SanAir Technologies Laboratory

The Identification Specialists

Analysis Report
prepared for
Northern Analytical Services, LLC

Report Date: 3/6/2025

Project Name: Coleman Jr Sr

Project #: 250042

SanAir ID#: 25014840

NVLAP TESTING

NVLAP LAB CODE 600227-0

11709 Chesterdale Road, Cincinnati, Ohio 45246
888.895.1177 | 513.438.6066 | LabReports@SanAir.com | SanAir.com

SanAir ID Number
25014840
FINAL REPORT
3/6/2025 5:31:44 PM

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

Project Number: 250042
P.O. Number:
Project Name: Coleman Jr Sr
Collected Date: 3/5/2025
Received Date: 3/6/2025 10:30:00 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, March 06, 2025 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 Technologies Laboratory

SanAir ID Number
25014840
FINAL REPORT
3/6/2025 5:31:44 PM

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

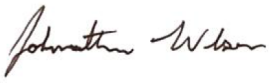
Project Number: 250042
P.O. Number:
Project Name: Coleman Jr Sr
Collected Date: 3/5/2025
Received Date: 3/6/2025 10:30:00 AM

Analyst: Farnsworth-Pinkerton, Shoshauna

Asbestos Bulk PLM EPA 600/R-93/116

	Stereoscopic	Components		
SanAir ID / Description	Appearance	% Fibrous	% Non-fibrous	Asbestos Fibers
201 / 25014840-001 Mudded Pipe Fitting, Mud	Grey Non-Fibrous Homogeneous	5% Glass 5% Min. Wool	90% Other	None Detected
201 / 25014840-001 Mudded Pipe Fitting, Wrap	Off-White Fibrous Homogeneous	90% Cellulose	10% Other	None Detected
202 / 25014840-002 Mudded Pipe Fitting, Mud	Grey Non-Fibrous Homogeneous	5% Glass 5% Min. Wool	90% Other	None Detected
202 / 25014840-002 Mudded Pipe Fitting, Wrap	Off-White Fibrous Homogeneous	90% Cellulose	10% Other	None Detected
203 / 25014840-003 Mudded Pipe Fitting	Grey Non-Fibrous Homogeneous	5% Glass 5% Min. Wool	90% Other	None Detected

Analyst: 
Analysis Date: 3/6/2025

Approved Signatory: 
Date: 3/6/2025

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: 2501 4840

Company: Northern Analytical Services, LLC	Project #: 250047	Collected by: Joshua Christie
Address: 14870 225th Ave.	Project Name: Coleman Sr. Sr.	Phone #: (231) 679-0005
City, St., Zip: Big Rapids, MI, 49307	Date Collected: 3/5/2025	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	☒
	Positive Stop	☒
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	☐

Matrix **Other** ☐

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	Modified Pipe Fitting					
202						
203						

Relinquished by	Date	Time	Received by	Date	Time
Joshua Christie	1600	3/5/2025	RMB	MAR 06 2025	10:30am

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.

SEEML Reference Number:
G-251020092
Date Issued: 10/21/2025

Southeast Environmental Microbiology Laboratories
102 Edinburgh Court
Greenville, SC 29607
Phone: (864) 233-3770
Fax: (864) 233-6589

Asbestos Analytical Report By: Polarized Light Microscopy

This report has been prepared for **Northern Analytical Services, LLC** the information and data has been checked for thoroughness and accuracy. The results reported apply only to the materials as received. The documents(s) contained herein are confidential and privileged information intended for the exclusive use of the individual or entity named above. This report shall not be reproduced except in full without SEEML's approval.

Client Project Name: Coleman JR Sr High
The Following report was prepared using this test method(s) contained within this document.

- [x] EPA 600/R-93/116- Method for the Determination of Asbestos in Bulk Building Materials - - 40 CFR Appendix E to Subpart E of Part 763, Interim Method of the Determination of Asbestos in Bulk Insulation Samples
- [ ] PLM 400 Point Count (<0.25%) EPA 600/R-93/116
- [ ] PLM 1000 Point Count (<0.1%) EPA 600/R-93/116
- [ ] PLM Carb 435 Level A Reporting Limit (<0.25%)
- [ ] PLM Carb 435 Level B (Reporting limit <0.1%)
- [ ] PLM by EPA/600/R-93/116 with Milling Prep 400 Point Count
- [ ] PLM Vermiculite Initial Screening EPA 600R-93/116
- [ ] PLM Cincinnati Method 600/R-04/004 (Amphibole Only)
- [ ] PLM Vermiculite Method SOF-V 198.8 (Step 1 Chrysotile & Prep)
- [ ] PLM Vermiculite Method SOF-V 198.8 (Step 2 (Amphibole)

Approved By : *Andrea Berrios*

Thank you for choosing SEEML Labs. We strive to provide superior quality testing, analytical data and customer service. SEEML is accredited through the National Institute of Standards and Technology (NIST) National Voluntary Accreditation Program (NVLAP) for bulk asbestos analysis NVLAP # 201031-0 and licensed by the Texas Department of State Health Services (License Number: 300474). This report must not be used to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the US government.

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Phone: 864-233-3770, Fax: 864-233-6589 , www.seeml.com
NVLAP Lab ID:201031-0

PLM Asbestos Bulk Sample Summary

Northern Analytical Services, LLC 14870 225th Avenue Big Rapids, Michigan, 49307 231-679-0005		Date Sampled:	10/14/2025
		Date Received:	10/20/2025
		Date Analyzed:	10/21/2025
		Date Reported:	10/21/2025
		Date Revised:	
		Project Name:	Coleman JR Sr High
		Project No:	250226
Analyzed by:	Andrea Berrios	Project Address:	N/A
		City, State. ZIP:	N/A
Method:	EPA 600/R-93/116- Method for the Determination of Asbestos in Bulk Building Materials - - 40 CFR Appendix E to Subpart E of Part 763, Interim Method of the Determination of Asbestos in Bulk Insulation Samples	SEEML Ref#:	G-251020092

Client No.: Lab No:	Description/Location	% Asbestos Type	% Fibrous Non-Asbestos Material Type	% Non-Fibrous Material
204 G-251020092-489A	(Off-White) Wrap/N/A	**4% Chrysotile**	81% Cellulose	15% Organic Matrix
204 G-251020092-489B	(Gray) Mudded Fitting/N/A	**None Detected**	2% Cellulose,23% Min Wool	75% Binder/Filler
205 G-251020092-490A	(Off-White) Wrap/Mudded Fittings/N/A	**POSITIVE STOP**		
206 G-251020092-491A	(Off-White) Wrap/Mudded Fittings/N/A	**POSITIVE STOP**		
207 G-251020092-492A	(Off-White) Wrap/Mudded Fitting/N/A	**POSITIVE STOP**		
208 G-251020092-493A	(Off-White) Wrap/Mudded Fitting/N/A	**POSITIVE STOP**		
209 G-251020092-494A	(Off-White) Wrap/Mudded Fitting/N/A	**POSITIVE STOP**		
210 G-251020092-495A	(Off-White) Wrap/Mudded Fitting/N/A	**POSITIVE STOP**		
601 G-251020092-496A	(White) Joint Compound with White Paint/N/A	**None Detected**	None Detected	100% Binder/Filler

Approved By: Andrea Berrios

Disclaimer:
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NOB samples are tested as a preliminary analysis. We highly recommend for Negative NOB samples resulting in less than 1% Asbestos to be verified by TEM or Point Analysis.

Inhomogeneous samples are separated into homogeneous subsamples and analyzed individually. NAD means no asbestos fibers were detected. When detected the minimum detection and reporting limit is less than 1% unless point counting is performed. Floor tile samples may contain large amounts of interference material and it is recommended that the sample be analyzed by gravimetric point count analysis to lower the detection limit and to aid in asbestos identification.

Guidelines for Interpretation:
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Southeast Environmental Microbiology Laboratories - Asbestos Division
102 Edinburgh Court Greenville, SC 29607
Phone: 864-233-3770, Fax: 864-233-6589 , www.seeml.com
NVLAP Lab ID:201031-0

PLM Asbestos Bulk Sample Summary

Northern Analytical Services, LLC 14870 225th Avenue Big Rapids, Michigan, 49307 231-679-0005		Date Sampled:	10/14/2025
		Date Received:	10/20/2025
		Date Analyzed:	10/21/2025
		Date Reported:	10/21/2025
		Date Revised:	
		Project Name:	Coleman JR Sr High
		Project No:	250226
Analyzed by:	Andrea Berrios	Project Address:	N/A
		City, State. ZIP:	N/A
Method:	EPA 600/R-93/116- Method for the Determination of Asbestos in Bulk Building Materials - - 40 CFR Appendix E to Subpart E of Part 763, Interim Method of the Determination of Asbestos in Bulk Insulation Samples	SEEML Ref#:	G-251020092

Client No.: Lab No:	Description/Location	% Asbestos Type	% Fibrous Non-Asbestos Material Type	% Non-Fibrous Material
601 G-251020092-496B	(Gray) Drywall/N/A	**None Detected**	30% Cellulose,5% Fiberglass	65% Gypsum
602 G-251020092-497A	(White) Joint Compound with White Paint/N/A	**None Detected**	None Detected	100% Binder/Filler
602 G-251020092-497B	(Gray) Drywall/N/A	**None Detected**	20% Cellulose,5% Fiberglass	75% Gypsum
801 G-251020092-498A	(Black) Lab Counter Top/N/A	**12% Chrysotile**	None Detected	88% Organic Matrix
1201 G-251020092-500A	(Yellow) Carpet Glue/N/A	**None Detected**	None Detected	100% Organic Matrix
1202 G-251020092-501A	(Yellow) Carpet Glue/N/A	**None Detected**	None Detected	100% Organic Matrix
1301 G-251020092-502A	(Cream) Cove Base/N/A	**None Detected**	None Detected	100% Organic Matrix
1301 G-251020092-502B	(Yellow) Mastic/N/A	**None Detected**	None Detected	100% Organic Matrix
1301 G-251020092-502C	(Brown) Mastic/N/A	**None Detected**	None Detected	100% Organic Matrix

Approved By: Andrea Berrios

Disclaimer:
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NOB samples are tested as a preliminary analysis. We highly recommend for Negative NOB samples resulting in less than 1% Asbestos to be verified by TEM or Point Analysis.

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102 Edinburgh Court Greenville, SC 29607
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NVLAP Lab ID:201031-0

PLM Asbestos Bulk Sample Summary

Northern Analytical Services, LLC 14870 225th Avenue Big Rapids, Michigan, 49307 231-679-0005		Date Sampled:	10/14/2025
		Date Received:	10/20/2025
		Date Analyzed:	10/21/2025
		Date Reported:	10/21/2025
		Date Revised:	
		Project Name:	Coleman JR Sr High
		Project No:	250226
Analyzed by:	Andrea Berrios	Project Address:	N/A
		City, State. ZIP:	N/A
Method:	EPA 600/R-93/116- Method for the Determination of Asbestos in Bulk Building Materials - - 40 CFR Appendix E to Subpart E of Part 763, Interim Method of the Determination of Asbestos in Bulk Insulation Samples	SEEML Ref#:	G-251020092

Client No.: Lab No:	Description/Location	% Asbestos Type	% Fibrous Non-Asbestos Material Type	% Non-Fibrous Material
1302 G-251020092-503A	(Cream) Cove Base/N/A	**None Detected**	None Detected	100% Organic Matrix
1302 G-251020092-503B	(Yellow) Mastic/N/A	**None Detected**	None Detected	100% Organic Matrix
1401 G-251020092-504A	(White) Caulking/N/A	**None Detected**	None Detected	100% Organic Matrix
1402 G-251020092-505A	(White) Caulking/N/A	**None Detected**	None Detected	100% Organic Matrix
1501 G-251020092-506A	(Tan) Glazing/N/A	**6% Chrysotile**	None Detected	94% Organic Matrix
1502 G-251020092-507A	(Tan) Glazing/N/A	**POSITIVE STOP**		
1801 G-251020092-508A	(Black) Caulking/N/A	**None Detected**	None Detected	100% Organic Matrix
1802 G-251020092-509A	(Black) Caulking/N/A	**None Detected**	None Detected	100% Organic Matrix
1901 G-251020092-510A	(Tan) Ceiling Tile/N/A	**None Detected**	20% Min Wool,60% Cellulose	20% Perlite

Approved By: Andrea Berrios

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NOB samples are tested as a preliminary analysis. We highly recommend for Negative NOB samples resulting in less than 1% Asbestos to be verified by TEM or Point Analysis.

Inhomogeneous samples are separated into homogeneous subsamples and analyzed individually. NAD means no asbestos fibers were detected. When detected the minimum detection and reporting limit is less than 1% unless point counting is performed. Floor tile samples may contain large amounts of interference material and it is recommended that the sample be analyzed by gravimetric point count analysis to lower the detection limit and to aid in asbestos identification.

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NVLAP Lab ID:201031-0

PLM Asbestos Bulk Sample Summary

Northern Analytical Services, LLC 14870 225th Avenue Big Rapids, Michigan, 49307 231-679-0005		Date Sampled:	10/14/2025
		Date Received:	10/20/2025
		Date Analyzed:	10/21/2025
		Date Reported:	10/21/2025
		Date Revised:	
		Project Name:	Coleman JR Sr High
		Project No:	250226
Analyzed by:	Andrea Berrios	Project Address:	N/A
		City, State. ZIP:	N/A
Method:	EPA 600/R-93/116- Method for the Determination of Asbestos in Bulk Building Materials - - 40 CFR Appendix E to Subpart E of Part 763, Interim Method of the Determination of Asbestos in Bulk Insulation Samples	SEEML Ref#:	G-251020092

Client No.: Lab No:	Description/Location	% Asbestos Type	% Fibrous Non-Asbestos Material Type	% Non-Fibrous Material
1902 G-251020092-511A	(Tan) Ceiling Tile/N/A	**None Detected**	20% Min Wool,60% Cellulose	20% Perlite
2001 G-251020092-512A	(Black) Caulking/N/A	**None Detected**	None Detected	100% Organic Matrix
2002 G-251020092-513A	(White) Caulking/N/A	**None Detected**	None Detected	100% Organic Matrix
2101 G-251020092-514A	(Off-White) Glazing/N/A	**3% Chrysotile**	None Detected	97% Binder/Filler
2102 G-251020092-515A	(Off-White) Glazing/N/A	**POSITIVE STOP**		
2201 G-251020092-516A	(White) Floor Tile/N/A	**None Detected**	None Detected	100% Organic Matrix
2201 G-251020092-516B	(Yellow) Mastic/N/A	**None Detected**	None Detected	100% Organic Matrix
2202 G-251020092-517A	(White) Floor Tile/N/A	**None Detected**	None Detected	100% Organic Matrix
2202 G-251020092-517B	(Yellow) Mastic/N/A	**None Detected**	None Detected	100% Organic Matrix

Approved By: Andrea Berrios

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NVLAP Lab ID:201031-0

PLM Asbestos Bulk Sample Summary

Northern Analytical Services, LLC 14870 225th Avenue Big Rapids, Michigan, 49307 231-679-0005		Date Sampled:	10/14/2025
		Date Received:	10/20/2025
		Date Analyzed:	10/21/2025
		Date Reported:	10/21/2025
		Date Revised:	
		Project Name:	Coleman JR Sr High
		Project No:	250226
Analyzed by:	Andrea Berrios	Project Address:	N/A
		City, State. ZIP:	N/A
Method:	EPA 600/R-93/116- Method for the Determination of Asbestos in Bulk Building Materials - - 40 CFR Appendix E to Subpart E of Part 763, Interim Method of the Determination of Asbestos in Bulk Insulation Samples	SEEML Ref#:	G-251020092

Client No.: Lab No:	Description/Location	% Asbestos Type	% Fibrous Non-Asbestos Material Type	% Non-Fibrous Material
2301 G-251020092-518A	(Off-White) Floor Tile/N/A	**3% Chrysotile**	None Detected	97% Organic Matrix
2301 G-251020092-518B	(Black) Mastic/N/A	**6% Chrysotile**	None Detected	94% Organic Matrix
2302 G-251020092-519A	(Off-White) Floor Tile/Mastic/N/A	**POSITIVE STOP**		
2701 G-251020092-520A	(Black) Cove Base/N/A	**None Detected**	None Detected	100% Organic Matrix
2701 G-251020092-520B	(Brown) Mastic/N/A	**None Detected**	None Detected	100% Organic Matrix
2702 G-251020092-521A	(Black) Cove Base/N/A	**None Detected**	None Detected	100% Organic Matrix
2702 G-251020092-521B	(Brown) Mastic/N/A	**None Detected**	None Detected	100% Organic Matrix
2801 G-251020092-522A	(Black) Sink Undercoating/N/A	**2% Chrysotile**	None Detected	98% Organic Matrix
2802 G-251020092-523A	(Black) Sink Undercoating/N/A	**POSITIVE STOP**		

Approved By: Andrea Berrios

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PLM Asbestos Bulk Sample Summary

Northern Analytical Services, LLC 14870 225th Avenue Big Rapids, Michigan, 49307 231-679-0005		Date Sampled:	10/14/2025
		Date Received:	10/20/2025
		Date Analyzed:	10/21/2025
		Date Reported:	10/21/2025
		Date Revised:	
		Project Name:	Coleman JR Sr High
		Project No:	250226
Analyzed by:	Andrea Berrios	Project Address:	N/A
		City, State. ZIP:	N/A
Method:	EPA 600/R-93/116- Method for the Determination of Asbestos in Bulk Building Materials - - 40 CFR Appendix E to Subpart E of Part 763, Interim Method of the Determination of Asbestos in Bulk Insulation Samples	SEEML Ref#:	G-251020092

Client No.: Lab No:	Description/Location	% Asbestos Type	% Fibrous Non-Asbestos Material Type	% Non-Fibrous Material
2901 G-251020092-524A	(White) Caulking/N/A	**None Detected**	None Detected	100% Organic Matrix
2902 G-251020092-525A	(White) Caulking/N/A	**None Detected**	None Detected	100% Organic Matrix
3001 G-251020092-526A	(White) Sink Undercoating/N/A	**None Detected**	25% Cellulose	75% Organic Matrix
3002 G-251020092-527A	(White) Sink Undercoating/N/A	**None Detected**	25% Cellulose	75% Organic Matrix
3101 G-251020092-528A	(White) Joint Compound/N/A	**None Detected**	None Detected	100% Binder/Filler
3101 G-251020092-528B	(Off-White) Drywall/N/A	**None Detected**	30% Cellulose,5% Fiberglass	65% Gypsum
3102 G-251020092-529A	(White) Joint Compound/N/A	**None Detected**	None Detected	100% Binder/Filler
3102 G-251020092-529B	(White) Drywall/N/A	**None Detected**	20% Cellulose,5% Fiberglass	75% Gypsum
3201 G-251020092-530A	(Yellow) Ceramic Tile/N/A	**None Detected**	None Detected	100% Carbon/Quartz

Approved By: Andrea Berrios

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NVLAP Lab ID:201031-0

PLM Asbestos Bulk Sample Summary

Northern Analytical Services, LLC 14870 225th Avenue Big Rapids, Michigan, 49307 231-679-0005		Date Sampled:	10/14/2025
		Date Received:	10/20/2025
		Date Analyzed:	10/21/2025
		Date Reported:	10/21/2025
		Date Revised:	
		Project Name:	Coleman JR Sr High
		Project No:	250226
Analyzed by:	Andrea Berrios	Project Address:	N/A
		City, State. ZIP:	N/A
Method:	EPA 600/R-93/116- Method for the Determination of Asbestos in Bulk Building Materials - - 40 CFR Appendix E to Subpart E of Part 763, Interim Method of the Determination of Asbestos in Bulk Insulation Samples	SEEML Ref#:	G-251020092

Client No.: Lab No:	Description/Location	% Asbestos Type	% Fibrous Non-Asbestos Material Type	% Non-Fibrous Material
3201 G-251020092-530B	(Yellow) Mastic/N/A	**None Detected**	None Detected	100% Organic Matrix
3201 G-251020092-530C	(Gray) Grout/N/A	**None Detected**	None Detected	100% Carbon/Quartz
3202 G-251020092-531A	(Yellow) Ceramic Tile/N/A	**None Detected**	None Detected	100% Carbon/Quartz
3202 G-251020092-531B	(Yellow) Mastic/N/A	**None Detected**	None Detected	100% Organic Matrix
3202 G-251020092-531C	(Gray) Grout/N/A	**None Detected**	None Detected	100% Carbon/Quartz
3301 G-251020092-532A	(Tan) Terrazzo Flooring/N/A	**None Detected**	None Detected	100% Organic Matrix
3302 G-251020092-533A	(Tan) Terrazzo Flooring/N/A	**None Detected**	None Detected	100% Organic Matrix
3401 G-251020092-534A	(Yellow) Ceramic Tile/N/A	**None Detected**	None Detected	100% Carbon/Quartz
3401 G-251020092-534B	(White) Grout/N/A	**None Detected**	None Detected	100% Carbon/Quartz

Approved By: Andrea Berrios

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PLM Asbestos Bulk Sample Summary

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		Date Received:	10/20/2025
		Date Analyzed:	10/21/2025
		Date Reported:	10/21/2025
		Date Revised:	
		Project Name:	Coleman JR Sr High
		Project No:	250226
Analyzed by:	Andrea Berrios	Project Address:	N/A
		City, State. ZIP:	N/A
Method:	EPA 600/R-93/116- Method for the Determination of Asbestos in Bulk Building Materials - - 40 CFR Appendix E to Subpart E of Part 763, Interim Method of the Determination of Asbestos in Bulk Insulation Samples	SEEML Ref#:	G-251020092

Client No.: Lab No:	Description/Location	% Asbestos Type	% Fibrous Non-Asbestos Material Type	% Non-Fibrous Material
3402 G-251020092-535A	(Yellow) Ceramic Tile/N/A	**None Detected**	None Detected	100% Carbon/Quartz
3402 G-251020092-535B	(White) Grout/N/A	**None Detected**	None Detected	100% Carbon/Quartz
3501 G-251020092-536A	(Gray) Granular Plaster/N/A	**None Detected**	2% Cellulose	98% Gypsum
3502 G-251020092-537A	(Gray) Granular Plaster/N/A	**None Detected**	2% Cellulose	98% Gypsum
3503 G-251020092-538A	(Gray) Granular Plaster/N/A	**None Detected**	None Detected	100% Gypsum
3601 G-251020092-539A	(Gray) Ceiling Tile/N/A	**None Detected**	5% Cellulose,75% Min Wool	20% Binder/Filler
3602 G-251020092-540A	(Gray) Ceiling Tile/N/A	**None Detected**	5% Cellulose,70% Min Wool	25% Binder/Filler
3701 G-251020092-541A	(Gray) Vinyl Flooring/N/A	**None Detected**	None Detected	100% Organic Matrix
3701 G-251020092-541B	(Yellow) Mastic/N/A	**None Detected**	None Detected	100% Organic Matrix

Approved By: Andrea Berrios

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PLM Asbestos Bulk Sample Summary

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		Date Received:	10/20/2025
		Date Analyzed:	10/21/2025
		Date Reported:	10/21/2025
		Date Revised:	
		Project Name:	Coleman JR Sr High
		Project No:	250226
Analyzed by:	Andrea Berrios	Project Address:	N/A
		City, State. ZIP:	N/A
Method:	EPA 600/R-93/116- Method for the Determination of Asbestos in Bulk Building Materials - - 40 CFR Appendix E to Subpart E of Part 763, Interim Method of the Determination of Asbestos in Bulk Insulation Samples	SEEML Ref#:	G-251020092

Client No.: Lab No:	Description/Location	% Asbestos Type	% Fibrous Non-Asbestos Material Type	% Non-Fibrous Material
3702 G-251020092-542A	(Gray) Vinyl Flooring/N/A	**None Detected**	None Detected	100% Organic Matrix
3702 G-251020092-542B	(Yellow) Mastic/N/A	**None Detected**	None Detected	100% Organic Matrix
4001 G-251020092-543A	(Gray) Caulking/N/A	**None Detected**	None Detected	100% Organic Matrix
4002 G-251020092-544A	(White) Caulking/N/A	**None Detected**	None Detected	100% Organic Matrix
4101 G-251020092-545A	(Cream) Cove Base/N/A	**None Detected**	None Detected	100% Organic Matrix
4101 G-251020092-545B	(Yellow) Mastic/N/A	**None Detected**	None Detected	100% Organic Matrix
4102 G-251020092-546A	(Cream) Cove Base/N/A	**None Detected**	None Detected	100% Organic Matrix
4102 G-251020092-546B	(Yellow) Mastic/N/A	**None Detected**	None Detected	100% Organic Matrix
4201 G-251020092-547A	(Tan) Brick/N/A	**None Detected**	None Detected	100% Carbon/Quartz

Approved By: Andrea Berrios

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PLM Asbestos Bulk Sample Summary

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		Date Received:	10/20/2025
		Date Analyzed:	10/21/2025
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		Date Revised:	
		Project Name:	Coleman JR Sr High
		Project No:	250226
Analyzed by:	Andrea Berrios	Project Address:	N/A
		City, State. ZIP:	N/A
Method:	EPA 600/R-93/116- Method for the Determination of Asbestos in Bulk Building Materials - - 40 CFR Appendix E to Subpart E of Part 763, Interim Method of the Determination of Asbestos in Bulk Insulation Samples	SEEML Ref#:	G-251020092

Client No.: Lab No:	Description/Location	% Asbestos Type	% Fibrous Non-Asbestos Material Type	% Non-Fibrous Material
4201 G-251020092-547B	(Gray) Mortar/N/A	**None Detected**	None Detected	100% Carbon/Quartz
4202 G-251020092-548A	(Tan) Brick/N/A	**None Detected**	None Detected	100% Carbon/Quartz
4202 G-251020092-548B	(Gray) Mortar/N/A	**None Detected**	None Detected	100% Carbon/Quartz
4301 G-251020092-549A	(Black) Caulking/N/A	**None Detected**	None Detected	100% Organic Matrix
4302 G-251020092-550A	(Black) Caulking/N/A	**None Detected**	None Detected	100% Organic Matrix
4401 G-251020092-551A	(Black) Caulking/N/A	**None Detected**	None Detected	100% Organic Matrix
4402 G-251020092-552A	(Black) Caulking/N/A	**None Detected**	None Detected	100% Organic Matrix

Approved By: Andrea Berrios

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Form 8.0 Rev. 8 04/29/20

SEEML Asbestos Chain-of-Custody Form

102 Edinburgh Court, Greenville, SC. 29607
Ph: (864) 233-3770, Fax: (864) 233-6589
WWW.SEEML.COM
NVLAP Lab ID: 201031-0

SEEML Ref#	G-251020092	Lab ID:	4189-552
Company:	Northern Analytical Services, LLC	Date Sample:	10/14/2025
Project Manager:	Joshua Christie	Project Name:	Coleman Jr. Sr. High
Address:	14870 225th Avenue	Project Location:	
City, State, Zip:	Big Rapids, Michigan 49307		
Phone:	231-268-0004	Project No:	250226
Email:	john@northernas.com, kevindelancey@northernas.com		

PLM TAT: RUSH ☐ SAME DAY ☐ NEXT DAY ☐ 2DAY ☒ 3 DAY ☐ 4 DAY ☐ 5 DAY ☐

PLM-Bulk: **Positive Stop** Yes X No ____

☒ PLM EPA Method 600/R-93/116 -Appendix E to Subpart E of 40 CFR Part 763; Interim Method for the Determination of Asbestos in Bulk Insulation Samples.

Point Count **Positive Stop** Yes ____ No ____

- ☐ 400 w/o Gravimetric (<0.25%)
- ☐ 1000 w/o Gravimetric (0.1%)
- ☐ 400 with Gravimetric (0.25%)
- ☐ 1000 with Gravimetric (<0.1%)

PCM-AIR

- ☐ NIOSH 7400
- ☐ NIOSH 7400 w/ TWA OSHA

SOIL/ROCK/VERMICULITE

- ☐ PLM CARB 435- (LOD <1%)
- ☐ PLM CARB 435- (400 Point Count <0.25%)
- ☐ PLM CARB 435- (1000 Point Count <0.1%)
- ☐ Cincinnati Method EPA 600/R-04/004 by PLM

TEM: SAME DAY ☐ NEXT DAY ☐ 2DAY ☐ 3DAY ☐ 4DAY ☐ 5DAY ☐

*TEM Analysis is subcontracted. TAT starts after PLM results have been submitted by SEEML, unless otherwise requested.

Sample ID	Description/Location	Analysis Type	Comments
204	Modded Fitting	PLM Bulk	
205			
206			
207			
208			
209			
210			
601	Drywall		
602	Drywall		
801	Lab Counter Top		
1201	Carpet Glue		

Relinquished by:	Time/Date	Received by:	Time/Date
Joshua Christie		Melissa Zehm	10-20-25/1044

SEEML Asbestos Chain-of-Custody Form

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WWW.SEEML.COM
NVLAP Lab ID: 201031-0

SEEML Ref# G-251020092		Lab ID: 489-552	
Company:	Northern Analytical Services, LLC	Date Sample:	
Project Manager:		Project Name:	Coleman Jr. Sr. High
Address:	14870 225th Avenue	Project Location:	
City, State, Zip:	Big Rapids, Michigan 49307		
Phone:	231-268-0004	Project No:	250226
Email:	john@northernas.com, kevindelancey@northernas.com		

Sample ID	Description/Location	Analysis Type	Comments
1202	Carpet glue	PLM Bulk	
1301	Cove Base		
1302	Cove Base		
1401	Caulk		
1402	Caulk		
1501	Glazing		
1502	Glazing		
1801	Caulk		
1802	Caulk		
1901	Ceiling Tile		
1902	Ceiling Tile		
2001	Caulk		
2002	Caulk		
2101	Glazing		
2102	Glazing		
2201	Floor Tile & Mastic		
2202	Floor Tile & Mastic		
2301	Floor Tile & Mastic		
2302	Floor Tile & Mastic		
2701	Cove Base		
2702	Cove Base		
2801	Sink Undercoating		
2802	Sink Undercoating		
2901	Caulk		
2902	Caulk		
3001	Sink Undercoating		
3002	Sink Undercoating		
3101	Drywall & Joint Compound		
3102	Drywall & Joint Compound		

Relinquished by:	Time/Date	Received by:	Time/Date
		[signature]	10-20-25 / 1044

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SEEML Ref# G-251020092		Lab ID: 489-552	
Company:	Northern Analytical Services, LLC	Date Sample:	10/14/2025
Project Manager:		Project Name:	Coleman Jr. Sr. High
Address:	14870 225th Avenue	Project Location:	
City, State, Zip:	Big Rapids, Michigan 49307		
Phone:	231-268-0004	Project No:	250226
Email:	john@northernas.com, kevindelancey@northernas.com		

PLM TAT: RUSH ☐ SAME DAY ☐ NEXT DAY ☐ 2DAY ☒ 3 DAY ☐ 4 DAY ☐ 5 DAY ☐

PLM-Bulk: **Positive Stop** Yes X No ____

☒ PLM EPA Method 600/R-93/116 -Appendix E to Subpart E of 40 CFR Part 763; Interim Method for the Determination of Asbestos in Bulk Insulation Samples.

Point Count **Positive Stop** Yes ____ No ____

- ☐ 400 w/o Gravimetric (<0.25%)
- ☐ 1000 w/o Gravimetric (0.1%)
- ☐ 400 with Gravimetric (0.25%)
- ☐ 1000 with Gravimetric (<0.1%)

PCM-AIR

- ☐ NIOSH 7400
- ☐ NIOSH 7400 w/ TWA OSHA

SOIL/ROCK/VERMICULITE

- ☐ PLM CARB 435- (LOD <1%)
- ☐ PLM CARB 435- (400 Point Count <0.25%)
- ☐ PLM CARB 435- (1000 Point Count <0.1%)
- ☐ Cincinnati Method EPA 600/R-04/004 by PLM

TEM: SAME DAY ☐ NEXT DAY ☐ 2DAY ☐ 3DAY ☐ 4DAY ☐ 5DAY ☐

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Sample ID	Description/Location	Analysis Type	Comments
3201	Ceramic Tile & Grout	PLM Bulk	
3202	Ceramic Tile & Grout		
3301	Terrazzo		
3302	Terrazzo		
3401	Ceramic Tile & Grout		
3402	Ceramic Tile & Grout		
3501	Plaster		
3502	Plaster		
3503	Plaster		
3601	Ceiling Tile		
3602	Ceiling Tile		

Relinquished by:	Time/Date	Received by:	Time/Date
		Melissa Fehn	10-20-25/1044

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SEEML Ref#	G-251020092	Lab ID:	489-552
Company:	Northern Analytical Services, LLC	Date Sample:	10/14/2025
Project Manager:		Project Name:	Coleman Jr. Sr. High
Address:	14870 225th Avenue	Project Location:	
City, State, Zip:	Big Rapids, Michigan 49307		
Phone:	231-268-0004	Project No:	
Email:	john@northernas.com, kevindelancey@northernas.com		

Sample ID	Description/Location	Analysis Type	Comments
3701	Vinyl Sheet Flooring	PLM Bulk	
3702	Vinyl Sheet Flooring		
4001	Caulk		
4002	Caulk		
4101	Cove Base		
4102	Cove Base		
4201	Brick + Mortar		
4202	Brick + Mortar		
4301	Caulk		
4302	Caulk		
4401	Caulk		
4402	Caulk		

Relinquished by:	Time/Date	Received by:	Time/Date
		Melissa Tuhn	10-20-25/1044

Photos


JUNIOR/SENIOR HIGH SCHOOL


Glazing on exterior storefront frame contains 3% Chrysotile asbestos.


EXIT
Laboratory counter tops contain 12% Chrysotile asbestos.
Floor tile contains 3% Chrysotile asbestos and black mastic contains 6% Chrysotile asbestos.

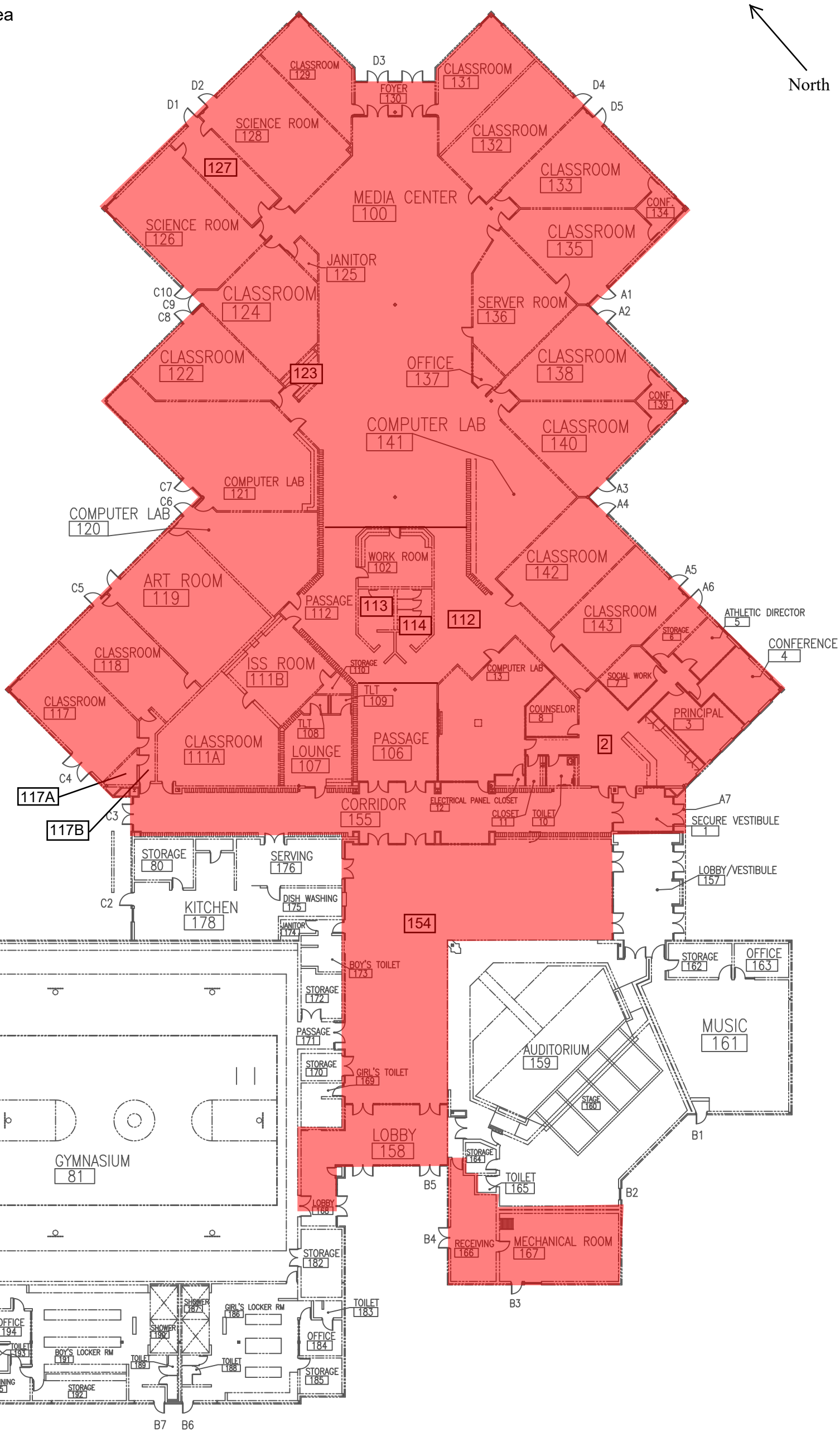

Mudded pipe fittings contain 4% Chrysotile asbestos.

Floor Plans

Coleman Jr/Sr High School

Built in 1975

= Inspected Area



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

Coleman Community Schools

2024 Bond – 2025 Junior High/Middle School Renovations

FOR CONSTRUCTION

Date: November 7, 2025

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END OF SECTION

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 CLOSEOUT SUBMITTALS

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

1.6 QUALITY ASSURANCE

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

1.7 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.

1.8 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 adequate ventilation when using cutting torches.
6. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.
7. Remove structural framing members and lower to ground by method suitable to avoid free fall and to prevent ground impact or dust generation.
8. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
9. 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. Clean and repair items to functional condition adequate for intended reuse.
2. Pack or crate items after cleaning and repairing. Identify contents of containers.
3. Protect items from damage during transport and storage.
4. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make item functional for use indicated.

E. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by Architect, items may be removed to a suitable, protected storage location during selective demolition, 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. 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 031000 "Concrete Forming and Accessories" for form-facing materials, form liners, insulating concrete forms, and waterstops.
2. Section 032000 "Concrete Reinforcing" for steel reinforcing bars and welded-wire reinforcement.
3. 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. 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.

2.7 ACCESSORIES

A. Bonding Agent: ASTM C932.
B. Vapor Barrier: ASTM D2103, 6 mil thick clear polyethylene film.

C. Non-Shrink Grout: Premixed compound with non-metallic aggregate, cement, water reducing and plasticizing agents; capable of minimum compressive strength of 4000 psi.
D. Drilled in Concrete Anchors (DCA's). Provide stainless steel or galvanized to F185 coating per ASTM A153 for DCA's in contact with preservative treated wood.
E. Flashing Reglets: Galvanized steel; longest possible lengths; alignment splines for joints; securable to formwork.
F. Construction Joints: 2"x2" key, formed with prefabbed galvanized steel or wood forms.
G. Expansion Joints: ½" wide with bituminous impregnated fiberboard filler conform to ANSI/ASTM D994.
H. Form Release Agent: Colorless material which will not stain concrete, absorb moisture, or impair natural bonding or color characteristics of coating intended for use on concrete.

2.8 CURING MATERIALS

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

2.9 CONCRETE MIXTURES

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

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

B. Class B: Normal-weight concrete used for foundation 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 and Light-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=20 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=35 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=35 & F_L=25 for the “F” number method.

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

3.9 INSTALLATION OF MISCELLANEOUS CONCRETE ITEMS

A. Filling In:

1. Fill in holes and openings left in concrete structures after Work of other trades is in place unless otherwise indicated.
2. Mix, place, and cure concrete, as specified, to blend with in-place construction.
3. Provide other miscellaneous concrete filling indicated or required to complete the Work.

B. Equipment Bases and Foundations:

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

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

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

3.10 TOLERANCES

A. Conform to ACI 117.

3.11 FIELD QUALITY CONTROL

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

1. Testing agency shall be responsible for providing curing container for composite samples on Site and verifying that field-cured composite samples are cured in accordance with ASTM C31/C31M.
2. Testing agency shall immediately report to Architect, Contractor, and concrete manufacturer any failure of Work to comply with Contract Documents.
3. Testing agency shall report results of tests and inspections, in writing, to Owner, Architect, Contractor, and concrete manufacturer within 48 hours of inspections and tests.

a. Test reports shall include reporting requirements of ASTM C31/C31M, ASTM C39/C39M, and ACI 301, including the following as applicable to each test and inspection:

1) Project name.
2) Name of testing agency.
3) Names and certification numbers of field and laboratory technicians performing inspections and testing.
4) Name of concrete manufacturer.
5) Date and time of inspection, sampling, and field testing.
6) Date and time of concrete placement.
7) Location in Work of concrete represented by samples.
8) Date and time sample was obtained.
9) Truck and batch ticket numbers.

10) Design compressive strength at 28 days.
11) Concrete mixture designation, proportions, and materials.
12) Field test results.
13) Information on storage and curing of samples before testing, including curing method and maximum and minimum temperatures during initial curing period.
14) Type of fracture and compressive break strengths at seven days and 28 days.

B. Batch Tickets: For each load delivered, submit three copies of batch delivery ticket to testing agency, indicating quantity, mix identification, admixtures, design strength, aggregate size, design air content, design slump at time of batching, and amount of water that can be added at Project site.

C. Inspections:

1. Headed bolts and studs.
2. Verification of use of required design mixture.
3. Concrete placement, including conveying and depositing.
4. Curing procedures and maintenance of curing temperature.
5. Verification of concrete strength before removal of shores and forms from beams and slabs.
6. Batch Plant Inspections: On a random basis, as determined by Architect.

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

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

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

2. Slump: ASTM C143/C143M:

   a. One test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture.
   b. Perform additional tests when concrete consistency appears to change.

3. Slump Flow: ASTM C1611/C1611M:

   a. One test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture.
   b. Perform additional tests when concrete consistency appears to change.

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

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

5. Concrete Temperature: ASTM C1064/C1064M:

a. One test hourly when air temperature is 40 deg F and below or 80 deg F and above, and one test for each composite sample.

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

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

7. Compression Test Specimens: ASTM C31/C31M:

   a. Cast and laboratory cure two sets of two 6-inch by 12-inch or 4-inch by 8-inch cylinder specimens for each composite sample.
   b. Cast, initial cure, and field cure two sets of two standard cylinder specimens for each composite sample.

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

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

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

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

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

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

3.12 PROTECTION

A. Protect concrete surfaces as follows:

1. Protect from petroleum stains.
2. Diaper hydraulic equipment used over concrete surfaces.
3. Prohibit vehicles from interior concrete slabs.
4. Prohibit use of pipe-cutting machinery over concrete surfaces.
5. Prohibit placement of steel items on concrete surfaces.
6. Prohibit use of acids or acidic detergents over concrete surfaces.
7. Protect liquid floor treatment from damage and wear during the remainder of construction period. Use protective methods and materials, including temporary covering, recommended in writing by liquid floor treatments installer.
8. Protect concrete surfaces scheduled to receive surface hardener or polished concrete finish using Floor Slab Protective Covering.

END OF SECTION

SECTION 042200
CONCRETE UNIT MASONRY

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

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

1.2 RELATED SECTIONS

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

1.3 REFERENCES

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

1.4 DEFINITIONS

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

1.5 ACTION SUBMITTALS

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

1. Face brick
2. Colored-aggregate mortar.

1.6 INFORMATIONAL SUBMITTALS

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

1.7 QUALITY ASSURANCE

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

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

1.8 FIELD CONDITIONS

A. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace unit masonry damaged by frost or by freezing conditions. Comply with cold-weather construction requirements contained in TMS 602/ACI 530.1/ASCE 6.
B. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in TMS 602/ACI 530.1/ASCE 6.

1.9 EFFLORESCENCE

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

PART 2 - PRODUCTS

2.1 UNIT MASONRY, GENERAL

A. Masonry Standard: Comply with TMS 602/ACI 530.1/ASCE 6, except as modified by requirements in the Contract Documents.
B. Defective Units: Referenced masonry unit standards may allow a certain percentage of units to contain chips, cracks, or other defects exceeding limits stated. Do not use units where such defects are exposed in the completed Work.
C. Fire-Resistance Ratings: Comply with requirements for fire-resistance-rated assembly designs indicated.

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

2.2 CONCRETE MASONRY UNITS

A. Shapes: Provide shapes indicated and as follows, with exposed surfaces matching exposed faces of adjacent units unless otherwise indicated.

1. Provide special shapes for lintels, corners, jambs, sashes, movement joints, headers, bonding, and other special conditions.

B. Integral Water Repellent: Provide units made with integral water repellent for exposed units and where indicated.
C. CMUs: ASTM C90.

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

2.3 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.

2.4 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.

2.5 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.

2.6 TIES AND ANCHORS

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

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

2.7 FLASHING

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

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

2.8 MISCELLANEOUS MASONRY ACCESSORIES

A. Bond-Breaker Strips: Asphalt-saturated felt complying with ASTM D226/D226M, Type I (No. 15 asphalt felt).

B. Drilled in Concrete Anchors (DCA’s) for grouted masonry. Provide stainless steel or galvanized to G185 coating per ASTM A153 for DCA’s in contact with preservative treated wood.

C. Drilled in Concrete Anchors (DCA’s) for hollow masonry. Provide stainless steel or galvanized to G185 coating per ASTM A153 for DCA’s in contact with preservative treated wood.

D. Control Joints: Form with preformed rubber or PVC joint devices.

2.9 MORTAR AND GROUT MIXES

A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures unless otherwise indicated.

1. Do not use calcium chloride in mortar or grout.
2. Use portland cement-lime or masonry cement mortar unless otherwise indicated.
3. For exterior masonry, use portland cement-lime or masonry cement mortar.

4. For reinforced masonry, use portland cement-lime or masonry cement mortar.
5. Add cold-weather admixture (if used) at same rate for all mortar that will be exposed to view, regardless of weather conditions, to ensure that mortar color is consistent.

B. Preblended, Dry Mortar Mix: Furnish dry mortar ingredients in form of a preblended mix. Measure quantities by weight to ensure accurate proportions, and thoroughly blend ingredients before delivering to Project site.

C. Mortar for Unit Masonry: Comply with ASTM C270, Proportion Specification. Provide the following types of mortar for applications stated unless another type is indicated.

1. For masonry below grade or in contact with earth, use Type S.
2. For reinforced masonry, use Type S.
3. For exterior, above-grade, load-bearing and nonload-bearing walls and parapet walls; for interior load-bearing walls; for interior nonload-bearing partitions; and for other applications where another type is not indicated, use Type N.
4. For interior nonload-bearing partitions, Type O may be used instead of Type N.

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

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

a. Face Brick

E. Grout for Unit Masonry: Comply with ASTM C476.

1. Use grout of type indicated or, if not otherwise indicated, of type (fine or coarse) that will comply with TMS 602/ACI 530.1/ASCE 6 for dimensions of grout spaces and pour height.
2. Proportion grout in accordance with ASTM C476, Table 1 or paragraph 4.2.2 for specified 28-day compressive strength indicated, but not less than 2000 psi.
3. Provide grout with a slump of 8 to 10 inches as measured according to ASTM C143/C143M.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Use full-size units without cutting if possible. If cutting is required to provide a continuous pattern or to fit adjoining construction, cut units with motor-driven saws; provide clean, sharp, unchipped edges. Allow units to dry before laying unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.

3.2 TOLERANCES

A. Dimensions and Locations of Elements:

1. For dimensions in cross section or elevation, do not vary by more than plus 1/2 inch or minus 1/4 inch.
2. For location of elements in plan, do not vary from that indicated by more than plus or minus 1/2 inch.
3. For location of elements in elevation, do not vary from that indicated by more than plus or minus 1/4 inch in a story height or 1/2 inch total.

B. Lines and Levels:

1. For bed joints and top surfaces of bearing walls, do not vary from level by more than 1/4 inch in 10 feet, or 1/2-inch maximum.
2. For conspicuous horizontal lines, such as lintels, sills, parapets, and reveals, do not vary from level by more than 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2-inch maximum.
3. For vertical lines and surfaces, do not vary from plumb by more than 1/4 inch in 10 feet, 3/8 inch in 20 feet, or 1/2-inch maximum.
4. For conspicuous vertical lines, such as external corners, door jambs, reveals, and expansion and control joints, do not vary from plumb by more than 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2-inch maximum.
5. For lines and surfaces, do not vary from straight by more than 1/4 inch in 10 feet, 3/8 inch in 20 feet, or 1/2-inch maximum.

C. Joints:

1. For bed joints, do not vary from thickness indicated by more than plus or minus 1/8 inch, with a maximum thickness limited to 1/2 inch.
2. For head and collar joints, do not vary from thickness indicated by more than plus 3/8 inch or minus 1/4 inch.
3. For exposed head joints, do not vary from thickness indicated by more than plus or minus 1/8 inch.

3.3 LAYING MASONRY WALLS

A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint thicknesses and for accurate location of openings, movement-type joints, returns, and offsets. Avoid using less-than-half-size units, particularly at corners, jambs, and, where possible, at other locations.
B. Bond Pattern for Exposed Masonry: Unless otherwise indicated, lay exposed masonry in running bond; do not use units with less-than-nominal 4-inch horizontal face dimensions at corners or jambs.
C. Built-in Work: As construction progresses, build in items specified in this and other Sections. Fill in solidly with masonry around built-in items.
D. Fill space between steel frames and masonry solidly with mortar unless otherwise indicated.
E. Where built-in items are to be embedded in cores of hollow masonry units, place a layer of metal lath, wire mesh, or plastic mesh in the joint below, and rod mortar or grout into core.
F. Fill cores in hollow CMUs with grout 24 inches under bearing plates, beams, lintels, posts, and similar items unless otherwise indicated.

3.4 MORTAR BEDDING AND JOINTING

A. Lay hollow CMUs as follows:

1. Bed face shells in mortar and make head joints of depth equal to bed joints.
2. Bed webs in mortar in all courses of piers, columns, and pilasters.
3. Bed webs in mortar in grouted masonry, including starting course on footings.
4. Fully bed entire units, including areas under cells, at starting course on footings where cells are not grouted.

B. Lay solid CMUs with completely filled bed and head joints; butter ends with sufficient mortar to fill head joints and shove into place. Do not deeply furrow bed joints or slush head joints.

C. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness unless otherwise indicated.
D. Cut joints flush for masonry walls to receive plaster or other direct-applied finishes (other than paint) unless otherwise indicated.

3.5 MASONRY-JOINT REINFORCEMENT

A. General: Install entire length of longitudinal side rods in mortar with a minimum cover of 5/8 inch on exterior side of walls, 1/2 inch elsewhere. Lap reinforcement a minimum of 6 inches.

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

B. Interrupt joint reinforcement at control and expansion joints unless otherwise indicated.
C. Provide continuity at wall intersections by using prefabricated T-shaped units.
D. Provide continuity at corners by using prefabricated L-shaped units.

3.6 FLASHING

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

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

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

3.7 WEEPS

A. Provide weep holes at 24” on center horizontally above through-wall flashing and at bottom of walls.
B. Weep holes and cavity vents shall consist of un-mortared, open head joints with honeycomb type inserts.

C. The weep hole shall extend through the lowest bed joint to the top side of the through-wall flashing.
D. Provide cavity vents at the top of each cavity space at 48” on center horizontally.

3.8 REINFORCED UNIT MASONRY

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

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

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

1. Comply with requirements in TMS 602/ACI 530.1/ASCE 6 for cleanouts and for grout placement, including minimum grout space and maximum pour height.
2. Limit height of vertical grout pours to not more than 60 inches.

3.9 FIELD QUALITY CONTROL

A. Reference structural drawings for additional Special Inspection requirements as designated per Chapter 17 of the Michigan Building Code.
B. Testing and Inspecting: Owner will engage special inspectors to perform tests and inspections and prepare reports. Allow inspectors access to scaffolding and work areas as needed to perform tests and inspections. Retesting of materials that fail to comply with specified requirements shall be done at Owners expense.
C. Inspections: Special inspections according to Level C in TMS 402/ACI 530/ASCE 5.

1. Begin masonry construction only after inspectors have verified proportions of site-prepared mortar.
2. Place grout only after inspectors have verified compliance of grout spaces and of grades, sizes, and locations of reinforcement.
3. Place grout only after inspectors have verified proportions of site-prepared grout.

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

3.10 REPAIRING, POINTING, AND CLEANING

A. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.

B. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:

1. Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes.
2. Clean concrete masonry by applicable cleaning methods indicated in NCMA TEK 8-4A.

END OF SECTION

SECTION 051200
STRUCTURAL STEEL FRAMING

PART 1 - GENERAL

1.1 SUMMARY

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

1. Section 052100 – Steel Joist Framing
2. Section 053100 – Steel Decking: 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 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. Rooftop bases and support curbs.
2. Wood blocking, cants, and nailers.
3. Wood furring.
4. 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 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.

C. 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.

1.5 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.
2. Roof 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.

1.4 QUALITY ASSURANCE

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 WOOD PANEL PRODUCTS

A. Emissions: Products shall meet the 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."

2.3 FIRE-RETARDANT-TREATED PLYWOOD

A. General: Where fire-retardant-treated materials are indicated on drawings, 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.

2.4 WALL SHEATHING

A. Plywood Sheathing: Exposure 1, Structural I sheathing.

B. Oriented-Strand-Board Sheathing: DOC PS 2, Exposure 1, Structural I sheathing.

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

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

2.5 ROOF SHEATHING

A. Plywood Sheathing: Exposure 1, Structural 1 sheathing. Fire retardant treated plywood.

2.6 FASTENERS

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

1. For roof and wall sheathing, provide fasteners with hot-dip zinc coating complying with ASTM A153/A153M.
2. For roof and 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 and roof 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 and Roof Sheathing:
   a. Screw to cold-formed metal framing.
   b. Space panels 1/8 inch apart at edges and ends.

END OF SECTION 061600

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. Interior board paneling.
2. Finish carpentry items, other than new shop prefabricated manufactured casework.
3. Benchtops in all locker rooms

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 DEFINITIONS

A. MDF: Medium-density fiberboard.

B. MDO: Plywood with a medium-density overlay on the face.

C. PVC: Polyvinyl chloride.

1.4 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.

1.5 QUALITY ASSURANCE

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

1.6 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.

1.7 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.

G. Melamine-Faced Particleboard: Particleboard complying with ANSI A208.1, Grade M-2, finished on both faces with thermally fused, melamine-impregnated decorative paper and complying with NEMA LD 3, Grade VGL, for Test Methods 3.3, 3.4, 3.6, 3.8, and 3.10.

1. Color: Selected from manufacturers standard.

2.2 BENCHTOPS

A. 1 3/4" Standard Maple Benchtop as manufactured by Michigan Maple Block Co.
B. Edge grained lamination, solid maple, electronically bonded.
C. Wear-resistant finish, Durakryl 102.
D. Size: refer to drawings.

2.3 WOOD-PRESERVATIVE-TREATED MATERIALS

A. Preservative Treatment by Pressure Process: AWPA U1; Use Category .

1. Kiln dry lumber and plywood after treatment to a maximum moisture content of 19 and 18 percent, respectively.
2. Preservative Chemicals: Acceptable to authorities having jurisdiction.
3. For exposed items indicated to receive transparent finish, do not use chemical formulations that contain colorants or that bleed through or otherwise adversely affect finishes.
4. Do not use material that is warped or does not comply with requirements for untreated material.
5. Mark lumber with treatment-quality mark of an inspection agency approved by the ALSC's Board of Review.
   a. For exposed lumber indicated to receive a stained or natural finish,.
6. Mark plywood with appropriate classification marking of an inspection agency acceptable to authorities having jurisdiction.

   a. For exposed plywood indicated to receive a stained or natural finish, mark back of each piece.
7. Application: Where indicated on Drawings.

2.4 PANELING AND TRIM

A. Board Paneling: Interior wood-board paneling complying with MMPA WM 9.

1. Species: Maple.
2. Grade: Clear No. 1.
3. Maximum Moisture Content: 15 percent with at least 85 percent of shipment at 12 percent or less.
4. Pattern: to be selected.

2.5 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. Paneling Adhesive: Comply with paneling manufacturer's written instructions for adhesives.

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

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

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

2.6 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.
2. Wood-board paneling.

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 PANELING INSTALLATION

A. Board Paneling: Install according to manufacturer's written instructions.

1. Arrange in random-width pattern suggested by manufacturer unless boards or planks are of uniform width.
2. Install in full lengths without end joints.
3. Stagger end joints in random pattern to uniformly distribute joints on each wall.
4. Install with uniform end joints with only end-matched (tongue-and-groove) joints within each field of paneling.
5. Install with uniform end joints. Locate end joints only over furring or blocking.
6. Select and arrange boards on each wall to minimize noticeable variations in grain character and color between adjacent boards.
7. Install with uniform tight joints between boards.
8. Fasten paneling by face nailing, setting nails, and filling over nail heads.
9. Fasten paneling with trim screws, set below face and filled.
10. Fasten paneling by blind nailing through tongues.
11. Fasten paneling with paneling system manufacturer's concealed clips.
12. Fasten paneling to gypsum wallboard with panel adhesive.

3.5 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.

3.6 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.

3.7 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.

3.8 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 062023

SECTION 064116 - PLASTIC-LAMINATE-CLAD ARCHITECTURAL CABINETS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Plastic-laminate-faced architectural 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 and agrifiber 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.

Basis-of-Design Product: Subject to compliance with requirements, provide Formica; Decorative Plastic Laminates.

1. Color Selections**: TBD, colors per Manufacturer Standard selections,** Provide samples to Architect for selection during construction.

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 and Agrifiber 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. 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 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.

4.

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 semiexposed 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 064116

SECTION 072100
THERMAL INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

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

B. Related Requirements:

1. Section 042000 "Unit Masonry" for insulation installed in masonry cells.
2. Section 075419 "Polyvinyl-Chloride (PVC) Roofing" for insulation specified as part of roofing construction.
3. Section 092900 "Gypsum Board" for sound attenuation blanket used as acoustic insulation.

1.3 SUBMITTALS

A. Product Data: For each type of product.

1.4 DELIVERY, STORAGE, AND HANDLING

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

B. Protect foam-plastic board insulation as follows:

1. Do not expose to sunlight except to necessary extent for period of installation and concealment.

2. Protect against ignition at all times. Do not deliver foam-plastic board materials to Project site until just before installation time.

3. Quickly complete installation and concealment of foam-plastic board insulation in each area of construction.

PART 2 - PRODUCTS

2.1 EXTRUDED POLYSTYRENE FOAM-PLASTIC BOARD

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

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

    a. DiversiFoam Products.
    b. Dow Chemical Company (The).
    c. MBCI.
    d. Owens Corning.
2. Fire Propagation Characteristics: Passes NFPA 285 testing as part of an approved assembly.

2.2 FIBERGLASS BATT INSULATION

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

1. ASTM C 665 type II Class A (batt with non-reflective facing, flame spread 25 or less), or III Class A (batt with reflective facing, flame spread 25 or less].

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

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

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

2.3 INSULATION FASTENERS

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

1. Recommended by its manufacturer for sealing the joints of extruded polystyrene insulation board in vertical cavity wall construction
2. Peel Adhesion Strength: Compliant with ICC-ES AC 148 and AAMA 711
3. Water Resistance and Joint Sealing: Compliant with ICC-ES AC 71
4. Air Permeance: Air permeance less than or equal to 0.02 L/s/m2, tested in accordance with ASTM E 2178
5. Service Temperature: Service temperature range shall be at least 0oF to 120oF maximum
6. Width: Minimum 3.5 inches.

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

1. Owens Corning.

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

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

E. ACCESSORIES

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

PART 3 - EXECUTION

3.1 PREPARATION

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

3.2 INSTALLATION, GENERAL

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

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

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

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

3.3 INSTALLATION OF FOUNDATION WALL INSULATION

A. Butt panels together for tight fit.

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

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

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

3.4 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

SECTION 072119
FOAMED-IN-PLACE INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Closed-cell spray polyurethane foam.

B. Related Requirements:

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

1.3 SUBMITTALS

A. Product Data: For each type of product.

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

1.4 QUALITY ASSURANCE

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

PART 2 - PRODUCTS

2.1 CLOSED-CELL SPRAY POLYURETHANE FOAM

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 075419 - POLYVINYL-CHLORIDE (PVC) ROOFING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Mechanically fastened, polyvinyl chloride (PVC) roofing system.
2. Roof insulation.
3. Cover board.
4. Walkways.

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."

C. Related Requirements:

1. Section 061000 "Rough Carpentry" for wood nailers, curbs, and blocking; and for wood-based, structural-use roof deck panels.
2. Section 061600 "Sheathing" for wood-based, structural-use roof deck panels.
3. Section 072100 "Thermal Insulation" for insulation beneath the roof deck.
4. Section 076200 "Sheet Metal Flashing and Trim" for metal roof flashings and counterflashings.
5. Section 079200 "Joint Sealants" for joint sealants, joint fillers, and joint preparation.

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, include copy of FM Approvals' RoofNav listing.

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 listed in FM Approvals' RoofNav 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. Special Warranty: Manufacturer agrees to repair or replace components of roofing system that fail in materials or workmanship within specified warranty period, 20 year, no dollar limit.

1. Special warranty includes roof membrane, base flashings, roof insulation, fasteners, cover boards, substrate board, roof pavers, and other components of roofing system.
2. Warranty Period: 20 years from date of Substantial Completion.

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, or the "Resistance to Foot Traffic Test" in FM Approvals 4470.

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 FM Approvals 4474, 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 shall comply with requirements in FM Approvals 4450 or FM Approvals 4470 as part of

a roofing system, and shall 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.
   d. Versico Roofing Systems.
2. Thickness: 50 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: 25 psi.
3. Size: 48 by 96 inches.
4. Thickness (total thickness refer to drawings): Provide min. R-36 value.

C. Tapered Insulation: Provide factory-tapered insulation boards.

1. Material: Match roof insulation.
2. Minimum Thickness: 1/4 inch.
3. Slope:

    a. Roof Field: 1/8 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 in FM Approvals 4470, 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. Cover Board: ASTM C1177/C1177M, glass-mat, water-resistant gypsum board or ASTM C1278/C1278M fiber-reinforced gypsum board.

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

    a. Georgia-Pacific Gypsum LLC.
    b. National Gypsum Company.
    c. USG Corporation.
2. Thickness: 1/2 inch.
3. Surface Finish: Factory primed.

E. 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, FM Approvals' RoofNav listed roof assembly requirements, and FM Global Property Loss Prevention Data Sheet 1-29.

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 requirements in FM Approvals' RoofNav for specified Windstorm Resistance Classification.
    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 FM Approvals' RoofNav listed roof assembly requirements for specified Windstorm Resistance Classification and FM Global Property Loss Prevention Data Sheet 1-29, 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.

D. Installation Over Decking:

1. Mechanically fasten slip sheet to roof deck using mechanical fasteners specifically designed and sized for fastening slip sheet to wood decks.
    a. Fasten slip sheet according to requirements in SPRI's Directory of Roof Assemblies for specified Wind Uplift Load Capacity.
    b. Fasten slip sheet to resist specified uplift pressure at corners, perimeter, and field of roof.
2. Install base layer of insulation with joints staggered not less than 24 inches in adjacent rows.
    a. 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.
    b. Trim insulation neatly to fit around penetrations and projections, and to fit tight to intersecting sloping roof decks.

c. Make joints between adjacent insulation boards not more than 1/4 inch in width.
d. 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.
e. Fill gaps exceeding 1/4 inch with insulation.
f. Cut and fit insulation within 1/4 inch of nailers, projections, and penetrations.
g. Loosely lay base layer of insulation units over substrate.
h. Mechanically attach base layer of insulation and substrate board using mechanical fasteners specifically designed and sized for fastening specified board-type roof insulation to wood decks.
    1) Fasten insulation according to requirements in SPRI's Directory of Roof Assemblies for specified Wind Uplift Load Capacity.
    2) Fasten insulation to resist specified uplift pressure at corners, perimeter, and field of roof.

3. 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.
        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 each layer of insulation units over substrate.
    i. Adhere each layer of insulation to substrate using adhesive according to SPRI's Directory of Roof Assemblies listed roof assembly requirements for specified Wind Uplift Load Capacity and FM Global Property Loss Prevention Data Sheet 1-29, 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.

E. Installation Over Cementitious Wood-Fiber Decks:

1. Mechanically fasten slip sheet to roof deck using mechanical fasteners specifically designed and sized for fastening slip sheet to cementitious wood-fiber decks.
    a. Fasten slip sheet according to requirements in SPRI's Directory of Roof Assemblies for specified Wind Uplift Load Capacity.
    b. Fasten slip sheet to resist specified uplift pressure at corners, perimeter, and field of roof.
2. Install base layer of insulation with joints staggered not less than 24 inches in adjacent rows.
    a. 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.
    b. Trim insulation neatly to fit around penetrations and projections, and to fit tight to intersecting sloping roof decks.
    c. Make joints between adjacent insulation boards not more than 1/4 inch in width.

d. 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.
e. Fill gaps exceeding 1/4 inch with insulation.
f. Cut and fit insulation within 1/4 inch of nailers, projections, and penetrations.
g. Loosely lay base layer of insulation units over substrate.
h. Adhere base layer of insulation to slip sheet according to SPRI's Directory of Roof Assemblies listed roof assembly requirements for specified Wind Uplift Load Capacity and FM Global Property Loss Prevention Data Sheet 1-29, as follows:
   1) Set insulation in a solid mopping of hot roofing asphalt, applied within plus or minus 25 deg F of equiviscous temperature.
   2) Set insulation in ribbons of bead-applied insulation adhesive, firmly pressing and maintaining insulation in place.
   3) Set insulation in a uniform coverage of full-spread insulation adhesive, firmly pressing and maintaining insulation in place.

3. 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.
      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 each layer of insulation units over substrate.
   i. Adhere each layer of insulation to substrate using adhesive according to SPRI's Directory of Roof Assemblies listed roof assembly requirements for specified Wind Uplift Load Capacity and FM Global Property Loss Prevention Data Sheet 1-29, 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 COVER BOARDS

A. Install cover boards over insulation with long joints in continuous straight lines with end joints staggered between rows. Offset joints of insulation below a minimum of 6 inches in each direction.

1. Trim cover board neatly to fit around penetrations and projections, and to fit tight to intersecting sloping roof decks.
2. At internal roof drains, conform to slope of drain sump.

   a. Trim cover board so that water flow is unrestricted.
3. Cut and fit cover board tight to nailers, projections, and penetrations.
4. Adhere cover board to substrate using adhesive according to FM Approvals' RoofNav listed roof assembly requirements for specified Windstorm Resistance Classification and FM Global Property Loss Prevention Data Sheet 1-29, as follows:

a. Set cover board in a solid mopping of hot roofing asphalt, applied within plus or minus 25 deg F of equiviscous temperature.
b. Set cover board in ribbons of bead-applied insulation adhesive, firmly pressing and maintaining insulation in place.
c. Set cover board in a uniform coverage of full-spread insulation adhesive, firmly pressing and maintaining insulation in place.

B. Install slip sheet over cover board and immediately beneath roof membrane.

3.6 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.

3.7 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.

3.8 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.

3.9 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 075419

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: of manufacturers full range of color options

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, nonsag, 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 Prepainted, 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. Pretin edges of sheets to be soldered to a width of 1-1/2 inches (38 mm) except where pretinned 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 076200

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:

1. 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.

2. Blank openings through fire-rated vertical barriers (walls and partitions), horizontal barriers (floor/ceiling assemblies), and vertical service shaft walls and partitions.

3. Openings and penetrations in fire-rated partitions or walls containing fire doors.

4. 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 092000 - Gypsum Board
4. Section 220000 - Plumbing
5. Section 230000 - Heating, Ventilating, and Air Conditioning
6. 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)

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 013000.

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. Hilti Speed Sleeve (CP 653) with integrated smoke seal fabric membrane.
2. Hilti Firestop Sleeve (CFS-SL SK)
3. Hilti Retrofit Sleeve (CFS-SL RK) for use with existing cable bundles.
4. Hilti Gangplate (CFS-SL GP) for use with multiple cable management devices.
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 078416
THROUGH-PENETRATION FIRESTOPPING

PART 1 - GENERAL

1.1 SUMMARY

A. This section includes through-penetration firestop systems for penetrations through the following fire-resistance rated assemblies, including both blank openings and openings containing penetrating items:

1. Walls and partitions.
2. Smoke barriers.

1.2 PERFORMANCE CRITERIA

A. Fire Test Requirements

1. Underwriters Laboratories, Inc. (UL):
   a. ANSI/ UL1479, “Fire Tests of Through Penetration Firestops”.
   b. ANSI/ UL263, “Fire Tests of Building Construction and Materials”.
   c. ANSI/ UL723, “Surface Burning Characteristics of Building Materials”.

2. American Society of Testing and Materials (ASTM):
   a. ASTM E-814, “Fire Tests of Penetration Fire Stops”.
   b. ASTM E-119, “Fire Tests of Building Construction and Materials”.
   c. ASTM E-84, “Surface Burning Characteristics of BuildingMaterials”.
   d. ASTM E2174, “Standard Practice for On Site Inspection of Installed Fire Stops”.

1.3 REFERENCES

1. Underwriters Laboratories (UL) of Northbrook, IL “Fire Resistance Directory”.
   a. Through Penetration Firestop Systems (XHEZ)
   b. Fill, Void or Cavity Materials (XHHW)
   c. Firestop Devices (XHJI)
   d. Forming Materials (XHKU)
   e. Wall Opening Protective Materials (CLIV)

2. 2015 Michigan Building Code
3. National Fire Protection Association (NFPA) of Quincy, MA “NFPA 101: Life Safety Code”.
4. National Fire Protection Association (NFPA) of Quincy, MA “NFPA 70: National Electrical Code”.
5. Factory Mutual Approvals (FM) of Norwood, MA “FM 4991: Standard for Approval of Firestop Contractors”.
6. Underwriters Laboratories (UL) of Northbrook, IL “UL Qualified Firestop Contractor Program”

1.4 PERFORMANCE REQUIREMENTS

A. Provide products that upon curing do not re-emulsify, dissolve, leach, breakdown, or otherwise deteriorate over time from exposure to atmospheric moisture, sweating pipes, ponding water or other forms of moisture characteristic during and after construction.

B. Maintenance free such that no action is required to activate the smoke and fire sealing mechanism.

1.5 SUBMITTALS

A. Product Data: For each type of through-penetration firestop system product indicated.

B. System Drawings: Submit documentation from a qualified third-party testing agency that is applicable to each through-penetration firestop system configuration for construction and penetrating items.

C. Product Certificates: Certificate of conformance signed by manufacturers of through-penetration firestop system products certifying that products comply with requirements.

1.6 QUALITY ASSURANCE

A. Provide through-penetration firestop systems that comply with the following requirements and those specified in “Performance Criteria” Article:

B. Firestopping tests are performed by a qualified, testing and inspection agency. A qualified testing and inspection agency is UL, or another agency performing testing and follow-up inspection services for firestop systems acceptable to authorities having jurisdiction.

C. Through-penetration firestop system products bear classification marking of qualified testing and inspection agency.

1.7 DELIVERY, STORAGE AND HANDLING

A. Deliver through-penetration firestop system products to Project site in original, unopened containers or packages with intact and legible manufacturer’s labels identifying product and manufacturer, date of manufacture; lot number; shelf life, if applicable; qualified testing and inspection agency’s classification marking; and mixing instructions for multicomponent materials.

B. Store and handle materials for through-penetration firestop systems to prevent their deterioration or damage due to moisture, temperature changes, contaminants or other causes.

1.8 PROJECT CONDITIONS

A. Do not install through-penetration firestop systems when ambient or substrate temperatures are outside limitations recommended by manufacturer.

B. Do not use materials that contain flammable solvents.

1.9 COORDINATION

A. Coordinate construction of openings and penetrating items to ensure that through-penetration firestop systems are installed according to specified requirements.

B. Coordinate sizing of sleeves, openings, core-drilled holes or cut openings to accommodate through-penetration firestop systems.

C. Schedule installation of firestopping after completion of penetrating item installation but prior to covering or concealing of openings.

PART 2 - PRODUCTS

2.1 FIRESTOPPING, GENERAL

A. Provide through-penetration firestop systems that are compatible with one another, with the substrates forming openings, and with the items, if any, penetrating through-penetration firestop systems, under conditions of service and application, as demonstrated by through-penetration firestop system manufacturer based on testing and field experience.

B. Provide components for each through-penetration firestop system that are needed to install fill materials. Use only components specified by the firestopping manufacturer and approved by the qualified testing agency for the designated fire-resistance-rated systems.

2.2 ACCEPTABLE MANUFACTURERS

A. Acceptable Manufacturer: Specified Technologies Inc., 210 Evans Way, Somerville, NJ 08876. Tel: (800) 992-1180, Fax: (908) 526-9623, Email: specseal@stifirestop.com, Website: www.stifirestop.com.

2.3 MATERIALS

A. General: Use only firestopping products that have been tested for specific fire-resistance-rated construction conditions conforming to construction assembly type, penetrating item type or joint opening width and movement capabilities, annular space requirements, and fire-rating involved for each separate instance.

B. Firestop Devices: Factory-assembled steel collars lined with intumescent material capable of expanding a minimum 30 times sized to fit specific outside diameter of penetrating item, the following products are acceptable:

1. Specified Technologies, Inc. (STI) SpecSeal Series SSC Firestop Collars
2. Specified Technologies, Inc. (STI) SpecSeal Series LCC Firestop Collars

PART 3 - EXECUTION

3.1 PREPARATION

A. Examination of Conditions: Examine areas and conditions under which work is to be performed and identify conditions detrimental to proper or timely completion.

B. Surfaces to which firestop materials will be applied shall be free of dirt, grease, oil, scale, laitance, rust, release agents, water repellents, and any other substances that may inhibit optimum adhesion.

C. Provide masking and temporary covering to prevent soiling of adjacent surfaces by firestopping materials.

D. Do not proceed until unsatisfactory conditions have been corrected.

3.2 FIELD QUALITY CONTROL

A. Inspections: Owner shall engage a qualified independent inspection agency to inspect through-penetration firestop systems in accordance with ASTM E2174, “Standard Practice for On Site Inspection of Installed Fire Stops”.

B. Keep areas of work accessible until inspection by authorities having jurisdiction.

C. Where deficiencies are found, repair or replace through-penetration firestop systems so they comply with requirements.

3.3 ADJUSTING AND CLEANING

A. Remove equipment, materials and debris, leaving area in undamaged, clean condition.

B. Clean all surfaces adjacent to sealed openings to be free of excess through-penetration firestop system materials and soiling as work progresses.

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 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.

D. Product Test Reports: For each kind of joint sealant, for tests performed by manufacturer and witnessed by a qualified testing agency.

1.4 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.

1.5 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.

1.6 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.

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 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 door and frames, 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 non-vented plastic.

1. Provide additional protection to prevent damage to factory-finished units.

B. Deliver welded frames with two removable spreader bars across bottom of doors and 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 frame 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 frames comply with standard construction requirements for tested and labeled fire-rated frame assemblies except for size.
3. Temperature-Rise Limit: provide frames 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 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. Frames:

a. Materials: Uncoated steel sheet, minimum thickness of 0.060 inch (16 ga).
b. Sidelite Frames: Fabricated from same thickness material as adjacent door frame.
c. Construction: Full profile welded.

2. Exposed Finish: Prime.

3. 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 0.048 inch (18 ga).
d. Edge Construction: Model 1, Full Flush
e. Edge Bevel: Provide manufacturer's standard beveled or square edges.
f. Core: Manufacturer's standard
g. Fire-Rated Core: Manufacturer's standard vertical steel stiffener core for fire-rated doors.

2.4 FRAME ANCHORS

A. Jamb Anchors:

1. Type: Anchors of minimum size and type required by applicable 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.

2.5 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.

2.6 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 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 frames to receive non-templated, mortised, and surface-mounted hardware.
2. Comply with BHMA A156.115 for preparing hollow-metal 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 beveled 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 frames. Provide loose stops and moldings on inside of hollow-metal 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.

2.7 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..

8. Hollow-Metal Doors: Fit and adjust hollow-metal doors accurately in frames, within clearances specified below.
9. Non-Fire-Rated Steel Doors: Comply with ANSI/SDI A250.8
    1) Fire-Rated Doors: Install doors with clearances according to NFPA 80.
    2) Smoke-Control Doors: Install doors according to NFPA 105.

C. 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 081416 - FLUSH WOOD DOORS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Five-ply flush wood veneer-faced doors for transparent finish.
2. Factory finishing flush wood doors.
3. Factory fitting flush wood doors to frames and factory machining for hardware.

B. Related Requirements:

1. Section 088000 "Glazing" for glass view panels in flush wood doors.
2. Section 099300 "Staining and Transparent Finishing" for field finishing doors.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product, including the following:

1. Door core materials and construction.
2. Door edge construction
3. Door face type and characteristics.
4. Door louvers.
5. Door trim for openings.
6. Door frame construction.
7. Factory-machining criteria.
8. Factory- finishing specifications.

B. Shop Drawings: Indicate location, size, and hand of each door; elevation of each type of door; construction details not covered in Product Data; and the following:

1. Door schedule indicating door location, type, size, fire protection rating, and swing.
2. Door elevations, dimension and locations of hardware, lite and louver cutouts, and glazing thicknesses.
3. Details of frame for each frame type, including dimensions and profile.
4. Details of electrical raceway and preparation for electrified hardware, access control systems, and security systems.
5. Dimensions and locations of blocking for hardware attachment.
6. Dimensions and locations of mortises and holes for hardware.
7. Clearances and undercuts.
8. Requirements for veneer matching.
9. Doors to be factory finished and application requirements.
10. Apply AWI Quality Certification Program label to Shop Drawings.

C. Samples for Initial Selection: For factory-finished doors.

1.3 CLOSEOUT SUBMITTALS

A. Quality Standard Compliance Certificates: AWI Quality Certification Program certificates.

B. Record Documents: For fire-rated doors, list of door numbers and applicable room name and number to which door accesses.

1.4 QUALITY ASSURANCE

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

1.5 DELIVERY, STORAGE, AND HANDLING

A. Comply with requirements of referenced standard and manufacturer's written instructions.

B. Package doors individually in cardboard cartons, and wrap bundles of doors in plastic sheeting.

C. Mark each door on bottom rail with opening number used on Shop Drawings.

1.6 FIELD CONDITIONS

A. Environmental Limitations: Do not deliver or install doors until spaces are enclosed and weathertight, wet-work in spaces is complete and dry, and HVAC system is operating and maintaining temperature and relative humidity at levels designed for building occupants for the remainder of construction period.

1.7 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace doors that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Delamination of veneer.
b. Warping (bow, cup, or twist) more than 1/4 inch in a 42-by-84-inch section.
c. Telegraphing of core construction in face veneers exceeding 0.01 inch in a 3-inch span.

2. Warranty shall also include installation and finishing that may be required due to repair or replacement of defective doors.
3. Warranty Period for Solid-Core Interior Doors: Life of installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain flush wood doors from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. Fire-Rated Wood 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 in accordance with NFPA 252.

1. 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.

B. Smoke- and Draft-Control Door Assemblies: Listed and labeled for smoke and draft control by a qualified testing agency acceptable to authorities having jurisdiction, based on testing in accordance with UL 1784 and installed in compliance with NFPA 105.

2.3 FLUSH WOOD DOORS, GENERAL

A. Quality Standard: In addition to requirements specified, comply with AWI/AWMAC/WI's "Architectural Woodwork Standards."

1. The Contract Documents contain requirements that are more stringent than the referenced quality standard. Comply with the Contract Documents in addition to those of the referenced quality standard.

2.4 SOLID-CORE FIVE-PLY FLUSH WOOD VENEER-FACED DOORS FOR TRANSPARENT FINISH

A. Interior Doors :

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

a. Eggers Industries.
b. Lambton Doors.
c. Oshkosh Door Company.
d. VT Industries Inc.

2. Performance Grade: ANSI/WDMA I.S. 1A Heavy Duty.
3. Faces: Single-ply wood veneer not less than 1/50 inch thick.
   a. Species: Oak species wood, clear plain sliced with pair matched grain, for semi-transparent finish. Stain color to be selected during construction.
   b. Cut: Plain sliced (flat sliced).
   c. Match between Veneer Leaves: Book match.
   d. Assembly of Veneer Leaves on Door Faces: Center-balance match.
   e. Pair and Set Match: Provide for doors hung in same opening or separated only by mullions.
   f. Room Match: Match door faces within each separate room or area of building. Corridor-door faces do not need to match where they are separated by 10 feet or more.
   g. Room Match: Provide door faces of compatible color and grain within each separate room or area of building.
   h. Transom Match:.
   i. Blueprint Match: Where indicated, provide doors with faces produced from same flitches as adjacent wood paneling and arranged to provide blueprint match with

wood paneling. Comply with requirements in Section 064216 "Flush Wood Paneling."

4. Exposed Vertical and Top Edges: Same species as faces or a compatible species - Architectural Woodwork Standards edge Type A.

    a. Fire-Rated Single Doors: Provide edge construction with intumescent seals concealed by outer stile. Comply with specified requirements for exposed vertical edges.
    b. Fire-Rated Pairs of Doors: Provide fire-retardant stiles that are listed and labeled for applications indicated without formed-steel edges and astragals. Provide stiles with concealed intumescent seals. Comply with specified requirements for exposed edges.
    c. Fire-Rated Pairs of Doors: Provide formed-steel edges and astragals with intumescent seals.
        1) Finish steel edges and astragals with baked enamel.
        2) Finish steel edges and astragals to match door hardware (locksets or exit devices).
    d. Mineral-Core Doors: At hinge stiles, provide laminated-edge construction with improved screw-holding capability and split resistance. Comply with specified requirements for exposed edges.
        1) Screw-Holding Capability: 550 lbf in accordance with WDMA T.M. 10.
5. Core for Non-Fire-Rated Doors:
    a. ANSI A208.1, Grade LD-1 particleboard.
        1) Blocking: Provide wood blocking in particleboard-core doors as needed to eliminate through-bolting hardware.
            a) 5-inch top-rail blocking, in doors indicated to have closers.
            b) 5-inch bottom-rail blocking, in exterior doors and doors indicated to have kick, mop, or armor plates.
            c) 5-inch midrail blocking, in doors indicated to have exit devices.
        2) Provide doors with glued-wood-stave or WDMA I.S. 10 structural-composite-lumber cores instead of particleboard cores for doors scheduled to receive exit devices in Section 087100 "Door Hardware."
    b. Glued wood stave.
    c. WDMA I.S. 10 structural composite lumber.
        1) Screw Withdrawal, Door Face: 550 lbf.
        2) Screw Withdrawal, Vertical Door Edge: 550 lbf.
    d. Either glued wood stave or WDMA I.S. 10 structural composite lumber.
6. Core for Fire-Rated Doors: As required to achieve fire-protection rating indicated on Drawings.

    a. Blocking for Mineral-Core Doors: Provide composite blocking with improved screw-holding capability approved for use in doors of fire-protection ratings indicated on Drawings as needed to eliminate through-bolting hardware.
        1) 5-inch top-rail blocking.
        2) 5-inch bottom-rail blocking, in doors indicated to have protection plates.
        3) 5-inch midrail blocking, in doors indicated to have armor plates.
        4) 4-1/2-by-10-inch lock blocks, in doors indicated to have exit devices.
7. Construction: Five plies, hot-pressed bonded (vertical and horizontal edging is bonded to core), with entire unit abrasive planed before veneering.

2.5 FABRICATION

A. Transom and Side Panels:

1. Fabricate matching panels with same construction, exposed surfaces, and finish as specified for associated doors.
2. Finish bottom edges of transoms and top edges of rabbeted doors same as door stiles.
3. Fabricate door and transom panels with full-width, solid-lumber, rabbeted, meeting rails.
4. Provide factory-installed spring bolts for concealed attachment into jambs of metal door frames.

B. Openings: Factory cut and trim openings through doors.

1. Light Openings: Trim openings with moldings of material and profile indicated.
   a. All doors with round vision lites shall be painted metal or size indicated in drawings.
2. Glazing: Factory install glazing in doors indicated to be factory finished. Comply with applicable requirements in Section 088000 "Glazing."
3. Louvers: Factory install louvers in prepared openings.

2.6 FACTORY FINISHING

A. Comply with referenced quality standard for factory finishing.

1. Complete fabrication, including fitting doors for openings and machining for hardware that is not surface applied, before finishing.
2. Finish faces, all four edges, edges of cutouts, and mortises.
3. Stains and fillers may be omitted on top and bottom edges, edges of cutouts, and mortises.

B. Factory finish doors where indicated in schedules or from manufactured standard selections as factory finished.

C. Transparent Finish:

1. ANSI/WDMA I.S. 1A Grade: Premium.
2. Finish: ANSI/WDMA I.S. 1A TR-6 Catalyzed Polyurethane.
3. Staining: As selected by Architect from manufacturer's full range.
4. Effect: Semifilled finish, produced by applying an additional finish coat to partially fill the wood pores.
5. Sheen: Satin.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine doors and installed door frames, with Installer present, before hanging doors.

1. Verify that installed frames comply with indicated requirements for type, size, location, and swing characteristics and have been installed with level heads and plumb jambs.
2. Reject doors with defects.

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

3.2 INSTALLATION

A. Hardware: For installation, see Section 087100 "Door Hardware."

B. Install doors to comply with manufacturer's written instructions and referenced quality standard, and as indicated.

C. Install frames level, plumb, true, and straight.

1. Shim as required with concealed shims. Install level and plumb to a tolerance of 1/8 inch in 96 inches.
2. Anchor frames to anchors or blocking built in or directly attached to substrates.
    a. Secure with countersunk, concealed fasteners and blind nailing.
    b. Use fine finishing nails or finishing screws for exposed fastening, countersunk and filled flush with woodwork.
        1) For factory-finished items, use filler matching finish of items being installed.
3. Install fire-rated doors and frames in accordance with NFPA 80.
4. Install smoke- and draft-control doors in accordance with NFPA 105.

D. Job-Fitted Doors:

1. Align and fit doors in frames with uniform clearances and bevels as indicated below.
    a. Do not trim stiles and rails in excess of limits set by manufacturer or permitted for fire-rated doors.
2. Machine doors for hardware.
3. Seal edges of doors, edges of cutouts, and mortises after fitting and machining.
4. Clearances:
    a. Provide 1/8 inch at heads, jambs, and between pairs of doors.
    b. Provide 1/8 inch from bottom of door to top of decorative floor finish or covering unless otherwise indicated on Drawings.
    c. Where threshold is shown or scheduled, provide1/4 inch from bottom of door to top of threshold unless otherwise indicated.
    d. Comply with NFPA 80 for fire-rated doors.
5. Bevel non-fire-rated doors 1/8 inch in 2 inches at lock and hinge edges.
6. Bevel fire-rated doors 1/8 inch in 2 inches at lock edge; trim stiles and rails only to extent permitted by labeling agency.

E. Factory-Fitted Doors: Align in frames for uniform clearance at each edge.

F. Factory-Finished Doors: Restore finish before installation if fitting or machining is required at Project site.

3.3 ADJUSTING

A. Operation: Rehang or replace doors that do not swing or operate freely.

B. Finished Doors: Replace doors that are damaged or that do not comply with requirements. Doors may be repaired or refinished if Work complies with requirements and shows no evidence of repair or refinishing.

END OF SECTION 081416

SECTION 082200
FIBERGLASS DOORS AND FRAMES

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:

1. Fiberglass reinforced plastic (FRP) doors.
2. Frames – Aluminum Entrances and Storefront 084113.

1.2 SUBMITTALS

A. Product Data: Manufacturer's printed product data indicating characteristics of products specified and installation instructions.
B. Shop Drawings:

1. Dimensioned elevation of each type door assembly in project; indicate sizes and locations of door hardware, and lights and louvers, if specified.
2. Installation details of each type installation condition in project; indicate installation details of glazing, if specified.
3. Schedule: Indicate each door assembly in project; cross-reference to plans, elevations, and details. Use same designation indicated on Drawings.

C. Samples: Manufacturer's standard color chips.
D. Manufacturer's standard warranty documents, executed by manufacturer's representative, countersigned by Contractor.

1.3 DELIVERY, STORAGE, AND HANDLING

A. Packing, Shipping, Handling, and Unloading: Package door assemblies in manufacturer's standard containers.
B. Store door assemblies in manufacturer's standard containers, on end, to prevent damage to face corners and edges.

1.4 WARRANTY

A. Manufacturer's Lifetime warranty against failure due to corrosion from specified environment.

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. VALE DOOR (Basis of Design : Model VC100)
B. SPECIAL LITE
C. KAWNEER
D. FIB-R-DOR.
E. Chem-Pruf.

2.2 MATERIALS

A. Aluminum Extrusions: Alloy and temper recommended by aluminum-framed flush entrance doors manufacturer for strength, corrosion resistance, and application of

required finish and not less than 0.090” wall thickness at any location for the main frame and sash members.

B. Flush Entrance Door Core: Shall be froth-in-place urethane foam at 5.0 lb./cu.ft. density, R-value: minimum 9; U-value = 0.11 and shall have “0” O.D.P. = “Zero” Ozone Depletion Potential and contains no Chlorofluorocarbons (CFC’s) or Hydrochlorofluorocarbons (HCFC’s).

C. Fasteners: Aluminum, nonmagnetic stainless steel or other materials to be non-corrosive and compatible with aluminum-framed flush entrance door 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 or other suitable zinc coating; 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 or other suitable zinc coating; provide sufficient strength to withstand design pressure indicated.

2.3 DOOR AND FRAME COMPONENTS

A. Fiberglass Reinforced Plastic (FRP) Doors:

1. Thickness: 1-3/4 inches.
2. FRP Sheet Finish: Sandstone (fine) textured fiberglass reinforced polyester (FRP) 0.120” (3.1 mm)
3. Thermal Insulating Value: R-value of 9, U-value = .11.
4. Mortise for lockset, and recess for strike plate in lock stile.
5. Embed steel reinforcement for hinges in fiberglass matrix; provide for hinge leaf recesses in hinge stile.
6. Sizes: Indicated on drawings.
7. Color: Provide color chart for selection by OWNER/ARCHITECT. Color to match existing at each building.

B. Glazing: As specified in Division 08 Section "Glazing."

1. Glazing Gaskets: Manufacturer's standard compression types; replaceable, extruded EPDM rubber.
2. Spacers and Setting Blocks: Manufacturer's standard elastomeric type.
3. Sizes: Exterior window sizes: field verify to match existing panel sizes and spacing. Configuration shown on drawings.

C. Frame Anchors: Types recommended by manufacturer for project conditions.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that openings are correctly prepared to receive doors and frames and are correct size and depth in accordance with shop drawings.

B. Examine conditions under which construction activities of this section are to be performed and submit written report if conditions are unacceptable.

C. Verify that glazing has been factory-installed.

3.2 INSTALLATION

A. Install door opening assemblies in accordance with shop drawings, ANSI A250.8, and manufacturer's printed installation instructions, using installation methods and materials specified in installation instructions.
B. Install of door hardware as specified in Section 087100.
C. Install door hardware in accordance with manufacturer's printed instructions, using through-bolts to secure surface applied hardware.
D. Installation Tolerances: Maintain plumb and level tolerances specified in manufacturer's printed installation instructions.

3.3 ADJUSTING

A. Adjust doors in accordance with door manufacturer's maintenance instructions to swing open and shut without binding, and to remain in place at any angle without being moved by gravitational influence.
B. Adjust door hardware to operate correctly in accordance with hardware manufacturer's maintenance instructions.

3.4 CLEANING

A. Clean surfaces of door assemblies and exposed door hardware in accordance with manufacturer's maintenance instructions.

3.5 PROTECTION

A. Protect door assemblies and door hardware from damage by subsequent construction activities until final inspection.

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 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.

1.3 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. Stainless Steel Plate, Sheet, and Strip: ASTM A240/A240M or ASTM A666, Type 304. Remove tool and die marks and stretch lines, or blend into finish.

E. Stainless Steel Flat Bars: ASTM A666, Type 304. Remove tool and die marks and stretch lines, or blend into finish.

F. Aluminum Extrusions: ASTM B221, Alloy 6063.

G. Aluminum Sheet: ASTM B209, alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated.

H. Frame Anchors: Same material as door face.

I. 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.

E. Stainless Steel Finishes:

1. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.
2. Polished Finish: ASTM A480/A480M No. 4 finish. Grind and polish surfaces to produce uniform finish, free of cross scratches.

    a. Run grain of directional finishes with long dimension of each piece.
    b. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.
3. Bright, Cold-Rolled, Unpolished Finish: ASTM A480/A480M No. 2B.

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 083113

SECTION 083310
ROLLING FIRE DOORS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Rolling fire service doors.

1.2 RELATED SECTIONS

A. Section 055000 - Metal Fabrications: Support framing and framed opening.

B. Section 099123 - Painting: Field applied finish.

C. Section 260533 - Raceway and Boxes: Conduit from electric circuit to door operator.

D. Section 262726 - Wiring Connections: Power to disconnect.

1.3 REFERENCES

A. ASTM A 653 - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

B. ASTM A 666 - Standard Specification for Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.

C. ASTM A 924 - Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process.

D. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).

E. NEMA MG 1 - Motors and Generators.

F. NFPA-80 – Standard for Fire Doors and Fire Windows.

1.4 DESIGN / PERFORMANCE REQUIREMENTS

A. Fire Rated Assemblies: Provide assemblies complying with NFPA 80 and listed in UL Directory or Intertek Testing Services (Warnock Hersey Listed) Directory.

1.5 SUBMITTALS

A. Submit under provisions of Section 013300.

B. Product Data: Manufacturer's data sheets on each product to be used, including:
   1. Preparation instructions and recommendations.
   2. Storage and handling requirements and recommendations.
   3. Details of construction and fabrication.
   4. Installation methods.

C. Shop Drawings: Include detailed plans and elevations, details of framing members, anchoring methods, clearances, hardware, and accessories.

D. Selection Samples: For each finish product specified, two complete sets of color chips representing manufacturer's full range of available colors and patterns.

E. Manufacturer's Certificates: Certify products meet or exceed specified requirements.

F. Operation and Maintenance Data: Submit lubrication requirements and frequency, and periodic adjustments required.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in performing Work of this section with a minimum of five years experience.

B. Installer Qualifications: Installer Qualifications: Company approved by manufacturer, specializing in performing Work of this section with minimum three years experience, with IDEA Certified Installers and service technicians on staff.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

B. Protect materials from exposure to moisture. Do not deliver until after wet work is complete and dry.

C. Store materials in a dry, warm, ventilated weathertight location.

1.8 PROJECT CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

1.9 COORDINATION

A. Coordinate Work with other operations and installation of adjacent materials to avoid damage to installed materials.

1.10 WARRANTY

A. Manufacturer’s Warranty: Provide manufacturer’s two year limited warranty.

B. Warranty: Manufacturer’s limited door and operators System warranty of all parts and components of the system except counterbalance spring and finish for 3 years or 20,000 cycles, whichever comes first.

C. PowderGuard Finish
1. PowderGuard Premium Applied to curtain, guides, bottom bar, headplates: Manufacturer's limited Premium Finish warranty for 2 years.
2. PowderGuard Zinc Base Coat applied to guides, bottom bar, headplates plus PowderGuard Premium applied to curtain and top coat for guides, bottom bar, headplates: Manufacturer's limited Zinc Finish warranty for 4 years.
3. PowderGuard Textured: Applied to curtain, guides, bottom bar, headplates: Manufacturer's limited Textured Finish warranty for 3 years.
4. PowderGuard Zinc Base Coat applied to guides, bottom bar, headplates plus PowderGuard Textured applied to curtain and top coat for guides, bottom bar, headplates: Manufacturer's limited Zinc Finish warranty for 4 years.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Basis of design for roll down fire door is: Overhead Door Corp. 630 Series Fire King Steel Door or comparable product by one of the following:

a. Overhead Door Corporation (Basis of Design)
b. McKeon
c. Entrematic
d. Martin Door Manufacturing
e. Raynor Garage Doors

2.2 ROLLING FIRE SERVICE DOOR (DOOR E101.2 – REFER TO ARCHITECT SCHEDULE)

A. Rolling Fire Service Doors: FireKing Model 630 Fire Doors.
1. Label: Provide fire doors certified with the following listing.
a. Rolling fire doors up to 117 sf (13.4 sm) and not exceeding 11 feet (3.4 m) in height or width shall receive the FM 1-1/2-Hour Class B Label when when face mounted to masonry opening.
b. Provide UL labeled smoke protection. Comply with UL label for "Leakage Rated Assembly" or "S" label.
1) Comply with NFPA 105 air leakage requirements.
2) Pass UL test procedure 1784.
2. Curtain: Interlocking roll-formed slats as specified following. Endlocks shall be attached to each end of alternate slats to prevent lateral movement.
a. Curved profile type C-187 for doors thru 14 feet (4.27 m) wide by 12 feet (3.65 m) high, fabricated of:
1) 18 gauge galvanized steel.

3. Finish:
a. Galvanized Steel: Slats and hood galvanized steel to ASTM A 653 finished with a rust-inhibitive roll coating process, including bonderizing, a 0.2 mils thick baked prime paint, and a 0.6 mils thick baked top coat.
1) Polyester Top Coat.
(a) Gray polyester.
b. Non-galvanized exposed ferrous surfaces shall be black powder coated.
4. Bottom Bar:
a. Two black powder coated structural steel angles 1-1/2 inch by 1-1/2 inch by 1/8 inch (38 mm by 38 mm by 3 mm) minimum.
5. Guides: Three structural steel angles.
a. Fastening Guides to Masonry Fire Walls: UL listed for fire and smoke in accordance with manufacturer’s listing.
6. Brackets:
a. Hot rolled steel to support counterbalance, curtain and hood
7. Finish; Bottom Bar, Guides, and Brackets:
a. Finish: Black powdercoat finish.

8. Counterbalance: Helical torsion spring type housed in a steel tube or pipe barrel, supporting the curtain with deflection limited to 0.03 inch per foot of span. Counterbalance is adjustable by means of an adjusting tension wheel.
9. Hood:
    a. Fabricate of 24 gauge galvanized primed steel minimum for wall openings thru 19 feet (5.79 m) wide.
    b. Hood equipped with thermally controlled, internal, galvanized steel flame baffle as required for FM listing.
10. Electric Motor Operation: Provide electric operator as listed in the door UL file, for size as recommended by manufacturer to move door in either direction.
    a. Floor Resettable Electric Motor Operation.
    b. Sensing Edge Protection:
        1) Electric sensing edge.
    c. Operator Controls:
        1) Key operation with NEMA 1 interior, NEMA 4 exterior, surface and flush mounted open, close, and stop controls.
11. Automatic Closure Standard Fire Door: UL approved release mechanism equipped with a 165 degree fusible link.
    a. Doors will be equipped with floor resettable electric motor operation system, requiring only one sash chain to be routed to the operated side (sash chain not required to be routed to adjusting wheel side.)
        1) Release mechanism includes planetary gear differential system.
        2) Door will close by a thermally actuated link rated @165 degrees F, or by an optional listed releasing device, or by manually activating the release handle.
        3) All counterbalance spring tension shall be maintained when the release mechanism is activated.
        4) After closing by alarm activation with power on the electric motor, the door shall be able to be reset by resetting the alarm system without additional tools required.
    b. Fire Sentinel time-delay release mechanism provides an added measure of safety to control the doors' closure.
12. Locking:
    a. Cylinder lock for electric operation with interlock switch.
13. Wall Mounting Condition:
    a. Face-of-wall mounting.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify opening sizes, tolerances and conditions are acceptable.

B. Examine conditions of substrates, supports, and other conditions under which this work is to be performed.

C. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.3 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install rolling counter fire doors in compliance with requirements of NFPA 80. Test fire-release system and reset components after testing.

C. Use anchorage devices to securely fasten assembly to wall construction and building framing without distortion or stress.

D. Securely and rigidly brace components suspended from structure. Secure guides to structural members only.

E. Fit and align assembly including hardware; level and plumb, to provide smooth operation.

F. Coordinate installation of electrical service with Section 260533. Complete wiring from disconnect to unit components.

G. Install and test Fire Sentinel release device(s) in accordance with the manufacturer’s instructions and in compliance with applicable regulations and codes of the local authority having jurisdiction.

H. Coordinate installation of sealants and backing materials at frame perimeter as specified in Section 079200.

I. Install perimeter trim and closures.

3.4 ADJUSTING

A. Test for proper operation and adjust as necessary to provide proper operation without binding or distortion.

B. Release device(s) shall be tested and witnessed for proper operation with the door manufacturer recommendations

C. Adjust hardware and operating assemblies for smooth and noiseless operation.

3.5 FIELD QUALITY CONTROL

A. Functional testing of fire door and window assemblies shall be performed by IDEA Certified personnel with knowledge and understanding of the operating components of the type of door being subject to testing.

3.6 CLEANING

A. Clean curtain and components using non-abrasive materials and methods recommended by manufacturer.

B. Remove labels and visible markings.

C. Touch-up, repair or replace damaged products before Substantial Completion.

3.7 PROTECTION

A. Protect installed products until completion of project.

END OF SECTION

SECTION 084113
ALUMINUM FRAMED ENTRANCES AND STOREFRONTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Aluminum Flush Doors
2. Aluminum Door Frames

1.2 REFERENCES

A. ASTM B 209 - Aluminum and Aluminum-Alloy Sheet and Plate.
B. ASTM B 221 - Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
C. ASTM B 308 - Aluminum-Alloy 6061-T6 Standard Structural Profiles.
D. ASTM E 283 - Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen.
E. ASTM E 330 - Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference.
F. ASTM E 331 - Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference.

1.3 SYSTEM DESCRIPTION

A. System Performance Requirements:

1. Air infiltration: When tested in accordance with ASTM E 283, the air infiltration should not exceed .04 cfm per square foot of fixed area.
2. Uniform Load Deflection: Entry system shall be tested in accordance with ASTM E 330: 3840 Pa or 80.0 psf positive and negative pressure for a minimum of 60 seconds.
3. Uniform Load Structural: Entry system shall be tested in accordance with ASTM E 330: 5760 Pa or 120.0 psf positive and negative pressure for a minimum of 10 seconds.
4. ~~*Missile Impact: Entry system will pass double impact from large missile; ASTM E 1886.*~~
5. Air Pressure Cycling: Entry system will pass cyclic pressure tests with a design pressure of negative 80.0 psf and positive 80.0 psf.

1.4 SUBMITTALS

A. General: Refer to Submittal Procedures – Section 013300
B. Product Data: Include manufacturer’s product information, including material, elemental construction, fabrication, and finishes.
C. Shop Drawings: Include shop drawings relating to fabrication, finish and installation.

1. Drawings should include the following:

a. Elevations with necessary detail keys
b. Entry system reinforcements (if applicable)
c. Fabrication and Finish

D. Samples:

1. Color: Provide manufacturer’s samples of standard and non-standard finishes.
2. Door: Supply manufacturer’s door sample presenting finish, interior insulation, and

standard reinforcement components.

E. Test Results: Offer any required test results for particular jobs. Accredited test reports will be available upon request.

1.5 QUALITY ASSURANCE

A. Manufacturer's Qualifications:

1. Manufacturing process with contemporary inspection using neoteric checklist for optimum field performance.
2. Manufacturing same product specified for over 25 years.

B. Pre-Installation Meetings: Plan initial pre-installation meetings for job details.

1.6 DELIVERY, STORAGE, HANDLING

A. Packing: Finished products shall be packaged securely with appropriate labeling for protection and product identification visible on packaging.
B. Shipping and Handling: Deliver materials to site in original condition and packaging without any damage to packaging or materials.
C. Unloading: Individually packaged products to be unloaded by hand truck or 2-person team lift (or more if needed) to avoid unnecessary damage.
D. Storage and Protection:

1. Store items indoors away from excessive amounts of moisture.
2. Protect entry doors against damage from outdoor hazards and during the entire installation

E. Waste Management: Refer to contact information apparent on packaging for appropriate recycling opportunities.

1.7 WARRANTY

A. Warrant doors and frames to be free from defects which include factory applied hardware, and premature degradation of finish and door structure.
B. Warranty period will be ten years from the date of manufacture.

PART 2- PRODUCTS

2.1 MANUFACTURER

A. Aluminum Doors:

1. Provide products complying with requirements of the contract documents and made by one of the following:
   a. Cross Aluminum Products, Inc., basis of design.
   b. Kawneer Company, Inc.
   c. Tubelite
   d. Specialite

B. Components: Door and frame components from same manufacturer.

2.2 WIDE STILE AND RAIL ALUMINUM DOORS

A. Product: WS-500 Entry Series with required aluminum frames.
B. Door Opening Size: refer to drawings.
C. Door Assembly:
   1. Door Stile: To be aluminum alloy 6063; temper to be T5 with a minimum 3/16” wall thickness.
   2. Stile and Rail Thickness: To be 1 3/4” thick tubular extrusion.
   3. Stile Width: 4”
   4. Rail Widths: Refer to drawings.
D. Pattern: Smooth
E. Insulation: Polyisocyanurate Rigid Foam
F. New door to match existing front entry doors in dimension, field verify prior to shop drawings.

2.3 MATERIALS & ACCESSORIES

A. Aluminum:

   1. ASTM B 221, alloy and temper to be 6063 T-5 or similar alloy and temper recommended by manufacturer for optimum finish results and consistency. Color to match window and door material.

B. Internal Reinforcement

   1. ASTM B 308, for structural aluminum.

C. Fasteners

   1. Material: Aluminum, 18-8 Stainless Steel, or other non-corrosive materials compatible with items being screw applied.
   2. Exposed:
      a. Type: Fasteners exposed will be Philips flathead fasteners unless provided by other supplier.
      b. Finish: Fasteners to match appropriate finish on standard doors and frames.
   3. Concealed: To be standard according to manufacturer’s standards.

D. Weather stripping:

   1. Wool pile:

      a. Material: Solid Propylene Base with resilient fibers.
      b. Color: Manufacturer’s standard black color.

2.4 HARDWARE

A. Hardware Preparation: To be fabricated at factory according to hardware templates provided.
B. Hardware Installation: To factory install all applicable and supplied hardware to doors and frames.
C. Hardware Reinforcement: To provide necessary reinforcement for proper longevity and hardware function; ASTM B 209 and/or ASTM 308.
D. Refer to Section 087100 for Door Hardware.

2.5 FABRICATION

A. Processes:

1. Job Preparation:

    a. Preliminary Analysis: Job drawings to indicate door types, sizes, vision lite configuration(s), and finishes.
    b. Fulfill Custom Requirements: Follow through on any specific deviations from standard requirements.

2. Assembly:

    a. Product Operation: Measure, cut, and fabricate required materials for job.
    b. Product Refinement: Smooth rough cut edges.
    c. Arrangement: Place prepared structural fasteners inside door to conceal from view.
    d. Reinforcement Preparation: To apply necessary structural and hardware reinforcement in beneficial areas of doors and frames where needed.

3. Fitting:

    a. Placement: Product materials to fit accurately in appropriate locations.
    b. Alignment: Doors to be in proper alignment with intended elevations.

B. Tolerances: Doors and/or frame elevations will not deviate from last revised and approved drawings.

2.6 FRAMING SYSTEMS

A. Framing Members: Manufacturer's standard aluminum extruded profiles with required thickness for load support.

1. Vertical Jamb Sizes: 2" x 4 1/2"
2. Header Sizes: 2" x 4 1/2"

B. Clips and Reinforcements: Manufacturer's standard high strength aluminum: ASTM B 221 and/or ASTM B 308.

C. Fasteners and Accessories: Manufacturer's standard non-bleeding and non-corrosive material congruent to adjacent material.

1. Exposed Fasteners: To be stainless steel Philips flathead screws with appropriate finish: ASME B 18.6.4
2. Concealed Fasteners: To be manufacturer's standard.

D. Assembly:

1. Framing members are separate aluminum pieces cut to length and mechanically fastened from either spline or clip systems.
2. Joinery to be hairline.
3. Sommer and Maca Silicone 88R or Dow Corning® 795 Sealants applied on applicable areas.
4. Framing elevations to be identified according to final approved drawings.

E. Anchoring:

1. Appropriate anchoring fasteners to be secured no more than 18" apart on entire frame opening.
2. Frame headers to receive no less than 2 anchoring fasteners.

3. Add extra fasteners where hardware and hinge may require more.

F. Doorstop:

1. To be #CDM-32.
   a. Wall Thickness: To be 3/16” thick for receiving applicable hardware.
   b. Profile Height: To be no less than 5/8” high.
2. Snap-in: Fits standard manufacturer’s door jamb profiles.
3. To receive weather strip around acting door leafs.
   a. Wool pile: Solid Propylene Base with resilient fibers in a standard black color.

G. Hardware Preparation:

1. Intramural Work: Hardware preparation according to hardware suppliers’ templates.
2. Field Work: Refer to manufacturers’ installation instructions.

2.7 LOUVERS

A. Style: Extruded Aluminum, mitered corners secured with reinforcing clips, inverted-Y design
B. Dimension: Refer to plans
C. Finish: To match door
D. Installation: Louvers to be factory installed and removable from interior only.

2.8 FINISHES

A. Standard Anodic Finishes (door, frame, and trim):

1. Selected from manufacturers standards

PART 3- EXECUTION

3.1 EXAMINATION

A. Examine conditions for compliance with requirements for installation tolerances and other conditions affecting proper installation.

3.2 INSTALLATION

A. Comply with manufacturer’s instructions.
B. Do not install damaged components.
C. Install doors plumb, level, and square, with no warp or rack in frame.
D. Hang doors with the following required clearances:

1. Lock Stiles: 0.125”
2. Between Meeting Stiles: 0.187”- 0.25”
3. At Top Rails: 0.125”
4. Between Bottom Rail and Threshold: 0.125” - 0.187”

E. Fit joints to produce hairline joints free of burrs and distortion.
F. Apply bituminous coatings to keep Aluminum free from contacting other metals.
G. Rigidly secure non movement joints.
H. Install recommended anchors with separators to prevent metal corrosion and electrolytic deterioration.
I. Seal joints watertight, unless otherwise indicated.
J. Glazers to provide necessary glazing shims for proper glass installation on vision lites and side lites. Reference section Glazing Accessories 08800.

K. Place thresholds in bed of proper weather sealant.

3.3 ADJUSTING

A. Fine-tune doors and hinges to operate properly without bind or sag.
B. Adjust pressure settings on closers.

1. For doors accessible to people with disabilities, adjust closers to provide a 3-second closer sweep period for doors to move from a 70-degree open position to 3 inches from the latch measured to the leading door edge.

3.4 CLEANING

A. Immediately clean doors after installation.
B. Avoid any harsh cleaners not specified on manufacturer’s cleaning and care guide.

3.5 PROTECTION

A. Follow Manufacturer’s guide to cleaning and care for proper treatment on entrances for optimum longevity, function, and performance.

END OF SECTION

SECTION 085113
ALUMINUM WINDOWS

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 aluminum windows for exterior locations.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
2. Review, discuss, and coordinate the interrelationship of aluminum windows with other exterior wall components. Include provisions for anchoring, flashing, weeping, sealing perimeters, and protecting finishes.
3. Review and discuss the sequence of work required to construct a watertight and weathertight exterior building envelope.
4. Inspect and discuss the condition of substrate and other preparatory work performed by other trades.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, glazing and fabrication methods, dimensions of individual components and profiles, hardware, and finishes for aluminum windows.

B. Shop Drawings: For aluminum windows.

1. Include plans, elevations, sections, hardware, accessories, insect screens, operational clearances, and details of installation, including anchor, flashing, and sealant installation.

C. Product Schedule: For aluminum windows. Use same designations indicated on Drawings.

1.5 INFORMATIONAL SUBMITTALS

A. Product Test Reports: For each type of aluminum window, for tests performed by a qualified testing agency.

B. Sample Warranties: For manufacturer's warranties.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: A manufacturer capable of fabricating aluminum windows that meet or exceed performance requirements indicated and of documenting this performance by test reports and calculations.

1.7 WARRANTY

A. Manufacturer's Warranty: Manufacturer agrees to repair or replace aluminum windows that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:
   a. Failure to meet performance requirements.
   b. Structural failures including excessive deflection, water leakage, condensation, and air infiltration.
   c. Faulty operation of movable sash and hardware.
   d. Deterioration of materials and finishes beyond normal weathering.
   e. Failure of insulating glass.
2. Warranty Period:
   a. Window: 10 years from date of Substantial Completion.
   b. Glazing Units: 10 years from date of Substantial Completion.
   c. Aluminum Finish: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 WINDOW PERFORMANCE REQUIREMENTS

A. Product Standard: Comply with AAMA/WDMA/CSA 101/I.S.2/A440 for definitions and minimum standards of performance, materials, components, accessories, and fabrication unless more stringent requirements are indicated.

1. Window Certification: AAMA certified with label attached to each window.

B. Performance Class and Grade: AAMA/WDMA/CSA 101/I.S.2/A440 as follows:

1. Minimum Performance Class: CW.

C. Thermal Transmittance: NFRC 100 maximum whole-window U-factor of 0.33 Btu/sq. ft. x h x deg F .

D. Condensation-Resistance Factor (CRF): Provide aluminum windows tested for thermal performance according to AAMA 1503, showing a CRF of 62.

E. Thermal Movements: Provide aluminum windows, including anchorage, that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

F. Uniform Load Structural Test:

1. With window sash closed and locked, the unit shall be tested in accordance with ASTM E 330-02 on a test size of 99” x 79”, at a static test pressure difference of 120PSF with the first exterior [positive] pressure applied, and then the interior [negative] pressure applied.

2. At conclusion of test, there shall be no glass breakage, permanent damage to fasteners, hardware parts, or actuating mechanisms, nor any other damage that would cause the window to be inoperable. Permanent deformation of any frame or sash member shall not exceed 0.4% of its span

G. Windborne-Debris Impact Resistance: Passes ASTM E1886 missile-impact and cyclic-pressure tests in accordance with ASTM E1996 for Wind Zone for protection in compliance with the 2015 Michigan Building Code.

H. Forced Entry Resistance: The window shall have a level 10 Forced Entry Resistance Rating as per ASTM F588.

2.2 ALUMINUM WINDOWS

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

1. EFCO Corporation (Basis of Design):
   a. Series 3900 Thermal Architectural Grade (Fixed)
   b. Series 2700 Thermal (Project-Out)
2. Graham Architectural Products Corporation.
3. Kawneer North America, an Arconic company.
4. Winco.

B. Types: Provide the following types in locations indicated on Drawings:

1. Project-out.
2. Fixed.

C. Frames and Sashes: Aluminum extrusions complying with AAMA/WDMA/CSA 101/I.S.2/A440.

1. Thermally Improved Construction: Fabricate frames, sashes, and muntins with an integral, concealed, low-conductance thermal barrier located between exterior materials and window members exposed on interior side in a manner that eliminates direct metal-to-metal contact.

D. Insulating-Glass Units: ASTM E2190. Refer to Section 088000 Glazing.

E. Glazing System: Manufacturer's standard factory-glazing system that produces weathertight seal.

F. Hardware, General: Provide manufacturer's standard hardware fabricated from aluminum, stainless steel, carbon steel complying with AAMA 907, or other corrosion-resistant material compatible with adjacent materials; designed to smoothly operate, tightly close, and securely lock windows, and sized to accommodate sash weight and dimensions.

1. Exposed Hardware Color and Finish: As selected by Architect from manufacturer's full range.

G. Thermal Barrier:
   1. Poured-in-place structural thermal barrier shall transfer shear during bending and provide composite action between frame components.
   2. Thermal barrier pocket on aluminum extrusions shall be Azo-Braded to create a mechanical lock to improve the adhesion properties between the polyurethane polymer and the surface of the thermal barrier pocket.
   3. Window manufacturer must provide a warranty from the manufacturer of the polyurethane thermal barrier that warrants against product failure as a result of thermal shrinkage beyond 1/8 inch (3.2 mm) from each end and fracturing of the polyurethane for a period not to exceed ten years from the date of window manufacture.
   4. Thermal barrier's made of crimped in place polyamide (insulbar®) strips are not acceptable unless all strips are covered and tooled with Dow 795 silicone caulking to eliminate water migration.

H. Weather Stripping: Provide full-perimeter weather stripping for each operable sash unless otherwise indicated.

I. Fasteners: Noncorrosive and compatible with window members, trim, hardware, anchors, and other components.

   1. Exposed Fasteners: Do not use exposed fasteners to greatest extent possible. For application of hardware, use fasteners that match finish hardware being fastened.

2.3 ACCESSORIES

A. Interior Trim: Extruded-aluminum profiles in sizes and configurations indicated on Drawings.

B. Panning Trim: Extruded-aluminum profiles in sizes and configurations indicated on Drawings.

2.4 INSECT SCREENS

A. General: Fabricate insect screens to integrate with window frame. Provide screen for each operable exterior sash. Screen wickets are not permitted.

   1. Type and Location: Half, outside for sliding sashes.

B. Aluminum Frames: Manufacturer's standard aluminum alloy complying with SMA 1004 or SMA 1201. Fabricate frames with mitered or coped joints or corner extrusions, concealed fasteners, and removable PVC spline/anchor concealing edge of frame.

   1. Tubular Framing Sections and Cross Braces: Roll formed from aluminum sheet.

C. Glass-Fiber Mesh Fabric: 18-by-14 or 18-by-16 mesh of PVC-coated, glass-fiber threads; woven and fused to form a fabric mesh resistant to corrosion, shrinkage, stretch, impact damage, and weather deterioration. Comply with ASTM D3656/D3656M.

   1. Mesh Color: Manufacturer's standard.

D. Screen mesh shall be so installed that the cloth may be easily replaceable.

E. NOTE: Screens shall be provided at all operable windows. All screens, including non-egress windows, shall be mounted to frame with hinges in lieu of tabs.

2.5 FABRICATION

A. Fabricate aluminum windows in sizes indicated. Include a complete system for assembling components and anchoring windows.

B. Glaze aluminum windows in the factory.

C. Weather strip each operable sash to provide weathertight installation.

D. Weep Holes: Provide weep holes and internal passages to conduct infiltrating water to exterior.

E. Provide water-shed members above side-hinged sashes and similar lines of natural water penetration.

F. Mullions: Provide mullions and cover plates, 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. Provide mullions and cover plates capable of withstanding design wind loads of window units.

G. Complete fabrication, assembly, finishing, hardware application, and other work in the factory to greatest extent possible. Disassemble components only as necessary for shipment and installation.

2.6 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM's "Metal Finishes Manual" 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.

2.7 ALUMINUM FINISHES

A. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.

B. **Dark Bronze Anodized**. Thickness shall be a .7 mil and shall conform to AAMA 611.

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 the Work.

B. Verify rough opening dimensions, levelness of sill plate, and operational clearances.

C. Examine wall flashings, vapor retarders, water and weather barriers, and other built-in components to ensure weathertight window installation.

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

3.2 INSTALLATION

A. Comply with manufacturer's written instructions for installing windows, hardware, accessories, and other components. For installation procedures and requirements not addressed in manufacturer's written instructions, comply with installation requirements in ASTM E2112.

B. Install windows 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 to produce weathertight construction.

C. Install windows and components to drain condensation, water penetrating joints, and moisture migrating within windows to the exterior.

D. Separate aluminum and other corrodible surfaces from sources of corrosion or electrolytic action at points of contact with other materials.

3.3 ADJUSTING, CLEANING, AND PROTECTION

A. Adjust operating sashes and hardware for a tight fit at contact points and weather stripping for smooth operation and weathertight closure.

B. Clean exposed surfaces immediately after installing windows. Avoid damaging protective coatings and finishes. Remove excess sealants, glazing materials, dirt, and other substances. Keep protective films and coverings in place until final cleaning.

C. Remove and replace glass that has been broken, chipped, cracked, abraded, or damaged during construction period.

D. Protect window surfaces from contact with contaminating substances resulting from construction operations. If contaminating substances do contact window surfaces, remove contaminants immediately according to manufacturer's written instructions.

END OF SECTION 085113

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. Markar

B. Requirements:

1. Provide aluminum geared continuous hinges conforming to ANSI/BHMA A156.26, Grade 1.
2. Provide aluminum geared continuous hinges, where specified in the hardware sets, fabricated from 6063-T6 aluminum.

3. Provide split nylon bearings at each hinge knuckle for quiet, smooth, self-lubricating operation.
4. Provide hinges capable of supporting door weights up to 450 pounds, and successfully tested for 1,500,000 cycles.
5. On fire-rated doors, provide aluminum geared continuous hinges classified for use on rated doors by testing agency acceptable to authority having jurisdiction.
6. Provide aluminum geared continuous hinges with electrified option scheduled in the hardware sets. Provide with number and gage of wires enough to accommodate electric function of specified hardware.
7. Provide hinges 1 inch (25 mm) shorter in length than nominal height of door, unless otherwise noted or door details require shorter length and with symmetrical hole pattern.

2.05 ELECTRIC POWER TRANSFER

A. Manufacturers:

1. Scheduled Manufacturer and Product:
   a. Von Duprin EPT-10

2. Acceptable Manufacturers and Products:
   a. Securitron CEPT-10

B. 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 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. 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. 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: 03A

2.07 EXIT DEVICES

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product:
    a. Von Duprin 98/35A series

2. Acceptable Manufacturers and Products:
    a. Sargent 19-43-GL-80 series

B. Requirements:

1. Provide exit devices tested to ANSI/BHMA A156.3 Grade 1 and UL listed for Panic Exit or Fire Exit Hardware.
2. Cylinders: Refer to "KEYING" article, herein.
3. Provide smooth touchpad type exit devices, fabricated of brass, bronze, stainless steel, or aluminum, plated to standard architectural finishes to match balance of door hardware.
4. Touchpad must extend a minimum of one half of door width. No plastic inserts are allowed in touchpads.
5. Provide exit devices with deadlatching feature for security and for future addition of alarm kits and/or other electrified requirements.
6. Provide exit devices with weather resistant components that can withstand harsh conditions of various climates and corrosive cleaners used in outdoor pool environments.
7. Provide flush end caps for exit devices.
8. Provide exit devices with manufacturer's approved strikes.
9. Provide exit devices cut to door width and height. Install exit devices at height recommended by exit device manufacturer, allowable by governing building codes, and approved by Architect.
10. Mount mechanism case flush on face of doors or provide spacers to fill gaps behind devices. Where glass trim or molding projects off face of door, provide glass bead kits.
11. Provide cylinder or hex-key dogging as specified at non fire-rated openings.
12. Removable Mullions: 2 inches (51 mm) x 3 inches (76 mm) steel tube. Where scheduled as keyed removable mullion, provide type that can be removed by use of a keyed cylinder, which is self-locking when re-installed.
13. Provide factory drilled weep holes for exit devices used in full exterior application, highly corrosive areas, and where noted in hardware sets.
14. Provide electrified options as scheduled.
15. Top latch mounting: double- or single-tab mount for steel doors, face mount for aluminum doors eliminating requirement of tabs, and double tab mount for wood doors.
16. Provide exit devices with optional trim designs to match other lever and pull designs used on the project.

2.08 ELECTRIC STRIKES

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product:
    a. Von Duprin 6000 Series

2. Acceptable Manufacturers and Products:
    a. HES 1006/9000 Series

B. Requirements:

1. Provide electric strikes designed for use with type of locks shown at each opening.
2. Provide electric strikes UL Listed as burglary resistant that are tested to a minimum endurance test of 1,000,000 cycles.
3. Where required, provide electric strikes UL Listed for fire doors and frames.
4. Provide transformers and rectifiers for each strike as required. Verify voltage with electrical contractor.

2.09 POWER SUPPLIES

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product:
    a. Schlage/Von Duprin PS900 Series

2. Acceptable Manufacturers and Products:
    a. Securitron BPS series

B. 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.

2.10 CYLINDERS

A. Manufacturers:

1. Scheduled Manufacturer and Product:
    a. (MATCH EXISTING AS DIRECTED BY OWNER)

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.

2.11 KEYING

A. Scheduled System:

1. Existing KEY system:
   a. Provide cylinders/cores keyed into Owner's existing keying system managed by Owner's representative, 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.

2.12 DOOR CLOSERS

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product:
   a. LCN 4010/4110/4020 series

2. Acceptable Manufacturers and Products:
   a. Sargent 281 series

B. Requirements:

1. Provide door closers conforming to ANSI/BHMA A156.4 Grade 1 requirements by BHMA certified independent testing laboratory. Certify surface mounted mechanical closers to meet fifteen million (15,000,000) full load cycles. ISO 9000 certify closers. Stamp units with date of manufacture code.
2. Provide door closers with fully hydraulic, full rack and pinion action with high strength cast iron cylinder, and full complement bearings at shaft.
3. Cylinder Body: 1-1/2-inch (38 mm) diameter with 11/16-inch (17 mm) diameter double heat-treated pinion journal.
4. Hydraulic Fluid: Fireproof, passing requirements of UL10C, and requiring no seasonal closer adjustment for temperatures ranging from 120 degrees F to -30 degrees F.
5. Spring Power: Continuously adjustable over full range of closer sizes, and providing reduced opening force as required by accessibility codes and standards.
6. Hydraulic Regulation: By tamper-proof, non-critical valves, with separate adjustment for latch speed, general speed, and backcheck.
7. Provide closers with solid forged steel main arms and factory assembled heavy-duty forged forearms for parallel arm closers. When closers are parallel arm mounted, provide closers which mount within 6-inch (152 mm) top rail without use of mounting plate so that closer is not visible through vision panel from pull side.
8. Pressure Relief Valve (PRV) Technology: Not permitted.
9. Finish for Closer Cylinders, Arms, Adapter Plates, and Metal Covers: Powder coating finish which has been certified to exceed 100 hours salt spray testing as described in ANSI/BHMA Standard A156.4 and ASTM B117, or has special rust inhibitor (SRI).
10. Provide special templates, drop plates, mounting brackets, or adapters for arms as required for details, overhead stops, and other door hardware items interfering with closer mounting.

2.13 ELECTROMECHANICAL CLOSER/HOLDERS

A. Manufacturers:

1. Scheduled Manufacturer:
   a. LCN SEM7800 Series

2. Acceptable Manufacturers:
   a. Rixson

B. Requirements:

1. Provide single-point or multi-point hold-open electromechanical closer/holders as specified. Coordinate voltage requirements and provide transformer if necessary.
2. Provide closer/holders that function as full rack and pinion door closer when current is interrupted or continuous hold-open is not engaged.
3. Provide door closers with fully hydraulic, full rack and pinion action with high strength cylinder and full complement bearings at shaft.
4. Hydraulic Fluid: Fireproof, passing requirements of UL10C, and requiring no seasonal closer adjustment for temperatures ranging from 120 degrees F to -30 degrees F.
5. Spring Power: Continuously adjustable over full range of closer sizes, and providing reduced opening force as required by accessibility codes and standards.
6. Hydraulic Regulation: By tamper-proof, non-critical valves, with separate adjustment for latch speed, general speed, and backcheck.
7. Pressure Relief Valve (PRV) Technology: Not permitted.
8. Provide special templates, drop plates, mounting brackets, or adapters for arms as required for details, overhead stops, and other door hardware items interfering with closer mounting.

2.14 DOOR TRIM

A. Manufacturers:

1. Scheduled Manufacturer:
   a. Ives

2. Acceptable Manufacturers:
   a. Burns
   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.

2.15 PROTECTION PLATES

A. Manufacturers:

1. Scheduled Manufacturer:
   a. Ives

2. Acceptable Manufacturers:
   a. Burns
   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.

2.16 OVERHEAD STOPS AND OVERHEAD STOP/HOLDERS

A. Manufacturers:

1. Scheduled Manufacturers:
   a. Glynn-Johnson

2. Acceptable Manufacturers:
   a. Rixson

B. Requirements:

1. Provide overhead stop at any door where conditions do not allow for a wall stop or floor stop presents tripping hazard.

2.17 DOOR STOPS AND HOLDERS

A. Manufacturers:

1. Scheduled Manufacturer:
   a. Ives

2. Acceptable Manufacturers:
   a. Burns
   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:

B. Scheduled Manufacturer:

1. Zero International

C. Acceptable Manufacturers:

1. National Guard
2. Pemko

D. Seals and Gasketing: Provide continuous gasketing on exterior openings, to the head and jambs, forming a continuous seal between the door and the frame. Provide smoke, light, or sound gasketing on interior doors where indicated.

1. Provide self-tapping fasteners for aluminum extruded gasketing being applied to hollow metal frames.
   a. Provide non-corrosive fasteners for all exterior applications.
   b. Provide security fasteners where indicated.

2. Provide neoprene, EPDM, silicone, or nylon brush inserts as specified in hardware sets. Provide non brush inserts of solid or sponge cell, as specified in hardware sets. Vinyl inserts are not allowed except where specified in hardware sets.

E. Smoke Labeled Gasketing: At all smoke labeled openings, provide smoke listed perimeter gasketing assemblies complying with NFPA 105 listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction for smoke control ratings indicated based on testing according to UL 1784.

F. Fire Listed Gasketing: Assemblies complying with NFPA 80 that are listed by a testing and inspecting agency acceptable to authorities having jurisdiction for fire ratings indicated based on testing according to UL-10C.

1. Where frame-applied intumescent seals are required by the manufacturer, provide gaskets that comply with UL10C Standard for Positive Pressure Fire Tests of Door Assemblies and UBC 7-2, Fire Tests of Door Assemblies.

G. Sound-Rated Gasketing: Provide acoustic gasketing to meet Sound Transmission Class (STC) rating required.

H. Meeting-Stile Gasketing: Provide meeting-stile gasketing that fastens to the meeting stiles forming a continuous seal when doors are closed.

I. Door Sweeps or Shoes: Apply to the bottom of the door to close the gap between the door bottom and finished floor or saddle threshold.

1. Provide solid neoprene, EPDM, silicone, or nylon brush type of seal as specified in hardware sets. Vinyl inserts are not allowed except where specified in hardware sets.

J. Automatic Door Bottoms:

1. Provide closed cell sponge, bulb neoprene. or EPDM type of seal as specified in hardware sets.
2. Door bottom to be mortised, semi mortised, or surface mount as with a minimum thickness as specified in hardware sets.

K. Rain Drips:

1. Provide overhead rain drips for out-swinging hollow metal doors that are not covered against 45 degree blowing rain. Aluminum extrusion to be a minimum of .088 inches thick and extend 2.50 inches from the face of the frame, in anodized finish to match door.
2. Door sweeps or shoes with integral rain drip must meet ADA requirements

L. Thresholds: Provide threshold units not less than 4 inches wide, formed to accommodate change in floor elevation where indicated, and fabricated to accommodate door hardware and fit door frames.

1. Threshold extrusion to be a minimum thickness as specified in hardware sets.

2.19 MAGNETIC HOLDERS

A. Manufacturers:

1. Scheduled Manufacturer:
   a. LCN

2. Acceptable Manufacturers:
   a. 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. Sargent

B. Requirements:

1. Provide recessed or surface mounted type door position switches as specified.
2. Coordinate door and frame preparations with door and frame suppliers. If switches are being used with magnetic locking device, provide minimum of 4 inches (102 mm) between switch and magnetic locking device.

2.21 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:

1. Set thresholds in full bed of sealant complying with requirements specified in Division 07 Section "Joint Sealants."
2. Aluminum thresholds to be cut-in, and scribed around mullions, frame members, and stops. Do not butt to thresholds. Provide a continuous surface across full width of opening from jamb to jamb.
3. Where aluminum panic-type (rabbeted) thresholds with neoprene inserts are specified, undercut doors as required to properly mate with seal in threshold.

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:

1. Apply to head and jamb, forming seal between door and frame.
2. Install gasketing in a manner eliminating need to cut any seal to install surface mounted hardware. Install compatible mounting bracket for surface mounted hardware unless minimum 1/4 inch thick solid aluminum seals are provided for mounting of surface applied hardware.

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):
144.1

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
2	EA	POWER TRANSFER	EPT10			689	VON
1	EA	ELEC FIRE EXIT HARDWARE	QEL-9827-L-DT-F-LBRAFL-03-499F			626	VON
1	EA	ELEC FIRE EXIT HARDWARE	QEL-9827-L-NL-F-LBRAFL-03-499F			626	VON
1	EA	RIM CYLINDER	MATCH EXISTING KEY SYTEM			626	
2	EA	SURFACE CLOSER	4111 EDA			689	LCN
2	EA	KICK PLATE	8400 10" X 1" LDW B-CS			630	IVE
2	EA	FIRE/LIFE WALL MAG	SEM7840/7850 (AS REQ'D)			689	LCN
1	EA	GASKETING	488SBK PSA			BK	ZER
1	EA	MEETING SEAL	8217SBK PSA			BK	ZER
2	EA	DOOR CONTACT	679-05HM			BLK	SCE
1	EA	POWER SUPPLY	PS904 BBK 900-2RS-FA (CONFIRM REQ WITH SECURITY CONTRACTOR)			LGR	SCE
1	EA	FIRE ALARM CONTACTS	PROVIDED BY FIRE ALARM CONTRACTOR				B/O
1	EA	CARD READER	BY ACCESS CONTROL/SECURITY CONTRACTOR				B/O

DOORS NORMALLY HELD OPEN AND TIED TO FIRE ALARM. WHEN CLOSED, PRESENTING A VALID CREDENTIAL TO THE READER WILL MOMENTARILY RETRACT PANIC DEVICE LATCHES ALLOWING ACCESS. DOORS CAN BE SCHEDULED LOCKED/UNLOCKED VIA ACCESS CONTROL SYSTEM.

COORDINATE SYSTEM OPERATION AND COMPONENT LOCATIONS WITH THE OWNER, THE ARCHITECT, AND ALL RELATED TRADES.

Hardware Group No. 02

For use on Door #(s):
144.0

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
2	EA	POWER TRANSFER	EPT10		689	VON
2	EA	ELEC FIRE EXIT HARDWARE	QEL-9827-L-DT-F-LBRAFL-03-499F		626	VON
2	EA	SURFACE CLOSER	4111 EDA		689	LCN
2	EA	KICK PLATE	8400 10" X 1" LDW B-CS		630	IVE
2	EA	FIRE/LIFE WALL MAG	SEM7840/7850 (AS REQ'D)		689	LCN
1	EA	GASKETING	488SBK PSA		BK	ZER
1	EA	MEETING SEAL	8217SBK PSA		BK	ZER
2	EA	DOOR CONTACT	679-05HM		BLK	SCE
1	EA	POWER SUPPLY	(SHARED W/ADJACENT OPENING)		LGR	SCE
1	EA	FIRE ALARM CONTACTS	PROVIDED BY FIRE ALARM CONTRACTOR			B/O

DOORS NORMALLY HELD OPEN AND TIED TO FIRE ALARM. DOORS CAN BE SCHEDULED LOCKED/UNLOCKED VIA ACCESS CONTROL SYSTEM.

COORDINATE SYSTEM OPERATION AND COMPONENT LOCATIONS WITH THE OWNER, THE ARCHITECT, AND ALL RELATED TRADES.

Hardware Group No. 03

For use on Door #(s):
102.0 104.0 105.0

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	FIRE EXIT HARDWARE	98-L-F-2SI-03		626	VON
1	EA	RIM CYLINDER	MATCH EXISTING KEY SYTEM		626	
1	EA	RIM CYL THUMBTURN	XB11-979		626	SCH
1	EA	SURFACE CLOSER	4111 EDA		689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
1	EA	WALL STOP	WS33/WS33X		626	IVE
1	EA	GASKETING	488SBK PSA		BK	ZER

Hardware Group No. 04

For use on Door #(s):

104.1 123.0 125.0 130.0 134.0

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 03A		626	SCH
1	EA	MORTISE CYLINDER	MATCH EXISTING KEY SYTEM		626	
1	EA	SURFACE CLOSER	4011		695	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
1	EA	WALL STOP	WS33/WS33X		626	IVE
1	EA	GASKETING	488SBK PSA		BK	ZER

Hardware Group No. 05

For use on Door #(s):

102.1

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	STOREROOM LOCK	L9080L 03A		626	SCH
1	EA	MORTISE CYLINDER	MATCH EXISTING KEY SYTEM		626	
1	EA	OH STOP	100S		630	GLY
1	EA	SURFACE CLOSER	4011 ST-1544		695	LCN
1	EA	MOUNTING PLATE	4020-18 (AS REQ'D)		689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
1	EA	GASKETING	488SBK PSA		BK	ZER

Hardware Group No. 06

For use on Door #(s):

124.0 128.0 129.0 131.0 132.0 133.0

142.2 142.0

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/ENTRY LOCK W/ INSIDE INDICATOR	L9050L 03A 09-544 IS-LOC		626	SCH
1	EA	MORTISE CYLINDER	MATCH EXISTING KEY SYTEM		626	
1	EA	SURFACE CLOSER	4011		695	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
1	EA	WALL STOP	WS33/WS33X		626	IVE
1	EA	GASKETING	488SBK PSA		BK	ZER

Hardware Group No. 07

For use on Door #(s):

106.0	107.0	108.0	109.0	110.0	111.0
112.0	113.0	114.0	115.0	116.0	117.0
118.0	119.0	120.0	122.0		

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/ENTRY LOCK W/ INSIDE INDICATOR	L9050L 03A 09-544 IS-LOC		626	SCH
1	EA	MORTISE CYLINDER	MATCH EXISTING KEY SYTEM		626	
1	EA	SURFACE CLOSER	4111 EDA		689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
1	EA	WALL STOP	WS33/WS33X		626	IVE
1	EA	GASKETING	488SBK PSA		BK	ZER

Hardware Group No. 08

For use on Door #(s):

139.1

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/ENTRY LOCK W/ INSIDE INDICATOR	L9050L 03A 09-544 IS-LOC		626	SCH
1	EA	MORTISE CYLINDER	MATCH EXISTING KEY SYTEM		626	
1	EA	SURFACE CLOSER	4111 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. 09

For use on Door #(s):
152.0 154.0

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	INSTITUTION LOCK	L9082L 03A			626	SCH
2	EA	MORTISE CYLINDER	MATCH EXISTING KEY SYTEM			626	
1	EA	ELECTRIC STRIKE	6211 FSE		✓	630	VON
1	EA	SURFACE CLOSER	4111 EDA			689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS			630	IVE
1	EA	WALL STOP	WS33/WS33X			626	IVE
1	EA	GASKETING	488SBK PSA			BK	ZER
1	EA	POWER SUPPLY	PS902 BBK 900-2RS (CONFIRM REQ WITH SECURITY CONTRACTOR)		✓	LGR	SCE
2	EA	CARD READER	BY ACCESS CONTROL/SECURITY CONTRACTOR		✓		B/O

DOORS NORMALLY CLOSED AND LOCKED FROM BOTH SIDES. PRESENTING A VALID CREDENTIAL TO THE READER WILL MOMENTARILY UNLOCK ELECTRIC STRIKES ALLOWING ACCESS. DOORS CAN BE SCHEDULED LOCKED/UNLOCKED VIA ACCESS CONTROL SYSTEM.

DOUBLE CYLINDER LOCKS ON ANY DOOR SHOULD BE IN INSTALLED IN ACCORDANCE WITH EXISTING CODES ONLY.

COORDINATE SYSTEM OPERATION AND COMPONENT LOCATIONS WITH THE OWNER, THE ARCHITECT, AND ALL RELATED TRADES.

DOORS 152.0 AND 154.0 CAN SHARE (1) POWER SUPPLY.

Hardware Group No. 10

For use on Door #(s):
142.1

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	PRIVACY LOCK W/ OUTSIDE INDICATOR	L9040 03A 09-544 OS-OCC		626	SCH
1	EA	SURFACE CLOSER	4011		695	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
1	EA	WALL STOP	WS33/WS33X		626	IVE
1	EA	GASKETING	488SBK PSA		BK	ZER

Hardware Group No. 11

For use on Door #(s):
126.0 127.0

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 & INDICATOR	L9056L 03A 09-544 OS-OCC		626	SCH
1	EA	MORTISE CYLINDER	MATCH EXISTING KEY SYTEM		626	
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
1	EA	WALL STOP	WS33/WS33X		626	IVE
1	EA	GASKETING	488SBK PSA		BK	ZER

Hardware Group No. 12

For use on Door #(s):
121.2

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	REMOVABLE MULLION	KR4954		689	VON
2	EA	PANIC HARDWARE	LD-98-L-2SI-03		626	VON
1	EA	MORTISE CYLINDER	MATCH EXISTING KEY SYTEM		626	
2	EA	RIM CYLINDER	MATCH EXISTING KEY SYTEM		626	
2	EA	RIM CYL THUMBTURN	XB11-979		626	SCH
2	EA	SURFACE CLOSER	4111 EDA		689	LCN
2	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
2	EA	WALL STOP	WS33/WS33X		626	IVE
1	EA	GASKETING	488SBK PSA		BK	ZER
1	EA	MULLION SEAL	8780NBK PSA		BK	ZER

Hardware Group No. 13

For use on Door #(s):
121.1

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	DBL CYL STORE W/DB W/ OUTSIDE INDICATOR W/ INSIDE INDICATOR	L9466L 03A OS-LOC IS-LOC		626	SCH
2	EA	MORTISE CYLINDER	MATCH EXISTING KEY SYTEM		626	
1	EA	OH STOP	100S		630	GLY
1	EA	SURFACE CLOSER	4011 ST-1544		695	LCN
1	EA	MOUNTING PLATE	4020-18 (AS REQ'D)		689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
1	EA	GASKETING	488SBK PSA		BK	ZER

Hardware Group No. 14

For use on Door #(s):
129.1

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	DBL CYL STORE W/DB W/ OUTSIDE INDICATOR W/ INSIDE INDICATOR	L9466L 03A OS-LOC IS-LOC		626	SCH
1	EA	MORTISE CYLINDER	MATCH EXISTING KEY SYTEM		626	
1	EA	SURFACE CLOSER	4011		695	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
1	EA	WALL STOP	WS33/WS33X		626	IVE
1	EA	GASKETING	488SBK PSA		BK	ZER

Hardware Group No. 15

For use on Door #(s):
121.0

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	PANIC HARDWARE	LD-98-L-2SI-03		626	VON
1	EA	RIM CYLINDER	MATCH EXISTING KEY SYTEM		626	
1	EA	RIM CYL THUMBTURN	XB11-979		626	SCH
1	EA	SURFACE CLOSER	4111 EDA		689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
1	EA	WALL STOP	WS33/WS33X		626	IVE
1	EA	GASKETING	488SBK PSA		BK	ZER

Hardware Group No. 16

For use on Door #(s):
145.0

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	CD-98-NL-OP-110MD			626	VON
1	EA	MORTISE CYLINDER	MATCH EXISTING KEY SYTEM			626	
1	EA	RIM CYLINDER	MATCH EXISTING KEY SYTEM			626	
1	EA	ELECTRIC STRIKE	6300 FSE			630	VON
1	EA	90 DEG OFFSET PULL	8190EZHD 12" O			630-316	IVE
1	EA	OH STOP	100S			630	GLY
1	EA	SURFACE CLOSER	4111 EDA			689	LCN
1	EA	GASKETING/SEALS	BY DOOR/FRAME MANUFACTURER				B/O
1	EA	DOOR SWEEP	39A			A	ZER
1	EA	THRESHOLD	655A-V3-223			A	ZER
1	EA	DOOR CONTACT	679-05HM			BLK	SCE
1	EA	POWER SUPPLY	PS902 BBK 900-2RS (CONFIRM REQ WITH SECURITY CONTRACTOR)			LGR	SCE
1	EA	CARD READER	BY ACCESS CONTROL/SECURITY CONTRACTOR				B/O

DOORS NORMALLY CLOSED AND LOCKED. PRESENTING A VALID CREDENTIAL TO THE READER WILL MOMENTARILY UNLOCK ELECTRIC STRIKES ALLOWING ACCESS. DOORS CAN BE SCHEDULED LOCKED/UNLOCKED VIA ACCESS CONTROL SYSTEM.

COORDINATE SYSTEM OPERATION AND COMPONENT LOCATIONS WITH THE OWNER, THE ARCHITECT, AND ALL RELATED TRADES.

Hardware Group No. 17

For use on Door #(s):
149.0

Provide each PR door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
2	EA	CONT. HINGE	112XY		628	IVE
1	EA	REMOVABLE MULLION	KR4854B STAB		689	VON
1	EA	PANIC HARDWARE	CD-98-EO		626	VON
1	EA	PANIC HARDWARE	CD-98-NL-OP-110MD		626	VON
3	EA	MORTISE CYLINDER	MATCH EXISTING KEY SYTEM		626	
1	EA	RIM CYLINDER	MATCH EXISTING KEY SYTEM		626	
2	EA	ELECTRIC STRIKE	6300 FSE		630	VON
2	EA	90 DEG OFFSET PULL	8190EZHD 12" O		630-316	IVE
2	EA	OH STOP	100S		630	GLY
2	EA	SURFACE CLOSER	4111 EDA		689	LCN
1	EA	MULLION SEAL	8780NBK PSA		BK	ZER
1	EA	GASKETING/SEALS	BY DOOR/FRAME MANUFACTURER			B/O
2	EA	DOOR SWEEP	39A		A	ZER
1	EA	THRESHOLD	655A-V3-223		A	ZER
2	EA	DOOR CONTACT	679-05HM		BLK	SCE
1	EA	POWER SUPPLY	PS902 BBK 900-2RS (CONFIRM REQ WITH SECURITY CONTRACTOR)		LGR	SCE
1	EA	CARD READER	BY ACCESS CONTROL/SECURITY CONTRACTOR			B/O

DOORS NORMALLY CLOSED AND LOCKED. PRESENTING A VALID CREDENTIAL TO THE READER WILL MOMENTARILY UNLOCK ELECTRIC STRIKES ALLOWING ACCESS. DOORS CAN BE SCHEDULED LOCKED/UNLOCKED VIA ACCESS CONTROL SYSTEM.

COORDINATE SYSTEM OPERATION AND COMPONENT LOCATIONS WITH THE OWNER, THE ARCHITECT, AND ALL RELATED TRADES.

Hardware Group No. 18

For use on Door #(s):
152.1

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	PASSAGE SET	L9010 03A			626	SCH
1	EA	MORTISE CYLINDER	MATCH EXISTING KEY SYTEM			626	
1	EA	SURFACE CLOSER	4111 EDA			689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS			630	IVE
1	EA	FIRE/LIFE WALL MAG	SEM7840/7850 (AS REQ'D)		✓	689	LCN
1	EA	GASKETING	488SBK PSA			BK	ZER
1	EA	FIRE ALARM CONTACTS	PROVIDED BY FIRE ALARM CONTRACTOR		✓		B/O

DOORS NORMALLY HELD OPEN AND TIED TO FIRE ALARM.

COORDINATE SYSTEM OPERATION AND COMPONENT LOCATIONS WITH THE OWNER, THE ARCHITECT, AND ALL RELATED TRADES.

Hardware Group No. 19

For use on Door #(s):
125.1

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	STOREROOM W/DEADBOLT W/ OUTSIDE INDICATOR	L9480L 03A 09-544 OS-OCC		626	SCH
1	EA	MORTISE CYLINDER	MATCH EXISTING KEY SYTEM		626	
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
1	EA	WALL STOP	WS33/WS33X		626	IVE
1	EA	GASKETING	488SBK PSA		BK	ZER

Hardware Group No. 20

For use on Door #(s):
101.0 103.0 143.0

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 03A			626	SCH
1	EA	MORTISE CYLINDER	MATCH EXISTING KEY SYTEM			626	
1	EA	SURFACE CLOSER	4111 EDA			689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS			630	IVE
1	EA	WALL STOP	WS33/WS33X			626	IVE
1	EA	GASKETING	488SBK PSA			BK	ZER

Hardware Group No. 21

For use on Door #(s):
139.0

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 03A			626	SCH
1	EA	MORTISE CYLINDER	MATCH EXISTING KEY SYTEM			626	
1	EA	ELECTRIC STRIKE	6211 FSE		✓	630	VON
1	EA	SURFACE CLOSER	4111 EDA			689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS			630	IVE
1	EA	WALL STOP	WS33/WS33X			626	IVE
1	EA	GASKETING	488SBK PSA			BK	ZER
1	EA	DOOR CONTACT	679-05HM		✓	BLK	SCE
1	EA	POWER SUPPLY	PS902 BBK 900-2RS (CONFIRM REQ WITH SECURITY CONTRACTOR)		✓	LGR	SCE
1	EA	INTERCOM/CARD READER	BY ACCESS CONTROL/SECURITY CONTRACTOR		✓		B/O

DOORS NORMALLY CLOSED AND LOCKED. PRESENTING A VALID CREDENTIAL TO THE READER OR INTERCOM BUTTON WILL MOMENTARILY UNLOCK ELECTRIC STRIKES ALLOWING ACCESS. DOORS CAN BE SCHEDULED LOCKED/UNLOCKED VIA ACCESS CONTROL SYSTEM.

COORDINATE SYSTEM OPERATION AND COMPONENT LOCATIONS WITH THE OWNER, THE ARCHITECT, AND ALL RELATED TRADES.

END OF SECTION

SECTION 088000 - GLAZING

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. Glass for windows doors storefront framing.
2. Glazing sealants and accessories.

B. Related Requirements:

1. Section 081740 FRP Doors and Aluminum Framing

1.3 COORDINATION

A. Coordinate glazing channel dimensions to provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances.

1.4 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. Laminated glass.
4. Tempered glass
5. Insulating glass.

C. Glazing Schedule: List glass types and thicknesses for each size opening and location. Use same designations indicated on Drawings.

1.5 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.

1.6 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.

1.7 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.

B. Basis of Design: Guardian SunGuard, SNR 43, SuperNeutral Low-E

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.

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

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. Glass Type: Clear fully tempered float glass.

1. Minimum Thickness: 6 mm.
2. Safety glazing required.

3.7 TEMPERED GLASS SCHEDULE

A. Glass Type: Clear heat strengthened fully tempered float glass.

1. Basis-of-Design Product: Guardian ClimaGuard.
2. Minimum Thickness of Each Glass Ply: 6 mm.
3. Safety glazing required.

3.8 LAMINATED GLASS SCHEDULE

A. Glass Type: Clear laminated glass with two plies of ultraclear fully tempered float glass.

1. Basis-of-Design Product: Guardian ClimaGuard.
2. Minimum Thickness of Each Glass Ply: 6 mm.
3. Interlayer Thickness: 0.090 inch.
4. Safety glazing required.

3.9 INSULATING GLASS SCHEDULE

A. Glass Type: Low-E-coated, tinted insulating glass. Laminated or Tempered where indicated in drawings.

1. Basis-of-Design Product: Guardian SuperNeutral Low-E SNX 62/27.
2. Overall Unit Thickness: 1 inch.
3. Minimum Thickness of Each Glass Lite: 6 mm.
4. Outdoor Lite: Tinted annealed float glass.
5. Tint Color: Gray
6. Interspace Content: Argon.
7. Indoor Lite: Clear fully tempered float glass.
8. Low-E Coating: Pyrolytic on third surface.
9. Winter Nighttime U-Factor: 0.24 maximum.
10. Summer Daytime U-Factor: 0.27maximum.
11. Visible Light Transmittance: 31 percent minimum.
12. Solar Heat Gain Coefficient0.24 maximum.
13. Safety glazing required.

3.10 MIRROR GLASS SCHEDULE

1. UltraMirror heat strengthened fully tempered float glass

END OF SECTION 088000

SECTION 088813 - FIRE-RATED GLAZING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Fire-resistance-rated glazing.

1.2 DEFINITIONS

A. Glass Manufacturers: Firms that produce primary glass, fabricated glass, or both, as defined in referenced glazing publications.

B. Glass Thicknesses: Indicated by thickness designations in millimeters according to ASTM C1036.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Glass Samples: For each type of glass product; 12 inches square.

C. Glazing Schedule: List glass types and thicknesses for each size opening and location. Use same designations indicated on Drawings.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data.

B. Product Certificates: For each type of glass and glazing product, from manufacturer.

1.5 QUALITY ASSURANCE

1.6 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.

1.7 FIELD CONDITIONS

A. Environmental Limitations: Do not deliver or install fire-resistant glazing until spaces are enclosed and weathertight and temporary HVAC system is operating and maintaining ambient temperature conditions at occupancy levels during the remainder of the construction period.

1.8 WARRANTY

A. Manufacturer's Special Warranty on 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.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations for Glass: Obtain from single source from single manufacturer for each glass type.

B. 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 impact loads (where applicable) without failure, including loss or glass breakage attributable to the following: defective manufacture, fabrication, or installation; deterioration of glazing materials; or other defects in construction.

2.3 GLASS PRODUCTS, GENERAL

A. Glazing Publications: Comply with published recommendations of glass product manufacturers and organization below unless more stringent requirements are indicated. Refer to 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."

B. Safety Glazing Labeling: Permanently mark glazing with certification label of the Safety Glazing Certification Council or another certification agency acceptable to authorities having jurisdiction. Label shall indicate manufacturer's name, type of glass, glass thickness, and safety glazing standard with which glass complies.

2.4 GLASS PRODUCTS

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 unless fire-protection or fire-resistance rating is based on another product.
2. Interlayer Thickness: Provide thickness as needed to comply with requirements.
3. Interlayer Color: Clear unless otherwise indicated.

2.5 FIRE-RESISTANCE-RATED GLAZING

A. Fire-Resistance-Rated Glazing: Listed and labeled by a testing agency acceptable to authorities having jurisdiction, for fire-resistance ratings indicated, based on testing according to ASTM E119 or UL 263.

B. Fire-Resistance-Rated Glazing Labeling: Permanently mark fire-resistance-rated glazing with certification label of a testing agency acceptable to authorities having jurisdiction. Label shall indicate manufacturer's name, test standard, that the glazing is approved for use in walls, and the fire-resistance rating in minutes.

C. Laminated Glass with Intumescent Interlayers: Laminated glass made from multiple plies of uncoated, ultraclear float glass; with intumescent interlayers; and complying with 16 CFR 1201, Category II.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. SAFTI FIRST Fire Rated Glazing Solutions.
      b. AGC Glass Company North America, Inc.
      c. Pilkington North America.
      d. Technical Glass Products.

2.6 GLAZING ACCESSORIES

A. Provide glazing gaskets, glazing sealants, glazing tapes, setting blocks, spacers, edge blocks, and other glazing accessories that are compatible with glazing products and each other and are approved by testing agencies that listed and labeled fire-resistant glazing products with which products are used for applications and fire-protection ratings indicated.

B. Glazing Sealants for Fire-Rated Glazing Products: Neutral-curing silicone glazing sealant complying with ASTM C920, Type S, Grade NS, Class 50, Use NT. Comply with sealant and glass manufacturers' written instructions for selecting glazing sealants suitable for applications indicated.

   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. Tremco Incorporated.
   2. Colors of Exposed Glazing Sealants: As selected by Architect from manufacturer's full range.

C. Back-Bedding Mastic Glazing Tapes: Preformed, butyl-based, 100 percent solids elastomeric tape; nonstaining and nonmigrating in contact with nonporous surfaces; with or without spacer rod as recommended in writing by tape and glass manufacturers for application indicated; and complying with ASTM C1281 and AAMA 800 for products indicated below:

   1. AAMA 804.3 tape, where indicated.
   2. AAMA 806.3 tape, for glazing applications in which tape is subject to continuous pressure.
   3. AAMA 807.3 tape, for glazing applications in which tape is not subject to continuous pressure.

2.7 MISCELLANEOUS GLAZING MATERIALS

A. General: Provide products of material, size, and shape complying with referenced glazing standard, requirements of manufacturers of glass and other glazing materials for application indicated, and with a proven record of compatibility with surfaces contacted in installation.

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.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine framing, glazing channels, and stops, with Installer present, for compliance with manufacturing and installation tolerances, including those for size, squareness, and offsets at corners, and for compliance with minimum required face and edge clearances.

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 fire side and protected side. Label or mark units as needed so that fire side and protected side are readily identifiable. Do not use materials that leave visible marks in the completed work.

3.3 GLAZING, GENERAL

A. Use methods approved by testing agencies that listed and labeled fire-resistant glazing products.

B. 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.

C. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass is glass with edge damage or other imperfections that, when installed, could weaken glass and impair performance and appearance.

D. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction testing.

E. 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.

F. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.

G. 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.

H. 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.

I. 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.

J. 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 TAPE GLAZING

A. Position tapes on fixed stops so that, when compressed by glass, their exposed edges are flush with or protrude slightly above sightline of stops.

B. Install tapes continuously, but not necessarily in one continuous length. Do not stretch tapes to make them fit opening.

C. Cover vertical framing joints by applying tapes to heads and sills first and then to jambs. Cover horizontal framing joints by applying tapes to jambs and then to heads and sills.

D. Place joints in tapes at corners of opening with adjoining lengths butted together, not lapped. Seal joints in tapes with compatible sealant approved by tape manufacturer.

E. Do not remove release paper from tape until right before each glazing unit is installed.

F. Apply heel bead of elastomeric sealant.

G. Center glass lites in openings on setting blocks and press firmly against tape 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.

H. Apply cap bead of elastomeric sealant over exposed edge of tape.

3.5 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.

D. Install gaskets so they protrude past face of glazing stops.

3.6 SEALANT GLAZING (WET)

A. Install continuous spacers, or spacers combined with cylindrical sealant backing, between glass lites and glazing stops to maintain glass face clearances. Secure spacers or spacers and backings in place and in position to control depth of installed sealant relative to edge clearance for optimum sealant performance.

B. Force sealants into glazing channels to eliminate voids and to ensure complete wetting or bond of sealant to glass and channel surfaces.

C. Tool exposed surfaces of sealants to provide a substantial washaway from glass.

3.7 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.

C. Remove and replace glass that is damaged during construction period.

D. Wash glass on both exposed surfaces in each area of Project not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended in writing by glass manufacturer.

3.8 FIRE-RESISTANCE-RATED GLAZING SCHEDULE

A. Glass Type: 60- minute, 90-minuute and 120-minute fire-resistance-rated glazing with 450 deg F temperature-rise limitation; laminated glass with intumescent interlayers. Refer to drawings.

END OF SECTION 088813

SECTION 092116.23 - GYPSUM BOARD SHAFT WALL ASSEMBLIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Gypsum board shaft wall assemblies.

1.3 ACTION SUBMITTALS

A. Product Data: For each component of gypsum board shaft wall assembly.

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 support them on risers on a flat platform to prevent sagging.

1.5 FIELD CONDITIONS

A. Environmental Limitations: Comply with gypsum-shaftliner-board manufacturer's written instructions.

B. Do not install finish panels until installation areas are enclosed and conditioned.

C. Do not install panels that are wet, moisture damaged, or mold damaged.

1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, and 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 E119 by an independent testing agency.

B. STC-Rated Assemblies: Provide materials and construction identical to those of assemblies tested according to ASTM E90 and classified according to ASTM E413 by a testing and inspecting agency.

2.2 GYPSUM BOARD SHAFT WALL ASSEMBLIES

A. Fire-Resistance Rating: [**As indicated on Drawings**] [**2 hours**]

B. Gypsum Shaftliner Board:

1. Type X: ASTM C1396/C1396M; manufacturer's proprietary fire-resistive liner panels with paper faces, 1 inch thick, with double beveled long edges.

a. USG

b. American Gypsum

c. Gold Bond

d. Georgia-Pacific

e. Or Equal to be approved by architect.

C. Framing, General: Complying with ASTM C645 requirements for metal unless otherwise indicated and complying with requirements for fire-resistance-rated assembly indicated.

D. Studs: Manufacturer's standard profile for repetitive, corner, and end members as assembly proposed by contractor.

E. Runner Tracks: Manufacturer's standard J-profile track with manufacturer's standard long-leg length, but at least 2 inches long and matching studs in depth.

1. Minimum Base-Metal Thickness: **Matching steel studs**

F. Firestop Tracks: Top runner manufactured to allow partition heads to expand and contract with movement of the structure while maintaining continuity of fire-resistance-rated assembly indicated; in thickness not less than indicated for studs and in width to accommodate depth of studs.

G. Finish Panels: [**As indicated.**] [**Gypsum board as specified in Section 092900 "Gypsum Board."**]

2.3 AUXILIARY MATERIALS

A. Provide auxiliary materials that comply with shaft wall manufacturer's written instructions.

B. Trim Accessories: Cornerbead, edge trim, and control joints of material and shapes as specified in [**Section 092900 "Gypsum Board"**] that comply with gypsum board shaft wall assembly manufacturer's written instructions for application indicated.

C. Steel Drill Screws: ASTM C1002 unless otherwise indicated.

D. Track Fasteners: Power-driven fasteners of size and material required to withstand loading conditions imposed on shaft wall assemblies without exceeding allowable design stress of track, fasteners, or structural substrates in which anchors are embedded.

1. Expansion Anchors: Fabricated from corrosion-resistant materials, with allowable load or strength design capacities calculated according to ICC-ES AC193 and ACI 318 greater than or equal to the design load, as determined by testing per ASTM E488/E488M conducted by a qualified testing agency.
2. Power-Actuated Anchors: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with allowable load capacities calculated according to ICC-ES AC70, greater than or equal to the design load, as determined by testing per ASTM E1190 conducted by a qualified testing agency.

E. Reinforcing: Galvanized-steel reinforcing strips with **0.033-inch** minimum thickness of base metal (uncoated).

F. Acoustical Sealant: Section 079219 "Acoustical Joint Sealants."

G. Gypsum Board Cants:

1. Gypsum Board Panels: As specified in Section 092900 "Gypsum Board," [**Type X, 5/8-inch .**
2. Adhesive: Laminating adhesive as specified in Section 092900 "Gypsum Board."
3. Non-Load-Bearing Steel Framing: As specified in Section 092216 "Non-Structural Metal Framing."

PART 3 - EXECUTION

3.1 EXAMINATION

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

B. Examine panels before installation. Reject panels that are wet, moisture damaged, or mold damaged.

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

3.2 PREPARATION

A. Sprayed Fire-Resistive Materials: Coordinate with gypsum board shaft wall assemblies so both elements of Work remain complete and undamaged. Patch or replace sprayed fire-resistive materials removed or damaged during installation of shaft wall assemblies to comply with requirements specified in Section 078100 "Applied Fire Protection."

B. After sprayed fire-resistive materials are applied, remove only to extent necessary for installation of gypsum board shaft wall assemblies and without reducing the fire-resistive material thickness below that which is required to obtain fire-resistance rating indicated. Protect remaining fire-resistive materials from damage.

3.3 INSTALLATION

A. General: Install gypsum board shaft wall assemblies to comply with requirements of fire-resistance-rated assemblies indicated and manufacturer's written installation instructions.

B. Do not bridge building expansion joints with shaft wall assemblies; frame both sides of expansion joints with furring and other support.

C. Install supplementary framing in gypsum board shaft wall assemblies around openings and as required for blocking, bracing, and support of gravity and pullout loads of fixtures, equipment, services, heavy trim, furnishings, wall-mounted door stops, and similar items that cannot be supported directly by shaft wall assembly framing.

D.

1. Reinforcing: Provide where items attach directly to shaft wall assembly as indicated on Drawings; accurately position and secure behind at least one layer of face panel.

E. Penetrations: At penetrations in shaft wall, maintain fire-resistance rating of shaft wall assembly by installing supplementary steel framing around perimeter of penetration and fire protection behind boxes containing wiring devices, elevator call buttons and floor indicators, and similar items.

F. Isolate perimeter of gypsum panels from building structure to prevent cracking of panels while maintaining continuity of fire-rated construction.

G. Firestop Tracks: Where indicated, install to maintain continuity of fire-resistance-rated assembly indicated.

H. Control Joints: Install control joints [**at locations indicated on Drawings**] [**according to ASTM C840 and in specific locations approved by Architect**] while maintaining fire-resistance rating of gypsum board shaft wall assemblies.

I. Sound-Rated Shaft Wall Assemblies: Seal gypsum board shaft walls with acoustical sealant at perimeter of each assembly where it abuts other work and at joints and penetrations within each assembly.

J. Gypsum Board Cants: At projections into shaft **exceeding 4 inches** , install gypsum board cants covering tops of projections.

1. Slope cant panels at least 75 degrees from horizontal. Set base edge of panels in adhesive and secure top edges to shaft walls at 24 inches o.c. with screws fastened to shaft wall framing.
2. Where non-load-bearing steel framing is required to support gypsum board cants, install framing at 24 inches o.c. and extend studs from the projection to shaft wall framing.

K. 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.

3.4 PROTECTION

A. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.

B. Remove and replace panels that are wet, moisture damaged, or mold damaged.

1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, and 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 092116.23

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.

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: Interior gypsum board.

B. Related Requirements:

1. Section 092216 "Non-Structural Metal Framing" for non-structural steel framing and suspension systems that support gypsum board panels.

1.3 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 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.

2.3 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.

2.4 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.

2.5 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.

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 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.

3.5 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."

3.6 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 092900

SECTION 093013
CERAMIC TILING

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. Ceramic tile.
2. Stone thresholds.

B. Related Requirements:

1. Section 079200 "Joint Sealants" for sealing of expansion, contraction, control, and isolation joints in tile surfaces.

1.3 DEFINITIONS

A. General: Definitions in the ANSI A108 series of tile installation standards and in ANSI A137.1 apply to Work of this Section unless otherwise specified.

B. ANSI A108 Series: ANSI A108.01, ANSI A108.02, ANSI A108.1A, ANSI A108.1B, ANSI A108.1C, ANSI A108.4, ANSI A108.5, ANSI A108.6, ANSI A108.8, ANSI A108.9, ANSI A108.10, ANSI A108.11, ANSI A108.12, ANSI A108.13, ANSI A108.14, ANSI A108.15, ANSI A108.16, and ANSI A108.17, which are contained in its "Specifications for Installation of Ceramic Tile."

C. Face Size: Actual tile size, excluding spacer lugs.

D. Module Size: Actual tile size plus joint width indicated.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: Show locations of each type of tile and tile pattern. Show widths, details, and locations of expansion, contraction, control, and isolation joints in tile substrates and finished tile surfaces.

C. Samples for Verification:

1. Full-size units of each type and composition of tile and for each color and finish required. For ceramic mosaic tile in color blend patterns, provide full sheets of each color blend.
2. Assembled samples mounted on a rigid panel, with grouted joints, for each type and composition of tile and for each color and finish required. Make samples at least 12 inches

square , but not fewer than four tiles. Use grout of type and in color or colors approved for completed Work.
3. Full-size units of each type of trim and accessory for each color and finish required.
4. Stone thresholds in 6-inch lengths.
5. Metal edge strips in 6-inch lengths.

1.5 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match and are from same production runs as products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Tile and Trim Units: Furnish quantity of full-size units equal to 3 percent of amount installed for each type, composition, color, pattern, and size indicated.
2. Grout: Furnish quantity of grout equal to 3 percent of amount installed for each type, composition, and color indicated.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store packaged materials in original containers with seals unbroken and labels intact until time of use. Comply with requirements in ANSI A137.1 for labeling tile packages.

B. Store tile and cementitious materials on elevated platforms, under cover, and in a dry location.

C. Store aggregates where grading and other required characteristics can be maintained and contamination can be avoided.

D. Store liquid materials in unopened containers and protected from freezing.

1.7 FIELD CONDITIONS

A. Environmental Limitations: Do not install tile until construction in spaces is complete and ambient temperature and humidity conditions are maintained at the levels indicated in referenced standards and manufacturer's written instructions.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations for Tile: Obtain from single source or producer.

1. Obtain tile of each type and color or finish from same production run and of consistent quality in appearance and physical properties for each contiguous area.

B. Source Limitations for Setting and Grouting Materials: Obtain ingredients of a uniform quality for each mortar, adhesive, and grout component from single manufacturer and each aggregate from single source or producer.

1. Obtain setting and grouting materials, except for unmodified Portland cement and aggregate, from single manufacturer.

2. Obtain crack isolation membrane, except for sheet products, from manufacturer of setting and grouting materials.

C. Source Limitations for Other Products: Obtain each of the following products specified in this Section from a single manufacturer:

1. Stone thresholds.
2. Waterproof membrane.
3. Crack isolation membrane.
4. Metal edge strips.

2.2 PRODUCTS, GENERAL

A. ANSI Ceramic Tile Standard: Provide tile that complies with ANSI A137.1 for types, compositions, and other characteristics indicated.

1. Provide tile complying with Standard grade requirements unless otherwise indicated.

B. ANSI Standards for Tile Installation Materials: Provide materials complying with ANSI A108.02, ANSI standards referenced in other Part 2 articles, ANSI standards referenced by TCNA installation methods specified in tile installation schedules, and other requirements specified.

C. Factory Blending: For tile exhibiting color variations within ranges, blend tile in factory and package so tile units taken from one package show same range in colors as those taken from other packages and match approved Samples.

D. Mounting: For factory-mounted tile, provide back- or edge-mounted tile assemblies as standard with manufacturer unless otherwise indicated.

1. Where tile is indicated for installation in wet areas, do not use back- or edge-mounted tile assemblies unless tile manufacturer specifies in writing that this type of mounting is suitable for installation indicated and has a record of successful in-service performance.

2.3 TILE PRODUCTS

A. See Finish Schedule for tile manufacturer, color, size, and installation.

2.4 THRESHOLDS

A. General: Fabricate to sizes and profiles indicated or required to provide transition between adjacent floor finishes.

1. At Terrazzo, and all gang toilet room thresholds:

a. Marble Thresholds: ASTM C503/C503M, with a minimum abrasion resistance of 10 according to ASTM C1353 or ASTM C241/C241M and with honed finish.

b. Description: Uniform, fine- to medium-grained white stone with gray veining.

2.5 GROUT MATERIALS

A. Sand-Portland Cement Grout: ANSI A108.10, consisting of white or gray cement and white or colored aggregate as required to produce color indicated.

1. Color selection to be from manufacturers full range.

B. Standard Cement Grout: ANSI A118.6.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Bonsal American, an Oldcastle company.
   b. Bostik, Inc.
   c. Custom Building Products.
   d. LATICRETE SUPERCAP, LLC.
   e. MAPEI Corporation.
   f. Summitville Tiles, Inc.

C. High-Performance Tile Grout: ANSI A118.7.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Bonsal American, an Oldcastle company.
   b. Bostik, Inc.
   c. Custom Building Products.
   d. LATICRETE SUPERCAP, LLC.
   e. MAPEI Corporation.
   f. Summitville Tiles, Inc.
2. Polymer Type: Ethylene vinyl acetate or acrylic additive, in dry, redispersible form, prepackaged with other dry ingredients.
3. Polymer Type: Acrylic resin in liquid-latex form for addition to prepackaged dry-grout mix.

D. Water-Cleanable Epoxy Grout: ANSI A118.3, with a VOC content of 65 g/L or less.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Bonsal American, an Oldcastle company.
   b. Bostik, Inc.
   c. Custom Building Products.
   d. LATICRETE SUPERCAP, LLC.
   e. MAPEI Corporation.
   f. Summitville Tiles, Inc.
2. Provide product capable of withstanding continuous and intermittent exposure to temperatures of up to 140 and 212 deg F, respectively, and certified by manufacturer for intended use.

E. Grout for Pregrouted Tile Sheets: Same product used in factory to pregrout tile sheets.

2.6 MISCELLANEOUS MATERIALS

A. Metal Edge Strips: Angle or L-shaped, height to match tile and setting-bed thickness, metallic or combination of metal and PVC or neoprene base, designed specifically for flooring applications; stainless steel, ASTM A276/A276M or ASTM A666, 300 Series exposed-edge material.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Blanke Corporation.
   b. Ceramic Tool Company, Inc.
   c. Schluter Systems L.P.

B. Tile Cleaner: A neutral cleaner capable of removing soil and residue without harming tile and grout surfaces, specifically approved for materials and installations indicated by tile and grout manufacturers.

C. Floor Sealer: Manufacturer's standard product for sealing grout joints and that does not change color or appearance of grout.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Bonsal American, an Oldcastle company.
   b. Custom Building Products.
   c. Summitville Tiles, Inc.

2.7 MIXING MORTARS AND GROUT

A. Mix mortars and grouts to comply with referenced standards and mortar and grout manufacturers' written instructions.

B. Add materials, water, and additives in accurate proportions.

C. Obtain and use type of mixing equipment, mixer speeds, mixing containers, mixing time, and other procedures to produce mortars and grouts of uniform quality with optimum performance characteristics for installations indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions where tile will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

1. Verify that substrates for setting tile are firm; dry; clean; free of coatings that are incompatible with tile-setting materials, including curing compounds and other substances that contain soap, wax, oil, or silicone; and comply with flatness tolerances required by ANSI A108.01 for installations indicated.
2. Verify that concrete substrates for tile floors installed with thinset mortar comply with surface finish requirements in ANSI A108.01 for installations indicated.
   a. Verify that surfaces that received a steel trowel finish have been mechanically scarified.
   b. Verify that protrusions, bumps, and ridges have been removed by sanding or grinding.
3. Verify that installation of grounds, anchors, recessed frames, electrical and mechanical units of work, and similar items located in or behind tile has been completed.
4. Verify that joints and cracks in tile substrates are coordinated with tile joint locations; if not coordinated, adjust joint locations in consultation with Architect.

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

3.2 PREPARATION

A. Fill cracks, holes, and depressions in concrete substrates for tile floors installed with thinset mortar with trowelable leveling and patching compound specifically recommended by tile-setting material manufacturer.

B. Where indicated, prepare substrates to receive waterproof membrane by applying a reinforced mortar bed that complies with ANSI A108.1A and is sloped 1/4 inch per foot toward drains.

C. Blending: For tile exhibiting color variations, verify that tile has been factory blended and packaged so tile units taken from one package show same range of colors as those taken from other packages and match approved Samples. If not factory blended, either return to manufacturer or blend tiles at Project site before installing.

3.3 INSTALLATION OF CERAMIC TILE

A. Comply with TCNA's "Handbook for Ceramic, Glass, and Stone Tile Installation" for TCNA installation methods specified in tile installation schedules. Comply with parts of the ANSI A108 series "Specifications for Installation of Ceramic Tile" that are referenced in TCNA installation methods, specified in tile installation schedules, and apply to types of setting and grouting materials used.

1. For the following installations, follow procedures in the ANSI A108 series of tile installation standards for providing 95 percent mortar coverage:
    a. Exterior tile floors.
    b. Tile floors in wet areas.
    c. Tile floors consisting of tiles 8 by 8 inches or larger.
    d. Tile floors consisting of rib-backed tiles.

B. Extend tile work into recesses and under or behind equipment and fixtures to form complete covering without interruptions unless otherwise indicated. Terminate work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.

C. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish, or built-in items for straight aligned joints. Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so plates, collars, or covers overlap tile.

D. Provide manufacturer's standard trim shapes where necessary to eliminate exposed tile edges.

E. Where accent tile differs in thickness from field tile, vary setting-bed thickness so that tiles are flush.

F. Jointing Pattern: Lay tile in grid pattern unless otherwise indicated. Lay out tile work and center tile fields in both directions in each space or on each wall area. Lay out tile work to minimize the use of pieces that are less than half of a tile. Provide uniform joint widths unless otherwise indicated.

1. For tile mounted in sheets, make joints between tile sheets same width as joints within tile sheets so joints between sheets are not apparent in finished work.

2. Where adjoining tiles on floor, base, walls, or trim are specified or indicated to be same size, align joints.
3. Where tiles are specified or indicated to be whole integer multiples of adjoining tiles on floor, base, walls, or trim, align joints unless otherwise indicated.

G. Joint Widths: Unless otherwise indicated, install tile with the following joint widths:

1. Ceramic Mosaic Tile: 1/8 inch.
2. Porcelain Tile: 1/4 inch.

H. Lay out tile wainscots to dimensions indicated or to next full tile beyond dimensions indicated.

I. Expansion Joints: Provide expansion joints and other sealant-filled joints, including control, contraction, and isolation joints, where indicated. Form joints during installation of setting materials, mortar beds, and tile. Do not saw-cut joints after installing tiles.

1. Where joints occur in concrete substrates, locate joints in tile surfaces directly above them.

J. Stone Thresholds: Install stone thresholds in same type of setting bed as adjacent floor unless otherwise indicated.

1. At locations where mortar bed (thickset) would otherwise be exposed above adjacent floor finishes, set thresholds in improved modified dry-set mortar (thinset).

K. Metal Edge Strips: Install where exposed edge of tile flooring meets carpet, wood, or other flooring that finishes flush with or below top of tile and no threshold is indicated.

L. Floor Sealer: Apply floor sealer to cementitious grout joints in tile floors according to floor-sealer manufacturer's written instructions. As soon as floor sealer has penetrated grout joints, remove excess sealer and sealer from tile faces by wiping with soft cloth.

3.4 ADJUSTING AND CLEANING

A. Remove and replace tile that is damaged or that does not match adjoining tile. Provide new matching units, installed as specified and in a manner to eliminate evidence of replacement.

B. Cleaning: On completion of placement and grouting, clean all ceramic tile surfaces so they are free of foreign matter.

1. Remove grout residue from tile as soon as possible.
2. Clean grout smears and haze from tile according to tile and grout manufacturer's written instructions but no sooner than 10 days after installation. Use only cleaners recommended by tile and grout manufacturers and only after determining that cleaners are safe to use by testing on samples of tile and other surfaces to be cleaned. Protect metal surfaces and plumbing fixtures from effects of cleaning. Flush surfaces with clean water before and after cleaning.

3.5 PROTECTION

A. Protect installed tile work with kraft paper or other heavy covering during construction period to prevent staining, damage, and wear. If recommended by tile manufacturer, apply coat of neutral protective cleaner to completed tile walls and floors.

B. Prohibit foot and wheel traffic from tiled floors for at least seven days after grouting is completed.

C. Before final inspection, remove protective coverings and rinse neutral protective cleaner from tile surfaces.

3.6 INTERIOR CERAMIC TILE INSTALLATION SCHEDULE

A. Interior Floor Installations, Concrete Subfloor:

1. Ceramic Tile Installation: TCNA F115; thinset mortar; epoxy grout.
   a. Ceramic Tile Type: MCT-1, MCT-2
   b. Thinset Mortar: Standard dry-set mortar.
   c. Grout: Water-cleanable epoxy grout.

B. Interior Wall Installations, Masonry or Concrete:

1. Ceramic Tile Installation Wall Tile: TCNA W202; thinset mortar.
   a. Ceramic Tile Type: MCTB-1, MCTB-2
   b. Thinset Mortar: Standard dry-set mortar.
   c. Grout: Water-cleanable epoxy grout.

END OF SECTION 093013

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 635 Standard Specification for Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings
5. ASTM C 636 Recommended Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels
6. ASTM D 3273 Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber
7. ASTM E 84 Standard Test Method for Surface Burning Characteristics of Building Materials
8. ASTM E 119 Standard Test Methods for Fire Tests of Building Construction and Material

B. ASHRAE Standard 62.1-2004, Ventilation for Acceptable Indoor Air Quality

C. NFPA 70 National Electrical Code

D. ASCE 7 American Society of Civil Engineers, Minimum Design Loads for Buildings and Other Structures

1.3 SUBMITTALS

A. Product Data: Submit manufacturer's technical data for each type of acoustical ceiling unit and suspension system required.

B. Samples: Minimum 6 inch x 6 inch samples of specified acoustical panel; 8 inch long samples of exposed wall molding and suspension system, including main runner and 4 foot cross tees.

C. Shop Drawings: Layout and details of acoustical ceilings show locations of items that are to be coordinated with, or supported by the ceilings.

1.4 QUALITY ASSURANCE

A. Single-Source Responsibility: Provide acoustical panel units and grid components by a single manufacturer.

1. Fire Performance Characteristics: Identify acoustical ceiling components with appropriate markings of applicable testing and inspecting organization.
2. Surface Burning Characteristics: As follows, tested per ASTM E 84 and complying with ASTM E 1264 Classification.
3. Fire Resistance: As follows tested per ASTM E119 and listed in the appropriate floor or roof design in the Underwriters Laboratories Fire Resistance Directory

B. Acoustical Panels: As with other architectural features located at the ceiling, may obstruct or skew the planned fire sprinkler water distribution pattern through possibly delay or accelerate the activation of the sprinkler or fire detection systems by channeling heat from a fire either toward or away from the device. Designers and installers are advised to consult a fire protection engineer, NFPA 13, or their local codes for guidance where automatic fire detection and suppression systems are present.

C. Coordination of Work: Coordinate acoustical ceiling work with installers of related work including, but not limited to building insulation, gypsum board, light fixtures, mechanical systems, electrical systems, and sprinklers.

1.5 DELIVERY, STORAGE AND HANDLING

A. Deliver acoustical ceiling units to project site in original, unopened packages and store them in a fully enclosed space where they will be protected against damage from moisture, direct sunlight, surface contamination, and other causes.

B. Before installing acoustical ceiling units, permit them to reach room temperature and a stabilized moisture content.

C. Handle acoustical ceiling units carefully to avoid chipping edges or damaged units in any way.

1.6 PROJECT CONDITIONS

A. Space Enclosure:

1. Standard Ceilings: Do not install interior ceilings until space is enclosed and weatherproof; wet work in place is completed and nominally dry; work above ceilings is complete; and ambient conditions of temperature and humidity are continuously maintained at values near those intended for final occupancy. Building areas to receive ceilings shall be free of construction dust and debris.
2. HumiGuard Plus Ceilings: Building areas to receive ceilings shall be free of construction dust and debris. Products with HumiGuard Plus performance and hot dipped galvanized steel, aluminum or stainless steel suspension systems can be installed up to 120°F (49°C) and in spaces before the building is enclosed, where HVAC systems are cycled or not operating. Cannot be used in exterior applications where standing water is present or where moisture will come in direct contact with the ceiling.

1.7 WARRANTY

A. Acoustical Panel: Submit a written warranty executed by the manufacturer, agreeing to repair or replace panels that fail within the warranty period. Failures include, but are not limited to the following:

1. Acoustical Panels: Sagging and warping
2. Grid System: Rusting and manufacturer's defects

B. Warranty Period:

1. Acoustical panels: Ten (10) years from date of substantial completion
2. Suspension: Ten (10) years from date of substantial completion
3. Ceiling System: Thirty (30) years from date of substantial completion

C. The Warranty shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and will be in addition to and run concurrent with other warranties made by the Contractor under the requirements of the Contract Documents.

1.8 MAINTENANCE

A. Extra Materials: Deliver extra materials to Owner. Furnish extra materials described below that match products installed. Packaged with protective covering for storage and identified with appropriate labels.

1. Acoustical Ceiling Units: Furnish quality of full-size units equal to 5.0 percent of amount installed.
2. Exposed Suspension System Components: Furnish quantity of each exposed suspension component equal to 2.0 percent of amount installed.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Ceiling Panels:

1. 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 UNITS

A. Acoustical Panels Type ATC-1 (REFER TO ROOM FINISH SCHEDULE)

1. Size: 2' x 2'
2. Thickness: 3/4"
3. Edge: Reveal.
4. Surface Color: White, fine text., **ATC-1** (**Armstrong ULTIMA 1941A** or equal):
5. NRC: 0.75
6. Fire Resist: Class A
7. Grid: 15/16” exposed tee grid, white.

C. ALUMINUM CUSTOM TRIM - EXTRUDED

B. Product/Manufacturer: Axiom Trim Channel: 12in Axiom Classic Curved Armstrong World Industries, Incorporated

C. 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: Blizzard White
2. Size: Refer to drawings.
3. Recycle Content: Post-Consumer - 50% Pre-Consumer - 0%
4. Acceptable Product: AXIOM Classic, 12in Axiom Classic Curved as manufactured by Armstrong World Industries

D. Axiom Trim Channel:

1. 12in Axiom Classic Curved

2.3 METAL SUSPENSION SYSTEMS

A. Components:

1. Main beams and cross tees, base metal and end detail, fabricated from commercial quality hot dipped galvanized steel complying with ASTM A 653. Main beams and cross tees are double-web steel construction with type exposed flange design. Exposed surfaces chemically cleansed, capping prefinished galvanized steel in baked polyester paint. Main beams and cross tees shall have rotary stitching.

a. Structural Classification: ASTM C 635 Heavy Duty duty
b. Color: Blizzard White and match the actual color of the selected ceiling tile, unless noted otherwise.
c. Sustainability: Environmetal Product Declaration (EPD), Health Product Declaration (HPD)
d. Acceptable Product: PRELUDE XL 15/16" Exposed Tee as manufactured by Armstrong World Industries

B. Attachment Devices: Size for five times design load indicated in ASTM C 635, Table 1, Direct Hung unless otherwise indicated.

C. Wire for Hangers and Ties: ASTM A 641, Class 1 zinc coating, soft annealed, with a yield stress load of at least time three design load, but not less than 12 gauge.

D. Edge Moldings and Trim:

E. Accessories:

1. 7902 - 15/16" Shadow Reveal Transition Molding
2. 7904 - 15/16" Flush Act. to Drywall Transition Molding

PART 3 - EXECUTION

3.1 EXAMINATION

A. Do not proceed with installation until all wet work such as concrete, terrazzo, plastering and painting has been completed and thoroughly dried out, unless expressly permitted by manufacturer's printed recommendations. (Exception: HumiGuard Max Ceilings)

3.2 PREPARATION

A. Measure each ceiling area and establish layout of acoustical units to balance border widths at opposite edges of each ceiling. Avoid use of less than half width units at borders, and comply with reflected ceiling plans. Coordinate panel layout with mechanical and electrical fixtures.

B. Coordination: Furnish layouts for preset inserts, clips, and other ceiling anchors whose installation is specified in other sections.

1. Furnish concrete inserts and similar devices to other trades for installation well in advance of time needed for coordination of other work.

3.3 INSTALLATION

A. Follow manufacturer installation instructions.

B. Install suspension system and panels in accordance with the manufacturer's instructions, and in compliance with ASTM C 636 and with the authorities having jurisdiction.

C. Suspend main beam from overhead construction with hanger wires spaced 4-0 on center along the length of the main runner. Install hanger wires plumb and straight.

D. Install wall moldings at intersection of suspended ceiling and vertical surfaces. Miter corners where wall moldings intersect or install corner caps.

E. For reveal edge panels: Cut and reveal or rabbet edges of ceiling panels at border areas and vertical surfaces.

F. Install acoustical panels in coordination with suspended system, with edges resting on flanges of main runner and cross tees. Cut and fit panels neatly against abutting surfaces. Support edges by wall moldings.

3.4 ADJUSTING AND CLEANING

A. Replace damaged and broken panels.

B. Clean exposed surfaces of acoustical ceilings, including trim, edge moldings, and suspension members. Comply with manufacturer's instructions for cleaning and touch up of minor finish damage. Remove any ceiling products that cannot be successfully cleaned and or repaired. Replace with attic stock or new product to eliminate evidence of damage.

END OF SECTION

SECTION 096513
RESILIENT BASE AND 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. Vinyl base.
2. Vinyl molding accessories.

1.3 SUBMITTALS

A. Product Data: For each type of product.

B. Samples: For each exposed product and for each color and texture specified, not less than 12 inches long.

C. Product Schedule: For resilient base and accessory products.

1.4 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Furnish not less than 10 linear feet for every 500 linear feet or fraction thereof, of each type, color, pattern, and size of resilient product installed.

1.5 QUALITY ASSURANCE

A. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.

1. Coordinate mockups in this Section with mockups specified in other Sections.
2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store resilient products and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F or more than 90 deg F.

1.7 FIELD CONDITIONS

A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F or more than 95 deg F, in spaces to receive resilient products during the following periods:

1. 48 hours before installation.
2. During installation.
3. 48 hours after installation.

B. Install resilient products after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.1 VINYL BASE

A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

1. Armstrong World Industries, Inc.
2. Johnsonite; a Tarkett company.
3. Roppe Corporation, USA.
4. Nora by Interface

B. Product Standard: ASTM F 1861, Type TV (vinyl, thermoplastic).

1. Group: I (solid, homogeneous).
2. Style and Location:

a. Style B, Cove: Provide in areas with resilient floor coverings , new carpet areas, and as otherwise indicated in drawings..

b. Provide Molded Vinyl Cove Outside Corner Pieces at all corner locations.

C. Minimum Thickness: 0.125 inch.

D. Height: 4 inches.

E. Lengths: Coils in manufacturer's standard length.

F. Outside Corners: Job formed or preformed.

G. Inside Corners: Job formed or preformed.

1. Colors and Patterns: **RB-1**– Color to be NORA 0749 Stone Grey or equal

2.2 INSTALLATION MATERIALS

A. Adhesives: Water-resistant type recommended by resilient-product manufacturer for resilient products and substrate conditions indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of resilient products.

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

1. Installation of resilient products indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of resilient products.

B. Concrete Substrates for Resilient Stair Accessories: Prepare horizontal surfaces according to ASTM F 710.

1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.
3. Alkalinity and Adhesion Testing: Perform tests recommended by manufacturer. Proceed with installation only after substrate alkalinity falls within range on pH scale recommended by manufacturer in writing, but not less than 5 or more than 9 pH.
4. Moisture Testing: Perform tests so that each test area does not exceed 1000 sq. ft., and perform no fewer than three tests in each installation area and with test areas evenly spaced in installation areas.
    a. Anhydrous Calcium Chloride Test: ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. in 24 hours.
    b. Relative Humidity Test: Using in-situ probes, ASTM F 2170. Proceed with installation only after substrates have a maximum 75 percent relative humidity level measurement.

C. Do not install resilient products until materials are the same temperature as space where they are to be installed.

1. At least 48 hours in advance of installation, move resilient products and installation materials into spaces where they will be installed.

D. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient products.

3.3 RESILIENT BASE INSTALLATION

A. Comply with manufacturer's written instructions for installing resilient base.

B. Apply resilient base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.

C. Install resilient base in lengths as long as practical without gaps at seams and with tops of adjacent pieces aligned.

D. Tightly adhere resilient base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.

E. Do not stretch resilient base during installation.

F. On masonry surfaces or other similar irregular substrates, fill voids along top edge of resilient base with manufacturer's recommended adhesive filler material.

G. Preformed Corners: Install preformed corners before installing straight pieces.

H. Job-Formed Corners:

1. Outside Corners: Use straight pieces of maximum lengths possible and form with returns not less than 3 inches in length.

    a. Form without producing discoloration (whitening) at bends.
2. Inside Corners: Use straight pieces of maximum lengths possible and form with returns not less than 3 inches in length.

    a. Miter or cope corners to minimize open joints.

3.4 RESILIENT ACCESSORY INSTALLATION

A. Comply with manufacturer's written instructions for installing resilient accessories.

B. Resilient Molding Accessories: Butt to adjacent materials and tightly adhere to substrates throughout length of each piece. Install reducer strips at edges of floor covering that would otherwise be exposed.

3.5 CLEANING AND PROTECTION

A. Comply with manufacturer's written instructions for cleaning and protecting resilient products.

B. Perform the following operations immediately after completing resilient-product installation:

1. Remove adhesive and other blemishes from surfaces.
2. Sweep and vacuum horizontal surfaces thoroughly.
3. Damp-mop horizontal surfaces to remove marks and soil.

C. Protect resilient products from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.

D. Cover resilient products subject to wear and foot traffic until Substantial Completion.

END OF SECTION

SECTION 096519
RESILIENT TILE FLOORING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Luxury Vinyl Plank (LVT).

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.
B. Shop Drawings: For each type of resilient floor tile.

1. Include floor tile layouts, edges, columns, doorways, enclosing partitions, built-in furniture, cabinets, and cutouts.
2. Show details of special patterns.

C. Samples: Full-size units of each color, texture, and pattern of floor tile required.

1. For heat-welding bead, manufacturer's standard-size Samples, but not less than long, of each color required.

D. Product Schedule: For floor tile. Use same designations indicated on Drawings.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For each type of floor tile to include in maintenance manuals.

1.6 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Floor Tile: Furnish one box for every 20 boxes or fraction thereof, of each type, color, and pattern of floor tile installed.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are competent in techniques required by manufacturer for floor tile installation and seaming method indicated.

1. Engage an installer who employs workers for this Project who are trained or certified by floor tile manufacturer for installation techniques required.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Store floor tile and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F or more than 90 deg F. Store floor tiles on flat surfaces.

1.9 FIELD CONDITIONS

A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F or more than 95 deg F, in spaces to receive floor tile during the following periods:

1. 48 hours before installation.
2. During installation.
3. 48 hours after installation.

B. After installation and until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F or more than 95 deg F.
C. Close spaces to traffic during floor tile installation.
D. Close spaces to traffic for 48 hours after floor tile installation.
E. Install floor tile after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Test-Response Characteristics: For resilient floor tile, as determined by testing identical products according to ASTM E 648 or NFPA 253 by a qualified testing agency.

1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.

2.2 LUXURY VINYL TILE

Manufacturers:

1. REFER TO ROOM FINISH SCHEDULE

2.3 INSTALLATION MATERIALS

A. Trowelable Leveling and Patching Compounds: Latex-modified, portland-cement-based or blended hydraulic-cement-based formulation provided or approved by floor tile manufacturer for applications indicated.
B. Adhesives: Class A rated Adhesive as recommended by floor tile and adhesive manufacturers to suit floor tile and substrate conditions indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of floor tile.

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

3.2 PREPARATION

A. Prepare substrates according to floor tile manufacturer's written instructions to ensure adhesion of resilient products.
B. Concrete Substrates: Prepare according to ASTM F 710.

1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by floor tile manufacturer. Do not use solvents.
3. Alkalinity and Adhesion Testing: Perform tests recommended by floor tile manufacturer. Proceed with installation only after substrate alkalinity falls within range on pH scale recommended by manufacturer in writing, but not less than 5 or more than 9 pH.
4. Moisture Testing: Perform tests so that each test area does not exceed 1000 sq. ft., and perform no fewer than three tests in each installation area and with test areas evenly spaced in installation areas.

a. Anhydrous Calcium Chloride Test: ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. in 24 hours.
b. Relative Humidity Test: Using in-situ probes, ASTM F 2170. Proceed with installation only after substrates have a maximum 75 percent relative humidity level measurement.

C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.
D. Do not install floor tiles until materials are the same temperature as space where they are to be installed.

1. At least 48 hours in advance of installation, move resilient floor tile and installation materials into spaces where they will be installed.

E. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient floor tile.

3.3 FLOOR TILE INSTALLATION

A. Comply with manufacturer's written instructions for installing floor tile.
B. Lay out floor tiles from center marks established with principal walls, discounting minor offsets, so tiles at opposite edges of room are of equal width. Adjust as necessary to avoid using cut widths that equal less than one-half tile at perimeter.

1. Lay tiles square with room axis or as indicated in finish plans.

C. Match floor tiles for color and pattern by selecting tiles from cartons in the same sequence as manufactured and packaged, if so numbered. Discard broken, cracked, chipped, or deformed tiles.

1. Lay tiles in direction as indicated on the finish plans.

D. Scribe, cut, and fit floor tiles to butt neatly and tightly to vertical surfaces and permanent fixtures including built-in furniture, cabinets, pipes, outlets, and door frames.

E. Extend floor tiles into toe spaces, door reveals, closets, and similar openings. Extend floor tiles to center of door openings.

F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on floor tiles as marked on substrates. Use chalk or other nonpermanent marking device.

G. Install floor tiles on covers for telephone and electrical ducts, building expansion-joint covers, and similar items in installation areas. Maintain overall continuity of color and pattern between pieces of tile installed on covers and adjoining tiles. Tightly adhere tile edges to substrates that abut covers and to cover perimeters.

H. Adhere floor tiles to substrates using a full spread of adhesive as recommended by the manufacturer and applied to the substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.

3.4 CLEANING AND PROTECTION

A. Comply with manufacturer's written instructions for cleaning and protecting floor tile.

B. Perform the following operations immediately after completing floor tile installation:

1. Remove adhesive and other blemishes from surfaces.
2. Sweep and vacuum surfaces thoroughly.
3. Damp-mop surfaces to remove marks and soil.

C. Protect floor tile from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.

D. Cover floor tile until Substantial Completion.

END OF SECTION

SECTION 096813
TILE CARPETING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including; General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This section includes the following:
   1. Tufted carpet tile.

1.3 SUBMITTALS

A. Manufacturer's Data - Submit two (2) copies of manufacturer's specifications and installation instructions for carpet tile and related items specified. Manufacturer shall also submit a Shop Drawings showing the extent of product, seam direction and accessories shall be submitted to Architect for approval prior to installation. Check pattern match, if any, for matching during installation and possible waste factors in ordering required amounts. Should also indicate columns, doorways, enclosing walls or partitions, built-in cabinets, and locations where cutouts are required. Copy of approved shop drawings to be available on job site during installation.
B. Floor schedule using same room designations indicated on drawings.
C. Product Data: Provide data on specified products, describing physical and performance characteristics, sizes, patterns, colors available, and method of installation.
D. Verification Samples: Submit samples illustrating color and pattern for each carpet material specified only if requested by Architect.
E. Manufacturer’s Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.
F. Maintenance Data: Include maintenance procedures, recommendations for maintenance materials and equipment, and suggested schedule for cleaning.
G. Manufacturer’s Product Warranty.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications
   1. Carpet manufacturer shall have no less than three years of production Manufacturer Qualifications
   2. Company specializing in manufacturing specified carpet with minimum 15 years documented experience.
   3. Upon request, manufacturer to provide representative to assist in project start-up and to inspect installation while in process and upon completion. Representative will notify designated contact if any installation instructions are not followed.
   4. Single Source Responsibility: Obtain each type of product from one source and by a single manufacturer.
B. Installer Qualifications
   1. Flooring contractor must be certified by the manufacturer prior to bid.
   2. Flooring contractor to be a specialty contractor normally engaged in this type of work and shall have prior experience in the installation of these types of materials.
   3. Flooring contractor possessing Contract for the product installation shall not sub-contract the labor without written approval of the Project Manager.

4. Flooring contractor will be responsible for proper product installation, including floor testing and preparation as specified by the manufacturer and JOB CONDITIONS herein.
5. Flooring contractor to provide Owner a written installation warranty that guarantees the completed installation to be free from defects in materials and workmanship for a period of one year after job completion.

1.5 PRODUCT DELIVERY AND STORAGE

A. Deliver materials to the site in manufacturer's original packaging listing manufacturer's name, product name, identification number, and related information.
B. Store in a dry location, between 65 degrees F and 90 degrees F and a relative humidity below 65%. Protect from damage and soiling. Stack carpet rolls horizontally on a flat surface, stacked no higher than two rolls.
C. Make stored materials available for inspection by the Owner's representative.
D. Store materials in area of installation for minimum period of 48 hours prior to installation.

1.6 PROJECT CONDITIONS

A. Sub-floor preparation is to include all required work to prepare the existing floor for installation of the product as specified in this document and Manufacturer's installation instructions.
B. Please see Powerbond Cushion Installation & Floor Preparation Instructions for specific requirements for moisture vapor emission rate, ambient conditions, and other requirements.
C. All material used in sub-floor preparation and repair shall be recommended by the carpet manufacturer and shall be chemically and physically compatible with the carpet system being bid.
D. Maintain minimum 65 degrees F ambient temperature and 65% Relative Humidity for 72 hours prior to, during, and 48 hours after installation.
E. Do not install flooring until space is enclosed and weatherproof, wet-work in space is completed and nominally dry, work above ceilings is complete, and ambient temperature and humidity conditions are and will be continuously maintained at values near those indicated for final occupancy

1.7 WARRANTY

A. Warranty to be sole source responsibility of the Manufacturer. Second source warranties and warranties that involve parties other than the carpet manufacturer are unacceptable.
B. If the product fails to perform as warranted when properly installed and maintained, the affected area will be repaired or replaced at the discretion of the Manufacturer.
C. Chair pads are not required, but are recommended for optimum textural performance. Absent the use of chair pads, more intensive maintenance will be required for areas in direct contact with chair caster traffic, and some degree of appearance change is to be expected.
D. Warranty shall not exclude carpet product installed on stairs provided it is properly installed and maintained.
E. The non-prorated lifetime limited warranty shall specifically warrant against :
    1. Excessive Surface Wear: More than 15% loss of pile fiber weight
    2. Excessive Static Electricity: More than 3.0 kV per AATCC 134
    3. Resiliency Loss of the Backing: More than 10% loss of backing resiliency
    4. Delamination
    5. Edge Ravel
    6. Zippering
F. Tuft Bind warranty in lieu of edge ravel and zippering is not acceptable.

PART 2 - PRODUCTS

2.1 MANUFACTURER

A. Subject to the minimum requirements listed above and below, provide carpeting as specified.
   1. Colors and patterns of carpet shall match samples.

2.2 CARPET TILE

A. Package Marking - Mark each carpet package according to style, color, pattern, dye lot, run number and quantity. Within each continuous carpet area, install carpet from same dye lot and run.
B. Carpet Construction Specification - All yarn and carpet shall be manufacturer's first quality and 100% recyclable.

2.3 Carpet shall meet the following performance standards:

A. Test reports for the following performance assurance testing to be submitted upon request. Submitted results shall represent average results for production goods of the referenced style. Requirements listed below must be met by all products.
   1. Flooring Radiant Panel: ASTM E-648 / NFPA 253: Class 1 (CRF: 0.45 watts/sq cm or greater)
   2. Federal Flammability: CPSC FF 1-70: Passes
   3. Smoke Density: ASTM E-662 / NFPA 258: ≤ 450 Flaming Mode
   4. Electrostatic Propensity: AATCC 134 (Step & Scuff): 3.0 kV or less
   5. Static Coefficient of Friction: ASTM C-1028: Passes ADA Requirements for Accessible Routes (minimum 0.60)
   6. Delamination of Secondary Backing of Pile Floor Coverings: ASTM D-3936: No Delamination
   7. Lightfastness: AATCC 16E: 4 @ 60 hours yarn dyed
   8. TARR: Severe Traffic: 3.5 minimum, All other applications: 3.0 min.
   9. Moisture Barrier: Moisture Penetration by Impact @ 10 psi: No penetration of backing and seam after 10,000 impacts
   10. Air Flow Barrier: Air Permeability of Textile Fabrics: No Air Flow (0.0 cu. ft/min) through backing and seam
   11. Seam Integrity: Seam to remain intact after 50,000 cycles per Phillips Chair Test

2.4 MANUFACTURER

A. **MOHAWK Group**

160 S. Industrial Blvd.
Calhoun, GA 30701
1-800-554-6637
www.mohawkgroup.com

B. **PATCRAFT**

PO Box 2128,
Dalton, GA 30722
1-800-241-4014
www.patcraft.com

1. **REFER TO ROOM FINISH SCHEDULE**

2.2 MATERIALS

A. Carpet shall be first quality of American manufacture and all yarn shall be of domestic origin. Carpet shall be 100% recyclable; fiber-to-fiber and backing-to-backing.

1. Preference will be given to manufacturers recycling 100% of the reclaimed carpet back into carpet with recycled content at the end of its useful life.
2. The product must be capable of disassembly, with nylon returned to nylon carpet yarn production and backing returned to carpet backing production.

2.5 RELATED CARPET MATERIALS

A. Leveling Compound - Latex type as recommended by carpet manufacturer and is compatible with carpet adhesive and curing/sealing compound on concrete.
B. Releasable pressure sensitive type adhesive - Use the following as recommended by the carpet manufacturer which will allow removal of carpet at any time without damage or adherence to carpet: N5000 low VOC (no solvents) carpet tile adhesive.
C. Multi-purpose Adhesive - Provide the following adhesive as recommended by carpet manufacturer for direct glue-down of carpet on steps.
D. Carpet Edge Guard, Nonmetallic - Extruded or molded heavy duty vinyl or rubber carpet edge guard of size and profile indicated and with minimum 2 inch wide anchorage flange; colors selected by architect/designer from among standard colors available within the industry.
E. Miscellaneous Materials - As recommended by manufacturer of carpet, cushion and other carpeting products and selected by Trade Contractor to meet project circumstance and requirements.

PART 3 - EXECUTION

3.1 PRE-INSTALLATION REQUIREMENTS AND PREPARATORY WORK

A. The Trade Contractor shall measure carefully and check all dimensions and other conditions in the field to insure proper fit in the areas designated. Trade Contractor shall be totally responsible for the accuracy of his measurements on total yardage requirements, individual floor yardage requirements and dye lot yardage requirements. No request for carpet or installation extras from the owner will be considered due to measurement or takeoff errors by the Trade Contractor. The Trade Contractor shall confirm total yardage required, including 3% attic stock along with bid.
B. The Trade Contractor shall coordinate all installation activities with the Construction Manager.
C. Removal of carpet to be replaced (if applicable) should be handled according to preapproved plan for reuse and/or recycling. See carpet reclamation specification.
D. Sequence carpeting with other work so as to minimize possibility of damage and soiling of carpet during remainder of construction period. Carpet installation must not commence until painting and finishing work is complete and ceiling and other overhead work has been tested, approved and completed, unless specifically approved by owner's Project Manager, in writing.

E. Trade Contractor and manufacturer's representative must examine substrates for conditions over which carpeting is to be installed.

1. New concrete shall be allowed to cure for ninety (90) days before carpet installation.
2. Trade Contractor shall perform moisture content testing as required in manufacturer's instructions to ensure pH readings of no more than 9. Moisture transmission of 5.5 pounds per sqm per 24 hours is acceptable. If values exceed this level manufacturer's recommendations must be followed for moisture transmission mitigation. Do not proceed until unsatisfactory conditions are corrected.
3. Cracks 1/16 inch or more, holes, unevenness and roughness must be filled, leveled and made smooth with a compatible latex floor patching compound. Prior to filling, the floor must be swept clean of all loose granular debris. After filling, allow filler to dry. Then damp mop the floor with warm water and allow to dry. Vacuum after mopping, to ensure all lose granular debris is removed and provide a proper substrate to install carpet.

F. All surfaces to receive carpet shall be clean and dry, and in a condition satisfactory to the Trade Contractor. Trade Contractor shall notify Construction Manager in writing of any conditions which will prevent him from producing satisfactory finish work after above specified preparatory work is completed.

G. Trade Contractor shall vacuum floors again immediately before installation of carpeting.

H. Confirm compatibility of adhesive with curing compounds on concrete floors.

I. Environmental Conditions - Areas to be carpeted must be pre-heated at a minimum of 68° F. for 72 hours prior to installation with the relative humidity not more than 65%. A minimum temperature of 50° F. shall be maintained thereafter. Carpet and adhesive must be stored at a minimum temperature of 68° F. for 72 hours prior to installation.

J. Once the Trade Contractor commences installation work under this contract, it shall be assumed that the condition of the floor has been accepted and any repairs or further corrections in the floor surface shall become the responsibility of the Trade Contractor.

3.2 INSTALLATION

A. General
1. Comply with manufacturer's instructions and recommendations for uniformity of direction of carpet installation.
2. Install carpet under open-bottom obstructions and under removable flanges and furnishings, and into alcoves and closets of each space.
3. Provide cut outs where required. Conceal cut edges with protective edge guards or overlapping flanges.
4. Run carpet under open-bottom items such as heating convectors and install tight against walls, columns and cabinets so that the entire floor area is covered with carpet. Cover over all floor type door closures.
5. Install edging guard at all openings and doors wherever carpet terminates, unless indicated otherwise. Prior to installation, report to the Construction Manager all other obstructions which may occur.
6. Cutting shall be done in accordance with the manufacturer's recommendation, using the tools designed for the carpet being installed. Scraps shall be retained or disposed of per the manufacturer’s environmental program.
7. Edges shall be butted together with the proper pressure to produce the tightest joint possible without distortion.
8. All carpet shall be installed with pile-lay in the same direction except when directed to use a quarter turned method as specified in the drawings.
9. Use leveling compound where necessary. Any floor filling or leveling shall have a minimum of 4'0" of feather.
10. Expansion joints - Do not bridge building expansion joints with continuous carpeting. Provide for movements.

B. Installation
1. Install carpet according to carpet manufacturer's printed instructions.
2. Measuring - Divide the room into four quadrants and snap a chalk line. Make sure quadrants meet at right angles (offset the center line, if necessary, to ensure that

perimeter tiles will be cut no less than half size (9 inches).

3. Apply environmentally approved adhesive as per instructions in the area to be carpeted first.
4. Note carefully if the product is designed to be installed "quarter turned" only. Arrows should point in the same direction every other tile and diagonally. Arrows on alternating tiles should be turned 90^{o} in either direction, consistently.
5. Begin installing by laying an anchor row of tiles on one side of the center chalk line. Ensure straight lines and square corners. Repeat anchor rows in each quadrant, extending out from center. Fill in each quadrant with tiles using a stair step technique.
6. Tip individual tiles into place to avoid catching pile in the joint. Frequently check tile joints for proper alignment and firm abutment.
7. Although tiles are nominally 24 inches by 24 inches square, there will be slight gain due to joints. To check, measure 10 installed tiles from edge to edge, spanning 10 joints. This measurement should be no greater than 240 and 1/8 inches for tufted product. If more gain is measured, tiles are not butted tightly enough. Reposition and check again. Use this method to continually check for excessive gain. See manufacturer's instructions for 24" x 24" modular tiles.
8. Fixtures, architectural elements, and perimeters will require tile cutting. Cut tiles from the back. Secure cut or partial tiles with adhesive.
9. Electrical floor outlets are usually wired after tile installation. Install tile over electrical boxes and mark locations with a piece of tape. Tiles can be lifted for cut-outs later.
10. Center trench headers directly under a full tile row.
11. In open perimeter designs, use a fixed reducer strip to secure the tile area.
12. Compatible edge trim and nosing products may also be required.

3.3 CLEANING AND PROTECTION

A. On completion of the installation in each area, all dirt, carpet scraps, etc., must be removed from the surface of the carpet. Any soiling sports or excessive adhesive on the carpet shall be removed with the proper spot remover. (See Section 1.3.7)
B. Construction traffic other than as may be required to fit up specific carpeted area will not be allowed to traverse the completed work.
C. Remove debris, and sort pieces to be saved from scraps to be redirected and recycled.
D. Protect carpeting against damage during construction. Cover with 6-mil thick polyethylene covering with taped joints during the construction period, wherever protection is required, so that carpet will be without any indication of deterioration, wear, or damage at the time of acceptance. Damaged carpeting will be rejected and recycled. As the carpet is laid, remove all trimmings, excess pieces of carpet and laying materials.
E. At the completion of the work and when directed by the Construction Manager, vacuum carpet using commercial dual motor vacuum of type recommended by carpet manufacturer. Remove spots and replace carpet where spots cannot be removed. Remove rejected carpeting and replace with new carpeting. Remove any protruding yarns with shears or sharp scissors.

3.4 INSPECTION

A. Preliminary Acceptance - Upon completion of the carpet installation of each floor, it shall be inspected by Owner, the Construction Manager and Trade Contractor.
B. Upon completion of the installation, verify that work is complete, properly installed and acceptable. Remove and replace all work not found acceptable to the owner at the installer's expense.

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 099123

SECTION 101100 - VISUAL DISPLAY UNITS

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

A. Section Includes:

1. Glass Marker Walls
2. Porcelain Enamel Steel Markerboards
3. Tack boards and strips
4. Chalkboard

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. Glass Magnetic Marker Walls (Magnetic Dry Erase Whiteboard by Claridge is basis of design)

1. Glass: ¼-inch thick tempered, low-iron, extra clear, safety writing glass with polished edges
2. Glass Marker Wall writing surface: Smooth finish for use with wet or dry-erase markers
3. Glass Sizes: Refer to drawings.
4. Glass Color: Calm White
5. Backing: Glass Marker Walls have steel backing permanently adhered to the back of the glass providing a surface that accepts rare earth magnets
6. Separator: Vinyl t-mold cushions and protects glass edges at butt joints. T-mold is approx. 1-1/4” wide at base.
7. Writing Surface Face Sheet – Manufactured in accordance with Porcelain Enamel Institute’s specification.
8. Shall be enameling grade cold rolled steel.
9. Enameling grade steel shall be coated with LCS3 Porcelain Enamel
10. 3-Coat process shall include:

    a. Bottom Ground Coat – 1.5 to 2.2 mils
    b. Top Ground Coat – 2.0 to 2.8 mils
    c. Top Cover (Color) Coat – 3.0 to 4.0 mils

11. Firing Temperature: Enamel shall be fired at lowest possible temperatures to reduce steel and porcelain stresses and achieve superior enamel and hardness.
12. Color: As selected by architect from manufacturer’s standards.
13. Locate in each classroom where indicated. Refer to drawings for size and location.

B. 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

C. Fixed Chalkboard Panel Make-Up (Claridge Evolve is basis of design)

1. Face Sheet: LCS3 porcelain enamel steel Chalkboard
2. Core Material: 7/16” Medium Density Fiberboard
3. Backing: Moisture Barrier Back
4. Size: Refer to drawings
5. Color: As selected from manufacturers standards
6. Snap-in Accessory Tray, approx. 2” wide, furnished with each fixed markerboard
7. Claridge Extruded Aluminum Trim and Adhesive

D. MWG - Marker Wall Trim

1. Perimeter trim for top and bottom of glass walls is slotted every 8” for easy installation
2. Length: Refer to drawings.

3. Finish: Satin anodize finish is standard; powder coat paint optional
4. Marker Wall Adhesive
5. F-38 or 16A Adhesive (wall board or construction adhesive) required for mounting glass panels to wall
6. Glass Mounting Clips
7. 1136 Slotted clips – 1” wide (one clip required for every 6”)
8. Finish: Satin anodize finish is standard; powder coat paint optional

E. Glass Marker Wall Accessories

1. Marker/Accessory Tray
   a. MGM-MC1 Marker Caddy 3-1/2” x 3-1/8” x 1-3/4” for holding markers and/or eraser, eraser cloth. Integrated rare earth magnets
   b. Standard continuous solid blade type aluminum tray with ribbed section and injection molded end closures at bottom of each markerboard or chalkboard.

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 101100

SECTION 101400
SIGNAGE

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Plaques.
2. Dimensional characters.
3. Panel signs.
4. Interior Wall Decal

1.2 DEFINITIONS

A. ADA-ABA Accessibility Guidelines: U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines."

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.
B. Shop Drawings: Show fabrication and installation details for signs.

1. Show sign mounting heights, locations of supplementary supports, and accessories.
2. Provide message list, typestyles, graphic elements, including tactile characters and Braille, and layout for each sign.

C. Samples: Provide 1 sample of signage for each color/material selected.

1.4 QUALITY ASSURANCE

A. Regulatory Requirements: Comply with applicable provisions in ADA-ABA Accessibility Guidelines and ICC/ANSI A117.1.

PART 2 - PRODUCTS

2.1 INTERIOR SIGNS

A. Manufacturers:

1. APCO Graphics.
2. ASI Sign Systems.
3. Inersign Corporation.
4. Dixie Graphics.
5. Mills Manufacturing.
6. Kroy Sign Systems.
7. Substitutions: Submit product data for approval under Provisions of Division 1.

2.2 INTERIOR ROOM SIGNS (REFER TO FINISH SCHEDULE)

A. Raised letter signs: Used for room identification.

1. Base material: 1/8” thick backplate, solid color, acrylic plastic.

2. Characters: Contrasting color of background, cut letters applied to top surface. Unless noted otherwise on plan - 1” high numbers, ¾” high room names, ¾” high removable teacher name tag. Computer generated with precise edges and form.
3. Edges: Radiused.
4. Character Font: Helvetica complying with Michigan Barrier Free.
5. Braille: Grade II Braille applied by the Raster ™ method or engraved into the sign.

B. Accessories:

1. Tape Adhesive: Double sided tape, permanent adhesive

2.3 CAST PLAQUE

A. Size: 18” wide x 30” high.
B. Metal: Bronze, satin face, black edges and background, semi-gloss polyurethane finish.
C. Font: Helvetica, 400 letter allowance.
D. Border: Projected single line beveled edge.
E. Background: Leatherette.
F. Mounting: Blind mount.
G. Accessories:

1. Screw Anchors: Self taping screws, countersink in face up sign.

2.5 INTERIOR CUT LETTERS:

A. Gemini Cut Plastic Letters (Or Equal): Arial Bold Font all Uppercase.

1. N/A

2.6 ALUMINUM CAST LETTERS/LOGO FOR ENTRANCE CANOPY.

A. Material: Custom Aluminum Cast Lettering, see plans for content
B. Size: 18” LETTERS
C. Mounting Method: Projected Mount.
D. Mounting Location and Height: See Plans.
E. Painted, Gloss
F. Color: To be selected from manufacturer’s list of standard colors. Provide color chart for selection by architect. Coordinate logo with Owner During Construction.
G. General Fabrication:

1. Design, fabricate, and install sign assemblies to prevent buckling, opening up of joints, and over-stressing of welds and fasteners. Provide fade/crack resistant exterior grade finish.
2. Mill joints to a tight, hairline fit. Form joints exposed to the weather to exclude water penetration.
3. Conceal fasteners if possible; otherwise, locate fasteners where they will be inconspicuous.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Locate signs and accessories where indicated, using mounting methods of types described and complying with manufacturer's written instructions.

1. Install signs level, plumb, and at heights indicated, with sign surfaces free of distortion and other defects in appearance.

B. Wall-Mounted Signs: Comply with sign manufacturer's written instructions except where more stringent requirements apply.

1. Shim Plate Mounting: Provide 1/8-inch thick, concealed aluminum shim plates with predrilled and countersunk holes, at locations indicated, and where other mounting methods are not practicable. Attach plate with fasteners and anchors suitable for secure attachment to substrate. Attach panel signs to plate using method specified above.
2. Mechanical Fasteners: Use non-removable mechanical fasteners placed through predrilled holes. Attach signs with fasteners and anchors suitable for secure attachment to substrate as recommended in writing by sign manufacturer.

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, Blue 9509 TT** Texture or equal.

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, Blue 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 102113.19

SECTION 102800
TOILET ACCESSORIES

PART 1- GENERAL

1.1 SECTION INCLUDES

A. Toilet accessories.
B. Mirrors
C. Attachment hardware.
D. Coordinate the work of this Section with the placement of internal wall reinforcement to receive anchor attachments.

1.2 REFERENCES

A. ANSI A117.1 - Specifications for Making Buildings and Facilities Accessible To and Usable by Physically Handicapped People.
B. ANSI/ASTM A123 - Zinc (Hot-Dip Galvanized) Coatings on Products Fabricated from Rolled, Pressed, and Forged Steel Shapes, Plates, Bars and Strips.
C. ANSI/ASTM A366 - Steel, Carbon, Cold-Rolled Sheet, Commercial Quality.
D. ANSI/ASTM A386 - Zinc Coating (Hot-Dip) on Assembled Steel Products.
E. ANSI/ASTM B456 - Electrodeposited Coatings of Copper Plus Nickel Plus Chromium and Nickel Plus Chromium.
F. ASTM A167 - Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet and Strip.
G. ASTM A269 - Seamless and Welded Austenitic Stainless Steel Tubing for General Service.
H. NEMA LD-3 - High Pressure Decorative Laminates.
I. ADA - Americans with Disabilities Act
J. ANSI A117.1 - Specifications for Making Buildings and Facilities Accessible to and Usable by Physical Handicapped People.

1.3 SUBMITTALS

A. Provide Product Data on accessories describing size, finish, details of function, attachment methods.
B. Submit two samples chips of each specified color and finish.
C. Submit manufacturer's installation instructions for each product.

1.4 REGULATORY REQUIREMENTS

A. Conform to applicable code for installing work in conformance with ANSI A117.1 and ADA.

PART 2- PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS – TOILET ROOM ACCESSORIES

A. Bobrick
B. American Specialties Inc.
C. Bradley
D. McKinney
E. Manufacturers of equivalent products submitted and approved in accordance with Section 016000 - Product Requirements.

2.2 MATERIALS

A. Sheet Steel: ANSI/ASTM A366.
B. Stainless Steel Sheet: ASTM A167, Type 304.

C. Tubing: ASTM A269, stainless steel.
D. Adhesive: Contact type, waterproof.
E. Fasteners, Screws, and Bolts: Hot dip galvanized, tamperproof.
F. Expansion Shields: Fiber, lead, or rubber as recommended by accessory manufacturer for component and substrate.

2.3 FABRICATION

A. Weld and grind smooth joints of fabricated components.
B. Form exposed surfaces from single sheet of stock, free of joints.
C. Form surfaces flat without distortion. Maintain flat surfaces without scratches or dents.
D. Back paint components where contact is made with building finishes to prevent electrolysis.
E. Shop assemble components and package complete with anchors and fittings.
F. Provide steel anchor plates, adapters, and anchor components for installation.
G. Hot dip galvanize exposed and painted ferrous metal and fastening devices.

2.4 FACTORY FINISHING

A. Galvanizing: ANSI/ASTM A123 and A386 to 1.25 oz/sq. yd.
B. Shop Primed Ferrous Metals: Pre-treat and clean, spray apply one coat primer and bake.
C. Enamel: Pre-treat to clean conditions, apply one coat primer and a minimum of two coats electrostatic baked enamel.
D. Chrome/Nickel Plating: ANSI/ASTM B456, Type SC 2 satin finish.
E. Stainless Steel: No. 4 satin luster finish.

PART 3- EXECUTION

3.1 PREPARATION

A. Verify that site conditions are ready to receive work.
B. Beginning of installation means acceptance of existing conditions.
C. Deliver inserts and rough-in frames to site at appropriate time for building-in.
D. Provide templates and rough-in measurements as required.
E. Verify exact location of accessories for installation.

3.2 INSTALLATION

A. Install fixtures, accessories and items in accordance with manufacturers' instructions.
B. Install plumb and level, securely and rigidly anchored to substrate.
C. Protect products from damage caused by subsequent construction activities.
D. Field repair of damaged product finishes is prohibited; replace products having damaged finishes caused by subsequent construction activities.
E. Locate toilet accessories at heights and locations required for compliance with local accessibility regulations and the Americans with Disabilities Act.

3.3 SCHEDULE

Bobrick and American Specialties Inc. is used as a quality standard set to be expected on all items of this Section. Provide accessories where indicated on floor plan. The following accessories are:

A. Mirrors: 1/4" float/plate glass with stainless channel trim, size as indicated on plan.

1. Bobrick Series B-165.

B. Sanitary Napkin Disposal:

1. Bobrick Series B-270.

C. Grab Bars: 1 ¼" O.D. (minimum) stainless steel, with peened surface, with concealed fasteners. Length as indicated on plans.

1. Bobrick Series.
2. Provide anchors for solid walls or plastic toilet partitions where shown on plans.

D. Janitor's utility shelf, 302/304 stainless steel, 18 gage shelf with 1-1/2 inch return edge; 18 gage mounting brackets welded to shelf; 3 spring loaded rubber cam mop and broom holders and 2 rag hooks, 8 inches deep by 30 inches long.

1. Bobrick Series B-224.

E. Paper Towel Dispenser:

1. Provided by Owner and installed by Contractor. 1 minimum at each sink location.

F. Tissue Dispenser:

1. Provided by Owner and installed by Contractor. 1 minimum at each toilet location.

G. Soap Dispenser:

1. Provided by Owner and installed by Contractor. 1 minimum at each sink location.

H. Robe Hooks: Heavy duty clothes hook.

1. Single Prong: Bobrick Series B-211.

I. Baby Changing Station: N/A

J. Shower Curtain Rod: N/A

K. Shower Curtain: N/A

L. Shower Seats: Freedom, Model Number APFSLR-260225PWS 26" x 22½" ADA Reversible Shower Seat, Wall Supported, Phenolic Solid WHITE

1. N/A

A. Tissue, Paper Towel and Soap Dispensers: Provided by Owner and installed by Contractor. 1 minimum at each toilet location.
B. Provide (1) 24x42 mirror at each sink location. 1 per sink where there is a series of sinks.
C. Provide 1 (one) Robe Hook on the back of each toilet compartment door and as indication on Enlarged Plans.
D. Provide 1 Janitor's Utility Shelf at each Janitors Closet.

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 and mounting bracket.

1.3 SUBMITTALS

A. Product Data: For each type of product. Include rating and classification, material descriptions, dimensions of individual components and profiles, and finishes for fire extinguisher and mounting brackets.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For fire extinguishers to include in maintenance manuals.

1.5 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace fire extinguishers that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:
   a. Failure of hydrostatic test according to NFPA 10 when testing interval required by NFPA 10 is within the warranty period.
   b. Faulty operation of valves or release levers.
2. Warranty Period: Six years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. NFPA Compliance: Fabricate and label fire extinguishers to comply with NFPA 10, "Portable Fire Extinguishers."

B. Fire Extinguishers: Listed and labeled for type, rating, and classification by an independent testing agency acceptable to authorities having jurisdiction.

1. Provide fire extinguishers approved, listed, and labeled by FM Global.

2.2 PORTABLE, HAND-CARRIED FIRE EXTINGUISHERS

A. Fire Extinguishers:

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

   a. Guardian Fire Equipment, Inc.
   b. JL Industries, Inc.; a division of the Activar Construction Products Group.

c. Kidde Residential and Commercial Division.
d. Larsens Manufacturing Company.

2. Source Limitations: Obtain fire extinguishers, and accessories, from single source from single manufacturer.
3. Valves: Manufacturer's standard.
4. Handles and Levers: Manufacturer's standard.
5. Instruction Labels: Include pictorial marking system complying with NFPA 10, Appendix B.

B. Multipurpose Dry-Chemical Type in Aluminum Container: UL-rated 4-A:60-B:C, 10-lb nominal capacity, with monoammonium phosphate-based dry chemical in enameled-aluminum container.

C. Mounting wall bracket per manufacturers standards.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine fire extinguishers for proper charging and tagging. Remove and replace damaged, defective, or undercharged fire extinguishers.

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

3.2 INSTALLATION

A. General: Install fire extinguishers in locations indicated and in compliance with requirements of authorities having jurisdiction.

END OF SECTION

SECTION 105113
METAL LOCKERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Knocked-down corridor lockers, single tier.
2. 2-Tier Locker Room Lockers.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For metal lockers.

1. Include plans, elevations, sections, and attachment details.
2. Include locker identification system and numbering sequence.
3. Include location of ADA type lockers.

C. Samples:

1. Color chip for each color specified.

2. 1 full size Type “B” locker for review and approval by Owner, to be delivered to construction trailer.

1.3 CLOSEOUT SUBMITTALS

A. Maintenance data.

1.4 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of metal lockers that fail in materials or workmanship, excluding finish, within specified warranty period.

1. Warranty Period for Knocked-Down Metal Lockers: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Accessibility Standard: For lockers indicated to be accessible, comply with applicable provisions in the USDOJ's "2010 ADA Standards for Accessible Design" and ICC A117.1.

2.1 ACCEPTABLE MANUFACTURERS ARE: (Heavy Duty Type)

A. Penco
B. Lyon
B. DeBourgh
C. Republic
D. CSI
E. Scranton Products.
F. LockersMFG
G. AMP HDC
H. Substitutions: Under provisions of Division 1.

2.2 LOCKERS (CORRIDOR LOCKERS SHALL BE SINGLE TIER)

A. Penco Guardian or equal.
B. Sheet Steel: All parts made from prime grade mild cold rolled sheet steel free from surface imperfection, and capable of taking a high grade enamel finish.
C. Hinges: Full Height Continuous
D. Finishing: Chemically pretreat metal with a six stage cleaning phosphatizing and metal preparation process. Finish coat shall be powder coated. Select colors from manufacturer's minimum standard 21 colors. All lockers shall be painted inside and outside with the same color.
E. Equipment: Coat hooks and coat rods are zinc plated. Truss fin head bolts and hex nuts are zinc plated.
F. Fabrication General:

1. Construction: Built on the unit principle – each locker shall have an individual door and frame, individual top, bottom, back and shelves with common intermediate uprights separating compartments. Lockers shall be fabricated square, rigid and without warp. Doors shall be flat and free of distortion.
2. Door Frame: All door frame members to be not less than 16 gauge formed to a channel shape. Vertical members to have an additional flange to provide a continuous door strike. Intermembering parts to be mortised and tenoned and electrically welded together in a rigid assembly capable of resisting stains.
3. Body: Bolt spacing in locker body construction not to exceed 9" o.c. All 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. Tops and bottoms shall be 16 gauge with three sides formed 90° and the front offset formed to be flush with the horizontal frame member. Shelves shall be 16 gauge with four sides formed to 90°, the front edge shall have a second bend. Backs and sides shall be 24 gauge. Open sided locker end panels (no adjoining locker) shall be 16 gauge.
4. Doors (Guardian Plus): Doors 20" or higher shall be formed from one piece 14 gauge cold rolled sheet steel. Formations shall consist of a full channel shape on the lock side of adequate depth to fully conceal the lock bar, channel formation on the hinge side, and right angle formations across the top and bottom. Doors over 15" wide x 60" or 72" high shall have a 3" wide 20 gauge full height reinforcing pan welded to the inside face of the door on 6" centers.
5. Door Handle and Latching: Handles shall be recessed in the door and be finger lift control. The 20 gauge drawn pocket shall be brushed stainless steel securely fastened to the door with two tabs plus a positive tamper resistant decorative fastener. The pocket shall be of sufficient depth to prevent lock from protruding beyond the face of the door.

The lifting piece shall be 14 gauge formed steel, attached to the latching channel with one concealed retaining lug and one rivet assuring a positive two point connection.

Doors to have latch clip engaging the door frame at three points on 60” and 72” high doors. Locking device to be positive, automatic type, whereby locker door may be locked when open, then closed without unlocking. One rubber silencer shall be firmly secured in the frame at each heavy gauge latch hook. Latch clips shall be glass filled nylon for long life and low friction and shall hold doors shut by engaging the latch hooks. The latch channel assembly shall be quieted by the use of unique nylon glides to reduce noise.

6. Built-in Combination Locks: **NO COMBINATION LOCKS, NO LOCKS**. Stainless steel escutcheon plate.
7. Ventilation: Shall be facilitated by air flow slots located in the top and bottom flange of the door.
8. Number Plates: Each locker to be supplied with a polished aluminum number plate, 2 ¼” wide x 1” high, with black numerals not less than 3/8” high. Number plates shall be attached to the face of the door with two aluminum rivets.
9. Interior Equipment: Single tier locker 60” or higher shall have a hat shelf located approximately 9” below the top of the locker; locker shall have three single-prong wall hooks and one double-prong ceiling hook. Hooks to be steel, ball tip zinc plated, attached with two bolts per hook.
10. Size: Single-tier, 12” wide x 12” deep x 60” high.

G. Locker Accessories: Lockers shall be furnished with the following accessories:

1. Locks: Built-in combination.
2. Door Ventilation: Mini louvers shall be 5/8” wide x ¼” high and be placed in doors in manufacturer’s standard pattern.
3. Sloped tops: Sloped top kits.

H. Wheelchair accessible: Provide 5% of all lockers accessible. Accessible units to be evenly distributed throughout the corridors.

2.2 FABRICATION

A. Fabricate metal lockers square, rigid, without warp, and with metal faces flat and free of dents or distortion. Make exposed metal edges safe to touch and free of sharp edges and burrs.

B. Fabricate each metal locker with an individual door and frame; individual top, bottom, and back; and common intermediate uprights separating compartments.

C. Equipment: Provide each locker with an identification plate and the following equipment:

1. Single-Tier Units: Shelf, one double-prong ceiling hook, and two single-prong wall hooks.
   a. Locate Type “C” locker shelves where indicated in Drawings.

D. Knocked-Down Construction: Fabricate metal lockers by assembling at Project site, using manufacturer's nuts, bolts, screws, or rivets.

E. Accessible Lockers:

1. Provide ADA lockers as required by code.

2. Fabricate as follows:

   a. Locate bottom shelf no lower than 15 inches above the floor.
   b. Where hooks, coat rods, or additional shelves are provided, locate no higher than 48 inches above the floor.

F. Continuous Sloping Tops: Fabricated in lengths as long as practical, without visible fasteners at splice locations; finished to match lockers.

G. Recess Trim: Fabricated with minimum 2-1/2-inch face width and in lengths as long as practical; finished to match lockers.

H. Filler Panels: Fabricated in an unequal leg angle shape; finished to match lockers. Provide slip-joint filler angle formed to receive filler panel.

I. Boxed End Panels: Fabricated with 1-inch- wide edge dimension, and designed for concealing fasteners and holes at exposed ends of nonrecessed metal lockers; finished to match lockers.

J. Finished End Panels: Fabricated to conceal unused penetrations and fasteners, except for perimeter fasteners, at exposed ends of nonrecessed metal lockers; finished to match lockers.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install lockers level, plumb, and true; shim as required, using concealed shims.

1. Anchor locker runs at ends and at intervals recommended by manufacturer, but not more than 36 inches o.c. Using concealed fasteners, install anchors through backup reinforcing plates, channels, or blocking as required to prevent metal distortion.
2. Anchor single rows of metal lockers to walls near top.
3. Anchor back-to-back metal lockers to floor.

B. Assemble with manufacturer's standard fasteners, with no exposed fasteners on door faces or face frames.

C. Trim: Fit exposed connections of trim, fillers, and closures accurately together to form tight, hairline joints, with concealed fasteners and splice plates.

1. Attach recess trim to recessed metal lockers with concealed clips.
2. Attach filler panels with concealed fasteners.
3. Attach sloping-top units to metal lockers, with closures at exposed ends.
4. Attach boxed end panels using concealed fasteners to conceal exposed ends of nonrecessed metal lockers.
5. Attach finished end panels using fasteners only at perimeter to conceal exposed ends of nonrecessed metal lockers.

END OF SECTION 105113

SECTION 111320
PROJECTION SCREENS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:

1. Electrically operated wall mounted projection screens.
2. Related accessories.

1.2 REFERENCES

A. UL-Underwriters Laboratories Electrical Appliance and Utilization Equipment Directory.
B. FS GG-S-00172: Screen, Projection.

1.3 SUBMITTALS

A. Division 1 - Submittal Procedures: Requirements for submittals.
B. Product Data: Submit manufacturer's product data on materials, finishes, and operation of unit.
C. Samples: Submit one sample illustrating screen case prefinished components, and screen surface.
D. Manufacturer's Installation Instructions: Submit detailed installation instructions including rough-in measurements.

1.4 CLOSEOUT SUBMITTALS

A. Division 1 - Execution Requirements: Requirements for submittals.

1.5 QUALITY ASSURANCE

A. Maintain one copy of each document on site.

1.6 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing Products specified in this section with minimum three years experience.
B. Installer: Company specializing in performing work of this section with minimum three years experience and approved by manufacturer.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Division 1 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.
B. Deliver projection screens after building is enclosed, other work within spaces where screens are to be installed is substantially complete, and installation of screens is ready to take place.
C. Protect projection screens from damage before, during and after installation.

1.8 FIELD MEASUREMENTS

A. Verify field measurements prior to fabrication.

1.9 COORDINATION

A. Division 1 - Administrative Requirements: Requirements for coordination.
B. Coordinate installation of ceilings, walls, electric service power characteristics, and location.

PART 2 PRODUCTS

2.1 ELECTRICALLY OPERATED PROJECTION SCREENS –

A. Product: Provide Da-Lite Professional Electrol (Auditorium) projection screen, where indicated on plans, electrically operated 120 volt (60 Hz), 2.5 amp. Three wire quick reversal motor especially designed for the purpose, to be ball bearing and oiled for life. With automatic thermal overload cutout and integral interlocking gears. To have preset but accessible limit switches to automatically stop picture surface in the “up” and “down” positions. Stop action to be positive to prevent coasting. The roller to be of rigid metal at least 5” in diameter and mounted on two cast aluminum brackets equipped with self-aligning bearings. Screen fabric to be flame retardant and mildew resistant fiberglass with High Power picture surface with black masking borders standard. Heavy metal brackets shall be supplied for mounting screen to ceiling or walls. Motor compartment to be metal lined. A section of the bottom of the case shall be equipped with hinges and connected to the drive mechanism so that it opens and closes automatically with the lowering and raising of the screen surface. To be complete with three position control switch in locking cover plate. Screen to be listed by Underwriters’ Laboratories and CSA.

1. Multipurpose: 164” wide x 92” high screen to be suspended from structural steel, above stage. Case finish: Black

2.2 MANUALLY OPERATED FRONT PROJECTION SCREENS

A. General: Provide manufacturer’s standard units consisting of case, screen, mounting accessories and other components as required for a complete installation and complying with descriptive requirements indicated below.
B. Spring-Roller-operated Projection Screens: Units designed and fabricated for CEILING installation and complying with the following requirements:

1. Screen Case: Fabricated in one piece from not less than 22-gage (0.299 inch) steel with flat back design, baked enamel finish for mounting in suspended ceiling.

2. Screen: As indicated below, with top edge mounted on, and securely anchored to a 3-inch-diameter rigid steel spring roller and bottom edge formed into a pocket holding a tubular metal slat with ends of slat protected by plastic caps and saddle and pull attached to slat by screws.

a. Material: Vinyl-coated glass fiber fabric:
b. Size of Viewing Surface: 80” wide x 60” high, 100” diagonal.
c. Provide extra drop length of dimension indicated to comply with the following requirements for fabric color and location of drop length:

1. Color: Black
2. Location: At top of screen, 12”.

C. Products: Subject to compliance with requirements, provide of the following:

1. “Model C,” Da-Lite Screen Co., Inc.

2. “Luma 2,” Draper Shade & Screen So., Inc.
3. Solarflective Corporation.

D. Schedule: Classrooms/Conference: Refer to plan set for location and quantity.

PART 3 EXECUTION

3.1 EXAMINATION

A. Division 1 - Administrative Requirements: Verification of existing conditions before starting work.
B. Verify rough-in opening and conditions are acceptable.
C. Verify electrical power is available and of correct characteristics.

3.2 INSTALLATION

A. Install projection screens at location indicated on Drawings.
B. Securely anchor to supporting substrate.
C. Install to produce smoothly operating screen with plumb and straight vertical edges and plumb and flat viewing surfaces when lowered.

3.3 ADJUSTING

A. Division 1 - Execution Requirements: Requirements for balancing and adjusting.
B. Adjust installed unit for smooth and balanced operation.

3.4 CLEANING

A. Division 1 - Execution Requirements: Requirements for cleaning.
B. Remove protective coverings from finished surfaces. Clean surfaces and components ready for inspection.

3.5 DEMONSTRATION

A. Division 1 - Execution Requirements: Requirements for demonstration and training.
B. Demonstrate electrically operated projection screens to Owner. Allow two hours duration for demonstration.

3.6 PROTECTION OF FINISHED WORK

A. Division 1 - Quality Requirements: Tolerances.
B. Do not permit use of projection screens after installation.

END OF SECTION

SECTION 122413
ROLLER WINDOW SHADES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Manually operated roller shades with single rollers.

B. Related Requirements:

1. Section 061000 "Rough Carpentry" for wood blocking and grounds for mounting roller shades and accessories.
2. Section 079200 "Joint Sealants" for sealing the perimeters of installation accessories for light-blocking shades with a sealant.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, features, finishes, and operating instructions for roller shades.

B. Shop Drawings: Show fabrication and installation details for roller shades, including shadeband materials, their orientation to rollers, and their seam and batten locations.

C. Samples for Initial Selection: For each type and color of shadeband material.

1. Include Samples of accessories involving color selection.

1.4 INFORMATIONAL SUBMITTALS

A. Product Test Reports: For each type of shadeband material, for tests performed by a qualified testing agency.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For roller shades to include in maintenance manuals.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: Fabricator of products.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver roller shades in factory packages, marked with manufacturer, product name, and location of installation using same designations indicated on Drawings.

1.8 FIELD CONDITIONS

A. Environmental Limitations: Do not install roller shades until construction and finish work in spaces, including painting, is complete and dry and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

B. Field Measurements: Where roller shades are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on Shop Drawings. Allow clearances for operating hardware of operable glazed units through entire operating range. Notify Architect of installation conditions that vary from Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain roller shades from single source from single manufacturer.

2.2 MANUALLY OPERATED SHADES WITH SINGLE ROLLERS

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

1. Draper Inc.
2. Hunter Douglas Contract.
3. Lutron Electronics Co., Inc.
4. MechoShade Systems, Inc.

B. Chain-and-Clutch Operating Mechanisms: With continuous-loop bead chain and clutch that stops shade movement when bead chain is released; permanently adjusted and lubricated.

1. Bead Chains: Manufacturer's standard.

a. Loop Length: Full length of roller shade.
b. Limit Stops: Provide upper and lower ball stops.
c. Chain-Retainer Type: Clip, jamb mount.

C. Rollers: Corrosion-resistant steel or extruded-aluminum tubes of diameters and wall thicknesses required to accommodate operating mechanisms and weights and widths of shadebands indicated without deflection. Provide with permanently lubricated drive-end assemblies and idle-end assemblies designed to facilitate removal of shadebands for service.

1. Roller Drive-End Location: Right side of interior face of shade.
2. Direction of Shadeband Roll: Regular, from back (exterior face) of roller.
3. Shadeband-to-Roller Attachment: Manufacturer's standard method.

D. Mounting Hardware: Brackets or endcaps, corrosion resistant and compatible with roller assembly, operating mechanism, installation accessories, and mounting location and conditions indicated.

E. Shadebands:

1. Shadeband Material: Light-filtering fabric.

2. Shadeband Bottom (Hem) Bar: Steel or extruded aluminum.

a. Type: Enclosed in sealed pocket of shadeband material.

F. Shadecloth: Draper, Inc., (Phifer Sheer Weave Series): Non-raveling vinyl/fiberglass mesh, PVC free. Fabric thickness 0.025 inches, weight 16.4 oz./sq.yd.
1. Phifer Sheer Weave, Interior Sun Control Fabric, Basic 3% Openness.
a. Color: P05 White/Platinum

G. Installation Accessories:

1. Front Fascia: Aluminum extrusion that conceals front and underside of roller and operating mechanism and attaches to roller endcaps without exposed fasteners.

a. Shape: L-shaped.
b. Height: Manufacturer's standard height required to conceal roller and shadeband assembly when shade is fully open, but not less than 3 inches.

2. Closure Panel and Wall Clip: Removable aluminum panel designed for installation at bottom of site-constructed ceiling recess or pocket and for snap-in attachment to wall clip without fasteners.

a. Closure-Panel Width: 2 inches.

3. Installation Accessories Color and Finish: As selected from manufacturer's full range.

b. ROLLER SHADE FABRICATION

i. Product Safety Standard: Fabricate roller shades to comply with WCMA A 100.1, including requirements for flexible, chain-loop devices; lead content of components; and warning labels.
ii. Unit Sizes: Fabricate units in sizes to fill window and other openings as follows, measured at 74 deg F:

1. Between (Inside) Jamb Installation: Width equal to jamb-to-jamb dimension of opening in which shade is installed less 1/4 inch per side or 1/2-inch total, plus or minus 1/8 inch. Length equal to head-to-sill or -floor dimension of opening in which shade is installed less 1/4 inch, plus or minus 1/8 inch.

iii. Shadeband Fabrication: Fabricate shadebands without battens or seams to extent possible, except as follows:

1. Vertical Shades: Where width-to-length ratio of shadeband is equal to or greater than 1:4 , provide battens and seams at uniform spacings along shadeband length to ensure shadeband tracking and alignment through its full range of movement without distortion of the material.
2. Skylight Shades: Provide battens and seams at uniform spacings along shadeband as required to ensure shadeband tracking and alignment through its full range of movement without distortion or sag of material.
3. Railroaded Materials: Railroad material where material roll width is less than the required width of shadeband and where indicated. Provide battens and seams as required by railroaded material to produce shadebands with full roll-width panel(s) plus, if required, one partial roll-width panel located at top of shadeband.

H. EXECUTION

a. EXAMINATION

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

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

b. ROLLER SHADE INSTALLATION

i. Install roller shades level, plumb, and aligned with adjacent units according to manufacturer's written instructions.

1. Opaque Shadebands: Located so shadeband is not closer than 2 inches to interior face of glass. Allow clearances for window operation hardware.

ii. Roller Shade Locations: At exterior windows.

c. ADJUSTING

i. Adjust and balance roller shades to operate smoothly, easily, safely, and free from binding or malfunction throughout entire operational range.

d. CLEANING AND PROTECTION

i. Clean roller shade surfaces, after installation, according to manufacturer's written instructions.

ii. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure that roller shades are without damage or deterioration at time of Substantial Completion.

iii. Replace damaged roller shades that cannot be repaired, in a manner approved by Architect, before time of Substantial Completion.

END OF SECTION

SECTION 12 35 53.19 – WOOD LABORATORY CASEWORK

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:

1. All cabinets and casework, including tops, ledges, supporting structures, and miscellaneous items of equipment as listed in these specifications, or equipment schedules including delivery to the building, setting in place, leveling, scribing to walls and floors as required. Furnish and install all filler panels, knee space panels and scribes as shown on drawings. Installation shall be completed by a factory certified installer.
2. Furnish and deliver all utility service outlet accessory fittings, electrical receptacles, and switches, as listed in these specifications, equipment schedules or as shown on drawings as mounted on the laboratory furniture. Items shall be furnished with supply tank nipples and lock nuts, loose in boxes and properly marked. All plumbing and electrical fittings will be packaged separately and properly marked for delivery to the appropriate contractor.
3. Furnish and deliver, packed in boxes for installation by the mechanical contractor, all laboratory sinks, cup sinks or drains, drain troughs, overflows and sink outlets with integral tailpieces, which occur above the floor and where these items are part of the equipment or listed in the specifications, equipment schedules or shown on the drawings. Integral tailpieces when required shall be in accordance with the manufacturer's standards. All tailpieces shall be furnished less the couplings required to connect them to the drain piping system.
4. Furnish service strip supports and set in place service tunnels, service turrets, supporting structures and reagent racks of the type shown on the details.
5. Remove all debris, dirt and rubbish accumulated as a result of the installation of the laboratory casework to an onsite container provided by others, leaving the premises clean and orderly.

B. Related Divisions:

1. Divisions 05 00 00 & 06 00 00: Behind-the-Wall Blocking and Studs
2. Division 09 00 00: Base Molding
3. Division 11 53 13: Chemical Fume Hoods
4. Division 22 00 00: Plumbing
5. Division 26 00 00: Electrical Fittings and Connections

C. Related Publications:

1. Architectural Woodwork Institute Quality Standards, 8th Edition
2. NFPA 30 – National Fire Protection Association
3. NFPA-45 - National Fire Protection Association
4. UL - Underwriters Laboratory
5. ASTM D552 - Bending Test
6. SEFA 8W – Laboratory Furniture

1.02 BASIS OF WORK

A. This specification uses Diversified Casework (www.diversifiedcasework.com) - **Majestic Series** (reveal overlay) OAK Cabinetry as the standard of construction for wood laboratory casework. The construction standards of this product line shall provide the basis for quality and functional installation. Pricing from other manufacturers must be submitted as an alternate in order to assure quality standards are maintained.

B. Supply all equipment in accordance with this specification. No alternates, deviations or exceptions to the specified construction or materials are allowed.

C. As a means of maintaining the desired level of quality, any and all other manufacturers shall be submitted as an alternate to the specified product provided by Diversified Casework.

D. The owner / owner representative reserves the right to reject qualified or alternate proposals and to award based on product value where such action assures the owner greater integrity of product.

1.03 QUALITY ASSURANCE – the following items are required components of this specification and cannot be modified.

A. The wood laboratory furniture contractor shall also provide work tops and fume hoods to assure proper staging, shipment, and single source responsibility.

B. Each cabinet shall be foam and shrink wrapped to ensure cabinet surfaces are protected until the time of installation. Blanket-wrap is not allowed because they do not stay with the cabinets after delivery and because they are not assured of being grease and dirt-free.

C. SEFA Compliance and Assurance: Wood cabinets shall be capable of passing all tests contained in SEFA 8W. Documentation shall be provided showing independent testing and compliance with SEFA 8W.

D. MAS and/or Green Guard Certification: Manufacturer shall provide current documentation proving compliance and certification with either MAS or Green Guard small-scale chamber emissions test. Wood products shall be MAS Certified Green® and/or GreenGuard® Certified.

E. Casework shall be installed by a factory certified installer or Lifetime Warranty shall be negated to a 2-year warranty.

F. Cabinets shall be manufactured with dowel construction placed on a maximum 63mm on-center.

G. Cabinets shall use a minimum of 2 mechanical fasteners along with dowel construction in securing the toe-space panel.

H. Cabinets shall use a full sub-top construction composed of a minimum of 3/4" veneer core plywood.

I. Cabinet faces shall be vertically grain matched within door and drawer faces.

J. Wall cabinets shall be provided with 3/4" X 4" screw strips at both the top and bottom behind the cabinet back and doweled into both cabinet sides. Screws shall be applied via pocket hole fastener systems.

1.04 SUBMITTALS

A. Submit compliance statement with bid – see page 14 of this specification.

B. Casework samples will be required and reviewed per specification. Samples shall be delivered, at no cost to the architect or owner, to a destination set forth by the architect or owner. This must be done seven (7) days before quotation deadline as a condition of approval of each bidder. Samples shall be full size, production type samples, as will be delivered for the project. Furnish the following:

1. One combination drawer and cupboard base unit, including one shelf.
2. One sample of all top materials shown or called for.
3. Sample of all mechanical service fittings, locks, door pulls, hinges, and interior hardware.

C. Submit shop drawings for furniture assemblies showing plans, elevations, ends, cross-sections, service run spaces, location, and type of service fittings.

1. Coordinate shop drawings with other work involved.
2. Provide roughing-in drawings for mechanical and electrical services when required.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. The basis of this specification is Diversified Casework (www.diversifiedcasework.com) Majestic Series. No exceptions, deviations or alternates to the specified construction or materials are allowed.

B. Lifetime warranty: The selected manufacturer must warrant for the life of the product in the application and location installed, starting at the date of acceptance or occupancy, whichever comes first, that all products sold under the contract referenced above shall be free from defects in material and workmanship. Purchaser shall notify the manufacturer's representative immediately of any defective product. The manufacturer shall have a reasonable opportunity to inspect the goods. The purchaser shall return no product until receipt by purchaser of written shipping instructions from the manufacturer.

C. All manufacturers must submit samples in accordance with this specification.

D. The architect will impound the above samples of the successful manufacturer or owner to ensure that material delivered to the jobsite conforms in every respect to the samples submitted.

2.02 MATERIALS

A. It is the intent of this specification to provide a high-quality wood cabinet specifically designed for the lab environment.

B. Hardwood shall be kiln-dried, clear, and free of defects and shall meet surface requirements as specified below.

C. Plywood shall be of balanced construction and 3/4” 7-ply veneer core hardwood plywood for shelves, cabinet ends, tops and bottoms of base and tall cabinets; 1” 9-ply veneer core hardwood plywood for shelves over 36”, bottoms of wall and upper cabinets, and tops of wall, upper and tall cabinets; nominal 1/2” 9-ply veneer core plywood for drawer body; 3/4” 3-ply particleboard core plywood for cabinet doors and drawer heads. Plywood shall meet the standards of ANSI/HPVA HP-1-2009.

D. Casework parts shall be as defined in AWI Quality Standards, 8th Edition, 400-G-3.

E. Exposed surfaces shall be of plain-sliced, HPVA Grade A Northern Red Oak veneers and compatible clear, defect-free Red Oak hardwood lumber. Veneers shall be selected for golden wheat color and narrow hearts of no more than 5”. No split hearts are allowed. Appalachian and Southern red oak veneers are not allowed.

F. Semi-exposed surfaces shall be plain sliced, HPVA Grade 1 Northern Red Oak veneers and compatible clear, defect-free Red Oak hardwood lumber. Appalachian and Southern red oak veneers are not allowed.

G. Concealed surfaces shall be no less than HPVA Grade D face or Grade 3 back veneers and compatible mill option, hardwood lumber, suitable for the application.

H. Edging for cabinet parts shall be 3 mm hardwood edging of compatible hardwood Red Oak.

I. Hardboard shall be 1/4” thick 55 lb. density hardwood chip fiberboard formed with heat and pressure into sheets providing a hard, smooth surface.

J. Glass used for framed sliding and swinging doors shall be 3/16" tempered glass. Glass used for unframed sliding doors, shall be 1/4" tempered glass.

K. Drawer and door pulls shall be satin finish, zinc coated wire type, 96 mm centers, offering a comfortable hand grip, and be securely fastened to doors and drawers. Two pulls shall be required on all drawers over 24" long.

L. Hinges shall be BHMA Grade 1 of **stainless steel**, five (5) knuckle institutional, .083" thick, offset type for all swinging doors. Hinges shall be 2-1/2” long, one (1) pair for doors under 4 ft. in height and 1-1/2 pair on doors over 4 ft. in height. Hinges are mounted with flathead screws, so applied to door and cabinet to withstand a weight load of 150 lbs. minimum.

M. Locks when shown or called for shall be a National Lock, 5-disc tumbler with heavy duty interchangeable cylinder. Exposed lock noses shall be dull nickel (satin). Locks shall

have capacity for 200 primary key changes. Master key one level with the potential of 200 different, non-interchangeable master key groups.

N. Roller catches shall be used on swinging doors. Catches shall have two spring-loaded polyethylene rollers and metal catch to secure doors. Double doors without locks shall have a catch on each door. Full height cases shall have 3-point latching devices. Magnetic catches are not allowed.

O. Leg shoes shall be provided on all table legs, unless otherwise specified, to conceal leveling device. Shoes shall be 2-1/2" high and made of pliable, black rubber material. Use of a leg shoe, which does not conceal leveling device, will not be acceptable.

P. Floor glides, where specified for movable open-leg tables, shall be a non-skid material at least 1" diameter to prevent indenting composition flooring and shall have at least a 5/8" height adjustment. Use of metal buttons will not be acceptable.

Q. Dowels used to join frames and panels shall be fluted hardwood not less than 8 mm in diameter. Dowels shall be spaced at a maximum of 64mm on center.

R. Shelf support clips shall be “seismic” twin pin type for mounting on interior of cabinet work. Clips shall be corrosion resistant and shall retain shelves from accidental removal. Shelves in all cabinets are adjustable on 32mm centers. Single pin support clips and surface mounted metal support strips and clips are not acceptable.

S. Base molding and stainless steel corner clips shall be provided by others.

T. Upright rods, cross rods and ring support rods, where specified, shall be aluminum (1/2" or 3/4" dia., as required). Rod sockets shall be aluminum, secured through table tops with lock nut and washer. Rod clamps shall be heavy duty, designed to securely hold rod assembly in any position. Use of wood rod assemblies will not be accepted.

U. Label holders, where shown or called for, shall be stainless steel, brad-attached type with satin finish and designed for 2" x 1" cards.

V. Number plates, where shown or called for, shall be brass brad-attached type with satin finish and indented black lettering.

W. Sink supports, where required, shall be of a cradle type consisting of two 1-1/2” x 3/4” horizontal cleats and adjustable leveling bolts or glides. The horizontal cleats shall be supported by two 1/8” x 1-1/2” angle irons attached to the cabinet end panels.

2.03 CONSTRUCTION

A. Open-leg Tables: Legs shall be Red Oak hardwood construction, 2-1/4" square with 1/4” radius on all corners. Legs shall be secured to the apron frame by a heavy-duty corner bolt and a 13-gauge steel corner brace. Corner braces shall be locked into apron rails by accurately located grooves and shall be securely fastened with screws. All apron rails shall be 13/16" thick solid Red Oak. Top shall be attached using zinc coated screws through pocket holes in the apron. Leg stretchers, where required, shall be 7/8" x 2-1/2", secured with a 4" long through-bolt.

B. Base Cabinets shall consist of the following minimum construction:

1. Joinery must meet AWI Premium Grade requirements and these specifications.
2. End panels shall be multiple doweled and glued to top frame members, intermediate rails, and bottoms. Dowel spacing shall be a maximum of 64mm on center.
3. Cabinet bottoms shall be multiple doweled and glued to end panels. Dowel spacing shall be a maximum of 64mm on center.
4. Toe space shall be 4” high and fully enclosed. Toe space shall be attached with a minimum of 4 dowels and shall also be mechanically fastened to each end panel with screw fasteners.
5. Edging shall be provided on the front edges of ends, tops, bottoms, and shelves, and on all four edges of door and drawer fronts.
6. Cabinet top shall be composed of a single full sub-top composed of 3/4” veneer core plywood that has been doweled and glued to all end panels. A cutout in the top shall be provided in order to provide for ease of installation and leveling of tops.
7. Intermediate rails (3/4” x 2-1/2” hardwood per parts definition) shall be multiple doweled and glued to end panels at the front of the cabinet between drawers and between drawers and doors.
8. Screw strips (3/4” by 4” veneer core hardwood plywood) shall be located at the top and bottom behind the cabinet back and multiple doweled to the cabinet ends.
9. Hardboard cabinet backs shall be fully captured and dadoed into end panels and bottoms, with full perimeter gluing around the rear of the back. Where a removable back is indicated, it shall be an additional piece applied to cover an opening that is added to the fully captured back. (Backs are to meet the visual requirement of cabinet parts.)
10. Shelves shall be 3/4” thick in cabinets up to 36” wide, 1” thick in all cabinets over 36” wide. (Front edges of shelves are to meet the visual requirement of cabinet parts.)
11. Drawer box shall be four-sided (sub-front, sides and back), each panel made of nominal 1/2” thick, 9-ply Baltic Birch plywood and joined to adjacent panels by full glue and multiple dovetail joinery all four corners.
12. Drawer bottom (1/4” on drawers under 42” wide, 1/2" on larger drawers) shall be white faced hardboard (appearance to meet visual appearance of drawer box), dadoed into all four drawer box sides with full perimeter gluing on the underside.
13. Door and drawer heads shall be 3/4" thick plywood with edging as specified to resist warping. Reveals shall be 1/8” vertically and 1/4” horizontally between door and drawer heads and 7/16” on end panels. Face veneers shall be vertically grain matched.
14. Drawer slides shall be easily removable with a 100 lb. dynamic load rating and nylon roller bearings, powder coated surfaces, self-closing and with a hold-open feature. Slides shall be attached to the drawer box both from below and the side. File drawers shall be full extension, 150 lb. dynamic load rating mounted to the drawer sides.

C. Full Height Sliding Door Cases:

1. Shall be designed and constructed for full enclosure to assure dust proofing of the interior.
2. Tops shall be 1" thick plywood, multiple doweled into end panels, secured with glue.
3. A double extruded aluminum track shall be attached to the case top for suspension system when sliding doors are called for. Doors shall be suspended from an adjustable hanger and glide on nylon roller wheels. An aluminum U-channel is located on the case bottom to guide the bottom of the doors.

4. Solid panel doors shall be 3/4" thick plywood with edging as specified.
5. Glazed doors shall have 2-3/4" x 7/8" thick framing, mortised, tenoned, and glued. Glass shall be set into door frame and secured with a plastic retainer.
6. Doors shall be removable without use of tools, and so designed to prevent by-passing.
7. Shelves shall be 3/4" thick in cabinets up to 36” wide, 1” thick in all cabinets over 36” wide.
8. To assure a rigid case, the center shelf is structurally joined to the end panels and glued.
9. Case bottoms shall be 3/4" thick plywood, multiple doweled and glued securely to end panels.
10. A 3” full width strip shall be doweled and mechanically fastened into the side panels of the cabinet at both top and bottom of the back and used for attaching the cabinet to wall.
11. Toe space, 2-1/4” deep x 4” high, shall be totally enclosed by a 3/4" x 4" plywood rail**.**
12. Backs in open and glazed door cases shall be 1/4" plywood; backs not exposed to view shall be 1/4" high-density fiberboard.
13. Case interior shall be flush.

D. Full Height Swinging Door Cases: General construction features shall be the same as for sliding door cases except for the following:

1. Doors shall overlap opening on all four sides.
2. A 3” full width strip shall be doweled and mechanically fastened into the side panels of the cabinet at both top and bottom of the back and used for attaching cabinet to wall.
3. Hardwood door rails shall be mitered at corners.
4. Astragal applied to left hand door shall provide further dust proofing.

E. Wall-Hung Sliding Door Cases: General construction features shall be the same as for full height type cases with the following exception:

1. A 3” full width strip shall be doweled and mechanically fastened into the side panels of the cabinet at both top and bottom of the back and used for attaching the cabinet to wall.
2. Case bottoms shall be 1” thick plywood, multiple doweled and glued securely to end panels.

F. Wall Hung Swinging Door Cases: Construction and materials shall be the same as for sliding door cases with the following exceptions:

1. Panel or glass framed doors shall be hung on 1 pair of offset institutional type hinges under 48" in height. Doors on cases 48" high shall have 1-1/2 pair of offset institutional type hinges.
2. All doors shall overlap opening four sides.
3. A 3” full width strip shall be doweled and mechanically fastened into the side panels of the cabinet at both top and bottom of the back and used for attaching the cabinet to wall.
4. Glass doors shall use mitered corners for the hardwood stiles and rails.
5. Astragal applied to left hand door shall provide further dust proofing.

2.04 FINISH AND PERFORMANCE REQUIREMENTS

A. Wood Surface Preparation: Prior to application of the wood finish, case and cabinet surfaces shall be smoothly sanded to remove loose fibers, scratch marks and abrasions, with all dust thoroughly removed by compressed air. Finish shall be applied to cabinet parts prior to assembly in order to assure uniform coverage.

B. Wood Stain Color: Selected from Manufacturer's standard selection

C. Wood Finish Application: Finishes shall be applied and cured under controlled atmospheric conditions, aided by infrared radiant heaters. Finish must be VOC-free. Finish shall be applied via a flat line, roller applied system prior to cabinet assembly in order to assure uniform coverage.

D. Interior Wood Casework Finish: Interior surfaces shall receive a triple application of an acid, alkali, solvent, water, and abrasion resistant finish meeting AWI requirements.

E. Exterior Wood Casework Finish: Exposed exterior surfaces, including interiors of glazed cases and open shelving, shall be provided with an acid, alkali, solvent, water, and abrasion resistant finish meeting both AWI section 1500 and SEFA 8 requirements. Finish shall be applied to cabinet parts prior to assembly in order to assure uniform coverage.

2.05 WORKSURFACES

A. SOLID EPOXY RESIN:

1. Sheets cast from modified 1" epoxy resin and non-asbestos inert fillers; compounded mixture cured and thermoset specifically from formulation to provide exceptional physical and chemical resistance required in medium to heavy duty laboratory environments. Color shall be black.

B. ACCESSORIES:

1. Provide solid epoxy resin laboratory shelving, laboratory fume hood base work surfaces, pegboards, and reagent racks where indicated.
2. Installation Materials: Manufacturer's joint adhesive, panel adhesive, and sealants as required to suit project conditions.

C. FABRICATION:

1. Fabricate tops and accessories in accordance with manufacturer's recommendations, approved Shop Drawings, and SEFA 8.
2. Epoxy Resin Worksurfaces:
   a. Thickness:
      1) 1 inch (25 mm) unless otherwise indicated.
         a) Check each sheet at factory for required thickness.
         b) Maximum variation in thickness: plus or minus 1/16 inch (1.6mm) from corner to corner.

b. Warpage:
    1) Inspect tops for warpage prior to fabrication by placing on true flat surface.
        a) Maximum allowable warpage: 1/16-inch (1.5 mm) in 36-inch (900 mm) span or 3/16-inch (4.5 mm) in 96 inch (2400 mm) span.
c. Fabrication:
    1) Shop fabricates in longest practical lengths.
        a) Bond joints with highly chemical resistant cement with properties and color similar to base material.
        b) Provide 1/8-inch (3 mm) drip groove at underside of exposed edges, set back ½ inch (13 mm) from face.
        c) Finish exposed edges.
d. Edge treatment:
    1) Standard 1/8 inch (2 mm) chamfered edge.
e. Corner treatment:
    1) Exposed corners shall be eased slightly for safety
f. Back and end splashes:
    1) Supplied loose for field installation.
    2) Same material and thickness as worksurfaces.
    3) 4 inches high unless otherwise indicated.
    4) Top-mounted end splash where worksurfaces abut adjacent construction and locations indicated on Drawings.
g. Joints:
    1) Maximum 1/8 inch (2 mm), bonded with epoxy grout.
    2) Make joints between two benches level.
    3) Locate joints away from sinks and over or near supports.
h. Sink cutouts:
    1) Routed for drop-in sink.
i. Allowable tolerances:
    1) Square.
        a) Plus, or Minus 1/64 inch (0.4 mm) for each 12 inches (300 mm) of length.
    2) Location of cutouts and drilled openings.
        a) Plus, or Minus 1/8 inch (3 mm) of design dimension.
    3) Size of cutouts and drilled openings.
        a) Plus 1/8 inch (3 mm) or minus 0 inches (0 mm).

3. Epoxy Resin Sinks:
    a. Mold sinks from thermosetting epoxy resin.
    b. Mold interior corners to radius and slope sink base to drain outlet.
        1) Provide 1-1/2 inch (38 mm) outlet with open ended standpipe.
            a) Standpipe overflow 2 inches (50 mm) shorter than depth of sink.
    c. Unless otherwise indicated fabricate sinks of drop-in design supported by upper flange from worksurface.
        1) Color.
            a) Match adjacent worksurface.

2.06 SERVICE FITTINGS AND ACCESSORIES

A. MATERIALS:

1. Laboratory Service Fittings:
   Service fittings shall be laboratory grade, and water faucets and valve bodies shall be cast red brass alloy or bronze forgings, with a minimum content of 85%. All fittings shall be chromium plated unless specified otherwise.

2. Plastic Coated Finish (Sepia Bronze):
   When specified, laboratory service fittings shall have an acid resistant plastic coating applied over a fine sand-blasted surface. Surfaces shall be sprayed and baked three times with a minimum thickness of .0005 to .0010 mils. (See Performance Ratings).

3. Service Indexes:
   Fittings shall be identified with service indexes in the following color coding:

   Hot Water..... Red
   Cold Water..... Dark Green
   Gas ..... Dark Blue
   Air..... Orange
   Vacuum..... Yellow
   Distilled Water…. White
   Steam..... Black
   Nitrogen ..... Brown
   Oxygen..... Light Green
   Hydrogen ..... Pink
   Special Gases…. Light Blue

B. CONSTRUCTION:

1. Water Fittings:
   Water fittings shall be provided with a renewable unit containing all operating parts which are subject to wear. The renewable unit shall contain an integral volume control device and all faucets shall be capable of being readily converted from compression to self-closing, without disturbing the faucet body proper. Four (4) arm forged brass handles shall contain plastic screw-on type colored service index buttons.

2. Steam Fittings:
   Steam fittings shall have a black, heat resistant composition handle, and shall be the heavy pattern design with stainless steel removable seat and flat Teflon seat disc. They shall have Teflon impregnated packing, and shall be so constructed that they can be repacked under pressure.

3. Distilled Water Fittings:
   Distilled water fittings shall be chromium plated cast bronze with tin lined interior and self-closing type, or shall be made of aluminum and not be the self-closing type. Handles shall be furnished with tamper-proof and vandal resistant service indexes.

4. Laboratory Ball Valves:
   Laboratory ball valves shall have a forged brass valve body with a non-removable serrated hose end and a forged brass lever-type handle with a full view color-coded index button. Valves shall have a floating chrome plated brass ball and molded TFE seals. Valves shall be certified by CSA International for use with natural gas under ANSI Z21.15./CGA9.1

5. Needle Valve Hose Cocks:
   Needle type valves shall have a stainless steel replaceable floating cone, precision finished and self-centering. Cone locates against a stainless steel seat, easily removable and replaced with a socket wrench. Valve shall have "TEFLON" impregnated packing and designed so unit can be repacked while under pressure.

6. Gooseneck Type Outlets:
   Gooseneck outlets shall have a separate brazed coupling to provide a full thread attachment of anti-splash, serrated tip or filter pump fittings.

7. Remote Control Valves:
   All valves for remote control use shall be as previously specified, but shall be complete with aluminum extension rods, escutcheon plates, brass forged handles and screw-on type colored service index button.

8. Tank Nipples:
   Tank nipples shall be provided with locking nut and washer for all fixtures where fittings are anchored to equipment.

9. Sink Outlets:
   Unless otherwise specified, sink outlets for other than stainless steel sinks shall be sin, with integral cross bars, tapered for overflow and be complete with gasket and lock nut with 1-1/2" I.P.S. male straight thread outlet. Overflows shall not be furnished for sink outlets unless specifically called for.

10. Crumb Cup Strainers:
    Crumb cup strainers shall be stainless steel or chromium plated brass, as specified, and shall be furnished for stainless steel sinks, and be complete with gasket, lock nut and 4" long unthreaded tailpiece outlet in 1-1/2" size.

11. Vacuum Breakers:
    Vacuum breakers where required shall be "Nidel" or "Watts" unless otherwise specified or identified to be an integral part of the water fixture assembly.

12. Aerator Outlets:
    Aerator type outlets shall be furnished for all gooseneck water faucets not furnished with serrated hose connectors.

13. Waste Lines:
    Waste lines shall be furnished by other trades.

14. Traps:
    Traps shall be furnished by other trades.

15. Electrical Fittings:
    Electrical fittings shall contain 20 Amp., 125 Volt AC, 3-wire polarized grounded receptacles, unless otherwise specified. Pedestal and line-type boxes shall be of aluminum, metallic finish with stainless steel flush plates. Receptacle boxes shall be of plated steel. All electrical or conduit fittings called for or to be furnished under these specifications shall meet the requirements of the National Electrical Code.

C. PERFORMANCE:

1. Maximum Line Pressures:
   Laboratory Ball Valves (Gas and Air) …75 PSI
   Needle Point Cocks (Gas and Air) .……65 PSI
   Vacuum……...28.5" Mercury
   Hot and Cold Water……...80 PSI
   Steam……..30 PSI

2. Sepia Bronze Finish Performance:
   Finish shall show no rupture, other than a slight discoloration or possible softening when subjected to the following fumes for approximately six (6) days: Plastic coated fittings shall be suspended in a container, 6 cu. ft. capacity 12" above open beakers, each containing 199 cc. of 70% Nitric Acid, 94% Sulphuric Acid, 37-38% Hydrochloric Acid, respectively. Finish shall also withstand direct contact of reagents dropped from a burette at a rate of 60 drops/min. for a period of 10 minutes. Chemicals are shown below:

   Concentrated Hydrochloric Acid 37-38%*
   Concentrated Nitric Acid 70%*
   Concentrated Sulphuric Acid 94%
   Glacial Acetic Acid 99.5%*
   Ethyl and Other Alcohols
   Toluene and Other Hydrocarbons
   Carbon - Tetrachloride
   Mineral Oil
   *Percentages are by weight.

PART 3 EXECUTION

3.01 SITE EXAMINATION

A. The owner and/or his representative shall assure all building conditions conducive to the installation of a finished goods product; all critical dimensions and conditions previously checked have been adhered to by other contractors (general, mechanical, electrical, etc.) to assure a quality installation.

B. Site conditions shall be in compliance with AWS Edition 1, Section 2.

3.02 INSTALLATION

A. Installer: Installer shall be certified by the factory as having the necessary skills and equipment to install the casework so as not to void the warranty.

B. Installation shall be to the standards set forth in SEFA 2 -2010 Installation.

C. Preparation: Prior to beginning installation of casework, check and verify that no irregularities exist that would affect quality of execution of work specified.

D. Coordination: Coordinate the work of the Section with the schedule and other requirements of other work being performed in the area at the same time both with regard to mechanical and electrical connections to and in the fume hoods and the general construction work.

E. Performance:

1. Casework:
   a. Set casework components plumb, square, and straight with no distortion and securely anchor to building structure. Shim as required using concealed shims.
   b. Screw continuous cabinets together with joints flush, tight and uniform, and with alignment of adjacent units within 1/16" tolerance.
   c. Secure wall cabinets to solid supporting material, not to plaster, lath or gypsum board.
   d. Abut top edge surfaces in one true plane. Provide flush joints not to exceed 1/8" between top units.

2. Work surfaces:
   a. Where required due to field conditions, scribe to abutting surfaces.
   b. Only factory prepared field joints, located per approved shop drawings, shall be permitted. Secure the joints in the field, where practical, in the same manner as in the factory.
   c. Secure work surfaces to casework and equipment components with materials and procedures recommended by the manufacturer.

3. Adjust and Clean:
   a. Repair or remove and replace defective work, as directed by owner and/or his representative upon completion of installation.
   b. Adjust doors, drawers and other moving or operating parts to function smoothly.
   c. Clean shop finished casework; touch up as required.
   d. Clean work surfaces and leave them free of all grease and streaks.
   e. Casework to be left broom clean and orderly.

F. Protection:

1. Provide reasonable protective measures to prevent casework and equipment from being exposed to other construction activity.

2. Advise owner and/or his representative of procedures and precautions for protection of material, installed laboratory casework, and fixtures from damage by work of other trades.

END OF SECTION









Front Panel

DIVERSIFIED WOODCRAFTS

PRODUCT DESCRIPTION

ASSEMBLY REQUIRED

Mobile Fume Hood Station

A versatile fume hood that can be used in multiple classrooms. This ductless fume hood has an all-inclusive filter that handles liquids, gases and solid chemicals. This unit is so flexible, it does not require ducting (saves energy) and plugs into an ordinary outlet. Each unit comes with Smart Technology™ – an exclusive set of tools that is comprised of smart-light communication™, chemical sensors, real-time status, and the eGuard app. Smart-light communication is a soft band of light on the unit that lets you know the unit is operating safely. The band of light will slowly pulse to let you know if the airflow is compromised, if there is a fan failure, or there it is time to change your filters. The fume hood part of the unit is enclosed by 5/16" thick acrylic so a teacher can demonstrate while students surround the hood. The metallic parts are anti-corrosion metallic alloy protected by a thermo-hardened anti-acid polymer coating. The internal hood dimensions are 30-1/8"W x 23"D x 32"H; external dimensions are 31-1/2"W x 25"D x 45-1/4"H. Overall dimensions are: 32-3/8"W x 27-1/4"D x 81-1/2"H. Unit comes with an air flow meter, flow monitor, sampling port, programmable timer, energy ports, one filter (2-year average life) and a list of approved chemicals. A separate filter must be ordered. Filter type is determined by the results of the Valiquest Chemical Questionnaire. Fume hood comes standard with an internal light fixture. The fume hood is mounted to a 27-1/4"D x 32-3/8"W x 36"H oak cabinet. It provides an easy way to move the fume hood within a room or school. It rolls easily on 4" casters and has two drawers, two pull-out lipped shelves lined with a chemical resistant liner. The unit is finished in natural oak with an earth-friendly chemical resistant UV finish. Erlab hoods require filters be selected according to individual applications (Must get the Valiquest Chemical Questionnaire form completed prior to purchase and it will determine which model you will receive. On rare occasions results may also require purchase of a HEPA filter). Your specifications will be analyzed and validated by Erlab's PhD chemist, ensuring your safety. Please contact customer service with questions. Overall dimensions: 81-1/2"H x 32-3/8"W x 27-1/4"D.

ITEM #	PRODUCT
1800K-GF4AS	Fume Hood with VOC Carbon Filter
1800K-GF4BE	Fume Hood with Broad Range Filter
1800K-GF4F	Fume Hood with Formalin Carbon Filter
1800K-GF4K	Fume Hood with Carbon Filter
GF4HP	HEPA Filter



(Shown With Optional Mirror)







DIVERSIFIED WOODCRAFTS

PRODUCT DESCRIPTION

Economy Mobile Lab Table

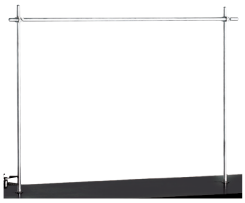
Constructed from select oak and oak veneers with a chemical resistant, earth-friendly UV finish. It features unbreakable aluminum sliding door glides and lock. The 1-1⁄4" thick high-pressure laminated top is bound with a Plastic-T Molding. It has a mobile capacity of 500 lbs., and is equipped with a stainless steel sink, hand pump, heavy-duty 4" locking swivel casters, 25' grounded extension cord, two 2-1/2 gallon water bottles, connecting hoses, two 3⁄4" diameter upright rods, one 1⁄2" diameter crossbar with clamps, two fully adjustable shelves, and a GFI protected AC duplex electrical outlet. Unit is also available with a flat top. Sink measures 15"W x 13"L x 5"D. Dimensions: 48"W x 24"D x 36"H. Weight: 185 lbs.

ITEM #	PRODUCT
4111K*	Economy Lab Table w/Sink & Rod Sockets
4111KF	Economy Lab Table w/Flat Top
4111KF-RS	Economy Lab Table w/Flat Top & Rod Sockets
100245GRARM*	Greenlaw Arm
100604*	Upright Set w/Full Crossbar
4000K*	Optional Mirror
4001K*	Optional Mirror/Marker Board

Note: On "RS" units, the greenlaw arm or upright full crossbar set is not included.



4121K



Upright Set



Greenlaw Arm



4121KF

DIVERSIFIED WOODCRAFTS

PRODUCT DESCRIPTION

Mobile Laboratory Unit

A fully equipped, locking self-contained demonstration unit. It features a sturdy 1-1⁄4" thick high-pressure laminated surface with durable drop leaf extensions. Constructed from select oak and oak veneers with a chemical resistant, earth-friendly UV finish. It features unbreakable aluminum sliding door glides and lock. The unit comes standard with a stainless steel sink, and hand pump. A GFI protected AC duplex electrical outlet is built into the lab. The cabinet rides on 4" heavy-duty ball-bearing swivel casters with brakes. Includes a 25- foot extension cord, two tote trays, two 2-1/2 gallon water bottles, connecting hoses, two 3⁄4" diameter upright rods, one 1⁄2" diameter crossbar and clamps, a propane burner with stand and 2 adjustable shelves. Unit is also available without the sink, faucet, rod sockets and upright set. Mobile capacity: 500 lbs. Weight: 230 lbs. Overall dimensions: 48"W x 24"D x 36"H. Extended Top: 72"W x 24"D. Sink: 15"W x 13"L x 5"D.

ITEM #	PRODUCT
4121K *	Mobile Laboratory Unit w/Sink & Rod Sockets
4121KF	Mobile Laboratory Unit w/Flat Top
4121KF-RS	Mobile Laboratory Unit Mobile w/Flat Top, Rod Sockets
100245GRARM*	Greenlaw Arm
100604*	Upright Set w/Full Crossbar
4000K*	Optional Mirror
4001K*	Optional Mirror/Marker Board

A. **Sheldon Synergy Sink:**
Mounted in Perimeter Casework.
Molded epoxy resin top and 19 gallon sink; two tiered with anti-splash feature.

1. The molded epoxy resin sink incorporates a two-tiered depth design to allow ADA accessibility at the front and a deep clean-up section at the rear of the sink. The sink has a unique curvilinear shape where the front is curved to match the curve of the counter top. The sink is 20-1/4” from the center of the front curve to the rear. The width of the curved front is 28-1/2” and the width of the rear is 22-1/2”. The width of the sides is 16” and the overall depth of the sink is 11-1/2”.

2. The front section of the sink has an integrally molded ADA ledge 28-1/2” wide, 8” front to back at the center of the curve, 5” deep from the sink top, and has molded drain grooves. The rear of the ADA ledge is sloped and designed to prevent splash from the two (2) water fixtures. The rear of the sink is a minimum of 12-1/4” from the rear of the ADA ledge. The sink shall accommodate approximately nineteen (19) gallons of water.

3. Unicast water fixtures are mounted at a slight angle to provide an anti-splash characteristic flowing on the sloped portion of the sink.

4. Synergy sink mounting options in perimeter casework.

    a. Synergy sink, curvilinear resin top, and Unicast water fixtures can be mounted within 35 ¾” standing height perimeter casework assembly supported by a 42” wide wood sink cabinet with doors, Oak or Maple as called for, and incorporate appropriate service rough-in area. **Provide this arrangement when specified.**

    b. Synergy sink, curvilinear resin top, and Unicast water fixtures can be mounted within ADA compliant perimeter casework assembly at 34” height, supported by a metal base, sink shroud, and removable knee space panel that provides access to service rough-in area behind panel. **Provide this arrangement when specified.**

80020 Unicast Combination Cold Water & Gas Fixture

The main body of the fixtures consists of solid cast 5A-ASTM-30 brass. Tubing shall not be a part of its structure. The main body is machined to allow the use of standard valve seats, composition washers and stems for the hot and cold water assemblies. The operating handles are Delrin plastic fitted with cold water identification buttons. Fixture is fitted with a neoprene gasket and (2) tank nipples that extend through the work surface and are secured with lock nuts.

Gas fixtures are ground key type that have a forged brass valve body with a straight (10) serration hose connector integral with the valve body. The valve plug is forged brass with an oversize operating handle that is held in place with a non-removable solid stainless steel pin. The handle is fitted with a color coded screw-on type identification button. Ground key cocks are individually ground, lapped and sealed and are individually tested at 100 PSI under water. The maximum working pressure for ground key cocks shall be 40 PSI.

Entire fixture receives a powder coat epoxy finish that is resistant to most classroom chemicals.

Those fixtures designated to meet ADA requirements shall be provided with wrist blades handles and ball cock gas valves.



AFT4830WB36D



AFT4830LNAW36C



AFT48307Q36C

DIVERSIFIED SPACES™

PRODUCT DESCRIPTION

A-Frame Tables

- Design your table—many sizes, top and color options to choose from
- Colored 3mm PVC edge banding options available on HPL (L) and ChemGuard (2) top options only
- Legs are constructed of 2-1/2" x 2-1/2" thick wall square steel tubes with a welded 2" x 2" cross brace, and an 11-gauge steel "L" channel table support
- Top is supported by two 14-gauge steel "C" channels attached to the legs with four 3/8" carriage bolts per channel, two on each end
- Carriage bolt heads color matched to the frame for a cohesive look
- Frame powder-coated in eight standard colors: black, dark gray, silver, light gray, white, carrot, lime and aqua with a matte finish for a modern look
- The top is attached with screws in two directions ensuring stability; phenolic and epoxy tops installed with silicone instead of screws
- Glide option (N) features adjustable leveling glides
- Locking caster and glide options: 350 lb. Industrial Caster (C) or 220 lb. Designer Caster (D) subtract 5/16"H, or heavy-duty leveling glide (N) subtract 2-5/8"H
- Add-on: each units fits up to four backpack hooks in matching frame colors (#256063-X)

AFT SERIES CONFIGURATOR

STYLE	WIDTH	DEPTH	TOP TYPE	HPL COLOR (L) TOP ONLY	EDGE BANDING (2) OR (L) TOPS ONLY	STEEL COLOR	HEIGHT	OPTIONS REQUIRED
AFT	48	30	ChemGuard (2)	Almond (A)	Almond (A)	Aqua (Q)	30	Glide (N)
	60	36	Phenolic (4)	Black (B)	Aqua (Q)	Black (B)	36	4" Industrial Caster (C)
	72	42	Maple BB (5)	Charcoal (C)	Black (B)	Carrot (T)	42	4"Designer Caster (D)
	84	48	Epoxy (6)	Erasable (E)	Carrot (T)	Dark Gray (D)		
	96*		ShopTop® (7)	Natural Maple (N)	Charcoal (C)	Light Gray (G)		
			Walnut BB (W)	White (W)	Lime (L)	Lime (L)		
			HPL (L)		Natural Maple (N)	Silver (S)		
					Peacock (P)	White (W)		
					Red (R)			
					Royal (Y)			
					White (W)			

BP HOOK #	QTY	COLOR
256063-B	1	Black
256063-W	1	White
256063-T	1	Carrot
256063-L	1	Lime
256063-Q	1	Aqua
256063-S	1	Silver
256063-G	1	Light Gray
256063-D	1	Dark Gray



* 96"W table has three leg sets

Steel Colors



HPL Top Colors



Edge Band Colors





P814LERM



P814LCLK



P814LNCM

PRODUCT DESCRIPTION

Uplight! Hybrid Table (ADA)

- Available in a variety of sizes and different top materials
- Colored 3mm PVC edge banding options available on HPL (L) and ChemGuard (2) top options only
- Choose from solid oak or maple hardwood with a chemical-resistant, earth-friendly UV finish
- Ergonomic and ADA-compliant tables with adjustable work surface
- Height adjusts from 26-1/4" to 42"H (with 3" provided spacer)
- Adjust height quickly in 2 cm increments—no tools needed
- Adaptable height for elementary to adult spaces
- Powder-coated legs with adjustable leveling glides
- Optional casters available

STYLE	SIZE	TOP TYPE	HPL COLOR (L) TOPS ONLY	3MM EDGE BANDING (2) OR (L) TOPS ONLY	WOOD	OPTIONS
P8	48" x 24" (10)	ChemGuard (2)	Almond (A)	ChemGuard (2)	Maple (M)	Casters (Qty 4): # 100709X4
	54" x 24" (20)	Phenolic (4)	Black (B)	Phenolic (4)	Oak (K)	
	60" x 24" (60)	HPL (L)	Charcoal (C)	Maple BB (5)		
	60" x 30" (14)		Erasable (E)	Epoxy (6)		
	72" x 24" (30)		Natural Maple (N)	ShopTop® (7)		
			White (W)	HPL (L)		
				Natural Maple (N)		
				Peacock (P)		
				Red (R)		
				Royal (Y)		
				White (W)		

HPL Top Colors



Edge Band Colors





SE-T5M



SE-T5D
w/Optional Casters



SELF-BRAKING
CASTERS
SE-C

DIVERSIFIED SPACES™

PRODUCT DESCRIPTION

Tech Chairs

- Formed to fit you—our ergonomic vinyl upholstered chairs feature a contoured waterfall seat cushion and an adjustable backrest with lumbar support
- Choose from four colors: black, charcoal, carrot or lime
- Available in two heights: desk or standing height (includes foot ring)
- Smooth height adjustment with a pneumatic circle lever
- Comes with black non-marring glides, but optional non-locking self-braking casters are available with a weight capacity of 300 lbs.
- 15-year warranty, lifetime on pneumatic lift

PRODUCT	ITEM #	COLOR	ADJUSTABLE HEIGHT	FOOT RING	SEAT SIZE	BACK SIZE
Tech Chair - Desk	SE-T2D	Black	18" - 23"H	No	19"W x 18"D	17"W x 10-1/2"H
Tech Chair - Standing	SE-T2M	Black	21" - 28"H	Yes	19"W x 18"D	17"W x 10-1/2"H
Tech Chair - Desk	SE-T5D	Charcoal	18" - 23"H	No	19"W x 18"D	17"W x 10-1/2"H
Tech Chair - Standing	SE-T5M	Charcoal	21" - 28"H	Yes	19"W x 18"D	17"W x 10-1/2"H
Tech Chair - Desk	SE-T3D	Carrot	18" - 23"H	No	19"W x 18"D	17"W x 10-1/2"H"
Tech Chair - Standing	SE-T3M	Carrot	21" - 28"H	Yes	19"W x 18"D	17"W x 10-1/2"H
Tech Chair - Desk	SE-T6D	Lime	18" - 23"H	No	19"W x 18"D	17"W x 10-1/2"H
Tech Chair - Desk	SE-T6M	Lime	21" - 28"H	Yes	19"W x 18"D	17"W x 10-1/2"H
Casters (Qty: 5)	SE-C	Black	--	--	--	--



BLACK - DESK HEIGHT
SE-T2D



CHARCOAL - DESK HEIGHT
SE-T5D



CARROT - DESK HEIGHT
SE-T3D



LIME GREEN - DESK HEIGHT
SE-T6D



STL7186-AR5T



STL7186-AL5N



STL7186-AH5R

DIVERSIFIED SPACES™

PRODUCT DESCRIPTION

Chroma Steel Stools

- 1-1/4" x 14" diameter MDF top with high-pressure laminate (HPL) and phenolic backer sheet with Lotz Armor Edge™
- Choose from 10 HPL colors: almond, aqua, black, carrot, charcoal, folkstone, lime, natural maple, peacock, red, royal and white
- Stools are available with 1" fixed legs and 1-1/4" adjustable height legs
- Available in three sizes: 18" fixed, desk height (AH5), 24" fixed, counter height (AL5), 18–28" adjustable, table height (AR5)
- Frame is fully welded and nearly indestructible
- Finished with textured black powder coating and non-marring glides

STL SERIES CONFIGURATOR

STYLE	ITEM #	COLOR
18"H Fixed Height Stool	STL7186-AH5	Almond (A)
18-28"H Adjustable Height Stool	STL7186-AR5	Aqua (Q)
24"H Fixed Height Stool	STL7186-AL5	Black (B)
		Carrot (T)
		Charcoal (C)
		Folkstone (F)
		Lime (L)
		Natural Maple (N)
		Peacock (P)
		Red (R)
		Royal (Y)
		White (W)

Seat Inset HPL Colors:



Sconnie Chair
specifications

Seat

Shell Shell is fabricated using virgin polypropylene; a blend of homopolymers, random and polypropylene compounds that are blended together to create a rigid, yet flexible structure that allows for the perfect combination of stability and ergonomic flexibility. Ergonomically designed with integral comfort grip handle for ease of moving. Engineered as a Wall Saver which is designed in keeping the back of the chair from scratching the wall. Shell is blow-molded with a smooth contoured back promotes easy cleaning.

-P09	-PCH	-PRD	-P03	-P04	-PRB
Black	Charcoal	Red	Indigo	Dove Grey	Royal Blue

Frame

4 Legged 1" round, 16-gauge heavy duty steel tube legs welded to a steel seat mounting plate. Frame is riveted to the seat making it a sturdier chair. Nylon glide has an internal mount which is a "fish hook" design that prevents loosening over long periods of use. Stackable up to 10 chairs high.

Cantilever (2 legs) 1" round, 13-gauge heavy duty steel tube legs welded to a steel seat mounting plate. Frame is riveted to the seat making it a sturdier chair. Nylon glides. Stackable up to 10 chairs high.

Finish Smooth silver powder coated

Compliance

4 Legged BIFMA certified weight rating - 300#

Cantilever (2 legs) BIFMA certified weight rating - 300#



CHR18-4

4-Legged Sconnie Chair

Model #	Description	Seat Height"	Seat Width"
CHR12-4	Stackable chair, 4-legged, nylon glides	12	16.31
CHR14-4	Stackable chair, 4-legged, nylon glides	14	16.19
CHR16-4	Stackable chair, 4-legged, nylon glides	16	19.56
CHR18-4	Stackable chair, 4-legged, nylon glides	18	19.75



CHR18-C

Cantilever Sconnie Chair

Model #	Description	Seat Height"	Seat Width"
CHR14-4	Stackable chair, cantilever, plastic feet with nylon glides	14	16.56
CHR16-4	Stackable chair, cantilever, plastic feet with nylon glides	16	19.56
CHR18-4	Stackable chair, cantilever, plastic feet with nylon glides	18	19.75

Additional Options

Adder Code	Description
-FG	Felt Glide
-SG	Steel Glide

EON™ Desk specifications

Tops

Standard Laminate Top w/Lotz Armor Edge™ (Standard)	High pressure laminate (HPL) top and moisture preventative & gum resistant phenolic backer bonded to 1.125" thick medium density fiberboard (MDF) core. Total top thickness 1.25". Choice of WB standard HPL. Optional top surface choices include writable surface laminate (markerboard) and most Panolam matte (-60) finish laminates with possible up charges. Other vendors available upon request. (Check availability of non-standard colors, minimum order may apply.) Lotz Armor Edge™ is a WB exclusive polyurea that is extremely strong and durable. This edge will not separate from the MDF core and makes the edge completely water tight. 0.25" beveled radius edge. See catalog for color options.
Standard Laminate Top w/3mm Edge Band (Optional)	The core material is 1.125" thick particle board with a phenolic backer sheet and high pressure laminate on top making the total thickness of the top at 1.25". 3mm PVC edge banding is applied to all edges, radius corners. Color matching unless otherwise specified. Complimentary colors available upon request. See catalog for color options. Optional top surface choices include writable surface laminate (markerboard) and most Panolam matte (-60) finish laminates with possible up charges. Other vendors available upon request. (Check availability of non-standard colors, minimum order may apply.)
OnVoy Laminate Top w/Lotz™ Armor Edge (Standard)	The core material for the top has a medium density fiberboard (MDF) core with double sided Thermal Fused Laminate (TFL) making the total thickness of the top at 1". Lotz Armor Edge™ is a WB exclusive polyurea that is extremely strong and durable. This edge will not separate from the MDF core and makes the edge completely water tight. 0.25" beveled radius edge. See catalog for color options.
OnVoy Laminate Top w/3mm Edge Band (Optional)	The core material for the top is made with particle board and is double sided with Thermal Fused Laminate (TFL) making the total thickness of the top at 1". 3mm PVC edge banding is applied to all edges, radius corners. Color matching unless otherwise specified. See catalog for color options.

Legs

EON™ Legs	16-gauge steel tube fully welded to a triangular 12-gauge mounting plate, 1.5" (EON) x 16-gauge insert. Gussets. Mounting plate secured to top with (6) metal-to-metal threaded inserts and ¼"-20x19mm joint connector bolts (included). Legs positioned at widest point of desk to improve stability and to provide more knee clearance.
Finish	The legs are available in powder-coated smooth silver (-G4) **ONLY**.
Glides	1⅜" adjustable nylon glide with ⅜"-16 thread x1".
Casters	2" dual wheel soft tread casters w/brake

Additional Options

	Adder Code	*Description*
Markerboard top	-__MB	See catalog for color options
1⅜" Non-marring glide		Standard on -EJA
Soft Touch glides	-FG	Optional on -EJA
Steel glides	-SG	Optional on -EJA
Grand Hank glides	-HG	Optional on -EJA
Locking casters	-CA	Raises overall height by 2.11"
Wheelbarrow	-2CA	Standard with 2 non-marring glides and 2 dual-wheel soft tread locking casters
Wire basket	-LW	Dimensions: 17.13"W x 14.5"D x 4.25"H, smooth silver
3" tote tray kit	-GK_S	Transparent totes are standard, see catalog for color options
Plastic book box	-P23CH	Dimensions: 22.07"W x 16.5"D x 4.682"H, charcoal
Backpack hook	-BPH	2" backpack hook, smooth silver
Swivel cup holder	-SCH	8"W x 5"H, flat black
Premium Lotz AE™	-S2_	See catalog for color options
Non-standard edge band		
Custom sizes		Call Estimating

Specifications are subject to change. Product images are for illustrative purposes only and may differ from the actual product.

V013125 Version subject to change

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EON™ Desk Options

STORAGE OPTIONS

EON™ Desk		EON™ Leg		
Shape Code	Name	Book Box -P23CH	Wire Basket -LW	Tote Tray Kit -GK_
600	Adapt	N/A	N/A	N/A
601	Adapt XL	✓	✓	✓
810	Adapt II	N/A	N/A	N/A
823	Adapt II XL	✓	✓	✓
813	Arcadia	✓	✓	✓
829	Aidacra	✓	✓	✓
400	Connect 4	✓	✓	✓
216	Connect 6	N/A	N/A	N/A
218	Connect 6 XL	N/A	N/A	N/A
217	Connect 8	✓	✓	✓
318	Diamond	✓	✓	✓
317	Mini Diamond	N/A	✓	✓
816	Hurley	✓	✓	✓
316	Loyal	✓	✓	✓
323	Loyal XL	✓	✓	✓
809	Mini Nimbus	N/A	✓	✓
811	Mini Tide	✓	✓	✓
500	Ocho	✓	✓	✓
840	Plover	✓	✓	✓
174	Plymouth (20x27.5)	N/A	N/A	N/A
067	Plymouth (24x36)	✓	✓	✓
364	Plymouth (20x28.5)	✓	✓	✓
171	Plymouth II (20x27.5)	N/A	N/A	N/A
173	Plymouth II (24x36)	✓	✓	✓
366	Plymouth II (20x28.5)	✓	✓	✓
814	Pyramid	✓	✓	✓
820	Weston	✓	✓	✓



EON
-EJA*
1.5" Adjustable
Slim Straight
Round Legs
21.25 - 34.25"

*Heights listed are for overall desk height with standard glides. For overall desk height with casters, add 2.11".
OnVoy series subtract 0.25" from desk height.



EON -EJA

EON™ Desks *(1.25" HPL Top)*

	Top Shape D" x L"	Leg Space	AE™	3mm	EON -EJA Wgt	OnVoy EON -EJA/T Wgt
	**Adapt XL** 22.5 x 33 *US Patent D780487*	22.37	EON7601	EON6601	37	30
	**Adapt II XL** 22 x 33	21.73	EON7823	EON6823	38	31
	**Arcadia** 26.11 x 28.67 *(Right Handed)*	21.25	EON7813	EON6813	36	30
	**Aidacra** 26.11 x 28.67 *(Left Handed)*	21.25	EON7829	EON6829	36	30
	**Connect 4** 23.88 x 35.88	25.09	EON7400	EON6400	30	24
	**Connect 6 XL** 18 x 32	20.76	EON7218	EON6218	30	25
	**Connect 8** 24 x 33	23.95	EON7217	EON6217	35	29
	**Mini Diamond** 27 x 30.5	20.7	EON7317	EON6317	31	25
	Diamond 30 x 34	23.82	EON7318	EON6318	37	29
	**Hurley** 21.5 x 33	21.31	EON7816	EON6816	38	31
	**Loyal** 22 x 30	20.69	EON7316	EON6316	36	29
	Loyal XL 23 x 31	21.46	EON7323	EON6323	38	31
	**Mini Nimbus** 25.5 x 35.88	27.19	EON7809	EON6809	32	25
	**Mini Tide** 23 x 32.5	25.22	EON7811	EON6811	37	30
	**Ocho** 20.6 x 35.17	27.75	EON7500	EON6500	35	29
	**Plover** 23 x 33	21.5	EON7840	EON6840	38	31
	**Plymouth** 20 x 28.5	21.37	EON7364	EON6364	35	29
	Plymouth 24 x 36	28.87	EON7067	EON6067	46	37
	**Plymouth II** 20 x 28.5	21.37	EON7366	EON6366	35	29
	Plymouth II 24 x 36	28.87	EON7173	EON6173	46	37
	**Pyramid** 23.42 x 41.18	28.93	EON7814	EON6814	31	25
	**Weston** 23.87 x 32	22.1	EON7820	EON6820	38	31

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 123623.13

SECTION 123661.16 - SOLID SURFACING COUNTERTOPS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Solid surface material countertops.
2. Solid surface material backsplashes.
3. Solid surface material end splashes.
4. Solid Surface Window Sills.

1.2 ACTION SUBMITTALS

A. Product Data: For countertop materials.

B. Shop Drawings: For countertops. Show materials, finishes, edge and backsplash profiles, methods of joining, and cutouts for plumbing fixtures.

C. Samples: For each type of material exposed to view.

PART 2 - PRODUCTS

2.1 SOLID SURFACE COUNTERTOP AND WINDOW SILL MATERIALS

Manufacturers: Subject to compliance with requirements, provide products by one of the following:
a. Wilsonart LLC, basis of design.
b. E. I. du Pont de Nemours and Company, Corian.
c. Formica Corporation.
d. LG HI MACS

A. Solid Surface Countertop Material: Homogeneous-filled plastic resin complying with ICPA SS-1.

2. Type: Provide Standard type unless Special Purpose type is indicated.
a. Colors and Patterns: (Price Groups B&C – Provide samples to Architect for selection during construction.

B. Solid Surface Window Sill material.

1. ½” thickness w/ satin finish.
b. Color/Pattern: (Price Groups B&C – Provide samples to Architect for selection during construction.

C. Particleboard: ANSI A208.1, Grade M-2-Exterior Glue.

D. Plywood: Exterior softwood plywood complying with DOC PS 1, Grade C-C Plugged, touch sanded.

2.2 COUNTERTOP FABRICATION

A. Fabricate countertops according to solid surface material manufacturer's written instructions and to the AWI/AWMAC/WI's "Architectural Woodwork Standards."

1. Grade: Premium.

B. Countertops: 1/2-inch- thick, solid surface material with ½” Top and Bottom Round Over edge finish at Office Desk and 1/8” Round Over Top at toilet rooms.

C. Backsplashes: 1/2-inch- thick, solid surface material. Beveled at toilet rooms.

D. Joints: Fabricate countertops without joints.

E. Provide cutouts/holes where indicated by District or shown on drawings. Minimum 4 at Office Desk.

F. Cutouts and Holes:

1. Undercounter Plumbing Fixtures: Make cutouts for fixtures [in shop] using template or pattern furnished by fixture manufacturer. Form cut outs to smooth, even curves.

a. Provide vertical edges, slightly eased at juncture of cutout edges with top and bottom surfaces of countertop.

2. Counter-Mounted Plumbing Fixtures: Prepare countertops in shop for field cutting openings for counter-mounted fixtures. Mark tops for cutouts and drill holes at corners of cutout locations. Make corner holes of largest radius practical.

3. Fittings: Drill countertops in shop for plumbing fittings, undercounter soap dispensers, and similar items.

4. Provide cutouts/holes where indicated by District or shown on drawings. Minimum three (3) 2” grommets shall be cut at Office Desk where indicated by Architect or Owner. Provide stainless steel grommet cap and sleeve.

2.3 INSTALLATION MATERIALS

A. Adhesive: Product recommended by solid surface material manufacturer.

B. Sealant for Countertops: Comply with applicable requirements in Section 079200 "Joint Sealants."

PART 3 - EXECUTION

3.1 INSTALLATION

A. Fasten countertops by screwing through corner blocks of base units into underside of countertop. Predrill holes for screws as recommended by manufacturer.

B. Install backsplashes and end splashes by adhering to wall and countertops with adhesive.

C. Complete cutouts not finished in shop. Mask areas of countertops adjacent to cutouts to prevent damage while cutting. Make cutouts to accurately fit items to be installed, and at right angles to finished surfaces unless beveling is required for clearance. Ease edges slightly to prevent snipping.

D. Apply sealant to gaps at walls; comply with Section 079200 "Joint Sealants."

END OF SECTION 123661.16

SECTION 211313 - WET-PIPE SPRINKLER SYSTEMS

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, fittings, and specialties.
2. Specialty valves.
3. Sprinklers.
4. Alarm devices.

1.3 DEFINITIONS

A. Standard-Pressure Sprinkler Piping: Wet-pipe sprinkler system piping designed to operate at working pressure of 175-psig maximum.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

B. Shop Drawings: For wet-pipe sprinkler systems.

1. Include plans, elevations, sections, and attachment details.
2. Include diagrams for power, signal, and control wiring.

C. Delegated-Design Submittal: For wet-pipe sprinkler systems indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For wet-pipe sprinkler systems and specialties to include in emergency, operation, and maintenance manuals.

1.6 QUALITY ASSURANCE

A. Installer Qualifications:

1. Installer's responsibilities include designing, fabricating, and installing sprinkler systems and providing professional engineering services needed to assume engineering responsibility. Base calculations on results of fire-hydrant flow test.

    a. Engineering Responsibility: Preparation of working plans, calculations, and field test reports by a qualified professional engineer.

B. Welding Qualifications: Qualify procedures and operators according to 2010 ASME Boiler and Pressure Vessel Code.

PART 2 - PRODUCTS

2.1 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.

B. Sprinkler system equipment, specialties, accessories, installation, and testing shall comply with NFPA 13.

C. Standard-Pressure Piping System Component: Listed for 175-psig minimum working pressure.

D. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design wet-pipe sprinkler systems.

1. Sprinkler system design shall be approved by authorities having jurisdiction.

    a. Margin of Safety for Available Water Flow and Pressure: [**10**] [**20**] percent, including losses through water-service piping, valves, and backflow preventers.
    b. Sprinkler Occupancy Hazard Classifications:

        1) Building Service Areas: Ordinary Hazard, Group 1.
        2) Electrical Equipment Rooms: Ordinary Hazard, Group 1.
        3) General Storage Areas: Ordinary Hazard, Group 1.
        4) Mechanical Equipment Rooms: Ordinary Hazard, Group 1.
        5) Office and Public Areas: Light Hazard.

2. Minimum Density for Automatic-Sprinkler Piping Design:

    a. Light-Hazard Occupancy: 0.10 gpm over 1500-sq. ft. area.
    b. Ordinary-Hazard, Group 1 Occupancy: 0.15 gpm over 1500-sq. ft. area.
    c. Ordinary-Hazard, Group 2 Occupancy: 0.20 gpm over 1500-sq. ft. area.
    d. Special Occupancy Hazard: As determined by authorities having jurisdiction.

3. Maximum protection area per sprinkler according to UL listing.
4. Maximum Protection Area per Sprinkler:

    a. Office Spaces: 225 sq. ft.
    b. Storage Areas: 130 sq. ft.
    c. Mechanical Equipment Rooms: 130 sq. ft.
    d. Electrical Equipment Rooms: 130 sq. ft.
    e. Other Areas: According to NFPA 13 recommendations unless otherwise indicated.

2.2 STEEL PIPE AND FITTINGS

A. Standard-Weight, Black-Steel Pipe: ASTM A53/A53M, Type E, Grade B. Pipe ends may be factory or field formed to match joining method.

B. Thinwall Black-Steel Pipe: ASTM A135/A135M or ASTM A795/A795M, threadable, with wall thickness less than Schedule 30 and equal to or greater than Schedule 10. Pipe ends may be factory or field formed to match joining method.

C. Schedule 10, Black-Steel Pipe: ASTM A135/A135M or ASTM A795/A795M, Schedule 10 in NPS 5 and smaller.

D. Black-Steel Pipe Nipples: ASTM A733, made of ASTM A53/A53M, standard-weight, seamless steel pipe with threaded ends.

E. Uncoated-Steel Couplings: ASTM A865/A865M, threaded.

F. Uncoated, Gray-Iron Threaded Fittings: ASME B16.4, Class 125, standard pattern.

G. Grooved-Joint, Steel-Pipe Appurtenances:

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

    a. Anvil International.
    b. CPS Products, Inc.
    c. National Fittings, Inc.
    d. Shurjoint-Apollo Piping Products USA Inc.
    e. Smith-Cooper International.
    f. Tyco by Johnson Controls Company.
    g. Victaulic Company.

2. Pressure Rating: 175-psig minimum.
3. Uncoated Grooved-End Fittings for Steel Piping: ASTM A47/A47M, malleable-iron casting or ASTM A536, ductile-iron casting, with dimensions matching steel pipe.
4. Grooved-End-Pipe Couplings for Steel Piping: AWWA C606 and UL 213 rigid pattern, unless otherwise indicated, for steel-pipe dimensions. Include ferrous housing sections, EPDM-rubber gasket, and bolts and nuts.

2.3 CPVC TUBE AND FITTINGS

A. Extruded or molded CPVC: Pipe shall meet or exceed the requirements of ASTM F442 material designation CPVC 4120-06 in standard dimension ration (SDR) 13.5.

B. Pipe must be marked with the following pressure ratings: “320 PSI @ 73°F”, “175 PSI @ 150°F” and “100 PSI @ 180°F”.

C. Fittings shall meet or exceed the requirements of ASTM F437 (schedule 80 threaded), ASTM F438 (schedule 40 socket) or ASTM 439 (schedule 80 socket).

D. Pipe compound shall meet cell class 23547 and the fittings compound shall meet cell class 24447 as defined by ASTTM D1784.

E. Both pipe and fittings shall be listed by Underwrites Laboratories for use in automatic fire sprinkler systems and shall bear the logo of the listing agency. See UL Fire Protection Equipment Directory, categories VIWT and HFYH.

F. Both pipe and fittings shall be certified by NSF International for use with potable water.

G. Ancillary products (including, but not limited to fire stops, thread sealants, leak detectors, etc.) coming into contact with pipe and fittings must be chemically compatible with manufacturer's CPVC pipe and fittings.

H. Manufacturer: Subject to compliance with requirements, provide products by the following:

1. BlazeMaster.

2.4 AIR VENT

A. Manual Air Vent/Valve:

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

a. AGF Manufacturing, Inc.
b. National Fittings, Inc.
c. Shurjoint-Apollo Piping Products USA Inc.
d. Victaulic Company.
e. Viking Corporation.

2.
3. Description: Ball valve that requires human intervention to vent air.
4. Body: Forged brass.
5. Ends: Threaded.
6. Minimize Size: 1/2 inch.
7. Minimum Water Working Pressure Rating: 300 psig.

B. Automatic Air Vent:

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

a. AGF Manufacturing, Inc.
b. CLA-VAL.
c. Engineered Corrosion Solutions.
d. Metraflex Company (The).
e. Val-Matic Valve & Manufacturing Corp.

2. Description: Automatic air vent that automatically vents trapped air without human intervention.
3. Standard: UL listed or FM Global approved for use in wet-pipe fire sprinkler systems.
4. Vents oxygen continuously from system.
5. Float valve to prevent water discharge.
6. Minimum Water Working Pressure Rating: 175 psig.

2.5 SPRINKLER PIPING SPECIALTIES

A. Branch Outlet Fittings:

1. Manufacturers: Subject to compliance with requirements, provide products by oen of the following:
   a. Anvil International.
   b. Grinnell; a registered trademark of Tyco International Ltd.
   c. Shurjoint-Apollo Piping Products USA Inc.
   d. Victaulic Compant.

2. Standard: UL 213.
3. Pressure Rating: 175-psig minimum.
4. Body Material: Ductile-iron housing with EPDM seals and bolts and nuts.
5. Type: Mechanical-tee and -cross fittings.
6. Configurations: Snap-on and strapless, ductile-iron housing with branch outlets.
7. Size: Of dimension to fit onto sprinkler main and with outlet connections as required to match connected branch piping.
8. Branch Outlets: Grooved, plain-end pipe, or threaded.
9.

B. Adjustable Drop Nipples:

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

   a. Aegis Technologies, Inc.
   b. CECA, LLC.
   c. CPS Products, Inc.
   d. Merit Manufacturing.

2. Standard: UL 1474.
3. Pressure Rating: 250-psig minimum.
4. Body Material: Steel pipe with EPDM-rubber O-ring seals.
5. Size: Same as connected piping.
6. Length: Adjustable.
7. Inlet and Outlet: Threaded.

C. Flexible Sprinkler Hose Fittings:

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

   a. ALEUM USA.
   b. FlexHead Induistries, Inc.
   c. Gateway Tubing, Inc.
   d. Victaulic Company.

2. Standard: UL 1474.
3. Type: Flexible hose for connection to sprinkler, and with bracket for connection to ceiling grid.
4. Pressure Rating: 175-psig minimum.
5. Size: Same as connected piping, for sprinkler.

2.6 SPRINKLERS

A. Manufacturer: Subject to compliance with requirements, provide products by one of the following:

1. Globe Fire Sprinkler Corporation.
2. Reliable Automatic Sprinkler Co., Inc. (The).
3. Tyco by Johnson Controls Company.
4. Venus Fire Protection Ltd.
5. Victaulic Company.
6. Viking Corporation.

B. Listed in UL's "Fire Protection Equipment Directory" or FM Global's "Approval Guide."

C. Pressure Rating for Automatic Sprinklers: 175-psig minimum.

D. Automatic Sprinklers with Heat-Responsive Element:

1. Early-Suppression, Fast-Response Applications: UL 1767.
2. Nonresidential Applications: UL 199.
3. Characteristics: Nominal 1/2-inch orifice with Discharge Coefficient K of 5.6, and for "Ordinary" temperature classification rating unless otherwise indicated or required by application.

E. Sprinkler Escutcheons: Materials, types, and finishes for the following sprinkler mounting applications. Escutcheons for concealed, flush, and recessed-type sprinklers are specified with sprinklers.

1. Ceiling Mounting: Plastic, white finish, one piece, flat.
2. Sidewall Mounting: Plastic, white finish, one piece, flat.

F. Sprinkler Guards:

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

a. Reliable Automatic Sprinkler Co., Inc. (The).
b. Tyco by Johnson Controls Company.
c. Victaulic Company.
d. Viking Corporation.

2. Standard: UL 199.
3. Type: Wire cage with fastening device for attaching to sprinkler.

2.7 ALARM DEVICES

A. Alarm-device types shall match piping and equipment connections.

B. Water-Flow Indicators:

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

a. ADT Security Services, Inc.

b. McDonnell & Miller.
c. Potter Electric Signal Company, LLC.
d. System Sensor.
e. Tyco by Johnson Controls Company.
f. Viking Corporation.
g. WATTS.

2. Standard: UL 346.
3. Water-Flow Detector: Electrically supervised.
4. Components: Two single-pole, double-throw circuit switches for isolated alarm and auxiliary contacts, 7 A, 125-V ac and 0.25 A, 24-V dc; complete with factory-set, field-adjustable retard element to prevent false signals and tamperproof cover that sends signal if removed.
5. Type: Paddle operated.
6. Pressure Rating: 250 psig.
7. Design Installation: Horizontal or vertical.

PART 3 - EXECUTION

3.1 PREPARATION

A. Perform fire-hydrant flow test according to NFPA 13 and NFPA 291. Use results for system design calculations required in "Quality Assurance" Article.

B. Report test results promptly and in writing.

3.2 PIPING INSTALLATION

A. Locations and Arrangements: Drawing plans, schematics, and diagrams indicate general location and arrangement of piping. Install piping as indicated on approved working plans.

1. Deviations from approved working plans for piping require written approval from authorities having jurisdiction. File written approval with Architect before deviating from approved working plans.
2. Coordinate layout and installation of sprinklers with other construction that penetrates ceilings, including light fixtures, HVAC equipment, and partition assemblies.

B. Piping Standard: Comply with NFPA 13 requirements for installation of sprinkler piping.

C. Use listed fittings to make changes in direction, branch takeoffs from mains, and reductions in pipe sizes.

D. Install unions adjacent to each valve in pipes NPS 2 and smaller.

E. Install flanges, flange adapters, or couplings for grooved-end piping on valves, apparatus, and equipment having NPS 2-1/2 and larger end connections.

F. Install sprinkler piping with drains for complete system drainage.

G. Install hangers and supports for sprinkler system piping according to NFPA 13. Comply with requirements for hanger materials in NFPA 13.

H. Fill sprinkler system piping with water.

I. Install sleeves for piping penetrations of walls, ceilings, and floors.

J. Install escutcheons for piping penetrations of walls, ceilings, and floors.

3.3 JOINT CONSTRUCTION

A. Install couplings, flanges, flanged fittings, unions, nipples, and transition and special fittings that have finish and pressure ratings same as or higher than system's pressure rating for aboveground applications unless otherwise indicated.

B. Install unions adjacent to each valve in pipes NPS 2 and smaller.

C. Install flanges, flange adapters, or couplings for grooved-end piping on valves, apparatus, and equipment having NPS 2-1/2 and larger end connections.

D. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

E. Remove scale, slag, dirt, and debris from inside and outside of pipes, tubes, and fittings before assembly.

F. 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.

G. Steel-Piping, Cut-Grooved Joints: Cut square-edge groove in end of pipe according to AWWA C606. Assemble coupling with housing, gasket, lubricant, and bolts. Join steel pipe and grooved-end fittings according to AWWA C606 for steel-pipe joints.

H. Steel-Piping, Roll-Grooved Joints: Roll rounded-edge groove in end of pipe according to AWWA C606. Assemble coupling with housing, gasket, lubricant, and bolts. Join steel pipe and grooved-end fittings according to AWWA C606 for steel-pipe grooved joints.

I. Dissimilar-Material Piping Joints: Make joints using adapters compatible with materials of both piping systems.

J. Plastic-Piping, Solvent-Cement Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:

1. Comply with ASTM F402 for safe-handling practice of cleaners, primers, and solvent cements. Apply primer.
2. CPVC Piping: Join according to ASTM D2846/D2846M Appendix.

3.4 VALVE AND SPECIALTIES INSTALLATION

A. Install listed fire-protection valves, trim and drain valves, specialty valves and trim, controls, and specialties according to NFPA 13 and authorities having jurisdiction.

B. Air Vent:

1. Provide at least one air vent at high point in each wet-pipe sprinkler system in accordance with NFPA 13 requirements. Connect vent into top of fire sprinkler piping.
2. Provide dielectric union for dissimilar metals, ball valve, and strainer upstream of automatic air vent.

3.5 SPRINKLER INSTALLATION

A. Install sprinklers in suspended ceilings in center of narrow dimension of acoustical ceiling panels.

B. Install sprinklers into flexible, sprinkler hose fittings, and install hose into bracket on ceiling grid.

3.6 IDENTIFICATION

A. Install labeling and pipe markers on equipment and piping according to requirements in NFPA 13.

3.7 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. Leak Test: After installation, charge systems and test for leaks. Repair leaks and retest until no leaks exist.
2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
3. Flush, test, and inspect sprinkler systems according to NFPA 13, "Systems Acceptance" Chapter.
4. Energize circuits to electrical equipment and devices.
5. Coordinate with fire-alarm tests. Operate as required.
6. Coordinate with fire-pump tests. Operate as required.
7. Verify that equipment hose threads are same as local fire department equipment.

B. Sprinkler piping system will be considered defective if it does not pass tests and inspections.

C. Prepare test and inspection reports.

3.8 CLEANING

A. Clean dirt and debris from sprinklers.

B. Only sprinklers with their original factory finish are acceptable. Remove and replace any sprinklers that are painted or have any other finish than their original factory finish.

3.9 PIPING SCHEDULE

A. Sprinkler specialty fittings may be used, downstream of control valves, instead of specified fittings.

B. Standard-pressure, wet-pipe sprinkler system, NPS 2 and smaller, shall be one of the following:

1. Standard-weight, black-steel pipe with threaded ends; uncoated, gray-iron threaded fittings; and threaded joints.
2. Standard-weight, black-steel pipe with cut- or roll-grooved ends; uncoated, grooved-end fittings for steel piping; grooved-end-pipe couplings for steel piping; and grooved joints.
3. Thinwall or Schedule 10 black-steel pipe with roll-grooved ends; uncoated, grooved-end fittings for steel piping; grooved-end-pipe couplings for steel piping; and grooved joints.
4. Schedule 5 steel pipe; steel pressure-seal fittings; and pressure-sealed joints.
5. CPVC extruded or molded pipe and solvent welded fittings.

C. Standard-pressure, wet-pipe sprinkler system, NPS 2-1/2 to NPS 4, shall be one of the following:

1. Standard-weight, black-steel pipe with threaded ends; uncoated, gray-iron threaded fittings; and threaded joints.
2. Standard-weight, black-steel pipe with cut- or roll-grooved ends; uncoated, grooved-end fittings for steel piping; grooved-end-pipe couplings for steel piping; and grooved joints.
3. Thinwall or Schedule 10 black-steel pipe with roll-grooved ends; uncoated, grooved-end fittings for steel piping; grooved-end-pipe couplings for steel piping; and grooved joints.
4. CPVC extruded or molded pipe and solvent welded fittings.

3.10 SPRINKLER SCHEDULE

A. Use sprinkler types in subparagraphs below for the following applications:

1. Rooms without ceilings: Upright sprinklers.
2. Rooms with Suspended Ceilings: Concealed sprinklers.
3. Wall Mounting: Sidewall sprinklers.

B. Provide sprinkler types in subparagraphs below with finishes indicated.

1. Concealed Sprinklers: Rough brass, with factory-painted white cover plate.
2. Upright, pendent, and sidewall sprinklers: Chrome plated in finished spaces exposed to view; rough bronze in unfinished spaces not exposed to view; wax coated where exposed to acids, chemicals, or other corrosive fumes.

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. Equipment Label Schedule: Include a listing of all equipment to be labeled with the proposed content for each label.

C. Valve numbering scheme.

D. Valve Schedules: For each piping system to include in maintenance manuals.

PART 2 - PRODUCTS

2.1 EQUIPMENT LABELS

A. Metal Labels for Equipment:

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

a. Brady Corporation.
b. Brimar Industries, Inc.
c. Craftmark Pipe Markers.
d. Emedco.
e. Kolbi Pipe Marker Co.
f. LEM Products Inc.
g. Seton Identification Products; a Brady Corporation company.

1. Material and Thickness: Brass, 0.032-inch; stainless steel, 0.025-inch; or aluminum, 0.032-inch minimum thickness, and having predrilled or stamped holes for attachment hardware.

2. Letter Color: White.
3. Background Color: Black.
4. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
5. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-quarters the size of principal lettering.
6. Fasteners: Stainless-steel rivets or self-tapping screws.
7. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

B. Plastic Labels for Equipment:

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

    a. Brady Corporation.
    b. Brimar Industries, Inc.
    c. Craftmark Pipe Markers.
    d. Emedco.
    e. Kolbi Pipe Marker Co.
    f. LEM Products Inc.
    g. Seton Identification Products; a Brady Corporation company.

2. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/16 inch thick, and having predrilled holes for attachment hardware.
3. Letter Color: White.
4. Background Color: Black.
5. Maximum Temperature: Able to withstand temperatures up to 160 deg F.
6. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
7. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-quarters the size of principal lettering.
8. Fasteners: Stainless-steel rivets or self-tapping screws.
9. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

C. Label Content: Include equipment's Drawing designation or unique equipment number. Owner may have an existing numbering scheme they would like to use.

D. Equipment Label Schedule: For each item of equipment to be labeled, on 8-1/2-by-11-inch bond paper. Tabulate equipment identification number and identify Drawing numbers where equipment is indicated (plans, details, and schedules) and the Specification Section number and title where equipment is specified. Equipment schedule shall be included in operation and maintenance data.

2.2 WARNING SIGNS AND LABELS

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

1. Brady Corporation.
2. Brimar Industries, Inc.

3. Craftmark Pipe Markers.
4. Emedco.
5. LEM Products Inc.
6. Natinal Marker Company.
7. Seton Identification Products; a Brady Corporation company.
8. 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. Craftmark Pipe Markers.
5. Emedco.
6. Kolbi Pipe Marker Co.
7. LEM Products Inc.
8. 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. Craftmark Pipe Markers.
5. Emedco.
6. Kolbi Pipe Marker Co.
7. LEM Products Inc.
8. 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. Craftmark Pipe Markers.
4. Emedco.
5. Kolbi Pipe Marker Co.
6. LEM Products Inc.
7. 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 or reinforced grommet and wire or string.
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. Low-Pressure Compressed Air Piping:

    a. Background: Blue.
    b. Letter Colors: White.

2. Domestic Cold Water Piping:

    a. Background: Green.
    b. Letter Colors: White.

3. Domestic Hot Water Piping:

    a. Background: Yellow.
    b. Letter Colors: Black.

4. Sanitary Waste and Storm Drainage Piping:

    a. Background Color: 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.
    c. Low-Pressure Compressed Air: 1-1/2 inches, round.

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. Domestic recirculating hot-water piping.
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.

PART 2 - PRODUCTS

2.1 INSULATION MATERIALS

A. Comply with requirements in "Piping Insulation Schedule, General" and "Indoor Piping Insulation Schedule" articles for where insulating materials shall be applied.

B. Products shall not contain asbestos, lead, mercury, or mercury compounds.

C. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.

D. Flexible Elastomeric: Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C534/C534M, Type I for tubular materials.

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

a. Aeroflex USA.
b. Armacell LLC.
c. K-Flex USA.

E. Mineral-Fiber, Preformed Pipe: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C547.

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

a. Johns Manville; a Berkshire Hathaway company.
b. Knauf Insulation.
c. Manson Insulation Inc.
d. Owens Corning.

2.
3. Preformed Pipe Insulation: Type I, Grade A, with factory-applied ASJ-SSL.
4. 850 deg F.
5. Factory fabricate shapes in accordance with ASTM C450 and ASTM C585.
6. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

2.2 INSULATING CEMENTS

A. Mineral-Fiber Insulating Cement: Comply with ASTM C195.

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

    a. Ramco Insulation, Inc.

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. FSK Jacket: Aluminum-foil-face, fiberglass-reinforced scrim with kraft-paper backing.

C. 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.

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 Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.

B. 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.

C. 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.

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. Sanitary Waste Piping Where Heat Tracing Is Installed:

1. All Pipe Sizes: Insulation shall be the following:

a. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1-1/2 inches 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. If more than one material is listed, selection from materials listed is Contractor's option.

C. Piping, Exposed:

1. 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. Piping joining materials.
3. Transition fittings.
4. Dielectric fittings.

1.3 ACTION SUBMITTALS

A. Product Data:

1. Pipe and tube.
2. Fittings.
3. Joining materials.
4. Transition fittings.

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

A. Potable-water piping and components shall comply with NSF 14, NSF 61, and NSF 372. Include marking "NSF-pw" on piping.

2.2 COPPER TUBE AND FITTINGS

A. Drawn-Temper Copper Tube: ASTM B88, Type L.

B. Wrought-Copper, Solder-Joint Fittings: ASME B16.22, pressure fittings.

C. Wrought Copper Unions: ASME B16.22.

D. Grooved, Mechanical-Joint, Copper Tube Appurtenances:

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

a. Anvil International.
b. Grinnel G-Fire by Johnson Controls Company.

c. Shurjoint-Apollo Piping Products USA Inc.
d. Victaulic Company.

2. Grooved-End, Copper Fittings: ASTM B75 copper tube or ASTM B584 bronze castings.
3. Grooved-End-Tube Couplings: To fit copper-tube dimensions; rigid pattern unless otherwise indicated; gasketed fitting, EPDM-rubber gasket, UL classified per NSF 61 and NSF 372, and rated for minimum 180 deg F, for use with ferrous housing and steel bolts and nuts; 300 psig minimum CWP pressure rating.

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.

F. Copper-Tube, Push-on-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. Elkhart Products Corporation.
c. NIBCO INC.
d. Victaulic Company.

2. Description:

a. Cast-copper fitting complying with ASME B16.18 or wrought-copper fitting complying with ASME B 16.22.
b. Stainless steel teeth and EPDM-rubber, O-ring seal in each end instead of solder-joint ends.

2.3 PIPING JOINING MATERIALS

A. Pipe-Flange Gasket Materials:

1. AWWA C110/A21.10, rubber, flat face, 1/8 inch thick or ASME B16.21, nonmetallic and asbestos free unless otherwise indicated.
2. Full-face or ring type unless otherwise indicated.

B. Metal, Pipe-Flange Bolts and Nuts: ASME B18.2.1, carbon steel unless otherwise indicated.

C. Solder Filler Metals: ASTM B32, lead-free alloys.

D. Flux: ASTM B813, water flushable.

E. Solvent Cements for Joining CPVC Piping and Tubing: ASTM F493.

F. Solvent Cements for Joining PVC Piping: ASTM D2564. Include primer according to ASTM F656.

2.4 TRANSITION FITTINGS

A. General Requirements:

1. Same size as pipes to be joined.
2. Pressure rating at least equal to pipes to be joined.
3. End connections compatible with pipes to be joined.

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.

2.5 DIELECTRIC FITTINGS

A. General Requirements: Assembly of copper alloy and ferrous materials with separating nonconductive insulating material. Include end connections compatible with pipes to be joined.

B. Dielectric Unions:

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

a. A.Y. McDonald Mfg. Co.
b. Capitol Manufacturing Company.
c. Central Plastics Company.
d. HART Industrial Unions, LLC.
e. Jomar Valve.
f. Matco-Norca.
g. WATTS.
h. Wilkins.
i. Zurn Industries, LLC.

2. Standard: ASSE 1079.
3. Pressure Rating: 125 psig minimum at 180 deg F.
4. End Connections: Solder-joint copper alloy and threaded ferrous.

C. Dielectric Flanges:

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. Factory-fabricated, bolted, companion-flange assembly.
4. Pressure Rating: 125 psig minimum at 180 deg F.

5. End Connections: Solder-joint copper alloy and threaded ferrous; threaded solder-joint copper alloy and threaded ferrous.

D. 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. 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.

D. Aboveground domestic water piping, NPS 2-1/2 to NPS 4, 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. Drawn-temper copper tube, ASTM B88, Type L; grooved-joint, copper-tube appurtenances; and grooved joints.

3.2 INSTALLATION OF PIPING

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of domestic water piping. Indicated locations and arrangements are used to size pipe and calculate friction loss, expansion, and other design considerations. Install piping as indicated unless deviations to layout are approved on coordination drawings.

B. Install valves according to Section 220500 "Common Work Results for Plumbing."

C. Install domestic water piping level with 0.25 percent slope downward toward drain and plumb.

D. Rough-in domestic water piping for water-meter installation according to utility company's requirements.

E. Install piping concealed from view and protected from physical contact by building occupants unless otherwise indicated and except in equipment rooms and service areas.

F. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

G. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal, and coordinate with other services occupying that space.

H. Install piping to permit valve servicing.

I. Install nipples, unions, special fittings, and valves with pressure ratings the same as or higher than the system pressure rating used in applications below unless otherwise indicated.

J. Install piping free of sags and bends.

K. Install fittings for changes in direction and branch connections.

L. Install unions in copper tubing at final connection to each piece of equipment, machine, and specialty.

M. 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.
2. Install thermostats in hot-water circulation piping.
3. Install sleeves for piping penetrations of walls, ceiling, and floors.
4. Install sleeve seals for piping penetrations of concrete walls and slabs.
5. Install escutcheons for piping penetrations of walls, ceilings, and floors.

3.3 JOINT CONSTRUCTION

A. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

B. Remove scale, slag, dirt, and debris from inside and outside of pipes, tubes, and fittings before assembly.

C. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

1. Apply appropriate tape or thread compound to external pipe threads.
2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged.

D. 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. Joint Construction for Grooved-End Copper Tubing: Make joints according to AWWA C606. Roll groove ends of tubes. Lubricate and install gasket over ends of tubes or tube and fitting. Install coupling housing sections over gasket with keys seated in tubing grooves. Install and tighten housing bolts.

G. Joint Construction for Grooved-End Steel Piping: Make joints according to AWWA C606. Square cut or roll groove ends of pipe as specified. 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.

H. Joints for Dissimilar-Material Piping: Make joints using adapters compatible with materials of both piping systems.

3.4 INSTALLATION OF TRANSITION FITTINGS

A. Install transition couplings at joints of dissimilar piping.

B. Transition Fittings in 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.

3.5 INSTALLATION OF DIELECTRIC FITTINGS

A. Install dielectric fittings in piping at connections of dissimilar metal piping and tubing.

B. Dielectric Fittings for NPS 2 and Smaller: Use dielectric couplings, nipples, or unions.

C. Dielectric Fittings for NPS 2-1/2 to NPS 4: Use dielectric flanges or nipples.

3.6 INSTALLATION OF HANGERS AND SUPPORTS

A. Comply with requirements for hangers, supports, and anchor devices in Section 220500 "Common Work Results for Plumbing."

3.7 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. When installing piping adjacent to equipment and machines, allow space for service and maintenance.

C. Connect domestic water piping to exterior water-service piping. Use transition fitting to join dissimilar piping materials.

3.8 IDENTIFICATION

A. Identify system components. Comply with requirements for identification materials and installation in Section 220553 "Identification for Plumbing Piping and Equipment."

3.9 ADJUSTING

A. Perform the following adjustments before operation:

1. Close drain valves, hydrants, and hose bibbs.
2. Open shutoff valves to fully open position.
3. Open throttling valves to proper setting.
4. Adjust balancing valves in hot-water-circulation return piping to provide adequate flow.

    a. Manually adjust ball-type balancing valves in hot-water-circulation return piping to provide hot-water flow in each branch.
    b. Adjust calibrated balancing valves to flows indicated.

5. Remove plugs used during testing of piping and for temporary sealing of piping during installation.
6. Remove and clean strainer screens. Close drain valves and replace drain plugs.
7. Remove filter cartridges from housings and verify that cartridges are as specified for application where used and are clean and ready for use.
8. Check plumbing specialties and verify proper settings, adjustments, and operation.

3.10 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. Piping Inspections:

    a. Do not enclose, cover, or put piping into operation until it has been inspected and approved by authorities having jurisdiction.
    b. During installation, notify authorities having jurisdiction at least one day before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction:

        1) Roughing-in Inspection: Arrange for inspection of piping before concealing or closing in after roughing in and before setting fixtures.
        2) Final Inspection: Arrange for authorities having jurisdiction to observe tests specified in "Piping Tests" Subparagraph below and to ensure compliance with requirements.

c. Reinspection: If authorities having jurisdiction find that piping will not pass tests or inspections, make required corrections and arrange for reinspection.
d. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.

2. Piping Tests:

a. Fill domestic water piping. Check components to determine that they are not air bound and that piping is full of water.
b. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit a separate report for each test, complete with diagram of portion of piping tested.
c. Leave new, altered, extended, or replaced domestic water piping uncovered and unconcealed until it has been tested and approved. Expose work that was covered or concealed before it was tested.
d. Cap and subject piping to static water pressure of 50 psig above operating pressure, without exceeding pressure rating of piping system materials. Isolate test source and allow it to stand for four hours. Leaks and loss in test pressure constitute defects that must be repaired.
e. 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.

3.11 CLEANING

A. Clean and disinfect potable domestic water piping as follows:

1. Purge new piping and parts of existing piping that have been altered, extended, or repaired before using.
2. Use purging and disinfecting procedures prescribed by authorities having jurisdiction; if methods are not prescribed, use procedures described in either AWWA C651 or AWWA C652 or follow procedures described below:

a. Flush piping system with clean, potable water until dirty water does not appear at outlets.
b. Fill and isolate system according to either of the following:

1) Fill system or part thereof with water/chlorine solution with at least 50 ppm of chlorine. Isolate with valves and allow to stand for 24 hours.
2) Fill system or part thereof with water/chlorine solution with at least 200 ppm of chlorine. Isolate and allow to stand for three hours.

c. Flush system with clean, potable water until no chlorine is in water coming from system after the standing time.
d. Repeat procedures if biological examination shows contamination.
e. Submit water samples in sterile bottles to authorities having jurisdiction.

B. Clean non-potable domestic water piping as follows:

1. Purge new piping and parts of existing piping that have been altered, extended, or repaired before using.
2. Use purging procedures prescribed by authorities having jurisdiction or; if methods are not prescribed, follow procedures described below:

a. Flush piping system with clean, potable water until dirty water does not appear at outlets.
b. Submit water samples in sterile bottles to authorities having jurisdiction. Repeat procedures if biological examination shows contamination.

C. Prepare and submit reports of purging and disinfecting activities. Include copies of water-sample approvals from authorities having jurisdiction.

D. Clean interior of domestic water piping system. Remove dirt and debris as work progresses.

END OF SECTION

SECTION 221119 - DOMESTIC WATER PIPING SPECIALTIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Balancing valves.
2. Temperature-actuated, water mixing valves.
3. Strainers for domestic water piping.
4. Wall hydrants.
5. Roof hydrants.
6. Drain valves.
7. Water-hammer arresters.
8. Flexible connectors.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For domestic water piping specialties.

1. Include diagrams for power, signal, and control wiring.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For domestic water piping specialties to include in emergency, operation, and maintenance manuals.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR PIPING SPECIALTIES

A. Domestic water piping specialties intended to convey or dispense water for human consumption are to comply with the SDWA, requirements of authorities having jurisdiction, and NSF 61 and NSF 372, or to be certified in compliance with NSF 61 and NSF 372 by an American National Standards Institute (ANSI)-accredited third-party certification body that the weighted average lead content at wetted surfaces is less than or equal to 0.25 percent.

2.2 PERFORMANCE REQUIREMENTS

A. Minimum Working Pressure for Domestic Water Piping Specialties: 125 psig unless otherwise indicated.

2.3 BALANCING VALVES

A. Copper-Alloy Calibrated Balancing Valves:

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

    a. Bell & Gossett; a Xylem brand.
    b. Hydronic Components Inc.
    c. IMI Hydronic Engineering Inc.
    d. Jomar Valve.
    e. Nexus Valve, Inc.
    f. NIBCO INC.
    g. WATTS.

2. Type: Ball or Y-pattern globe valve with two readout ports and memory-setting indicator.
3. Body: Brass 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.

2.4 TEMPERATURE-ACTUATED, WATER MIXING VALVES

A. Water-Temperature Limiting Devices:

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

    a. Acorn Engineering Company; A Division of Morris Group International.
    b. Apollo Valves; a part of Aalberts Integrated Piping Systems.
    c. Cash Acme, A Division of Reliance Worldwide Corporation.
    d. Leonard Valve Company.
    e. POWERS; A WATTS Brand.
    f. Symmons Industries, Inc.
    g. Taco Comfort Solutions, Inc.
    h. WATTS.
    i. Zurn Industries, LLC.

2. Standard: ASSE 1070.
3. Pressure Rating: 125 psig.
4. Type: Thermostatically controlled, water mixing valve.
5. Material: Bronze body with corrosion-resistant interior components.
6. Connections: Threaded union inlets and outlet.
7. Accessories: Check stops on hot- and cold-water supplies, and adjustable, temperature-control handle.
8. Valve Finish: Rough bronze.

2.5 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 for NPS 2 and smaller; cast iron with interior lining that complies with AWWA C550 or that is FDA approved, epoxy coated and for NPS 2-1/2 and larger.
4. End Connections: Threaded for NPS 2 and smaller; flanged for NPS 2-1/2 and larger.
5. Screen: Stainless steel with round perforations unless otherwise indicated.
6. Drain: Pipe plug, or factory-installed, hose-end drain valve.

2.6 WALL HYDRANTS

A. Nonfreeze Vacuum Breaker Wall Hydrants:

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

    a. A.Y. McDonald Mfg. Co.
    b. Champion – Arrowhead.
    c. Jay R. Smith Mfg Co; a division of Morris Group International.
    d. Prier Products, Inc.

e. WATTS.
f. Woodford Manufacturing Company.
g. Zurn Industries, LLC.

2. Standard: ASSE 1019, Type A or Type B.
3. Type: Automatic draining with integral air-inlet valve.
4. Integral anti-siphon vacuum breaker/backflow preventer.
5. Pressure Rating: 125 psig.
6. Operation: Loose key.
7. Casing and Operating Rod: Of length required to match wall thickness. Include wall clamp.
8. Inlet: NPS 3/4.
9. Outlet: Exposed with garden-hose thread complying with ASME B1.20.7.

2.7 ROOF HYDRANTS

A. Nonfreeze, Draining-Type Roof Hydrants:

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

a. A.Y. McDonald Mfg. Co.
b. Champion – Arrowhead.
c. Jay R. Smith Mfg Co; a division of Morris Group International.
d. Prier Products, Inc.
e. WATTS.
f. Woodford Manufacturing Company.
g. Zurn Industries, LLC.

2. Standard: ASME A112.21.3M.
3. Type: Nonfreeze, exposed-outlet roof hydrant with coated cast-iron head and lift handle with lock option. Provide with deck flange and under deck clamp.
4. Casing and Operating Rod: Bronze interior parts, galvanized-steel casing, and bronze valve housing designed with hole to drain.
5. Inlet: NPS 3/4.
6. Outlet: Garden-hose thread complying with ASME B1.20.7.
7. Vacuum Breaker:

a. Nonremovable, drainable, hose-connection vacuum breaker complying with ASSE 1011 or backflow preventer complying with ASSE 1052.
b. Garden-hose thread complying with ASME B1.20.7 on outlet.

2.8 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.

2.9 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: Metal bellows, piston, or diaphragm.
4. Size: ASSE 1010, Sizes AA and A through F, or PDI-WH 201, Sizes A through F.

2.10 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.
3. End Connections NPS 2-1/2 and Larger: Flanged steel nipple.

PART 3 - EXECUTION

3.1 INSTALLATION OF PIPING SPECIALTIES

A. Balancing Valves: Install in locations where they can easily be adjusted. Set at indicated design flow rates.

B. Temperature-Actuated, Water Mixing Valves: Install with check stops or shutoff valves on inlets and with shutoff valve on outlet.

1. Install cabinet-type units recessed in or surface mounted on wall as specified.

C. Y-Pattern Strainers: For water, install on supply side of each pump.

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.

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. 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 unit operation.
3. 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. PVC pipe and fittings.
4. Specialty pipe fittings.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.4 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. 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. Mission Rubber Company, LLC; a division of MCP Industries.
i. 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. Mission Rubber Company, LLC; a division of MCP Industries.
g. 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 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.

2.6 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.

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 at indicated slopes.

F. Install piping free of sags and bends.

G. Install fittings for changes in direction and branch connections.

H. Install piping to allow application of insulation.

I. 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.

J. 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.

K. Install soil and waste and vent piping at the following minimum slopes unless otherwise indicated:

1. Horizontal Sanitary Waste Piping: 2 percent downward in direction of flow for piping NPS 2 1/2 and smaller; 1 percent downward in direction of flow for piping NPS 3 and larger.
2. Vent Piping: 1 percent down toward vertical fixture vent or toward vent stack.

L. 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."

M. Install aboveground PVC piping according to ASTM D 2665.

N. Install underground PVC piping according to ASTM D 2321.

O. 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. 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."

P. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.

Q. Install sleeves for piping penetrations of walls, ceilings, and floors.

1. Comply with requirements for sleeves specified in Section 220500 "Common Work Results for Plumbing."

R. Install sleeve seals for piping penetrations of concrete walls and slabs.

1. Comply with requirements for sleeve seals specified in Section 220500 "Common Work Results for Plumbing."

S. 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. 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. 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.

3.5 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."

3.6 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."

D. Where installing piping adjacent to equipment, allow space for service and maintenance of equipment.

3.7 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."

3.8 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 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.

3.9 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.

3.10 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. Solid-wall PVC pipe, PVC socket fittings, and solvent-cemented joints.
4. 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.

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 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. Tyler Pipe; a subsidiary of McWane Inc.
d. WATTS.
e. 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 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. Sioux Chief Manufacturing Company, Inc.
    d. WATTS.
    e. Zurn Industries, LLC.

2. Standard: ASME A112.36.2M.
3. Size: Same as connected branch.
4. Type: Threaded, adjustable housing.
5. Body or Ferrule: Cast iron.
6. Clamping Device: Not required.
7. Outlet Connection: as required to match connected piping.
8. Closure: ABS tapered plug.
9. Adjustable Housing Material: Cast iron with threads.
10. Frame and Cover Material and Finish: Nickel-bronze, copper alloy.
11. Frame and Cover Shape: Round.
12. Top-Loading Classification: Light **d**uty.
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.

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. Oatey.
b. ProVent Systems.
c. 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. 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.

B. 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.

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 frost-resistant vent terminals on each vent pipe passing through roof. Maintain 1-inch clearance between vent pipe and roof substrate.

F. Install wood-blocking reinforcement for wall-mounting-type specialties.

G. 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.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

PART 2 - PRODUCTS

2.1 DRAIN ASSEMBLIES

A. Sanitary drains shall bear label, stamp, or other markings of specified testing agency.

B. Comply with NSF 14 for plastic sanitary piping specialty components.

2.2 FLOOR DRAINS

A. Cast-Iron Floor Drains (FD-1):

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.
3. Pattern: Floor drain.
4. Body Material: Gray iron.
5. Seepage Flange: Required.
6. Anchor Flange: Required.
7. Clamping Device: Required.
8. Outlet: Bottom.

9. Backwater Valve: Not required.
10. Coating on Interior and Exposed Exterior Surfaces: Not required.
11. Sediment Bucket: Not required.
12. Top of Body and Strainer Finish: Stainless steel, hell-proof.
13. Top Shape: Square.
14. Top Loading Classification: Medium Duty.
15. Funnel: Not required.
16. Inlet Fitting: 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.

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. Mission Rubber Company, LLC; a division of MCP Industries.
h. NewAge Casting.
i. 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 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.

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. Install piping at the following minimum slopes unless otherwise indicated:

1. Horizontal Storm Drainage Piping: 1 percent downward in direction of flow.

L. 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."

M. Install aboveground PVC piping according to ASTM D 2665.

N. Install underground PVC piping according to ASTM D 2321.

O. 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."

P. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.

Q. Install sleeves for piping penetrations of walls, ceilings, and floors.

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. 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.

C. 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.

D. 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.

E. 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 rigid sway bracing for pipe and fittings 4 inches and larger, upstream and downstream of all changes in direction 45 degrees and greater.

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 2-1/2 to NPS 4: Use dielectric flanges.

3.5 INSTALLATION OF HANGERS AND SUPPORTS

A. Comply with requirements for hangers, supports, and anchor devices specified in Section 220500 "Common Work Results for Plumbing."

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 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 flanges, in piping NPS 2-1/2 and larger, adjacent to flanged valves and at final connection to each piece of equipment.

3.7 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.

3.8 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.

3.9 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. Solid-wall PVC pipe, PVC socket fittings, and solvent-cemented joints.
4. Dissimilar Pipe-Material Couplings: Shielded, nonpressure transition couplings.

C. 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 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.

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. Miscellaneous storm drainage piping specialties.
2. 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 MISCELLANEOUS STORM DRAINAGE PIPING SPECIALTIES

A. 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: “Cow tongue” zozzle with wall flange and mounting holes to cover rough opening and serve as anchor.
3. Size: Same as connected piping.
4. Material: Cast bronze or nickel bronze nozzle and flange.
5. Piping Connection Type: No-hub.

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. Tyler Pipe; a subsidiary of McWane Inc.
    d. Wade; a subsidiary of McWane Inc.
    e. WATTS.
    f. 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, brass plug.
6. Closure Plug Size: Same as, or not more than, one size smaller than cleanout size.

B. 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. Tyler Pipe; a subsidiary of McWane Inc.
    d. Wade; a subsidiary of McWane Inc.
    e. WATTS.
    f. 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.
    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.

C. 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. Tyler Pipe; a subsidiary of McWane Inc.
    d. WATTS.
    e. 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 downspout nozzles at exposed bottom of conductors where they spill onto grade.

B. 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.
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.

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 test tees in vertical conductors and near floor.

E. Install wall cleanouts in vertical conductors. Install access door in wall if indicated.

F. Install through-penetration firestop assemblies for penetrations of fire- and smoke-rated assemblies.

1. Comply with requirements in Section 078413 "Penetration Firestopping."

3.2 CONNECTIONS

A. Comply with requirements for piping specified in Section 221413 "Facility Storm Drainage Piping." Drawings indicate general arrangement of piping, fittings, and specialties.

3.3 INSTALLATION OF FLASHING

A. Fabricate flashing from single piece of metal unless large pans, sumps, or other drainage shapes are required.

B. Install sheet flashing on pipes, sleeves, and specialties passing through or embedded in floors and roofs with waterproof membrane.

C. Set flashing on floors and roofs in solid coating of bituminous cement.

D. Secure flashing into sleeve and specialty clamping ring or device.

3.4 PROTECTION

A. Protect drains during remainder of construction period to avoid clogging with dirt or debris and to prevent damage from traffic or construction work.

B. Place plugs in ends of uncompleted piping at end of each day or when work stops.

END OF SECTION

SECTION 224213.13 - COMMERCIAL WATER CLOSETS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Floor-mounted, bottom-outlet water closets.
2. Flushometer valves.
3. Toilet seats.

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.

PART 2 - PRODUCTS

2.1 FLOOR-MOUNTED, BOTTOM-OUTLET WATER CLOSETS

A. Water Closets, Floor Mounted, Bottom Outlet, Top Spud:

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

a. American Standard.
b. Kohler Co.
c. Mansfield Plumbing Products LLC.
d. Sloan Valve Company.
e. TOTO USA, Inc.
f. Zurn Industries, LLC.

2. Bowl:

a. Standards: ASME A112.19.2/CSA B45.1 and ASME A112.19.5.
b. Material: Vitreous china.
c. Type: Siphon jet.
d. Style: Flushometer valve.
e. Height: Standard (WC-2) & Handicapped/elderly, complying with ICC/ANSI A117.1 (WC-1).
f. Rim Contour: Elongated.
g. Water Consumption: 1.6 gal. per flush.
h. Spud Size and Location: NPS 1-1/2; top.
i. Color: White.

3. Bowl-to-Drain Connecting Fitting: ASTM A1045 or ASME A112.4.3.
4. Flushometer Valve: Semi-red brass construction with synthetic rubber diaphragm.

2.2 FLUSHOMETER VALVES

A. Battery-Powered, 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.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine roughing-in of water supply and sanitary drainage and vent piping systems to verify actual locations of piping connections before water-closet installation.

B. Examine walls and floors for suitable conditions where water closets will be installed.

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

3.2 INSTALLATION, GENERAL

A. Water-Closet Installation:

1. Install level and plumb according to roughing-in drawings.
2. Install floor-mounted water closets on bowl-to-drain connecting fitting attachments to piping or building substrate.

B. 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 actuators in locations that are easy for people with disabilities to reach.
4. Install fresh batteries in battery-powered, electronic-sensor mechanisms.

C. Install toilet seats on water closets.

D. 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."

E. 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.

PART 2 - PRODUCTS

2.1 WALL-HUNG URINALS

A. Urinals, Wall Hung, Back Outlet, Washdown:

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. Include rectangular, steel uprights.
6. Urinal Mounting Height: Standard and Handicapped/elderly according to ICC A117.1. Refer to architectural plans and elevations for locations.

2.2 URINAL FLUSHOMETER VALVES

A. Battery-Powered, 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 3/4.

2.3 SUPPORTS

A. Type I Urinal Carrier:

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

    a. Jay R. Smith Mfg Co; a division of Morris Group International.
    b. Josam Company.
    c. Wade Drains.
    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 urinal installation.

B. Examine walls and floors for suitable conditions where urinals will be installed.

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

3.2 INSTALLATION

A. Urinal Installation:

1. Install urinals level and plumb according to roughing-in drawings.
2. Install wall-hung, back-outlet urinals onto waste fitting seals and attached to supports.
3. Install accessible, wall-mounted urinals at mounting height for the handicapped/elderly, according to ICC/ANSI A117.1.

B. Support Installation:

1. Install supports, affixed to building substrate, for wall-hung urinals.
2. Use off-floor carriers with waste fitting and seal for back-outlet urinals.
3. Use 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 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."

3.3 CONNECTIONS

A. Connect urinals with water supplies and soil, waste, and vent piping. Use size fittings required to match urinals.

B. Comply with water piping requirements specified in Section 221116 "Domestic Water Piping."

C. Comply with soil and waste piping requirements specified in Section 221316 "Sanitary Waste and Vent Piping."

D. Where installing piping adjacent to urinals, allow space for service and maintenance.

3.4 ADJUSTING

A. Operate and adjust urinals and controls. Replace damaged and malfunctioning urinals, fittings, and controls.

B. Adjust water pressure at flushometer valves to produce proper flow.

C. Install fresh batteries in battery-powered, electronic-sensor mechanisms.

3.5 CLEANING AND PROTECTION

A. Clean urinals and fittings with manufacturers' recommended cleaning methods and materials.

B. Install protective covering for installed urinals and fittings.

C. Do not allow use of urinals for temporary facilities unless approved in writing by Owner.

END OF SECTION

SECTION 224216.13 - COMMERCIAL LAVATORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Vitreous-china, counter-mounted lavatories.
2. Solid surface, wall-mounted, single-basin, multi-station, lavatories.
3. Automatically operated lavatory faucets.
4. Supply fittings.
5. Waste fittings.
6. 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.

B. Shop Drawings: Include diagrams for power, signal, and control wiring of automatic faucets.

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.

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. Support: Type II, concealed-arm lavatory carrier. Include rectangular, steel uprights where necessary.
4. Lavatory Mounting Height: Coordinate with architectural elevations.

2.2 SOLID SURFACE, WALL-MOUNTED, SINGLE-BASIN, MULTI-STATION LAVATORIES

A. Lavatory - Rectangular Countertop Deck with Integral Angled Basin:

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

    a. Acorn.
    b. Bradley.
    c. Sloan.
    d. Trueform Concrete, LLC.

2. Basin(s) and Countertop:

    a. Standard: CSA B45, IAPMO.
    b. Type: Monolithic, rectangular front and sides.
    c. Number of Stations: Three.
    d. Faucet-Hole Punching (per Station): Three-holes, 4-inch centerset.
    e. Faucet-Hole Location: Top.
    f. Color: Custom, by Architect.
    g. Mounting: Concrete wall brackets.

3. Waste Fittings:

a. Standard: ASME A112.18.2/CSA B125.2.
b. Connection: 1-1/4-inch fine thread tailpiece.
c. Finish: Polished chrome.

4. Support: Manufacturer's standard product.
5. Lavatory Mounting Height: Coordinate with architectural elevations.
6. Stainless steel under-counter enclosure, easily removable for access to under-counter piping and components.

2.3 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. American Standard.
b. Chicago Faucets; Geberit Company.
c. Kohler Co.
d. Sloan Valve Company.
e. Speakman Company.
f. Symmons.
g. T&S Brass and Bronze Works, Inc.
h. TOTO USA, INC.
i. 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.

2.4 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.

2.5 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.

2.6 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.
3. Supply fittings.
4. Waste fittings.

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 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.

PART 2 - PRODUCTS

2.1 SERVICE BASINS

A. Service Basins: Terrazzo, floor mounted.

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. Fiat Products.
c. Florestone Products Co., Inc.
d. Stern-Williams Co., Inc.

2. Fixture:

    a. Standard: IAPMO Z403.
    b. Shape: Square.
    c. Nominal Size: 24 by 24 inches.
    d. Height: 12 inches with dropped front.
    e. Tiling Flange: Not required.
    f. Rim Guard: Stainless steel on all top surfaces.
    g. Color: Manufacturer's standard.
    h. Drain: Grid with NPS 3 outlet.

3. Mounting: On floor and flush to wall.
4. Faucet:

    a. Manual type, two lever handle, wall mounted, with top-mounted supplies upturned 90 degrees for surface mounting of supply lines.
    b. 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.

    c. Standard: ASME A112.18.1/CSA B125.1.
    d. General: Include hot- and cold-water indicators.
    e. Body Type: Widespread.
    f. Body Material: Commercial, solid brass.
    g. Finish: Chrome plated
    h. Maximum Flow Rate: 2.2 gpm.
    i. Handle(s): Cross, four arm.
    j. Mounting Type: Back/wall, exposed.
    k. Spout Type: Rigid, solid brass with wall brace.
    l. Vacuum Breaker: Required for hose outlet.
    m. Spout Outlet: Hose thread.

2.2 STAINLESS STEEL SINKS

A. Single Bowl Sink: Drop-in.

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

    a. Acorn Engineering Company, Inc.
    b. Elkay Manufacturing Company.

c. Just Manufacturing.
d. Kohler Co.
e. Moen Incorporated.

2. Fixture:

a. Standard: ASME A112.19.3/CSA B45.4 and ADA & ICC A117.1.
b. Metal thickness: 18 gauge.
c. Dimensions

1) Overall: 25” long x 22” wide x 5-1/2” deep.
2) Bowl: 21” wide x 15-3/4” wide x 5-1/8” deep.

3. Faucet:

a. NSF Standard: Comply with NSF 372 for faucet-spout materials that will be in contact with potable water.
b. Manual type, two lever handle.
c. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1) American Standard.
2) Bradley Corporation.
3) Chicago Faucets; Geberit Company.
4) Delta Faucet Company.
5) Elkay.
6) GROHE America, Inc.
7) Just Manufacturing.
8) Kohler Co.
9) Moen Incorporated.
10) Sloan Valve Company.
11) Speakman Company.
12) T&S Brass and Bronze Works, Inc.
13) Zurn Industries, LLC.

d. Standard: ASME A112.18.1/CSA B125.1, ADA ANSI/ICC A117.1, NSF/ANSI/CAN 61
e. General: Include hot- and cold-water indicators; coordinate faucet inlets with supplies and fixture hole punchings; coordinate outlet with spout and sink receptor.
f. Body Type: Widespread.
g. Body Material: Commercial, solid brass.
h. Finish: Polished chrome plate.
i. Maximum Flow Rate: 1.5 gpm.
j. Handles: Wrist blade, 4 inches.
k. Mounting Type: Deck, exposed.
l. Spout Type: Swivel gooseneck.

2.3 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 stainless-steel flexible hose.

2.4 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.
2. Material: Chrome-plated, two-piece, cast-brass trap and swivel elbow with 0.032-inch-thick brass tube to wall; and chrome-plated brass or steel wall flange.

2.5 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. Set floor-mounted sinks in leveling bed of cement grout.

C. Install water-supply piping with stop on each supply to each sink faucet.

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 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."

F. Install protective shielding pipe covers and enclosures on exposed supplies and waste piping of accessible sinks. Comply with requirements in Section 220719 "Plumbing Piping Insulation."

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. Combination units.
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, for plumbing fixtures for people with disabilities.

2.2 COMBINATION UNITS

A. Accessible, Plumbed Emergency Shower with Eye/Face Wash Combination 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. Encon Safety Products.
d. Guardian Equipment Co.
e. Haws Corporation.
f. Speakman Company.
g. Stingray Systems LLC.
h. WaterSaver Faucet Co.

2. Piping:

a. Material: Galvanized steel.
b. Unit Supply: NPS 1-1/4 minimum.
c. Unit Drain: Outlet at back or side near bottom.

3. Shower:

a. Capacity: Not less than 20 gpm for at least 15 minutes.
b. Supply Piping: NPS 1 with flow regulator and stay-open control valve.
c. Control-Valve Actuator: Pull rod.
d. Shower Head: 10-inch-diameter, plastic.

4. Eye/Face Wash Unit:

a. Capacity: Not less than 3.0 gpm for at least 15 minutes.
b. Supply Piping: NPS 1/2 with flow regulator and stay-open control valve.
c. Control-Valve Actuator: Paddle.
d. Spray-Head Assembly: Four receptor-mounted spray heads with flip-top dust covers each head.
e. Receptor: stainless-steel bowl.
f. Mounting: Attached to shower pedestal.

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 85 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.

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.

1. Exception: Omit shutoff valve on supply to group of plumbing fixtures that includes emergency equipment.
2. Exception: Omit shutoff valve on supply to emergency equipment if prohibited by authorities having jurisdiction.

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.

B. Shop Drawings: Include diagrams for power, signal, and control wiring.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance Data: For pressure water coolers to include in maintenance manuals.

PART 2 - PRODUCTS

A. Pressure Water Coolers: Wall mounted, wheelchair accessible, bottle filler.

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.
f. Oasis International.

2. Standards:

a. Comply with NSF 61 and NSF 372.
b. Comply with ASHRAE 34, "Designation and Safety Classification of Refrigerants," for water coolers. Provide HFC 134a (tetrafluoroethane) refrigerant unless otherwise indicated.
c. Comply with ICC A117.1.

3. Cabinet: Bi-level with two attached cabinets and with a bi-level skirt kit. Stainless steel basin, Cabinet shall be stainless steel with satin finish.
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: NPS 3/8 with shutoff valve.
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. Capacities and Characteristics:

    a. Cooled Water: 8 gph.
    b. Ambient-Air Temperature: 90 deg F.
    c. Inlet-Water Temperature: 80 deg F.
    d. Cooled-Water Temperature: 50 deg F.

13. Support: Type I Water Cooler Carrier.

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. Install off-the-floor carrier supports, affixed to building substrate, for wall-mounted fixtures.

C. Install water-supply piping with shutoff valve on supply to each fixture to be connected to domestic-water distribution piping. Use ball or gate valve. Install valves in locations where they can be easily reached for operation. Valves are specified in Section 220500 "Common Work Results for Plumbing."

D. Install trap and waste piping on drain outlet of each fixture to be connected to sanitary drainage system.

E. 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 226600 - CHEMICAL-WASTE SYSTEMS FOR LABORATORY AND HEALTHCARE FACILITIES

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 piping.
2. Piping specialties.
3. Neutralization systems.

1.3 DEFINITIONS

A. FPM: Vinylidene fluoride (hexafluoropropylene copolymer rubber).

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For neutralization system and leak-detection system.

1. Include plans, elevations, sections, and attachment details.
2. Include details of neutralization-system assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
3. Include details of leak-detection-system assemblies. Indicate required clearances, method of field assembly, components, and location and size of each field connection.
4. Include diagrams for power, signal, and control wiring.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For chemical-waste specialties and neutralization systems to include in emergency, operation, and maintenance manuals.

1.6 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Neutralization-System Limestone and Chemicals: For each neutralization system.

a. Limestone: Equal to 500 percent of amount required for tank sump initial charge. Furnish limestone in 50-lb bags.
b. Chemicals: Equal to 500 percent of neutralizing chemicals required for filling tanks.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store piping and specialties with sealing plugs in ends or with end protection.

B. Do not store plastic pipe or fittings in direct sunlight.

C. Protect pipe, fittings, and seals from dirt and damage.

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

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 70.

2.2 PERFORMANCE REQUIREMENTS

A. Single-Wall Piping Pressure Rating: 5-psig.

2.3 SINGLE-WALL PIPE AND FITTINGS

A. PP Drainage Pipe and Fittings: ASTM F1412, extruded pipe and drainage-pattern fittings molded, with Schedule 40 dimensions and with fire-retardant additive complying with ASTM D4101; with fusion- and mechanical-joint ends.

1. Exception: Pipe and fittings made from PP resin without fire-retardant additive may be used for underground installation.
2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. GF Piping Systems: Georg Fischer LLC.
b. IPEX USA LLC.
c. Orion Fittings; A WATTS Brand.
d. Town & Country Plastics, Inc.
e. Zurn Industries, LLC.

3. Source Limitations: Obtain pipe and fittings from single source from single manufacturer.

B. PVDF Drainage Pipe and Fittings: ASTM F1673, Schedule 40, pipe and drainage-pattern fittings. Include fittings with fusion- and mechanical-joint ends.

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

a. GF Piping Systems: Georg Fischer LLC.
b. IPEX USA LLC.
c. Orion Fittings; A WATTS Brand.
d. Zurn Industries, LLC.

2. Source Limitations: Obtain pipe and fittings from single source from single manufacturer.

C. Adapters and Transition Fittings: Assemblies with combinations of clamps, couplings, adapters, and gaskets; compatible with piping and system liquid; made for joining different piping materials.

2.4 JOINING MATERIALS

A. Couplings: Assemblies with combinations of clamps, gaskets, sleeves, and threaded or flanged parts; compatible with piping and system liquid; and made by piping manufacturer for joining system piping.

B. Adapters and Transition Fittings: Assemblies with combinations of clamps, couplings, adapters, gaskets, and threaded or flanged parts; compatible with piping and system liquid; and made for joining different piping materials.

C. Flanges: Assemblies of companion flanges and gaskets complying with ASME B16.21 and compatible with system liquid, and bolts and nuts.

D. Solvent Cement for Joining CPVC Piping: ASTM F493. Include primer in accordance with ASTM F656.

2.5 PIPING SPECIALTIES

A. PP Floor Drains:

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

a. GF Piping Systems: Georg Fischer LLC.
b. IPEX USA LLC.
c. Orion Fittings; A WATTS Brand.
d. Schier Products Company.
e. Town & Country Plastics, Inc.
f. WATTS.
g. Zurn Industries, LLC.

2. Source Limitations: Obtain floor drains from single source from single manufacturer.
3. Body: With 6-inch top diameter, with flashing flange and weep holes; and with flashing clamp. Adjustable.
4. Outlet: Bottom, to match connecting pipe, with NPS 2, NPS 3 or NPS 4 outlet as indicated.

B. PP Sink Outlets:

1. Description: NPS 1-1/2, with clamping device, stopper, and 7-inch-high overflow fitting.

2.6 NEUTRALIZATION SYSTEMS

A. Plastic-Tank Neutralization Systems

1. Description: Automatic system for neutralizing chemical waste.
2. Manufacturers: subject to compliance with requirements, shall provide products by one of the following:

    a. IPEX.
    b. ParkUSA.
    c. Watts.

3. Source Limitations: Obtain neutralization systems from single source from single manufacturer.
4. Panel: NEMA 250, Type 4X enclosure with manufacturer's standard features, control devices, and indicators, but not less than the following:

    a. Hinged front, padlockable hasps, and wall mount flange.
    b. 110/120 VAC input power supply with 2 amp fuse with blown fuse indicator and resettable GFCI.
    c. Key lock off-on switch at door.
    d. Control power with 2 amp fuse with blown fuse indicator.
    e. Intermittent alarm horn and alarm silencing switch.
    f. Power light and on/off switch.
    g. pH analyzer with meter and high- and low-pH indicators.
    h. Low caustic- and acid-solution level indicators.

5. Piping between Tanks: Same material as chemical-waste piping system unless otherwise indicated.
6. Neutralization Tank: HDPE; with removable, gastight cover, sidewall inlet and outlet piping connections, and vent connection in sidewall or top.

    a. Limestone: Chips or lumps, with more than 90 percent calcium carbonate content and 1- to 3-inch diameter.
    b. Dolomitic Limestone: Chips or lumps, with more than 90 percent combined magnesium carbonate and calcium carbonate content and 1- to 3-inch diameter.

7. Sampling Tank: Same material as mixing tank; with removable, gastight cover, sidewall inlet and outlet piping connections, and opening in top for probe.

    a. pH probe: Type and length suitable for sampling-tank size.

PART 3 - EXECUTION

3.1 EARTHWORK

A. Comply with requirements in Section 312000 "Earth Moving" for excavating, trenching, and backfilling.

3.2 PIPING INSTALLATION

A. Chemical-Waste Piping Inside the Building:

1. Install piping adjacent to equipment, accessories, and specialties, to allow space for service and maintenance.
2. Transition and special fittings with pressure ratings at least equal to piping pressure rating may be used unless otherwise indicated.
3. Flanges may be used on aboveground piping unless otherwise indicated.
4. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.
5. 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.
6. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.
7. Install piping at indicated slopes.
8. Install piping free of sags and bends.
9. Install fittings for changes in direction and branch connections.
10. Verify final equipment locations for roughing-in.
11. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section 220500 "Common Work Results for Plumbing."
12. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Section 220500 "Common Work Results for Plumbing."
13. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 220500 "Common Work Results for Plumbing."

3.3 PIPING SPECIALTY INSTALLATION

A. Embed floor drains in 4-inch-minimum depth of concrete around bottom and sides. Comply with requirements in Section 033000 "Cast-in-Place Concrete" for concrete.

B. Fasten grates to drains if indicated.

C. Set floor drains with tops flush with pavement surface.

D. Install cleanouts and riser extension from sewer pipe to cleanout at grade. Use fittings of same material as sewer pipe at branches for cleanouts and riser extensions to cleanouts. Install piping so cleanouts open in direction of flow in pipe.

3.4 JOINT CONSTRUCTION

A. Chemical-Waste Piping Inside the Building:

1. Plastic-Piping Fusion Joints: Make PP drainage-piping joints in accordance with ASTM F1290.
2. Dissimilar-Material Piping Joints: Make joints using adapters compatible with both system materials.

3.5 HANGER AND SUPPORT INSTALLATION

A. Pipe sizes in this article refer to aboveground single-wall piping.

B. Comply with requirements in Section 220500 "Common Work Results for Plumbing" for pipe hanger and support devices.

3.6 NEUTRALIZATION SYSTEM INSTALLATION

A. Install interior **neutralization** tanks, complete with appurtenances indicated.

1. Set tops of tank covers flush with finished surface.
2. Include initial fill of limestone for neutralization tanks.

3.7 PIPING CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Make connections to existing piping, so finished Work complies as nearly as practical with requirements specified for new Work.

C. Use commercially manufactured wye fittings for sewerage piping branch connections.

D. Protect existing piping to prevent concrete or debris from entering while making connections. Remove debris or other extraneous material that may accumulate.

E. Where installing piping adjacent to equipment, allow space for service and maintenance.

3.8 LABELING AND IDENTIFICATION

A. Comply with requirements in Section 220553 "Identification for Plumbing Piping and Equipment" for labeling of equipment and piping.

3.9 ADJUSTING

A. Adjust neutralization-system set points.

B. Adjust leak-detection-system control and device settings.

3.10 CLEANING

A. Use procedures prescribed by authorities having jurisdiction or, if not prescribed, use procedures described below:

1. Purge new piping and parts of existing piping that have been altered, extended, or repaired before using.
2. Clean piping by flushing with potable water.

3.11 STARTUP SERVICE

A. Engage a factory-authorized service representative to perform startup service for neutralization systems.

1. Complete installation and startup checks according to manufacturer's written instructions.
2. Neutralization Systems:

    a. Verify that neutralization system is installed and connected according to the Contract Documents.
    b. Verify that electrical wiring installation complies with manufacturer's submittal.
    c. Install neutralizing solutions and limestone.
    d. Energize circuits.
    e. Start and run systems through complete sequence of operations.
    f. Adjust operating controls.

3. Leak-Detection Systems:

    a. Verify that electrical wiring installation complies with manufacturer's submittal.
    b. Energize circuits.
    c. Adjust operating controls.

3.12 FIELD QUALITY CONTROL

A. Inspect interior of sewerage 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. Defects requiring correction include the following:

    a. Alignment: Less than full diameter of inside of pipe is visible between inspection points.
    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. Crushed, broken, cracked, or otherwise damaged piping.
    d. Hydrostatic Tests for Drainage Piping:

        1) Allowable leakage is a maximum of 50 gal./inch of nominal pipe size per mile of pipe during 24-hour period.
        2) Close openings in system and fill with water.
        3) Purge air and refill with water.
        4) Disconnect water supply.
        5) Test and inspect joints for leaks.

    e. Air Tests for Drainage Piping: Comply with UNI-B-6.

2. Leaks and loss in test pressure constitute defects that must be repaired.
3. Submit separate reports for each test.

B. Replace leaking sewerage piping using new materials, and repeat testing until leakage is within allowances specified.

C. Perform tests and inspections with the assistance of a factory-authorized service representative:

D. Tests and Inspections:

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect assembled neutralization systems and their installation, including piping and electrical connections, and to assist in testing.
2. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

E. Chemical-waste piping will be considered defective if it does not pass tests and inspections.

F. Prepare test and inspection reports.

3.13 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain neutralization systems.

3.14 PIPING SCHEDULE

A. Transition and special fittings with pressure ratings at least equal to piping pressure rating may be used in applications below unless otherwise indicated.

B. Single-Wall, Chemical-Waste Sewerage Piping: Use any of the following piping materials for each size range:

1. NPS 1-1/2 to NPS 4: PP drainage pipe and fittings and fusion joints.
2. NPS 1-1/2 to NPS 4: PVDF drainage pipe and fittings and fusion joints.

C. Aboveground Chemical-Waste Piping: Use any of the following piping materials for each size range:

1. NPS 1-1/2 to NPS 6: PP drainage piping and fusion or mechanical joints.
2. NPS 1-1/2 to NPS 6: PVDF drainage piping and fusion or mechanical joints.

D. Under Slab-on-Grade, Indoor, Chemical-Waste Piping: Use any of the following piping materials for each size range:

1. NPS 1-1/2 to NPS 6: PP drainage piping and fusion joints.
2. NPS 1-1/2 to NPS 6: PVDF drainage piping and fusion joints.

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 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 Engineer’s 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 mechanical 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

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. 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 (Dezincification Resistant Brass Alloy, Lead-Free):

1. Standard: MSS SP-110.
2. SWP Rating: 150 psig.
3. CWP Rating: 600 psig, non-shock.
4. Body Design: Two piece.
5. Body material: Forged brass.
6. Ends: Threaded or solder.
7. Seats: PTFE.
8. Stem: Brass, blow-out proof.
9. Ball: T.E.A. (ternary eco alloy) coated brass.
10. Port: Full.

2. NPS 2-1/2 and Larger:

a. 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.
6. Seats: PTFE.
7. Stem: Stainless steel, blow-out proof.
8. Ball: Stainless steel.
9. Port: Full.

b. 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.
6. Seats: PTFE.

7. Stem: Stainless steel, blow-out proof.
8. Ball: Stainless steel, vented.
9. Port: Full.

F. Butterfly Valves:

1. NPS 2-1/2 and Larger

a. Iron, Single-Flange with Ductile-Iron Disc:

1. Standard: MSS SP-67.
2. CWP Rating: 200 psig, non-shock.
3. Body Design: Lug type; suitable for bidirectional dead-end service at rated pressure without use of downstream flange.
4. Body material: ASTM A126, cast iron or ASTM A536 ductile iron.
5. Seats: EPDM.
6. Stem: One-or two-piece stainless steel.
7. Disc: Nickel-plated or -coated ductile iron.

b. Iron, Grooved-End:

1. Standard: MSS SP-67, Type 1.
2. CWP Rating: 175 psig, non-shock.
3. Body material: Coated, ductile iron.
4. Stem: Two-piece stainless steel.
5. Disc: Coated, ductile iron.
6. Seal: EPDM.

c. Single-Flange, High-Performance, Class 150 (Steam applications):

1. Standard: MSS SP-68.
2. CWP Rating: 1285 psig at 100 deg F.
3. Body Design: Lug type; suitable for bidirectional dead-end service at rated pressure without use of downstream flange.
4. Body material: Carbon steel, cast iron, ductile iron, or stainless steel.
5. Seat: Reinforced PTFE or metal.
6. Stem: Stainless steel, offset from seat plane.
7. Disc: Carbon steel.
8. Service: Bidirectional.

G. 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 Bell & Gossett.

H. 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.

I. 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 exceed 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
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"

2.3 THERMOMETERS

A. Approved manufacturers are Duro Instrument Corp., Miljoco, and H.O. Trerice Co.

B. Thermometers shall have cast aluminum case with baked enamel finish; red reading tube with suitable 9" scale; adjustable multi-angle housing, and brass separable socket.

2.4 PRESSURE GAUGES

A. Approved manufacturers are Duro Instrument Corp., Miljoco, H.O. Trerice Co., and Ametek U.S. Gauge Division.

B. Pressure gauges sall 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, and 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 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:

2.6 Constructed for operation at work site altitude and surrounding temperature.
2.7 Dustproof/leakproof bearing rings.
2.8 Built to NEMA standards.
2.9 Factory balanced.
2.10 Open drip proof unless noted otherwise.
2.11 Integral thermal overload protection.

C. When not specifically noted under Division 26 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.

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 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 a Motor Control Center (MCC), electrical breaker/fuse panel or transformer per NEC codes. When a pipe appears to be shown on the plans near 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 more than 800 amps, additional clearance requirements of 72” should be adhered to.

3.4 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
Fused and unfused disconnect switches	EC/MC	EC	EC	
Control relays and transformers	MC	MC	EC	MC
Thermostats, time switches*	MC	MC	EC	MC
Temperature control panels	MC	MC	EC	MC
Refrigeration equipment and controls	MC	MC	EC	MC

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.

3.5 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 their 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.

3.6 ACCEPTANCE TEST

A. After the final air and water balance test, all environmental systems shall be tested to prove satisfactory performance of all units.

B. 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.

C. 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.

D. Check all duct smoke detectors and freezestats to assure that they are functioning properly.

3.7 MAINTENANCE

A. The Contractor shall provide the necessary skills and labor to assure the proper operation of and to provide all required maintenance for all equipment and controls provided under Division 23 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 all problems experienced in the operation of the equipment provided under Division 23 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.

3.8 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.

3.9 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 1/4”, 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.

3.10 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.

3.11 ESCUTCHEON PLATES

B. Escutcheon plates shall be provided for all exposed uninsulated pipes passing through walls, floors, ceilings, into cabinets, or other areas where visibly seen by occupants of the facility. Plates shall be nickel plated metal of the split ring type and 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.

C. Plates for water supply penetrations serving sinks or water closets shall be on-piece non-split ring.

3.12 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.

3.13 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 ceilings and walls. General Trades Contractor shall install.

3.14 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.

3.15 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.

3.16 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 clean and ready for use.

3.17 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.

3.18 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. 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.

D. All sleeves shall be constructed of steel pipe unless otherwise noted on the drawings or specifically specified for a particular installation.

3.19 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.

3.20 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 their work and the plans for the work of others, they shall report such discrepancies to the Architect/Engineer and shall obtain written instructions for any changes necessary to accommodate their 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 near, or will interfere with work of other trades, the Contractor shall assist in working out space conditions to make a satisfactory adjustment. If 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 their work is to be installed in relation to the work of other trades. If the Contractor installs their work before coordinating with other trades, or so as to cause any interference with work of other trades, they shall make the necessary changes in their work to correct the condition without extra charge.

3.21 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.

3.22 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.

3.23 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.

3.24 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. They 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.

3.25 EQUIPMENT ON ROOFS OR ELEVATED SURFACES

A. 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 to prevent the passage of a 21-inch diameter sphere and shall comply with the loading requirements for guards specified in the Building Code.

3.26 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 23 specification sections.

3.27 OPERATION AND MAINTENANCE MANUALS

A. The Contractor shall prepare operation and maintenance manuals which shall cover all systems installed under Division 23.

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.

3.28 DUST PROTECTION

A. During 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.

3.29 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.

3.30 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 230553 - IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Equipment labels.
2. Warning signs and labels.
3. Pipe labels.
4. Duct labels.
5. Valve tags.
6. Warning tags.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Equipment Label Schedule: Include a listing of all equipment to be labeled with the proposed content for each label.

C. Valve numbering scheme.

D. Valve Schedules: For each piping system to include in maintenance manuals.

PART 2 - PRODUCTS

2.1 EQUIPMENT LABELS

A. Metal Labels for Equipment:

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

a. Brady Corporation.
b. Brimar Industries, Inc.
c. Carlton Industries, LP.
d. Champion America.
e. Craftmark Pipe Markers.
f. Emedco.
g. Kolbi Pipe Marker Co.
h. LEM Products Inc.
i. Marking Services, Inc.
j. Seton Identification Products; a Brady Corporation company.

2. Material and Thickness: Brass, 0.032-inch; stainless steel, 0.025-inch; aluminum, 0.032-inch or anodized aluminum, 0.032-inch minimum thickness, and having predrilled or stamped holes for attachment hardware.
3. Letter Color: White.
4. Background Color: Black.
5. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
6. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-quarters the size of principal lettering.
7. Fasteners: Stainless-steel rivets or self-tapping screws.
8. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

B. Plastic Labels for Equipment:

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

    a. Brady Corporation.
    b. Brimar Industries, Inc.
    c. Carlton Industries, LP.
    d. Champion America.
    e. Craftmark Pipe Markers.
    f. Emedco.
    g. Kolbi Pipe Marker Co.
    h. LEM Products Inc.
    i. Marking Services, Inc.
    j. Seton Identification Products; a Brady Corporation company.

2. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/16 inch thick, and having predrilled holes for attachment hardware.
3. Letter Color: White.
4. Background Color: Black.
5. Maximum Temperature: Able to withstand temperatures up to 160 deg F.
6. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
7. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-quarters the size of principal lettering.
8. Fasteners: Stainless-steel rivets or self-tapping screws.
9. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

C. Label Content: Include equipment's Drawing designation or unique equipment number, Drawing numbers where equipment is indicated (plans, details, and schedules), and the Specification Section number and title where equipment is specified.

D. Equipment Label Schedule: For each item of equipment to be labeled, on 8-1/2-by-11-inch bond paper. Tabulate equipment identification number, and identify Drawing numbers where equipment is indicated (plans, details, and schedules) and the Specification Section number and title where equipment is specified. Equipment schedule shall be included in operation and maintenance data.

2.2 WARNING SIGNS AND LABELS

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

1. Brady Corporation.
2. Brimar Industries, Inc.
3. Carlton Industries, LP.
4. Champion America.
5. Craftmark Pipe Markers.
6. Emedco.
7. LEM Products Inc.
8. Marking Services, Inc.
9. Natinal Marker Company.
10. Seton Identification Products; a Brady Corporation company.
11. Stranco, Inc.

B. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/16 inch thick, and having predrilled holes for attachment hardware.

C. Letter Color: White.

D. Background Color: Red.

E. Maximum Temperature: Able to withstand temperatures up to 160 deg F.

F. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.

G. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-quarters the size of principal lettering.

H. Fasteners: Stainless-steel rivets or self-tapping screws.

I. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

J. Label Content: Include caution and warning information plus emergency notification instructions.

2.3 PIPE LABELS

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

1. Actioncraft Products, Inc; a division of Industrial Test Equipment Co., Inc.
2. Brady Corporation.
3. Brimar Industries, Inc.
4. Carlton Industries, LP.
5. Champion America.
6. Craftmark Pipe Markers.
7. Emedco.
8. Kolbi Pipe Marker Co.
9. LEM Products Inc.

10. Marking Services, Inc.
11. Seton Identification Products; a Brady Corporation company.

B. General Requirements for Manufactured Pipe Labels: Preprinted, color-coded, with lettering indicating service, and showing flow direction according to ASME A13.1.

C. Pretensioned Pipe Labels: Precoiled, semirigid plastic formed to cover full circumference of pipe and to attach to pipe without fasteners or adhesive.

D. Self-Adhesive Pipe Labels: Printed plastic with contact-type, permanent-adhesive backing.

E. Pipe Label Contents: Include identification of piping service using same designations or abbreviations as used on Drawings; also include pipe size and an arrow indicating flow direction.

1. Flow-Direction Arrows: Integral with piping system service lettering to accommodate both directions or as separate unit on each pipe label to indicate flow direction.
2. Lettering Size: Size letters according to ASME A13.1 for piping.

2.4 DUCT LABELS

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

1. Brady Corporation.
2. Brimar Industries, Inc.
3. Carlton Industries, LP.
4. Champion America.
5. Craftmark Pipe Markers.
6. Emedco.
7. Kolbi Pipe Marker Co.
8. LEM Products Inc.
9. Marking Services, Inc.
10. Seton Identification Products; a Brady Corporation company.

B. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/16 inch thick, and having predrilled holes for attachment hardware.

C. Letter Color: White.

D. Background Color: Black.

E. Maximum Temperature: Able to withstand temperatures up to 160 deg F.

F. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.

G. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-quarters the size of principal lettering.

H. Fasteners: Stainless-steel rivets or self-tapping screws.

I. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

J. Duct Label Contents: Include identification of duct service using same designations or abbreviations as used on Drawings; also include duct size and an arrow indicating flow direction.

1. Flow-Direction Arrows: Integral with duct system service lettering to accommodate both directions or as separate unit on each duct label to indicate flow direction.

2.5 VALVE TAGS

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

1. Actioncraft Products, Inc; a division of Industrial Test Equipment Co., Inc.
2. Brady Corporation.
3. Brimar Industries, Inc.
4. Carlton Industries, LP.
5. Champion America.
6. Craftmark Pipe Markers.
7. Emedco.
8. Kolbi Pipe Marker Co.
9. LEM Products Inc.
10. Marking Services, Inc.
11. Seton Identification Products; a Brady Corporation company.

B. Description: Stamped or engraved with 1/4-inch letters for piping system abbreviation and 1/2-inch numbers.

1. Tag Material: Brass, 0.032-inch; stainless steel, 0.025-inch; aluminum, 0.032-inch or anodized aluminum, 0.032-inch minimum thickness, and having predrilled or stamped holes for attachment hardware.
2. Fasteners: Brass wire-link chain, beaded chain, or S-hook.

C. Valve Schedules: For each piping system, on 8-1/2-by-11-inch bond paper. Tabulate valve number, piping system, system abbreviation (as shown on valve tag), location of valve (room or space), normal-operating position (open, closed, or modulating), and variations for identification. Mark valves for emergency shutoff and similar special uses.

1. Valve-tag schedule shall be included in operation and maintenance data.

2.6 WARNING TAGS

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

1. Brady Corporation.
2. Brimar Industries, Inc.
3. Champion America.
4. Craftmark Pipe Markers.
5. Emedco.
6. Kolbi Pipe Marker Co.
7. LEM Products Inc.

8. Marking Services, Inc.
9. Seton Identification Products; a Brady Corporation company.

B. Description: Preprinted or partially preprinted accident-prevention tags of plasticized card stock with matte finish suitable for writing.

1. Size: 3 by 5-1/4 inches minimum.
2. Fasteners: Brass grommet and wire.
3. Nomenclature: Large-size primary caption such as "DANGER," "CAUTION," or "DO NOT OPERATE."
4. Color: Safety-yellow background with black lettering.

PART 3 - EXECUTION

3.1 PREPARATION

A. Clean piping and equipment surfaces of substances that could impair bond of identification devices, including dirt, oil, grease, release agents, and incompatible primers, paints, and encapsulants.

3.2 GENERAL INSTALLATION REQUIREMENTS

A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.

B. Coordinate installation of identifying devices with locations of access panels and doors.

C. Install identifying devices before installing acoustical ceilings and similar concealment.

3.3 EQUIPMENT LABEL INSTALLATION

A. Install or permanently fasten labels on each major item of mechanical equipment.

B. Locate equipment labels where accessible and visible.

3.4 PIPE LABEL INSTALLATION

A. Pipe Label Locations: Locate pipe labels where piping is exposed or above accessible ceilings in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior exposed locations as follows:

1. Near each valve and control device.
2. Near each branch connection, excluding short takeoffs for fixtures and terminal units. Where flow pattern is not obvious, mark each pipe at branch.
3. Near penetrations and on both sides of through walls, floors, ceilings, and inaccessible enclosures.
4. At access doors, manholes, and similar access points that permit view of concealed piping.
5. Near major equipment items and other points of origination and termination.

6. Spaced at maximum intervals of 50 feet along each run. Reduce intervals to 25 feet in areas of congested piping and equipment.
7. On piping above removable acoustical ceilings. Omit intermediately spaced labels.

B. Directional Flow Arrows: Arrows shall be used to indicate direction of flow in pipes, including pipes where flow is allowed in both directions.

C. Pipe Label Color Schedule:

1. Chilled-Water Piping: White letters on a safety-green background.
2. Heating Water Piping: White letters on a safety-green background.

3.5 DUCT LABEL INSTALLATION

A. Install plastic-laminated or self-adhesive duct labels with permanent adhesive on air ducts in the following color codes:

1. Blue: For cold-air supply ducts.
2. Yellow: For hot-air supply ducts.
3. Green: For exhaust-, outside-, relief-, return-, and mixed-air ducts.

B. Locate labels near points where ducts enter into and exit from concealed spaces and at maximum intervals of 50 feet in each space where ducts are exposed or concealed by removable ceiling system.

3.6 VALVE-TAG INSTALLATION

A. Install tags on valves and control devices in piping systems, except check valves, valves within factory-fabricated equipment units, shutoff valves, faucets, convenience and lawn-watering hose connections, and HVAC terminal devices and similar roughing-in connections of end-use fixtures and units. List tagged valves in a valve schedule.

B. Valve-Tag Application Schedule: Tag valves according to size, shape, and color scheme and with captions similar to those indicated in the following subparagraphs:

1. Valve-Tag Size and Shape:

a. Chilled Water: 1-1/2 inches, round.
b. Refrigerant: 1-1/2 inches, round.
c. Hot Water: 1-1/2 inches, round.
d. Gas: 1-1/2 inches, round.

2. Valve-Tag Colors:

a. Toxic and Corrosive Fluids: Black letters on a safety-orange background.
b. Flammable Fluids: Black letters on a safety-yellow background.
c. Combustible Fluids: White letters on a safety-brown background.
d. Potable and Other Water: White letters on a safety-green background.
e. Compressed Air: White letters on a safety-blue background.
f. Defined by User: White letters on a safety-purple background, black letters on a safety-white background, white letters on a safety-gray background, and white letters on a safety-black background

3.7 WARNING-TAG INSTALLATION

A. Write required message on, and attach warning tags to, equipment and other items where required.

END OF SECTION

SECTION 230593 - TESTING, ADJUSTING, AND BALANCING FOR HVAC

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 RELATED SECTIONS

A. Section 232116 – Hydronic Specialties
B. Section 232123 – Hydronic Pumps
C. Section 233423 – HVAC Power Ventilators
D. Section 233600 – Air Terminal Units
E. Section 236200 – Packed Compressor and Condenser Units
F. Section 237223.29 – Packaged, Outdoor, Fixed Plate Energy Recovery Units
G. Section 237416 – Packaged Rooftop Air-Conditioning Units
H. Section 238126 – Split-System Air-Conditioners
I. Section 238216.11 – Hydronic Air Coils
J. Section 238223 – Unit Ventilators
K. Section 238236 – Finned-Tube Radiation Heaters
L. Section 238239.13 – Cabinet Unit Heaters

1.3 REFERENCES

A. AABC – Associated Air Balance Council, National Standards for Field Measurement and Instrumentation, Total System Balance.
B. ASHRAE – 1984 Systems Handbook: Chapter 37, Testing, Adjusting and Balancing.
C. NEBB - National Environmental Balancing Bureau. Procedural Standards for Testing, Balancing and Adjusting of Environmental Systems.

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

1. Title page:

    a. Company name
    b. Company address
    c. Company telephone number
    d. Project name
    e. Project location
    f. Project Engineer
    g. Project Contractor

2. Return Air/Outside Air Data:

    a. Identification/location
    b. Design air flow
    c. Actual air flow
    d. Design return air flow
    e. Actual return air flow
    f. Design outside air flow
    g. Actual outside air flow
    h. Return air temperature
    i. Outside air temperature

3. Electric Motors:

    a. Manufacturer
    b. HP/BHP
    c. Phase, voltage, amperage; nameplate, actual, no load.
    d. RPM
    e. Service factor
    f. Starter size, rating, heater elements

4. Pump Data:

    a. Identification/number
    b. Manufacturer
    c. Size/model
    d. Impeller
    e. Service
    f. Design flow rate, pressure drop, BHP
    g. Actual flow rate, pressure drop, BHP
    h. Discharge pressure

i. Suction pressure
j. Total operating head pressure
k. Shut off, discharge and suction pressures
l. Shut off, total head pressure

5. Heating and Cooling Coil Data (Water):

a. Identification number
b. Location
c. Service
d. Manufacturer
e. Air flow, design and actual
f. Water flow, design and actual
g. Water pressure drop, design and actual
h. Entering water temperature, design and actual
i. Leaving water temperature, design and actual
j. Entering air temperature, design and actual
k. Leaving air temperature, design and actual
l. Air pressure drop, design and actual

6. Air Moving Equipment:

a. Location
b. Manufacturer
c. Model
d. Air flow, specified and actual
e. Return air flow, specified and actual
f. Outside air flow, specified and actual
g. Total static pressure (total external), specified and actual.
h. Inlet pressure
i. Discharge pressure
j. Fan RPM
k. Total static pressure and measured air flow in coil bypass mode
l. Total static pressure and measured air flow in coil face operation

7. Exhaust Fan Data:

a. Location
b. Manufacturer
c. Model
d. Air flow, specified and actual
e. Total static pressure (total external), specified and actual
f. Inlet pressure
g. Discharge pressure
h. Fan RPM

8. Air Distribution Test Sheet:

a. Air terminal number
b. Room number/location
c. Terminal type
d. Terminal size
e. Area factor
f. Design velocity
g. Design air flow
h. Test (final) velocity

i. Test (final) air flow
j. Percent of design air flow

9. Duct Traverse:

a. System zone/branch
b. Duct size
c. Area
d. Design velocity
e. Design air flow
f. Test velocity
g. Test air flow
h. Duct static pressure
i. Air temperature
j. Air correction factor

10. Duct Leak Test

a. Description of ductwork under test
b. Duct design operating pressure
c. Duct design test static pressure
d. Duct capacity, air flow
e. Maximum allowable duct leakage shall be 5 percent of the system capacity
f. Test apparatus

1) Blower
2) Orifice, tube size
3) Orifice size
4) Calibrated

g. Test static pressure
h. Test orifice differential pressure
i. Leakage

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 PROJECT RECORD DOCUMENTS

A. A final test and balance report shall include information and data to provide an accurate quantitative record of system information, measurements, and final settings.

B. Reports shall include notes and comments as appropriate to provide the reviewer with additional details that include test procedure, system operation, and results.

C. Reports shall meet all the requirements of NEBB Procedural Standards Sections 5 and 6.

1.7 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."

1.8 TAB RESPONSIBILITIES

A. Follow the NEBB Procedural Standards latest edition when performing the TAB work. While some procedures are described within this section, the NEBB Procedural Standards are more comprehensive and shall be followed when specific system procedures are not detailed herein, or where NEBB procedures may differ from this specification section.

B. Communicate through the proper channels any design, installation, or functional concerns that prevent the TAB work from being completed in accordance with current NEBB Procedural Standards and the design specifications.

C. Perform the TAB for all mechanical and plumbing systems specified and indicated in the construction documents.

D. Work with the systems installing contractors and controls contractor when necessary to establish system pressure settings

E. When required, perform the specified commissioning support requirements.

F. Publish a certified TAB report.

1.9 SEQUENCING AND SCHEDULING

A. Sequence work to commence after completion of systems and schedule completion of work before Substantial Completion of Project.

B. All mechanical systems shall be tested, balanced, and operated to demonstrate to the Owner or his representative that the installation and performance of these systems conform to the requirements of the plans and specifications.

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. Before commencing work, verify that systems are complete and operable. Ensure the following:

1. Verify the construction team responsibilities for system installation and start-up are complete.
2. The equipment is operable and in a safe and normal condition.
3. Temperature control systems are installed complete and operable.
4. Proper thermal overload protection is in place for electrical equipment.
5. Correct fan rotation.
6. Coil fins have been cleaned and combed.
7. Hydronic systems have been flushed, filled and vented.
8. Correct pump rotation.
9. Proper strainer baskets are clean and in place.
10. Service and balance valves are open or preset as required, and all automatic temperature control valves are in a normal or desired position.
11. Fire, smoke, and volume dampers are in place and proper position.

G. Report any defects or deficiencies noted during performance of services to Architect/Engineer.

H. Promptly report abnormal conditions in mechanical systems or conditions which prevent system balance.

I. If, for design reasons, systems cannot be properly balanced, report as soon as observed.

J. Beginning of work means acceptance of existing conditions.

3.2 PREPERATION AND SCOPE

A. Provide instruments required for testing, adjusting, and balancing operations. Make instruments available to Architect/Engineer to facilitate spot checks during testing if requested.

B. Test and Balancing Contractor shall thoroughly review and fully understand the intent and expected results of the mechanical systems described in these construction documents and shall recommend to the engineer any additional balancing devices as required to accomplish the work of testing, adjusting and balancing the systems, and achieving system performances indicated.

C. Work with the mechanical, controls and other applicable contractors when necessary to engage their services in operating HVAC systems or altering settings that may require the services of the installation contractor.

D. At the end of each testing and adjustment session, leave systems in proper working order, replacing belt guards, closing access doors, closing doors to electrical switch boxes, and restoring all devices to specified settings.

E. Because it is unlikely all mechanical systems are performing as required per the construction documents at start-up, the work of Testing, Adjusting and Balancing shall be completed and reported in “a minimum of” two separate visits. A minimum of two visits are intentionally required with time allotted between the two to resolve all deficiencies found in the testing portion of the work.

3.3 INSTALLATION TOLERANCES

A. Adjust hydronic systems to plus or minus 10% of design conditions indicated.

B. Adjust air systems to plus or minus 5% of the design conditions indicated.

C. Adjust domestic hot water recirculation systems to 5% of the flows indicated.

3.4 TESTING, ADJUSTING AND PRELIMINARY BALANCING

A. The purpose of “testing” is to provide preliminary adjustments, and record preliminary settings of all damper positions, balancing valve positions, motor speeds, VAV box low and high volumes, etc.

B. Recorded data shall represent actual measured or observed condition.

C. Submit the preliminary test results to the Contractors responsible for the work as well as Engineer, noting deficiencies that were observed and possible causes for the deficiencies.

D. Correspond with the contractor(s) and engineer as requested to assist in providing resolution to the problems and deficiencies noted in the preliminary findings.

E. The TAB Contractor shall cooperate in facilitating the successful completion and operation of the HVAC equipment, controls, and other items specified within Divisions 22 and 23.

3.5 FINAL ADJUSTING AND BALANCING

A. After all corrections and changes have been made in the operation and performance of the HVAC systems to correct any deficiencies found during preliminary testing, provide final visit(s) as necessary to adjust, balance and record the final performance and settings of all mechanical or plumbing systems provided or altered under this project.

B. Record all final data in the same report form as the preliminary data and provide representation of actual measured or observed conditions.

C. Upon completion of the TAB work, permanently mark settings of valves, dampers, and other adjustment devices allowing settings to be restored.

D. After final adjustment, take measurements to verify final settings has not altered system balancing, or that such disruption has been rectified.

E. Leave systems in proper working order, replacing belt guards, closing access doors, closing doors to electrical switch boxes, and restoring thermostats to specified settings.

F. At final inspection, recheck random selections of data recorded in balancing report. Recheck points or areas as selected and witnessed by the Engineer/Owner.

G. The specified TAB project is complete when all HVAC systems and components are tested and balanced within specified tolerances.

H. When reasonable efforts have been taken to achieve requirements but system efficiencies still exist, the TAB contractor shall notify the engineer and other appropriate project personnel of system deficiencies that prevent balancing within tolerances. This notification shall be completed prior to the final report being submitted, and also noted in the project summary within the final TAB report.

3.6 GENERAL AIR SYSTEM PROCEDURES

A. Confirm the correct air filters are installed. Provide temporary filter blockage of any air handling unit, energy recovery unit, rooftop units, or other air handling system used to provide building outside air ventilation to simulate 0.15 in. w.c. partially loaded filters.

B. Check all barometric dampers for free operation. If dampers are equipped with adjustable weights, they shall be set to maintain the specified building static pressure. All exhaust systems shall be balanced before adjusting barometric relief dampers.

C. Verify that all manual branch and outlet volume dampers are locked 100% open.

D. Measure the motor operating voltage and amperage. Confirm that voltage and amperage match the motor rating.

E. Check for unusual noises that could indicate mechanical malfunction or system application issues.

F. Measure fan RPM and compare to design RPM.

G. Measure temperature conditions across outside air, return air, and exhaust/relief dampers to check leakage.

3.7 GENERAL HYDRONIC SYSTEM PROCEDURES

A. Verify that all automatically controlled devices in the piping or duct systems will not adversely affect the balancing procedures.

B. With the pumps off, observe and record system static pressure at the pumps.

C. Place the system into operation, check that all air has been vented from the piping systems and allow flow conditions to stabilize.

D. Verify that the system compression tanks, and automatic water fill valve are operating, and are set properly.

E. Record the operating voltage and amperage of the pumps and compare these with the nameplate ratings and thermal overload heater ratings.

F. Verify the RPM speed of each pump.

G. Where flow meters or calibrated balancing valves are installed, which would allow the flow rate of the pump circuits to be measured, perform the necessary work and record the data.

H. Measure the shut-off head of the operating pump by slowly closing an isolation valve or balancing valve in the pumps discharge piping. Record the discharge and suction pressures at the pump pressure gauge and determine the shut-off head. ***Note: do not fully close any valves on the suction side of any pump, nor close any valves on the discharge side of a positive displacement pump as severe damage will occur.***

I. Using shut-off head, determine and verify each pump's impeller size and operating curve. Compare this data with the submittal data curves. Open the discharge balancing valve slowly to the fully open position; record the discharge pressure, suction pressure and determine total operating head.

J. Using total operating head, read the pump water flow from the established and corrected pump curve. Verify the pump curve data with data from calibrated balancing valves or flow meters where available.

K. Set measured total head using the pump VFD or balancing valve when no VFD exists so that water flow is approximately 110% of design.

L. Use calibrated Venturi tubes, orifices, or other metered fittings and pressure gages to determine flow rates at all hydronic heating components for system balance. Where flow metering devices are not installed, base flow balance on temperature difference across various heat transfer elements in the system.

M. An initial recording of water flow distribution throughout the system shall be made without making any adjustments. Take a complete set of pressure drop measurements through all equipment and compare to submittal data. Check low flow circuits for air and vent if present. Retake readings as necessary.

N. Adjust systems to provide specified pressure drops and flows through heat transfer elements prior to thermal testing. Perform balancing by measurement of temperature differential in conjunction with air balancing.

O. Effect system balance with automatic control valves fully open to heat transfer elements.

P. Effect adjustment of water distribution systems by means of balancing cocks, valves, and fittings. Do not use service or shut-off valves for balancing unless indexed for balance point.

Q. Where available pump capacity is less than total flow requirements or individual system parts, full flow in one part may be simulated by temporary restriction of flow to other parts.

R. After all final adjustments have been completed, perform a final check of the pressures, and the flow of all pumps and equipment. RE-measure the voltage and amperage of pump motors.

S. When VFD pumping systems use system pressure to reset pump speeds, assist the controls contractor in determining and setting the final system pressure setpoint(s) to satisfy the maximum heating condition with all heating water valves fully open.

T. After all TAB work has been completed, set all memory stops and mark or score all balancing devices at final set points.

3.8 VARIABLE FLOW HYDRONIC SYSTEMS

A. TAB procedures for a variable flow system are similar to those for constant flow systems with the added mechanism(s) that exists to vary flow in response to demand. Variable flow systems shall be balanced under simulated full-load system conditions.

B. If necessary to simulate a full-load condition because of system diversity, temporary isolate portions of the system piping and terminals. Upon completion of the balancing procedures with a portion of the system isolated, the isolated units shall be opened and an equal capacity of units closed.

C. Conduct the basic pump testing and flow procedures as outlined previously and by NEBB Procedural Standards. If the pump is controlled by a VFD, verify the pump is operating at its rated speed. Caution shall be used when conducting the required pump “wide open test” on a system with diversity. Insure that an overload condition cannot be reached.

D. Slow the VFD down to achieve design flow while keeping the pump discharge balancing valve wide open.

E. The system operating pressure should always be adjusted to the minimum value necessary to meet the design conditions. Work with the controls contractor to set the value and record.

3.9 DUCTED CONSTANT VOLUME SUPPLY AHU AIR BALANCING

A. Upon completion and verification of examination, preparation and general requirements noted above, perform the following TAB procedures.

B. AHU’s to be set with a fixed outside air (and return/relief/exhaust) damper during occupied periods shall be set to an appropriate position as a starting point to the air balancing.

C. Air handling units with a cooling coil shall have outside air set to a position estimated to equal design minimum OA flow. Air handling units using with no mechanical cooling and specified to use 100% outside air for economizer cooling shall have OA damper(s) positioned 100% open and return dampers 100% closed.

D. For fan total static pressure, measure suction and discharge static pressure at the inlet and outlet of the fan. To verify external static pressure, measure the suction and discharge static

pressure at the return duct and discharge duct. The suction static can be measured immediately adjacent to the unit. The discharge static should be measured at a point 3 to 5 duct diameters downstream of the fan discharge and upstream of any elbow or turning vanes.

E. Measure the AHU total air volume by the most accurate method available as the discretion of and judgement of the technician. Adjust the fan airflow as necessary to meet design requirements.

F. Adjust air handling units to provide required design supply and return air flow at inlets and outlets.

G. After supply, return, and exhaust systems are properly balanced, the supply (and return) fan capacities should be rechecked with 100% outside air when units are specified to operate in economizer mode for ventilation.

H. At the end of all inlet and outlet balancing, re-adjust the AHU minimum outside air ventilation rate as necessary.

I. Constant volume return air systems shall be balanced using the same principles and guidelines as for constant volume supply air systems.

3.10 CONSTANT VOLUME RETURN AIR BALANCING

A. Constant volume ducted return air systems shall be balanced using the same principles and guidelines as for constant volume supply air systems.

B. Return diffusers open to ceiling plenums cannot be balanced, however airflows should be recorded and total return air summarized by fan system.

3.11 CONSTANT VOLUME EXHAUST AIR SYSTEMS

A. Constant volume exhaust air systems shall be balanced using the same principles and guidelines as for constant volume supply systems. Follow standard procedures and incorporate any modifications necessary to accomplish the specified requirements.

3.12 VARIABLE AIR VOLUME AHU WITH STATIC PRESSURE RESET CONTROL

A. VAV systems utilizing static pressure reset control using trim and respond logic shall require the balancing contractor to work with the controls contractor when tuning the reset control to prevent cyclic instability.

B. Final maximum setpoint shall be determined by the balancing contractor to satisfy the worst-case zone at maximum design condition.

3.13 VARIABLE AIR VOLUME TERMINAL UNITS – PRESSURE INDEPENDENT

A. Set the volume controller to design maximum airflow.

B. Test the total airflow delivered by the outlets downstream of the VAV box.

C. Calibrate the controller to the measured airflow.

D. Balance the airflow from each outlet.

E. Set the volume controller to the design minimum airflow.

F. Balance modulating heating water valve flow of reheat coil per hydronic balancing requirements.

3.14 VARIABLE AIR VOLUME RETURN FANS

A. An open loop, control shall use an adjustable span and start point on the supply air and return air fan controls to sequence the return fan operation and speed with supply fan. Resistance to air flow in the return air system may not vary in direct proportion to resistance in the supply air system zones as supply air varies. While only a sampling, the TAB contractor shall set the return fan offset (if any) at maximum supply air flow to the VAV boxes and then record the variation in CFM air flow between the supply and air flow at minimum VAV box airflow settings.

B. A closed loop control

3.15 CONDENSING UNITS

A. Verify proper rotation of fans.

B. Measure entering- and leaving-air temperatures.

C. Record fan and motor operating data.

3.16 BOILERS

A. Measure and record entering- and leaving-water temperatures.

B. Measure and record water flow.

C. Record relief valve pressure rating.

3.17 PROCEDURES FOR HEAT-TRANSFER COILS

A. Measure, adjust, and record the following data for each water coil:

B. Entering- and leaving-water temperature.

C. Water flow rate.

D. Water pressure drop for major (more than 20 gpm) equipment coils, excluding unitary equipment such as reheat coils, unit heaters, and fan-coil units.

E. Dry-bulb temperature of entering and leaving air.

F. Wet-bulb temperature of entering and leaving air for cooling coils.

G. Airflow.

H. Measure, adjust, and record the following data for each electric heating coil:

I. Nameplate data.

J. Airflow.

K. Entering- and leaving-air temperature at full load.

L. Voltage and amperage input of each phase at full load.

M. Calculated kilowatt at full load.

N. Fuse or circuit-breaker rating for overload protection.

O. Measure, adjust, and record the following data for each steam coil:

P. Dry-bulb temperature of entering and leaving air.

Q. Airflow.

R. Measure, adjust, and record the following data for each refrigerant coil:

S. Dry-bulb temperature of entering and leaving air.

T. Wet-bulb temperature of entering and leaving air.

U. Airflow.

V.

3.18 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 air.
2. Indoor, exposed supply air.
3. Indoor, concealed return located in unconditioned space.
4. Indoor, concealed exhaust between isolation damper and penetration of building exterior.
5. Outdoor, exposed supply and return.

B. Related Sections:

1. Section 230716 "HVAC Equipment Insulation."
2. Section 230719 "HVAC Piping Insulation."
3. Section 233113 "Metal Ducts" for duct liners.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include thermal conductivity, water-vapor permeance thickness, and jackets (both factory- and field-applied if any).

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Skilled mechanics who have successfully completed an apprenticeship program or another craft training program certified by the Department of Labor, Bureau of Apprenticeship and Training.

B. Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical products according to ASTM E84, by a testing agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing agency.

1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.
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. Insulation application may begin on segments that have satisfactory test results.

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 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.

2.3 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.

2.4 SEALANTS

A. FSK and Metal Jacket Flashing Sealants:

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

a. Childers Brand; H. B. Fuller Construction Products.
b. Eagle Bridges – Marathon Industries.
c. Foster Brand; H. B. Fuller Construction Products.
d. Mon-Eco Industries.

2. Materials shall be compatible with insulation materials, jackets, and substrates.
3. Fire- and water-resistant, flexible, elastomeric sealant.
4. Service Temperature Range: Minus 40 to plus 250 deg F.
5. Color: Aluminum.

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.

2.5 FACTORY-APPLIED JACKETS

A. Insulation system schedules indicate factory-applied jackets on various applications. When factory-applied jackets are indicated, comply with the following:

1. 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.

2.6 FIELD-APPLIED JACKETS

A. Field-applied jackets shall comply with ASTM C921, Type I, unless otherwise indicated.

B. Self-Adhesive Outdoor Jacket: Impact- and tear-resistant, pre-fabricated, self-adhering, sheet-type protective membrane serving as a vapor barrier and waterproofing membrane for installation over insulation located aboveground outdoors; consisting of a rubberized bituminous resin on a cross-laminated polyethylene film covered with stucco-embossed UV-resistant aluminum-foil facing. Roll stock ready for 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. 3M

1) VentureClad™ 1579CWE-EMJ

b. MFM Building Products Corp

1) FlexClad® 250

c. Polyguard Products, Inc.

1) Alumaguard®

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. 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.

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 FIELD-APPLIED JACKET INSTALLATION

A. Where metal jackets are indicated, install with 2-inch overlap at longitudinal seams and end joints. Overlap longitudinal seams arranged to shed water. Seal end joints with weatherproof sealant recommended by insulation manufacturer. Secure jacket with stainless-steel bands 12 inches o.c. and at end joints.

3.7 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."

3.8 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform 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.

B. All insulation applications will be considered defective Work if sample inspection reveals noncompliance with requirements.

3.9 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, concealed exhaust between isolation damper and penetration of building exterior.
5. 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.

3.10 INDOOR DUCT AND PLENUM INSULATION SCHEDULE

A. Concealed, round, supply-air duct insulation shall be one of the following:

1. Mineral-Fiber Blanket: 2 inches thick and 1.5 lb/cu.ft. density or of a thickness and density to achieve a minimum, installed, total R-value of 6.

B. Concealed, round, 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, 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.

D. 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.

E. 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.

F. 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.

G. 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.

H. Exposed, round, supply-air duct insulation shall be one of the following:

1. Mineral-Fiber Blanket: 2 inches thick and 1.5 lb/cu.ft. density or of a thickness and density to achieve a minimum, installed, total R-value of 6.

I. Exposed, round, 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.

J. 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.

K. 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.

L. 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.

M. 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.

3.11 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. 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.

3.12 OUTDOOR, 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. Ducts and Plenums, Exposed, up to 48 Inches in Diameter or with Flat Surfaces up to 72 Inches:

1. Self-adhesive aluminum, stucco embossed: Minimum 16 mils (0.016 inches/0.40 mm) thick.

END OF SECTION

SECTION 230719 - HVAC 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 insulation for HVAC piping systems.

B. Related Sections:

1. Section 230713 "Duct Insulation" for duct insulation.

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.
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 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," "Indoor Piping Insulation Schedule," and "Outdoor, Aboveground Piping Insulation Schedule" articles for where insulating materials shall be applied.

B. Products shall not contain asbestos, lead, mercury, or mercury compounds.

C. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.

D. Flexible Elastomeric: Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C534/C534M, Type I for tubular materials, Type II for sheet materials.

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

a. Aeroflex USA, Inc.

1) Aeroflex EPDM™ (Tubular, unslit)

b. Armacell LLC.

1) AP/ArmaFlex (For thickness up to and including 1 inch)
2) AP/ArmaFlex FS (For thickness greater than 1 inch)

c. K-Flex USA.

1) Insul-Tube (Tubular, unslit)
2) Insul-Lock DS (Pre-slit with overlap seal)

E. Mineral-Fiber, Preformed Pipe: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C547.

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

a. Johns Manville; a Berkshire Hathaway company.

1) Micro-Lok® HP

b. Knauf Insulation, Inc.

1) Earthwool® 1000° Pipe Insulation

c. Manson Insulation Inc.

1) Alley-K®

d. Owens Corning.

1) SSL II® with ASJ Max Fiberglas™

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 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.

E. PVDC Tape for Indoor Applications: White vapor-retarder PVDC tape with acrylic adhesive.

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

    a. Johns Manville; a Berkshire Hathaway company.

2. Width: 3 inches.
3. Film Thickness: 2 mils.
4. Adhesive Thickness: 1.5 mils.
5. Elongation at Break: 120 percent.
6. Tensile Strength: 20 psi in width.

F. PVDC Tape for Outdoor Applications: White vapor-retarder PVDC tape with acrylic adhesive.

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

a. Johns Manville; a Berkshire Hathaway company.

2. Width: 3 inches.
3. Film Thickness: 6 mils.
4. Adhesive Thickness: 1.5 mils.
5. Elongation at Break: 145 percent.
6. Tensile Strength: 55 psi in width.

2.9 SECUREMENTS

A. Bands:

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

a. Johns Manville; a Berkshire Hathaway company.
b. RPR Products, Inc.

2. Stainless Steel: ASTM A240/A240M, Type 304 or Type 316; 0.015-inch-thick, 1/2 inch wide with wing seal or closed seal.
3. Aluminum: ASTM B209, Alloy 3003, 3005, 3105, or 5005; Temper H-14, 0.020-inch-thick, 1/2 inch wide with wing seal or closed seal.
4. Springs: Twin spring set constructed of stainless steel, with ends flat and slotted to accept metal bands. Spring size is determined by manufacturer for application.

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; 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.

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 2 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.

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: 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.

E. 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 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. 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 to fit. 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.

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 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.

C. 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 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.

3.9 PIPING INSULATION SCHEDULE, GENERAL

A. Insulation conductivity and thickness per pipe size shall comply with schedules in this Section or with requirements of authorities having jurisdiction, whichever is more stringent.

B. 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.

3.10 INDOOR PIPING INSULATION SCHEDULE

A. Heating-Hot-Water Supply and Return, 200 Deg F and Below:

1. NPS 1-1/4 and Smaller: Insulation shall be the following:
    a. Mineral-Fiber, Preformed Pipe, Type I: 1-1/2 inches thick.
1. NPS 1-1/2 and Larger: Insulation shall be the following:
    a. Mineral-Fiber, Preformed Pipe Insulation, Type I: 2 inches thick.

B. Refrigerant Suction and Hot-Gas Piping:

1. NPS 7/8 and Smaller: Insulation shall be the following:
    a. Flexible Elastomeric: 1/2 inch thick.
2. NPS 1and Larger: Insulation shall be the following:
    a. Flexible Elastomeric: 1 inch thick.

C. Refrigerant Liquid Piping:

1. All Pipe Sizes: Insulation shall be one of the following:
    a. Flexible Elastomeric: 1 inch thick.

3.11 OUTDOOR, ABOVEGROUND PIPING INSULATION SCHEDULE

A. Refrigerant Suction and Hot-Gas Piping:

1. All Pipe Sizes: Insulation shall be one of the following:
    a. Flexible Elastomeric: 2 inches thick.

B. Refrigerant Liquid Piping:

1. All Pipe Sizes: Insulation shall be one of the following:
    a. Flexible Elastomeric: 1 inch thick.

END OF SECTION

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Building Management System (BMS), utilizing direct digital controls.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. Products Supplied But Not Installed Under This Section:

1. Control valves.
2. Flow switches.
3. Wells, sockets and other inline hardware for water sensors (temperature, pressure, flow).
4. Automatic control dampers, where not supplied with equipment.
5. Airflow measuring stations.
6. Terminal unit controllers and actuators, when installed by terminal unit manufacturer.
7. Variable frequency drives. (This does not include VFDs integral to machinery such as chillers or boilers).

B. Products Installed But Not Supplied Under This Section:

1. None.

C. Products Not Furnished or Installed But Integrated with the Work of This Section:

1. Chiller control systems.
2. Boiler control systems.
3. Pump control packages.
4. In-line meters (gas, water, power).
5. Refrigerant monitors.
6. Chemical water treatment.
7. Smoke detectors (through alarm relay contacts).

D. Work Required Under Other Divisions Related to This Section:

1. Power wiring to line side of motor starters, disconnects or variable frequency drives.
2. Provision and wiring of smoke detectors and other devices relating to fire alarm system.
3. Campus LAN (Ethernet) connection adjacent to JACE network management controller.

1.3 RELATED SECTIONS

A. Section 230500 “Common Work Results for HVAC”: Performance and reference standards for products and materials required for the Project.

1.4 SYSTEM DESCRIPTION

A. Scope: Furnish all labor, materials and equipment necessary for a complete and operating Building Management System (BMS), utilizing Direct Digital Controls as shown on the drawings

and as described herein. Drawings are diagrammatic only. All controllers furnished in this section shall communicate on a peer-to-peer bus over an open protocol bus (Examples: LonTalk, BACnet, MODBUS).

1. The intent of this specification is to provide a system that is consistent with BMS systems throughout the owner's facilities running the Niagara 4 Framework.
2. System architecture shall fully support a multi-vendor environment and be able to integrate third party systems via existing vendor protocols including, as a minimum, LonTalk, BACnet and MODBUS.
3. System architecture shall provide secure Web access using any of the current versions of Microsoft Internet Explorer, Mozilla Firefox, or Google Chrome browsers from any computer on the owner's LAN.
4. Any control vendor that shall provide additional BMS server software shall be unacceptable. Only systems that utilize the Niagara 4 Framework shall satisfy the requirements of this section.
5. The BMS server shall host all graphic files for the control system. All graphics and navigation schemes for this project shall match those that are on the existing campus Niagara 4 Framework server.
6. Owner shall receive all Administrator level login and passwords for engineering toolset prior to the final 10% of the project payment. The Owner shall have full licensing and full access rights for all network management, operating system server, engineering and programming software required for the ongoing maintenance and operation of the BMS.
7. OPEN NIC STATEMENTS - All Niagara 4 software licenses shall have the following NiCS set to ALL: "accept.station.in=*"; "accept.station.out=*"; "accept.wb.in=*"; "accept.wb.out=*". All open NIC statements shall follow Niagara Open NIC specifications.
8. All JACE hardware licenses and certificates shall be stored on local MicroSD memory card employing encrypted “safe boot” technology.
9. All JACE (SNC) and Station PASS PHRASES and PASSWORDS will be provided to the Owner or their representative at 90% completion or prior to retention being paid.
10. To ensure quality, only JACE/WEBs 8000 hardware products will be used on this project.

B. All products of the BMS shall be provided with the following agency approvals. Verification that the approvals exist for all submitted products shall be provided on request, with the submittal package. Systems or products not currently offering the following approvals are not acceptable.

1. Federal Communications Commission (FCC), Rules and Regulations, Volume II -July 1986 Part 15 Class A Radio Frequency Devices.
2. FCC, Part 15, Subpart B, Class B
3. FCC, Part 15, Subpart C
4. FCC, Part 15, Subpart J, Class A Computing Devices.
5. UL 504 - Industrial Control Equipment.
6. UL 506 - Specialty Transformers.
7. UL 910 - Test Method for Fire and Smoke Characteristics of Electrical and Optical-Fiber Cables Used in Air-Handling Spaces.
8. UL 916 - Energy Management Systems All.
9. UL 1449 - Transient Voltage Suppression.
10. Standard Test for Flame Propagation Height of Electrical and Optical - Fiber Cables Installed Vertically in Shafts.
11. EIA/ANSI 232-E - Interface Between Data Technical Equipment and Data Circuit Terminal Equipment Employing Serial Binary Data Interchange.
12. EIA 455 - Standard Test Procedures for Fiber Optic Fibers, Cables, Transducers, Connecting and Terminating Devices.
13. IEEE C62.41- Surge Voltages in Low-Voltage AC Power Circuits.
14. IEEE 142 - Recommended Practice for Grounding of Industrial and Commercial Power Systems.

a. NEMA 250 - Enclosures for Electrical Equipment.

15. NEMA ICS 1 - Industrial Controls and Systems.
16. NEMA ST 1 - Specialty Transformers.
17. NCSBC Compliance, Energy: Performance of control system shall meet or surpass the requirements of ASHRAE/IESNA 90.1-1999.
18. CE 61326
19. C-Tick
20. cUL

1.5 SPECIFICATION NOMENCLATURE

A. Acronyms used in this specification are as follows:

1. Actuator: Control device that opens or closes valve or damper in response to control signal.
2. AI: Analog Input.
3. AO: Analog Output.
4. Analog: Continuously variable state over stated range of values.
5. BMS: Building Management System.
6. DDC: Direct Digital Control.
7. Discrete: Binary or digital state.
8. DI: Discrete Input.
9. DO: Discrete Output.
10. FC: Fail Closed position of control device or actuator. Device moves to closed position on loss of control signal or energy source.
11. FO: Fail open (position of control device or actuator). Device moves to open position on loss of control signal or energy source.
12. GUI: Graphical User Interface.
13. HVAC: Heating, Ventilating and Air Conditioning.
14. IDC: Interoperable Digital Controller.
15. ILC: Interoperable Lon Controller.
16. LAN: Local Area Network.
17. Modulating: Movement of a control device through an entire range of values, proportional to an infinitely variable input value.
18. Motorized: Control device with actuator.
19. NAC: Network Area Controller.
20. NC: Normally closed position of switch after control signal is removed or normally closed position of manually operated valves or dampers.
21. NO: Normally open position of switch after control signal is removed; or the open position of a controlled valve or damper after the control signal is removed; or the usual position of a manually operated valve.
22. OSS: Operating System Server, host for system graphics, alarms, trends, etc.
23. Operator: Same as actuator.
24. PC: Personal Computer.
25. Peer-to-Peer: Mode of communication between controllers in which each device connected to network has equal status and each shares its database values with all other devices connected to network.
26. P: Proportional control; control mode with continuous linear relationship between observed input signal and final controlled output element.
27. PI: Proportional-Integral control, control mode with continuous proportional output plus additional change in output based on both amount and duration of change in controller variable (reset control).
28. PICS: BACnet Product Interoperability Compliance Statement.
29. PID: Proportional-Integral-Derivative control, control mode with continuous correction of final controller output element versus input signal based on proportional error, its time history (reset) and rate at which it's changing (derivative).

30. Point: Analog or discrete instrument with addressable database value.
31. WAN: Wide Area Network.

1.6 SUBMITTALS

A. Submit under provisions of Section 01 30 00.

B. Product Data: Manufacturer's data sheets on each product to be used, including:

1. Preparation instructions and recommendations.
2. Storage and handling requirements and recommendations.
3. Installation methods.

C. Submit documentation of contractor qualifications, including those indicated in "Quality Assurance" if requested by the A-E.

D. 1 copy of shop drawings of the entire control system shall be submitted and shall consist of a complete list of equipment and materials, including manufacturers' catalog data sheets and installation instructions. Submit in printed electronic format. Samples of written Controller Checkout Sheets and Performance Verification Procedures for applications similar in scope shall be included for approval.

E. Shop drawings shall also contain complete wiring and schematic diagrams, sequences of operation, control system bus layout and any other details required to demonstrate that the system has been coordinated and will properly function as a system. Terminal identification for all control wiring shall be shown on the shop drawings.

F. Upon completion of the work, provide 1 complete set of ' as-built' drawings and other project-specific documentation in 3-ring hard-backed binders and on Flash media. In addition, a digital copy (PDF format) of the as-built drawings shall be available for download via a link within the BMS.

G. Any deviations from these specifications or the work indicated on the drawings shall be clearly identified in the Submittals.

1.7 QUALITY ASSURANCE

A. The Control System Contractor shall have a full service DDC office within 100 miles of the job site. This office shall be staffed with applications engineers, software engineers and field technicians. This office shall maintain parts inventory and shall have all testing and diagnostic equipment necessary to support this work, as well as staff trained in the use of this equipment. This office shall NOT be the only office within 100 miles of the job site, from which parts, software, and authorized service can be provided by the system manufacturer. This office will employ at least four NiagaraN4 programmers.
This office will be established as a:

1. Honeywell Authorized Controls Integrator – ACI, ControlNET, LLC

B. Single Source Responsibility of Supplier: The Control System Contractor shall be responsible for the complete installation and proper operation of the control system. The Control System Contractor shall exclusively be in the regular and customary business of design, installation and service of computerized building management systems similar in size and complexity to the system specified. The Control System Contractor shall be the manufacturer of the primary DDC

system components or shall have been the authorized representative for the primary DDC components manufacturer for at least 5 years.

C. Equipment and Materials: Equipment and materials shall be cataloged products of manufacturers regularly engaged in the production and installation of HVAC control systems. Products shall be manufacturer's latest standard design and have been tested and proven in actual use.

1.8 PRE-INSTALLATION MEETINGS

A. Convene minimum two weeks prior to starting work of this section.

1.9 DELIVERY, STORAGE AND HANDLING

A. Maintain integrity of shipping cartons for each piece of equipment and control device through shipping, storage and handling as required to prevent equipment damage. Store equipment and materials inside and protected from weather.

1.10 JOB CONDITIONS

A. Cooperation with Other Trades: Coordinate the Work of this section with that of other sections to insure that the Work will be carried out in an orderly fashion. It shall be this Contractor's responsibility to check the Contract Documents for possible conflicts between his Work and that of other crafts in equipment location, pipe, duct and conduit runs, electrical outlets and fixtures, air diffusers and structural and architectural features.

1.11 SEQUENCING

A. Ensure that products of this section are supplied to affected trades in time to prevent interruption of construction progress.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturers: Tridium/Honeywell WEBs N4 Building Control Systems – Honeywell Spyder, Stryker and Optimizer Suite.

B. Substitutions: Others not permitted. Only open BACnet controllers will be accepted. Any additional programming tools and program files will be provided to the Owner or their representative prior to payment of last 10% of the project contract.

C. Requests for substitutions will be considered in accordance with provisions of Section 016000.

2.2 INSTALLING CONTRACTORS

A. Acceptable Contractors: ControlNET, LLC

2.3 GENERAL

A. The Building Management System (BMS) shall be comprised of a network of interoperable, stand-alone digital controllers, a network area controller, graphics and programming and other control devices for a complete system as specified herein.

B. The installed system shall provide secure password access to all features, functions and data contained in the overall BMS.

2.4 OPEN, INTEROPERABLE, INTEGRATED ARCHITECTURE

A. The intent of this specification is to provide a peer-to-peer networked, stand-alone, distributed control system utilizing Open protocols in one open, interoperable system.

B. The supplied computer software shall employ object-oriented technology (OOT) for representation of all data and control devices within the system. Physical connection of any BACnet control equipment, such as chillers, shall be via Ethernet or IP.

C. All components and controllers supplied under this contract shall be true "peer-to-peer" communicating devices. Components or controllers requiring "polling" by a host to pass data shall not be acceptable.

D. The supplied system shall incorporate the ability to access all data using HTML5 enabled browsers without requiring proprietary operator interface and configuration programs or browser plug-ins. An Open Database Connectivity (ODBC) or Structured Query Language (SQL) compliant server database is required for all system database parameter storage. This data shall reside on the Operating System Server located in the Facilities Office on the LAN. Systems requiring proprietary database and user interface programs shall not be acceptable.

E. A hierarchical topology is required to assure reasonable system response times and to manage the flow and sharing of data without unduly burdening the customer's internal Intranet network. Systems employing a "flat" single tiered architecture shall not be acceptable.

1. Maximum acceptable response time from any alarm occurrence (at the point of origin) to the point of annunciation shall not exceed 5 seconds for network connected user interfaces.
2. Maximum acceptable response time from any alarm occurrence (at the point of origin) to the point of annunciation shall not exceed 60 seconds for remote or dial-up connected user interfaces.

2.5 BAS SERVER HARDWARE

A. Minimum Computer Configuration (Hardware Independent).

1. Central Server. Owner shall provide a dedicated BAS server with configuration that includes the following components as a minimum:
2. Processor: Intel Xeon CPU E5-2640 x64 (or better), compatible with dual- and quad-core processors.
3. Memory: 2 GB or more recommended for large systems, 8 GB or more recommended for the Windows 64-bit version.
4. Hard Drive: 4 GB minimum, more recommended depending on archiving requirements.
5. Display: Video card and monitor capable of displaying 1024 x 768 pixel resolution or greater.

6. Network Support: Ethernet adapter (10/100 Mb with RJ-45 connector).
7. Connectivity: Full-time high-speed ISP connection recommended for remote site access (i.e. T1, ADSL, cable modem).

B. Standard Client: The thin-client Web Browser BAS GUI shall be Microsoft Internet Explorer (10.0 or later) running on Microsoft 10 or later. No special software shall be required to be installed on the PCs used to access the BAS via a web browser.

2.6 SYSTEM NETWORK CONTROLLER (SNC)

A. These controllers are designed to manage communications between the programmable equipment controllers (PEC), application specific controllers (ASC) and advanced unitary controllers (AUC) which are connected to its communications trunks, manage communications between itself and other system network controllers (SNC) and with any operator workstations (OWS) that are part of the BAS, and perform control and operating strategies for the system based on information from any controller connected to the BAS.

B. The controllers shall be fully programmable to meet the unique requirements of the facility it shall control.

C. The controllers shall be capable of peer-to-peer communications with other SNC's and with any OWS connected to the BAS, whether the OWS is directly connected, connected via cellular modem or connected via the Internet.

D. The communication protocols utilized for peer-to-peer communications between SNC's will be Niagara 4 Fox, BACnet TCP/IP and SNMP. Use of a proprietary communication protocol for peer-to-peer communications between SNC's is not allowed.

E. The SNC shall employ a device count capacity license model that supports expansion capabilities.

F. The SNC shall be enabled to support and shall be licensed with the following Open protocol drivers (client and server) by default:

1. BACnet
2. Lon
3. MODBUS
4. SNMP
5. KNX

G. The SNC shall be capable of executing application control programs to provide:

1. Calendar functions.
2. Scheduling.
3. Trending.
4. Alarm monitoring and routing.
5. Time synchronization.
6. Integration of LonWorks, BACnet, and MODBUS controller data.
7. Network management functions for all SNC, PEC and ASC based devices.

H. The SNC shall provide the following hardware features as a minimum:

1. Two 10/100 Mbps Ethernet ports.
2. Two Isolated RS-485 ports with biasing switches.
3. 1 GB RAM

4. 4 GB Flash Total Storage / 2 GB User Storage
5. Wi-Fi (Client or WAP)
6. USB Flash Drive
7. High Speed Field Bus Expansion
8. -20-60°C Ambient Operating Temperature
9. Integrated 24 VAC/DC Global Power Supply
10. MicroSD Memory Card Employing Encrypted Safe Boot Technology

I. The SNC shall support standard Web browser access via the Intranet/Internet. It shall support a minimum of 16 simultaneous users.

J. The SNC shall provide alarm recognition, storage, routing, management and analysis to supplement distributed capabilities of equipment or application specific controllers.

K. The SNC shall be able to route any alarm condition to any defined user location whether connected to a local network or remote via cellular modem, or wide-area network.

1. Alarm generation shall be selectable for annunciation type and acknowledgement requirements including but not limited to:

a. Alarm.
b. Return to normal.
c. To default.

2. Alarms shall be annunciated in any of the following manners as defined by the user:

a. Screen message text.
b. Email of complete alarm message to multiple recipients.
c. Pagers via paging services that initiate a page on receipt of email message.
d. Graphics with flashing alarm object(s).

3. The following shall be recorded by the SNC for each alarm (at a minimum):

a. Time and date.
b. Equipment (air handler #, access way, etc.).
c. Acknowledge time, date, and user who issued acknowledgement.

L. Programming software and all controller "Setup Wizards" shall be embedded into the SNC.

M. The SNC shall support the following security functions.

1. Module code signing to verify the author of programming tool and confirm that the code has not been altered or corrupted.
2. Role-Based Access Control (RBAC) for managing user roles and permissions.
3. Require users to use strong credentials.
4. Data in Motion and Sensitive Data at Rest be encrypted.
5. LDAP and Kerberos integration of access management.

N. The SNC shall support the following data modeling structures to utilize Search; Hierarchy; Template; and Permission functionality:

1. Metadata: Descriptive tags to define the structure of properties.
2. Tagging: Process to apply metadata to components
3. Tag Dictionary

O. The SNC shall employ template functionality. Templates are a containerized set of configured data tags, graphics, histories, alarms... that are set to be deployed as a unit based upon manufacturer's controller and relationships. All lower level communicating controllers (PEC, AUC, AVAV, VFD…) shall have an associated template file for reuse on future project additions.

P. The SNC shall be provided with a 1 Year Software Maintenance license. Labor to implement is to be included.

2.7 EQUIPMENT SUPPLIED CONTROLS AND CONTROLLERS

A. In order to ensure future serviceability it is the intent of this specification that the local control contractor provide all programmable microprocessor based controls for all HVAC equipment with the exception of controls that are internal to the operation of equipment, i.e. Chiller control and Boiler combustion control. It is acceptable if the equipment supplier has a DDC ready package available to include dampers, valves, actuators, sensors, relays and safeties, transformer etc. Any equipment provided devices from the factory must match those specified herein and be coordinated with the control contractor to ensure power and signal compatibility are met.

2.8 PROGRAMMABLE EQUIPMENT CONTROLLER (PEC)

A. HVAC control shall be accomplished using BACnet based devices where the application has a BTL Listed PICS defined. The controller platform shall provide options and advanced system functions, programmable and configurable using Niagara 4 Framework, that allow standard and customizable control solutions required in executing the "Sequence of Operation".

B. All PECs shall be application programmable and shall at all times maintain their certification. All control sequences within or programmed into the PEC shall be stored in non-volatile memory, which is not dependent upon the presence of a battery to be retained.

C. The following integral and remote Inputs/Outputs shall be supported per each PEC:

1. Eight integral dry contact digital inputs.
2. Any two digital inputs may be configured as pulse counters with a maximum pulse read rate of 15 Hz.
3. Eight integral analog inputs (configurable as 0-10V, 0-10,000 ohm or, 20K NTC).
4. Six integral 4-20 ma and/or 0-10 vdc analog outputs.
5. Eight integral 24 Vac Triac digital outputs, configurable as maintained or floating motor control outputs.
6. One integral 20 Vdc, 65-mA power supply for auxiliary devices.
7. If a 20 Vdc 65-mA power supply terminal is not integral to the PEC, provide at each PEC a separate, fully isolated, enclosed, current limited and regulated UL listed auxiliary power supply for power to auxiliary devices.

D. Each PEC shall have expansion ability to support additional I/O requirements through the use of remote input/output modules.

E. PEC Controllers shall support at minimum the following control techniques:

1. General-purpose control loops that can incorporate Demand Limit Control strategies, Set point reset, adaptive intelligent recovery, and time of day bypass.
2. General-purpose, non-linear control loops.
3. Start/stop Loops.
4. If/Then/Else logic loops.

5. Math Function loops (MIN, MAX, AVG, SUM, SUB, SQRT, MUL, DIV, ENTHALPY).

2.9 ADVANCED UNITARY CONTROLLER (AUC)

A. The advanced unitary controller (AUC) platform shall be designed specifically to control HVAC - ventilation, filtration, heating, cooling, humidification, and distribution. Equipment includes: constant volume air handlers, VAV air handlers, packaged RTU, heat pumps, unit vents, fan coils, natural convection units and radiant panels. The control shall use BACnet based devices where the application has a BTL Listed PICS defined. The controller platform shall provide options and advanced system functions, programmable and configurable using Niagara 4 Framework, that allow standard and customizable control solutions required in executing the "Sequence of Operation".

B. Minimum Requirements:

1. The controller shall be fully programmable with full functionality on any Niagara 4 brand platform.

    a. Support downloads to the controller from any brand of Niagara 4 platform.
    b. Support uploads from the controller to any brand of Niagara 4 platform.
    c. Support simulation/debug mode of the controller.
    d. Maintain native GUI.

2. The controller shall be capable of either integrating with other devices or stand-alone operation.
3. The controller shall have two microprocessors. The Host processor contains on-chip FLASH program memory, FLASH information memory, and RAM to run the main HVAC application. The second processor for network communications. Controller memory minimum requirements include:

    a. FLASH Memory Capacity: 116 Kilobytes with 8 Kilobytes for application program.
    b. FLASH Memory settings retained for ten years.
    c. RAM: 8 Kilobytes.

4. The controller shall have an internal time clock with the ability to automatically revert from a master time clock on failure.

    a. Operating Range: 24 hour, 365 day, multi-year calendar including day of week and configuration for automatic day-light savings time adjustment to occur on configured start and stop dates.
    b. Accuracy: ±1 minute per month at 77 degrees F (25 degrees C).
    c. Power Failure Backup: 24 hours at 32 degrees to 122 degrees F (0 degrees to 50 degrees C).

5. The controller shall have Significant Event Notification, Periodic Update capability, and Failure Detect when network inputs fail to be detected within their configurable time frame.
6. The controller shall have an internal DC power supply to power external sensors.

    a. Power Output: 20 VDC ±10% at 75 mA.

7. The controller shall have a visual indication (LED) of the status of the devise:

    a. Controller operating normally.

b. Controller in process of download.
c. Controller in manual mode under control of software tool.
d. Controller lost its configuration.
e. No power to controller, low voltage, or controller damage.
f. Processor and/or controller are not operating.

8. The minimum controller Environmental ratings.

a. Operating Temperature Ambient Rating: -40 degrees to 150 degrees F (-40 degrees to 65.5 degrees C).
b. Storage Temperature Ambient Rating: -40 degrees to 150 degrees F (-40 degrees to 65.5 degrees C).
c. Relative Humidity: 5% to 95% non-condensing.

9. The controller shall have the additional approval requirements, listings, and approvals:

a. UL/cUL (E87741) listed under UL916 (Standard for Open Energy Management Equipment) with plenum rating.
b. CSA (LR95329-3) Listed.
c. Meets FCC Part 15, Subpart B, Class B (radiated emissions) requirements.
d. Meets Canadian standard C108.8 (radiated emissions).
e. Conforms requirements European Consortium standard EN 61000-6-1; 2001 (EU Immunity).
f. Conforms requirements European Consortium standard EN 61000-6-3; 2001 (EU Emission).

10. The controller housing shall be UL plenum rated mounting to either a panel or DIN rail (standard EN50022; 7.5mm x 35mm).
11. The controller shall have a mix of digital inputs (DI), digital Triac outputs (DO), analog outputs (AO), and universal inputs (UI).

a. Analog outputs (AO) shall be capable of being configured as digital outputs (DO).
b. Input and Output wiring terminal strips shall be removable from the controller without disconnecting wiring.
c. Input and Output wiring terminals shall be designated with color coded labels.
d. Universal inputs shall be capable of being configured as binary inputs, resistive inputs, voltage inputs (0-10 VDC), or current inputs (4-20 mA).

12. The controller shall provide "continuous" automated loop tuning with an Adaptive Integral Algorithm Control Loop.
13. The controller platform shall have standard HVAC application programs that are modifiable to support both the traditional and specialized "sequence of operations" as outlined in Section 4.

a. Discharge air control and low limit.
b. Pressure-dependent dual duct without flow mixing.
c. Variable air volume with return flow tracking.
d. Economizer with differential enthalpy.
e. Minimum airflow coordinated with CO2.
f. Unit ventilator cycle (1, 2, 3) 2-pipe.
g. Unit ventilator cycle (1, 2, 3) 2-pipe with face/bypass.
h. Unit ventilator cycle (1, 2, 3) 4-pipe.
i. Unit ventilator cycle (1, 2, 3) 4-pipe with EOC valve.

2.10 ADVANCED VARIABLE AIR VOLUME CONTROLLER (AVAV)

A. The advanced VAV controller platform shall be designed specifically for room-level VAV control - pressure-independent air flow control, pressure dependent damper control, supply and exhaust pressurization/de-pressurization control; temperature, humidity, complex CO2, occupancy, and emergency control. Equipment includes: VAV terminal unit, VAV terminal unit with reheat, Series fan powered terminal unit, Parallel fan powered terminal unit, Supply and Exhaust air volume terminals and Constant volume dual-duct terminal unit. Control shall be accomplished using BACnet based devices where the application has a BTL Listed PICS defined. The controller platform shall provide options and advanced system functions, programmable and configurable using Niagara 4 Framework, that allow standard and customizable control solutions required in executing the "Sequence of Operation".

B. Minimum Requirements:

1. The controller shall be fully programmable with full functionality on any Niagara 4 brand platform.

    a. Support downloads to the controller from any brand of Niagara 4 platform.
    b. Support uploads from the controller to any brand of Niagara 4 platform.
    c. Support simulation/debug mode of the controller.
    d. Maintain native GUI.

2. The controller shall be capable of either integrating with other devices or stand-alone room-level control operation.
3. The controller shall have an internal velocity pressure sensor.

    a. Sensor Type: Microbridge air flow sensor with dual integral restrictors.
    b. Operating Range: 0 to 1.5 inch H2O (0 to 374 Pa).
    c. Accuracy: ±2% of full scale at 32 degrees to 122 degrees F (0 degrees to 50 degrees C); ±1% of full scale at null pressure.

4. The controller shall have two microprocessors. The Host processor contains on-chip FLASH program memory, FLASH information memory, and RAM to run the main HVAC application. The second processor for network communications.

    a. FLASH Memory Capacity: 60 Kilobytes with 8 Kilobytes for application program.
    b. FLASH Memory settings retained for ten years.
    c. RAM: 2 Kilobytes.

5. The controller shall have an internal time clock with the ability to automatically revert from a master time clock on failure.

    a. Operating Range: 24 hour, 365 day, multi-year calendar including day of week and configuration for automatic day-light savings time adjustment to occur on configured start and stop dates.
    b. Accuracy: ±1 minute per month at 77 degrees F (25 degrees C).
    c. Power Failure Backup: 24 hours at 32 degrees to 122 degrees F (0 degrees to 50 degrees C).

6. The controller shall have Significant Event Notification, Periodic Update capability and Failure Detect when network inputs fail to be detected within their configurable time frame.
7. The controller shall have an internal DC power supply to power external sensors.

a. Power Output: 20 VDC ±10% at 75 mA.

8. The controller shall have a visual indication (LED) of the status of the devise:

   a. Controller operating normally.
   b. Controller in process of download.
   c. Controller in manual mode under control of software tool.
   d. Controller lost its configuration.
   e. No power to controller, low voltage, or controller damage.
   f. Processor and/or controller are not operating.

9. The minimum controller Environmental ratings:

   a. Operating Temperature Ambient Rating: 32 degrees to 122 degrees F (0 degrees to 50 degrees C).
   b. Storage Temperature Ambient Rating: 32 degrees to 122 degrees F (0 degrees to 50 degrees C).
   c. Relative Humidity: 5% to 95% non-condensing.

10. The controller shall have the additional approval requirements, listings, and approvals:

   a. UL/cUL (E87741) listed under UL916 (Standard for Open Energy Management Equipment) with plenum rating.
   b. CSA (LR95329-3) Listed.
   c. Meets FCC Part 15, Subpart B, Class B (radiated emissions) requirements.
   d. Meets Canadian standard C108.8 (radiated emissions).
   e. Conforms requirements European Consortium standard EN 61000-6-1; 2001 (EU Immunity).
   f. Conforms requirements European Consortium standard EN 61000-6-3; 2001 (EU Emission).

11. The controller housing shall be UL plenum rated mounting to either a panel or DIN rail (standard EN50022; 7.5mm x 35mm).
12. The controller shall provide an integrated actuator option.

   a. Actuator type: Series Floating.
   b. Rotation stroke: 95 degrees ±3 degrees for CW or CCW opening dampers.
   c. Torque rating: 44 lb-inch (5 Nm).
   d. Run time for 90 degrees rotation: 90 seconds at 60 Hz.

13. The controller shall have digital inputs (DI), digital Triac outputs (DO), three analog outputs (AO), and universal inputs (UI).

   a. Analog outputs (AO) shall be capable of being configured as digital outputs (DO).
   b. Input and Output wiring terminal strips shall be removable from the controller without disconnecting wiring.
   c. Input and Output wiring terminals shall be designated with color coded labels.

14. The controller shall provide "continuous" automated loop tuning with an Adaptive Integral Algorithm Control Loop.
15. The controller shall have a loop execution response time of 1 second.
16. The controller platform shall have standard HVAC application programs that are modifiable to support both the traditional and specialized "sequence of operations" as outlined in Section 4.

a. VAV terminal unit.
b. VAV terminal unit fan speed control.
c. Series fan.
d. Parallel fan.
e. Regulated air volume (room pressurization/de-pressurization).
f. CV dual-duct.
g. Room CO2 control.
h. Room Humidity.
i. TOD occupancy sensor stand-by set points.

2.11 OTHER CONTROL SYSTEM HARDWARE

A. Motorized control dampers that will not be integral to the equipment shall be furnished by the Control System Contractor. Control damper frames shall be constructed of galvanized steel, formed into changes and welded or riveted. Dampers shall be galvanized, with nylon bearings. Blade edge seals shall be vinyl. Blade edge and tip seals shall be included for all dampers. Blades shall be 16-gauge minimum and 6 inches wide maximum and frame shall be of welded channel iron. Damper leakage shall not exceed 10 CFM per square foot, at 1.5 inches water gauge static pressure.

B. Control damper actuators shall be furnished by the Control System Contractor. Two-position or proportional electric actuators shall be direct-mount type sized to provide a minimum of 5 in-lb torque per square foot of damper area. Damper actuators shall be spring return type. Operators shall be heavy-duty electronic type for positioning automatic dampers in response to a control signal. Motor shall be of sufficient size to operate damper positively and smoothly to obtain correct sequence as indicated. All applications requiring proportional operation shall utilize truly proportional electric actuators.

C. Carbon Dioxide Sensors (CO2): Sensors shall utilize Non-dispersive infrared technology (N.D.I.R.), repeatable to plus or minus 20 PPM. Sensor range shall be 0 - 2000 PPM. Accuracy shall be plus or minus five percent (5%) or 75 PPM, whichever is greater. Response shall be less than one minute. Input voltage shall be 20 to 30 VAC or DC. Output shall be 0 - 10 VDC. Sensor shall be wall or duct mounted type, as appropriate for the application, housed in a high impact plastic enclosure.

D. Current Sensitive Switches: Solid state, split core current switch that operates when the current level (sensed by the internal current transformer) exceeds the adjustable trip point. Current switch to include an integral LED for indication of trip condition and a current level below trip set point.

E. Temperature Control Panels: Furnish temperature control panels of code gauge steel with locking doors for mounting all devices as shown. All electrical devices within a control panel shall be factory wired. A complete set of ' as-built' control drawings (relating to the controls within that panel) shall be furnished within each control panel.

F. Pipe and Duct Temperature sensing elements: 10,000 or 20,000-ohm thermistor temperature sensors with and accuracy of ±1% accuracy. Their range shall be -5 to 250 degrees F (-20 to 121 degrees C). Limited range sensors shall be acceptable provided they are capable of sensing the range expected for the point at the specified accuracy. Thermal wells with heat conductive gel shall be included.

G. Low Air Temperature Sensors: Provide SPST type switch, with 15 to 55 degrees F (-9 to 13 degrees C), range, vapor-charged temperature sensor. Honeywell model L482A, or approved equivalent.

H. Relays: Start/stop relay model shall provide either momentary or maintained switching action as appropriate for the motor being started. All relays shall be plugged in, interchangeable, mounted on a sub base and wired to numbered terminals strips. Relays installed in panels shall all be DPDT with indicating lamp. Relays installed outside of controlled devices shall be enclosed in a NEMA enclosure suitable for the location. Relays shall be labeled with UR symbol. RIB-style relays are acceptable for remote enable/disable.

I. Control Power Transformers: Provide step-down transformers for all DDC controllers and devices as required. Transformers shall be sized for the load, but shall be sized for 50 watts, minimum. Transformers shall be UL listed Class 2 type, for 120 VAC/24 VAC operation.

J. Line voltage protection: All DDC system control panels that are powered by 120 VAC circuits shall be provided with surge protection. This protection is in addition to any internal protection provided by the manufacturer. The protection shall meet UL, ULC 1449, IEEE C62.41B. A grounding conductor, (minimum 12 AWG), shall be brought to each control panel.

K. CONTROL BALL VALVES

1. The valve and actuator combination product family shall be a factory assembled and tested unit. All valves and actuators shall be manufactured under ISO 9001 International Quality Control Standards.
2. The actuator shall provide two-position, floating or proportional control. Proportional control refers to direct acceptance of 2-10 Vdc or a 4-20 mA input signal. Floating control refers to direct acceptance of 24Vac pulse-width modulated open and close commands from a tri-state (SP3T) controller. Two-position control of non-fail safe actuators shall be in the form of 24Vac power controlled by SPDT switch. Two-position control of fail-safe actuators shall be in the form of 24Vac power controlled by SPST switch.
3. Basis-of-Design: Honeywell VBN / VBF. Products of other manufacturers will be considered for acceptance provided they equal or exceed the minimum requirements and functional qualities of the specified product. Requests for Architect/Engineer's approval must be accompanied by the "Substitution Request Form", all valves and actuators shall be from the same manufacture, with complete technical data, and the valve manufacture's flow testing documentation from an independently owned third-party testing agency for each valve size and model for evaluation. All materials for evaluation must be received by the Project Manager and Specification Department at least 10 days prior to bid due date. Additional approved manufacturers will be issued by Addendum.

2-Way and 3-Way VBN Control Ball valves 1/2 to 3 inches (2 ½ inches for 3-way): Valves shall be available with female national pipe thread pipe (NPT) fittings

a. Minimum Requirements:

1) The control ball shall have an equal percentage flow characteristic provided by a laser-milled, glass-filled polymer ball insert.
2) Valve ball and stem construction shall be nickel-plated brass or stainless steel.
3) Differential close-off pressure shall be at least 40 psid for 3-way valves and 100 psid for 2-way valves with ANSI Class IV seat leakage.
4) Threaded valves bodies shall have static pressure rating of 360 psig (2500 kPa) at 250°F (121 C).
5) Valve stem assembly shall be of a pack-less design and be field-replaceable without removing the valve body from the piping. Teflon® seals shall hold the stem in alignment, and protect the O-ring from system temperature fluctuations. Stem O-ring shall be made of peroxide-cured EPDM and be isolated from system treatment chemicals by a reservoir of silicon grease. Valve shall have a blow-out proof stem with

minimum 600 psi rating.

6) Multiple Cv ratings shall be available in each valve size, with at least 5 discrete Cv options for each size ranging from 0.31 Cv to 266 Cv and contain a minimum of 53 unique Cv options.
7) Actuated valves shall be capable of closing off against their maximum operating differential pressure. Seat leakage when closed shall be ANSI/ASME Class IV, minimum.
8) Actuators shall be direct coupled rotary type requiring neither crank-arm nor linkage and direct mount to the valve actuator bracket. The bracket shall provide for up to 2 inches (50mm) of pipe insulation and provide a torque of a least 35 lb-in.
9) Actuators shall be capable of operating on 24Vac Class II power, or be UL Recognized or CSA Certified to U.S. and Canadian Standards where used with line voltage.
10) Actuators shall provide screw terminal wiring connections with adapters for flexible conduit where mechanical protection is required by local codes.
11) Proportional actuators shall have a rotation direction control switch accessible on the cover to change between proportional or floating control. Actuators that require to be electronically programmed by use of a handheld programming device or external computer software are NOT acceptable.
12) All actuators shall be designed for a minimum of 60,000 full-stroke cycles at actuator rated torque and temperature, and 1,500,000 repositions.
13) Two-position actuators shall be designed for a minimum of 100,000 full-stroke cycles at rated load and temperature.
14) Actuation shall be available with fail-safe operation capable of returning the valve to a normally open or normally closed position following loss of power.
15) All fail-safe actuators must be designed for either normally open or normally closed fail-safe operation with a continuously engaged mechanical return spring. This spring must return the actuator to a fail-safe position within 20-25 seconds of power loss.

2-Way and 3-Way VBF Control Ball Valves 4 to 6 inches: Valves shall be available with wafer flanges for use with either ANSI/ASME 125/150 pipe flanges in sizes from 4 up to 6 inches.

a. Minimum Requirements:

1) The control ball shall have an equal percentage flow characteristic provided by a laser-milled, glass-filled polymer ball insert.
2) Valve trim shall be stainless steel.
3) Close-off pressure shall be 70 psid minimum, with ANSI Class IV seat leakage.
4) Valve bodies shall have static pressure rating of 240 psi (1655kPa) at 250°F (121 C).
5) Valve stem seals shall be EPDM O-rings and be replaceable.
6) Multiple Cv ratings shall be available in each valve size, with at least 5 discrete Cv values for each size ranging from 91 Cv to 650 Cv.
7) Actuated valves shall be capable of closing off against their maximum operating differential pressure. Seat leakage when closed shall be ANSI/ASME Class IV, minimum.
8) Actuators shall have a minimum of 88 in.-lbs of torque for 4- and 5-inch valves. 6-inch valves shall require actuators with 140 in.-lbs of torque for flow rates under 700 GPM.

9) Actuators shall be direct coupled rotary type requiring neither crank-arm nor linkage and direct mount to the valve actuator bracket.
10) Actuators shall be capable of operating on 24Vac Class II power, in both electronic fail-safe and stay-in-place configurations. Actuator fail-safe action in the event of power failure shall be field-selectable normally open or normally closed.
11) Actuators shall provide screw terminal wiring connections with adapters for flexible conduit where mechanical protection is required by local codes.
12) Actuation shall be available with electronic fail-safe operation capable of returning the valve to a normally open or normally closed position following loss of power.
13) Proportional actuators shall have a rotation direction control switch accessible on the cover to change between proportional or floating control. Actuators that require to be electronically programmed by use of a handheld programming device or external computer software are NOT acceptable.
14) All actuators shall be designed for a minimum of 60,000 full-stroke cycles at actuator rated torque and temperature, and 1,500,000 repositions.
15) Two-position actuators shall be designed for a minimum of 100,000 full-stroke cycles at rated load and temperature.
16) Actuation shall be available with fail-safe operation capable of returning the valve to a normally open or normally closed position following loss of power.
17) All fail-safe actuators must be designed for either normally open or normally closed fail-safe operation with a continuously engaged mechanical return spring. This spring must return the actuator to a fail-safe position within 20-25 seconds of power loss.

b. General Requirements:

1) Valve Schedule shall include a separate line for each valve and a column for each of the valve attributes: Valve Identification Tag, Location, Valve Type, Valve Size, Pipe Size, Configuration, Flow Capacity, Minimum Design Pressure Drop, Maximum Pressure Drop, Fail Position, Close-off Pressure, Actuator Identification Tag, and Actuator Type.
2) Valves shall not be installed with stems below the horizontal plane to prevent actuator damage due to stem seal leakage, or accumulation of particulate in the stem packing.
3) Valves shall be capable for use only in cold, warm and hot water system applications with diethylene glycol, ethylene glycol, or propylene glycol solutions up to 50% concentration.
4) A water filtration and treatment system shall be installed and operated according to the requirements of Division 23 25 13, Water Treatment for Closed-Loop Hydronic Systems. These requirements shall meet or exceed European Norm VDI 2035. The presence of excess rust in the system will void the manufacturer's warranty.
5) Run time shall be constant and independent of: load, temperature, and supply voltage (within specifications).
6) Accessories Identification tags shall be available for all valves; tags shall be indelibly marked with size, Cv, model number, date code and tag location.

L. Control Valve Actuators: Actuators for VAV terminal unit heating coils shall be "drive-open; drive-closed" type. All actuators shall have inherent current limiting motor protection. Valve actuators shall be 24-volt, electronic type, modulating or two-position as required for the correct operating

sequence. Actuators on valves needing ' fail-safe' operation shall have spring return to Normal position. Modulating valves shall be positive positioning in response to the signal. All valve actuators shall be UL listed.

M. All control valves 2-1/2 inches (63.5 mm) or larger shall have position indication. All hot water control valves shall be Normally-Open arrangement; all chilled water control valves shall be Normally-Closed arrangement.

N. Wall Mount Room Temperature sensors: Each room temperature sensor shall provide temperature indication to the digital controller, provide the capability for a software-limited occupant set point adjustment (warmer-cooler slider bar or switch) and limited operation override capability. Room Temperature Sensors shall be 10,000 or 20,000-ohm thermistor type with a temperature range of -40 to 140 degrees F (-38 to 60 degrees C). The sensor shall be complete with a decorative cover and suitable for mounting over a standard electrical utility box. These devices shall have an accuracy of 0.5 degrees F (.024 degrees C) over the entire range.

O. Duct-mounted and Outside Air Temperature Sensors: 10,000 or 20,000-ohm thermistor temperature sensors with an accuracy of ±; 0.2 degrees C. Outside air sensors shall include an integral sun shield. Duct-mounted sensors shall have an insertion measuring probe of a length appropriate for the duct size, with a temperature range of -40 to 160 degrees F(-38 to 71 degrees C) The sensor shall include a utility box and a gasket to prevent air leakage and vibration noise. For all mixed air and preheat air applications, install bendable averaging duct sensors with a minimum 8 feet (2438 mm) long sensor element. These devices shall have accuracy of 0.5 degrees F (.024 degrees C) over the entire range.

P. Humidity sensors shall be thin-film capacitive type sensor with on-board nonvolatile memory, accuracy to plus or minus two percent (2%) at 0 to 90% RH, 12 - 30 VDC input voltage, analog output (0 - 10 VDC or 4 - 20mA output). Operating range shall be 0 to 100% RH and 32 to 140 degrees F (0 to 60 degrees C). Sensors shall be selected for wall, duct or outdoor type installation as appropriate.

Q. Carbon Dioxide Sensors (CO2): Sensors shall utilize Non-dispersive infrared technology (N.D.I.R.), repeatable to plus or minus 20 PPM. Sensor range shall be 0 - 2000 PPM. Accuracy shall be plus or minus five percent (5%) or 75 PPM, whichever is greater. Response shall be less than one minute. Input voltage shall be 20 to 30 VAC or DC. Output shall be 0 - 10 VDC. Sensor shall be wall or duct mounted type, as appropriate for the application, housed in a high impact plastic enclosure.

R. Current Sensitive Switches: Solid state, split core current switch that operates when the current level (sensed by the internal current transformer) exceeds the adjustable trip point. Current switch to include an integral LED for indication of trip condition and a current level below trip set point.

S. Differential Analog (duct) Static Pressure Transmitters Provide a pressure transmitter with integral capacitance type sensing and solid-state circuitry. Accuracy shall be plus or minus 1% of full range; range shall be selected for the specific application. Provide zero and span adjustment capability. Device shall have integral static pickup tube.

T. Differential Air Pressure Switches: Provide SPDT type, UL-approved, and selected for the appropriate operating range where applied. Switches shall have adjustable set points and barbed pressure tips.

U. Water Flow Switches: Provide a SPST type contact switch with bronze paddle blade, sized for the actual pipe size at the location. If installed outdoors, provide a NEMA-4 enclosure. Flow switch shall be UL listed.

V. Temperature Control Panels: Furnish temperature control panels of code gauge steel with locking doors for mounting all devices as shown. All electrical devices within a control panel shall be factory wired. A complete set of ' as-built' control drawings (relating to the controls within that panel) shall be furnished within each control panel.

W. Pipe and Duct Temperature sensing elements: 10,000 or 20,000-ohm thermistor temperature sensors with and accuracy of ±1% accuracy. Their range shall be -5 to 250 degrees F (-20 to 121 degrees C). Limited range sensors shall be acceptable provided they are capable of sensing the range expected for the point at the specified accuracy. Thermal wells with heat conductive gel shall be included.

X. Low Air Temperature Sensors: Provide SPST type switch, with 15 to 55 degrees F (-9 to 13 degrees C), range, vapor-charged temperature sensor. Honeywell model L482A, or approved equivalent.

Y. Variable Frequency Drives: The variable frequency drive (VFD) shall be designed specifically for use in Heating, Ventilation, and Air Conditioning (HVAC) applications in which speed control of the motor can be applied. The VFD, including all factory installed options, shall have UL & CSA approval. VFD’s shall include communications capability with DDC BMS via built-in interface card (MODBUS or BACnet).

Z. Relays: Start/stop relay model shall provide either momentary or maintained switching action as appropriate for the motor being started. All relays shall be plugged in, interchangeable, mounted on a sub base and wired to numbered terminals strips. Relays installed in panels shall all be DPDT with indicating lamp. Relays installed outside of controlled devices shall be enclosed in a NEMA enclosure suitable for the location. Relays shall be labeled with UR symbol. RIB-style relays are acceptable for remote enable/disable.

AA. Emergency Stop Switches: Provide toggle-type switch with normally-closed contact. Switch shall be labeled "AIR HANDLER EMERGENCY SHUTOFF, NORMAL - OFF.".

BB. Transducers: Differential pressure transducers shall be electronic with a 4-20 mA output signal compatible to the Direct Digital Controller. Wetted parts shall be stainless steel. Unit shall be designed to operate in the pressure ranges involved.

CC. Control Power Transformers: Provide step-down transformers for all DDC controllers and devices as required. Transformers shall be sized for the load, but shall be sized for 50 watts, minimum. Transformers shall be UL listed Class 2 type, for 120 VAC/24 VAC operation.

DD. Line voltage protection: All DDC system control panels that are powered by 120 VAC circuits shall be provided with surge protection. This protection is in addition to any internal protection provided by the manufacturer. The protection shall meet UL, ULC 1449, IEEE C62.41B. A grounding conductor, (minimum 12 AWG), shall be brought to each control panel.

2.12 BAS SERVER & WEB BROWSER GUI - SYSTEM OVERVIEW

A. The BAS Contractor shall provide system software based on server/thin-client architecture, designed around the open standards of web technology. The BAS server shall communicate using Ethernet and TCP. Server shall be accessed using a web browser over Owner intranet and remotely over the Internet.

B. The intent of the thin-client architecture is to provide the operator(s) complete access to the BAS system via a web browser. The thin-client web browser Graphical User Interface (GUI) shall be browser and operating system agnostic, meaning it will support HTML5 enabled browsers without

requiring proprietary operator interface and configuration programs or browser plug-ins. Microsoft, Firefox, and Chrome browsers (current released versions), and Windows as well as non-Window operating systems.

C. The BAS server software shall support at least the following server platforms (Windows 7, 8.1, 10, Server 12). The BAS server software shall be developed and tested by the manufacturer of the system stand-alone controllers and network controllers/routers.

D. The web browser GUI shall provide a completely interactive user interface and shall provide a HTML5 experience that supports the following features as a minimum:

1. Trending.
2. Scheduling.
3. Electrical demand limiting.
4. Duty Cycling.
5. Downloading Memory to field devices.
6. Real time 'live' Graphic Programs.
7. Tree Navigation.
8. Parameter change of properties.
9. Set point adjustments.
10. Alarm / event information.
11. Configuration of operators.
12. Execution of global commands.
13. Add, delete, and modify graphics and displayed data.

E. Software Components: All software shall be the most current version. All software components of the BAS system software shall be provided and installed as part of this project. BAS software components shall include:

1. Server Software, Database and Web Browser Graphical User Interface.
2. 1 Year Software Maintenance license. Labor to implement is to be included.
3. Embedded System Configuration Utilities for future modifications to the system and controllers.
4. Embedded Graphical Programming Tools.
5. Embedded Direct Digital Control software.

F. BAS Server Database: The BAS server software shall utilize a Java Database Connectivity (JDBC) compatible database such as: MS SQL 8.0, Oracle 8i or IBM DB2. BAS systems written to Non -Standard and/or Proprietary databases are NOT acceptable.

G. Thin Client - Web Browser Based: The GUI shall be thin client or browser based and shall meet the following criteria:

1. Web Browser's for PC's: Only the current released browser (Explorer/Firefox/Chrome) will be required as the GUI and a valid connection to the server network. No installation of any custom software shall be required on the operator's GUI workstation/client. Connection shall be over an intranet or the Internet.
2. Secure Socket Layers: Communication between the Web Browser GUI and BAS server shall offer encryption using 128-bit encryption technology within Secure Socket Layers (SSL). Communication protocol shall be Hyper-Text Transfer Protocol Secure (HTTPS).

2.13 WEB BROWSER GRAPHICAL USER INTERFACE

A. Web Browser Navigation: The Thin Client web browser GUI shall provide a comprehensive user

interface. Using a collection of web pages, it shall be constructed to "feel" like a single application, and provide a complete and intuitive mouse/menu driven operator interface. It shall be possible to navigate through the system using a web browser to accomplish requirements of this specification. The Web Browser GUI shall (as a minimum) provide for navigation, and for display of animated graphics, schedules, alarms/events, live graphic programs, active graphic set point controls, configuration menus for operator access, reports and reporting actions for events.

B. Mobile Web Browser Navigation through Smart Phones and Tablets: In order to assure comprehensive mobile navigation with all major browsers, navigation shall be done through the use of a touch-friendly dynamic navigation bar. Right-click commands are not compatible with most mobile/touch devices, so all equipment commands shall utilize touch-compatible buttons. The contents of the dynamic navigation bar shall be customized to match the specific requirements of each building, while retaining the same general categories for consistency and ease of use.

C. Critical Data Display: The dynamic navigation bar may also display a critical data summary

D. Login: On launching the web browser and selecting the appropriate domain name or IP address, the operator shall be presented with a login page that will require a login name and strong password. Navigation in the system shall be dependent on the operator's role-based application control privileges.

E. Navigation:

1. The buttons of the dynamic navigation bar shall be adaptive, changing hyperlink connections relevant to each system type, allowing hyperlinks, specific to the selected system to be added as requested by the consulting engineer.
2. The dynamic navigation bar at the top of each BMS page will be provided and have the following links/functions:

    a. Home: A link that takes the user to a main entry point of navigation at a building or district level.
    b. Main Systems Icons/Buttons: Links to general systems like HVAC, Lights, and Card Access are indicated by icon buttons. Links to major systems and equipment such Hydronic Systems or Air Handlers are listed in descriptive buttons.
    c. Floor Plans: Links to floor plan sections are shown as graphic outline keys with descriptive buttons. Visual indicators highlight the part of the building that is relevant to the user’s navigation (i.e. the section in which the currently viewed VAV box resides). Equipment occupancy status, when applicable, shall be indicated on the floor plan by a color-coded avatar.
    d. Alarm Console: A table that shows all points that are in an alarm state and allowing users to silence or acknowledge alarms from the alarm console. The dynamic navigation bar will show the total number of unacknowledged alarms without having to go to the Alarm Console page.
    e. Schedules: An at-a-glance schedule page that shows equipment schedule periods. The at-a-glance page allows users to change occupancy times with a weekly or calendar scheduler with a single click.
    f. Information: A page with links to pertinent documents, including a BMS User’s Guide. This page will provide legends/keys that define status colors and icons. This page will also serve as the landing page for links to the following feature pages, if they are not directly linkable from the dynamic navigation bar:

        1) Weather: A page that shows current local weather conditions in a seven-day forecast.
        2) Alarm History: A log of previous alarms that features sorting and time

range filters.

3) Audit Log: A log of users who have accessed the BMS. It records changes made by users and features sorting and time range filters.
4) Chart Builder: A tool that allows charts to be made comparing historical data. It allows custom-built chart data to be exported as an Excel or .PDF file.
5) Override Summary: A table of all equipment with a manual override status.
6) User Configuration: A page that allows users to change log-in and profile information. Users with administrative rights may add or delete users to the BMS.
7) Custom Dashboard: A page with customizable charts and gauges which can be saved independently for each operator.
8) Email Configuration: A page that will allow administrators to set up email notification specifics for operators regarding alarms.
9) User Configuration: A page that will allow administrators to add, delete, and edit the properties of users for the BAS.

g. Log-Out: Pressing this button will log the current user out of the BMS and return the browser to the log-in screen.
h. Navigational Info Fields: This feature provides information to the user by displaying the building name, current page name, current page description, outside air temperature, current date, and current time. The current page description is editable by the user from the graphic.

F. Graphics Pane: The Graphics Pane shall provide several functional views for each subsystem specified. A functional view shall be accessed by clicking on the corresponding button:

1. Graphics: Using graphical format suitable for display in a web browser, graphics shall include aerial building/campus views, color building floor-plans, equipment drawings, active graphic set point controls, web content and other valid HTML elements. The data on each graphic page shall automatically refresh.
2. Dashboards: User customizable data using drag and drop HTML5 elements. Shall include Web Charts, Gauges, and other custom developed widgets for web browser. User shall have ability to save custom dashboards. See Section 2.13 below.
3. Schedules: Shall be used to create, modify/edit and view schedules based on the systems hierarchy (using the dynamic navigation bar).
4. Alarms: Shall be used to view alarm information geographically (using the dynamic navigation bar), acknowledge alarms, sort alarms by category, actions and verify reporting actions.
5. Charting: Shall be used to display associated trend and historical data, modify colors, date range, axis and scaling. User shall have ability to create HTML charts through web browser without utilizing chart builder. User shall be able to drag and drop single or multiple data points, including schedules, and apply status colors for analysis.
6. Global Set Points page: This page is used to monitor and set global commands that affect multiple systems/equipment. (For example, all finned tube valves in the building would have a global minimum valve position set point and corresponding outside air temperature set point).
7. Preventative Maintenance Schedules page: This page is used to set and track runtimes for mechanical equipment. Alerts shall be sent to the Alarm Console when the runtime reaches the allocated time to notify operators that preventative maintenance is required. These runtime limits should be operator adjustable.
8. Logic - Live Graphic Programs: Shall be used to display' live' graphic programs of the control algorithm, (micro block programming) for the mechanical/electrical system selected in the navigation tree.

G. Color Graphics: The Web Browser GUI shall make extensive use of color in the graphic pane to communicate information related to set points and comfort. Animated .gifs or .jpg, vector scalable, active set point graphic controls shall be used to enhance usability. Graphics tools used to create Web Browser graphics shall be non-proprietary and conform to the following basic criteria:

1. General Graphic: General area maps shall show locations of controlled buildings in relation to local landmarks.
2. Color Floor Plans: Floor plan graphics shall show heating and cooling zones throughout the buildings in a range of colors, as selected by Owner. The room temperature label colors shall be updated dynamically as a zone's actual comfort condition changes to give an at-a-glance realization of temperatures to the operator.
3. Mechanical Components: Mechanical system graphics shall show the type of mechanical system components serving any zone through the use of a pictorial representation of components. Selected I/O points being controlled or monitored for each piece of equipment shall be displayed with the appropriate engineering units. Animation shall be used for rotation or moving mechanical components to enhance usability.
4. Minimum System Color Graphics: Color graphics shall be selected and displayed via a web browser for the following:

    a. Each piece of equipment monitored or controlled including each terminal unit.
    b. Each building.
    c. Each floor and zone controlled.

H. Hierarchical Schedules: Utilizing the Navigation Tree displayed in the web browser GUI, an operator (with proper access credentials) shall be able to define a Normal, Holiday or Override schedule for an individual piece of equipment or room, or choose to apply a hierarchical schedule to the entire system, site or floor area. For example, Independence Day ' Holiday' for every level in the system would be created by clicking at the top of the geographic hierarchy defined in the Navigation Tree. No further operator intervention would be required and every control module in the system with would be automatically downloaded with the ' Independence Day' Holiday. All schedules that affect the system/area/equipment shall be indicated on the Schedules Page.

1. Schedules: Schedules shall comply with the BACnet standards, (Schedule Object, Calendar Object, Weekly Schedule property and Exception Schedule property) and shall allow events to be scheduled based on:

    a. Types of schedule shall be Normal, Holiday or Override.
    b. A specific date.
    c. A range of dates.
    d. Any combination of Month of Year (1-12, any), Week of Month (1-5, last, any), Day of Week (M-Sun, Any).
    e. Wildcard (example, allow combinations like second Tuesday of every month).

2. Schedule Categories: The system shall allow operators to define and edit scheduling categories (different types of "things" to be scheduled; for example, lighting, HVAC occupancy, etc.). The categories shall include: name, description, icon (to display in the hierarchy tree when icon option is selected) and type of value to be scheduled.
3. Schedule Groups: In addition to hierarchical scheduling, operators shall be able to define functional Schedule Groups, comprised of an arbitrary group of areas/rooms/equipment scattered throughout the facility and site. For example, the operator shall be able to define an ' individual tenant' group - who may occupy different areas within a building or buildings. Schedules applied to the ' tenant group' shall automatically be downloaded to control modules affecting spaces occupied by the ' tenant group'.
4. Intelligent Scheduling: The control system shall be intelligent enough to automatically turn on any supporting equipment needed to control the environment in an occupied space. If the operator schedules an individual room in a VAV system for occupancy, for example,

the control logic shall automatically turn on the VAV air handling unit, chiller, boiler and/or any other equipment required to maintain the specified comfort and environmental conditions within the room.

5. Partial Day Exceptions: Schedule events shall be able to accommodate a time range specified by the operator (ex: board meeting from 6 pm to 9 pm overrides Normal schedule for conference room).
6. Schedule Summary Graph: The schedule summary graph shall clearly show Normal versus Holiday versus Override Schedules and the net operating schedule that results from all contributing schedules. Note: In case of priority conflict between schedules at the different geographic hierarchy, the schedule for the more detailed geographic level shall apply.

I. Alarms: Alarms associated with a specific system, area, or equipment selected in the Navigation Tree, shall be displayed in the Action Pane by selecting an ' Alarms' view. Alarms, and reporting actions shall have the following capabilities:

1. Alarms View: Each Alarm shall display an Alarms Category (using a different icon for each alarm category), date/time of occurrence, current status, alarm report and a bold URL link to the associated graphic for the selected system, area or equipment. The URL link shall indicate the system location, address and other pertinent information. An operator shall easily be able to sort events, edit event templates and categories, acknowledge or force a return to normal in the Events View as specified in this section.
2. Alarm Categories: The operator shall be able to create, edit or delete alarm categories such as HVAC, Maintenance, Fire, or Generator. An icon shall be associated with each alarm category, enabling the operator to easily sort through multiple events displayed.
3. Alarm Templates: Alarm template shall define different types of alarms and their associated properties. As a minimum, properties shall include a reference name, verbose description, severity of alarm, acknowledgement requirements, and high/low limit and out of range information.
4. Alarm Areas: Alarm Areas enable an operator to assign specific Alarm Categories to specific Alarm Reporting Actions. For example, it shall be possible for an operator to assign all HVAC Maintenance Alarm on the 1st floor of a building to email the technician responsible for maintenance. The Navigation Tree shall be used to setup Alarm Areas in the Graphic Pane.
5. Alarm Time/Date Stamp: All events shall be generated at the DDC control module level and comprise the Time/Date Stamp using the standalone control module time and date.
6. Alarm Configuration: Operators shall be able to define the type of Alarm generated per object. A ' network' view of the Navigation Tree shall expose all objects and their respective Alarm Configuration. Configuration shall include assignment of Alarm, type of Acknowledgement and notification for return to normal or fault status.
7. Alarm Summary Counter: The view of Alarm in the Graphic Pane shall provide a numeric counter, indicating how many Alarms are active (in alarm), require acknowledgement and total number of Alarms in the BAS Server database.
8. Alarm Auto-Deletion: Alarms that are acknowledged and closed shall be auto-deleted from the database and archived to a text file after an operator defined period.
9. Alarm Reporting Actions: Alarm Reporting Actions specified shall be automatically launched (under certain conditions) after an Alarm is received by the BAS server software. Operators shall be able to easily define these Reporting Actions using the Navigation Tree and Graphic Pane through the web browser GUI. Reporting Actions shall be as follows:

    a. Print: Alarm information shall be printed to the BAS server's PC or a networked printer.
    b. Email: Email shall be sent via any POP3-compatible e-mail server (most Internet Service Providers use POP3). Email messages may be copied to several email accounts. Note: Email reporting action shall also be used to support

alphanumeric paging services, where email servers support pagers.

c. File Write: The ASCII File write reporting action shall enable the operator to append operator defined alarm information to any alarm through a text file. The alarm information that is written to the file shall be completely definable by the operator. The operator may enter text or attach other data point information (such as AHU discharge temperature and fan condition upon a high room temperature alarm).

d. Write Property: The write property reporting action updates a property value in a hardware module.

e. SNMP: The Simple Network Management Protocol (SNMP) reporting action sends an SNMP trap to a network in response to receiving an alarm.

f. Run External Program: The Run External Program reporting action launches specified program in response to an event.

J. Trends: As system is engineered, all points shall be enabled to trend. Trends shall both be displayed and user configurable through the Web Browser GUI. Trends shall comprise analog, digital or calculated points simultaneously. A trend log's properties shall be editable using the Navigation Tree and Graphic Pane.

1. Viewing Trends: The operator shall have the ability to view trends by using the Navigation Tree and selecting a Trends button in the Graphic Pane. The system shall allow y- and x-axis maximum ranges to be specified and shall be able to simultaneously graphically display multiple trends per graph.
2. Local Trends: Trend data shall be collected locally by Multi-Equipment/Single Equipment general-purpose controllers, and periodically uploaded to the BAS server if historical trending is enabled for the object. Trend data, including run time hours and start time date shall be retained in non-volatile module memory. Systems that rely on a gateway/router to run trends are NOT acceptable.
3. Resolution. Sample intervals shall be as small as one second. Each trended point will have the ability to be trended at a different trend interval. When multiple points are selected for displays that have different trend intervals, the system will automatically scale the axis.
4. Dynamic Update. Trends shall be able to dynamically update at operator-defined intervals.
5. Zoom/Pan. It shall be possible to zoom-in on a particular section of a trend for more detailed examination and ' pan through' historical data by simply scrolling the mouse.
6. Numeric Value Display. It shall be possible to pick any sample on a trend and have the numerical value displayed.

K. Security Access: Systems that Security access from the web browser GUI to BAS server shall require a Login Name and Strong Password. Access to different areas of the BAS system shall be defined in terms of Role-Based Access Control privileges as specified:

1. Roles: Roles shall reflect the actual roles of different types of operators. Each role shall comprise a set of ' easily understood English language' privileges. Roles shall be defined in terms of View, Edit and Function Privileges.

a. View Privileges shall comprise: Navigation, Network, and Configuration Trees, Operators, Roles and Privileges, Alarm/Event Template and Reporting Action.

b. Edit Privileges shall comprise: Set point, Tuning and Logic, Manual Override, and Point Assignment Parameters.

c. Function Privileges shall comprise: Alarm/Event Acknowledgement, Control Module Memory Download, Upload, Schedules, Schedule Groups, Manual Commands, Print and Alarm/Event Maintenance.

2. Geographic Assignment of Roles: Roles shall be geographically assigned using a similar

expandable/collapsible navigation tree. For example, it shall be possible to assign two HVAC Technicians with similar competencies (and the same operator defined HVAC Role) to different areas of the system.

2.14 GRAPHICAL PROGRAMMING

A. The system software shall include a Graphic Programming Language (GPL) for all DDC control algorithms resident in all control modules. Any system that does not use a drag and drop method of graphical icon programming shall not be accepted. All systems shall use a GPL method used to create a sequence of operations by assembling graphic microblocks that represent each of the commands or functions necessary to complete a control sequence. Microblocks represent common logical control devices used in conventional control systems, such as relays, switches, high signal selectors etc., in addition to the more complex DDC and energy management strategies such as PID loops and optimum start. Each microblock shall be interactive and contain the programming necessary to execute the function of the device it represents.

B. Graphic programming shall be performed while on screen and using a mouse; each microblock shall be selected from a microblock library and assembled with other microblocks necessary to complete the specified sequence. Microblocks are then interconnected on screen using graphic "wires," each forming a logical connection. Once assembled, each logical grouping of microblocks and their interconnecting wires then forms a graphic function block which may be used to control any piece of equipment with a similar point configuration and sequence of operation.

C. Graphic Sequence: The clarity of the graphic sequence shall be such that the operator has the ability to verify that system programming meets the specifications, without having to learn or interpret a manufacturer's unique programming language. The graphic programming shall be self-documenting and provide the operator with an understandable and exact representation of each sequence of operation.

D. GPL Capabilities: The following is a minimum definition of the capabilities of the Graphic Programming software:

1. Function Block (FB): Shall be a collection of points, microblocks and wires which have been connected together for the specific purpose of controlling a piece of HVAC equipment or a single mechanical system.
2. Logical I/O: Input/Output points shall interface with the control modules in order to read various signals and/or values or to transmit signal or values to controlled devices.
3. Microblocks: Shall be software devices that are represented graphically and may be connected together to perform a specified sequence. A library of microblocks shall be submitted with the control contractors bid.
4. Wires: Shall be Graphical elements used to form logical connections between microblocks and between logical I/O.
5. Reference Labels: Labels shall be similar to wires in that they are used to form logical connections between two points. Labels shall form a connection by reference instead of a visual connection, i.e. two points labeled 'A' on a drawing are logically connected even though there is no wire between them.
6. Parameter: A parameter shall be a value that may be tied to the input of a microblock.
7. Properties: Dialog boxes shall appear after a microblock has been inserted which has editable parameters associated with it. Default parameter dialog boxes shall contain various editable and non-editable fields, and shall contain 'push buttons' for the purpose of selecting default parameter settings.
8. Icon: An icon shall be graphic representation of a software program. Each graphic microblock has an icon associated with it that graphically describes its function.
9. Menu-bar Icon: Shall be an icon that is displayed on the menu bar on the GPL screen, which represents its associated graphic microblock.

10. Live Graphical Programs: The Graphic Programming software shall support a ' live' mode, where all input/output data, calculated data and set points shall be displayed in a ' live' real-time mode.

2.15 ENERGY DASHBOARD

A. Furnish and install dashboard display graphics as a subset of the standard graphics package. Dashboard display graphics shall consist of a minimum of the following user selectable viewlets or widget libraries for easy visualization changes:

1. Circular and Semi-Circular Gauge
2. Column and Drilldown Charts
3. Demand Duration
4. Pie and Drilldown Charts
5. Axis Charts
6. History Color Grid and Line Charts
7. Visual Electric Meters
8. Point Line and Table Charts
9. Utility Usage Rankings Charts
10. Resource Consumption Charts
11. Scatter Plot
12. Spyder Charts

B. The Energy Dashboard display shall consist of the following “pages” or “screens”:

1. Home Page: The “Home Page” for the Owner shall indicate the following information:

   a. Professional quality picture or rendering of the building(s) along with information about the building.
   b. Tabs or Icons that take the user to the other sections of the interactive display.
   c. Screen saver mode that will scroll through selected images of the building and its features.

2. Building Education Page: The “Building Education Page” shall indicate the following information:

   a. Building Green Features
   b. Facility Information

3. Monitoring Page: The “Monitoring Page” shall indicate a minimum of five (5) icons that shall display the following information or other as appropriate to the project or as requested by the Owner (Geothermal System shown here is for example purposes only):

   a. Geothermal System BTU’s
   b. Solar System Energy Output
   c. Domestic Water Consumption – Hot and Cold (gpm and gallon per day)
   d. Electricity Usage (KW & KWH)
   e. Outside Air Temperature and Relative Humidity
   f. Geothermal pump water to wire efficiency

   This information shall have the historical information displayed through a graph and the live information displayed on a gauge. The historical information will be shown daily, weekly, monthly, and yearly. The historical points shall be shown in a combination of totalization, peak, and average demand.

4. Green Features Page: The “Green Features Page” shall provide the following information:

    a. LEED checklist describing features and some basic information about each feature.
    b. Information on mechanical systems and energy saving applications applied.

5. Weather Widget Page: The “Weather Widget Page” shall indicate the following:

    a. Current weather conditions and forecasts, and will be specific to the project site location.
    b. Outside Air Temperature and Relative Humidity.

PART 3 EXECUTION

3.1 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.3 GENERAL

A. Install system and materials in accordance with manufacturer's instructions, and as detailed on the project drawing set.

B. Line and low voltage electrical connections to control equipment shown specified or shown on the control diagrams shall be furnished and installed by the Control System Contractor in accordance with these specifications.

C. Equipment furnished by the Mechanical Contractor that is normally wired before installation shall be furnished completely wired. Control wiring normally performed in the field will be furnished and installed by the Control System Contractor.

D. All control devices mounted on the face of control panels shall be clearly identified as to function and system served with permanently engraved phenolic labels.

3.4 WIRING

A. All electrical control wiring to the control panels shall be the responsibility of the Control System Contractor, unless otherwise specified.

B. All wiring shall be in accordance with the Project Electrical Specifications (Division 16), the National Electrical Code and any applicable local codes. All control wiring shall be installed in raceways.

C. Excess wire shall not be looped or coiled in the controller cabinet.

D. Incorporate electrical noise suppression techniques in relay control circuits.

E. There shall be no drilling on the controller cabinet after the controls are mounted inside.

F. Careful stripping of wire while inside the cabinet is required to ensure that no wire strand fragments land on circuit boards.

G. Use manufacturer-specified wire for all network connections.

H. Use approved optical isolation and lightning protection when penetrating building envelope.

I. Read installation instructions carefully. Any unavoidable deviations shall be approved by owner's rep prior to installation.

3.5 ACCEPTANCE TESTING

A. Upon completion of the installation, the Control System Contractor shall load all system software and start-up the system. The Control System Contractor shall perform all necessary calibration, testing and de-bugging and perform all required operational checks to insure that the system is functioning in full accordance with these specifications.

B. The Control System Contractor shall perform tests to verify proper performance of components, routines and points. Repeat tests until proper performance results. This testing shall include a point-by-point log to validate 100% of the input and output points of the DDC system operation.

C. System Acceptance: Satisfactory completion is when the Control System Contractor has performed successfully all the required testing to show performance compliance with the requirements of the Contract Documents to the satisfaction of the Owner's Representative. System acceptance shall be contingent upon completion and review of all corrected deficiencies.

3.6 OPERATOR TRAINING

A. During system commissioning and at such time acceptable performance of the Control System hardware and software has been established, the Control System Contractor shall provide on-site operator instruction to the owner's operating personnel. Operator instruction shall be done during normal working hours and shall be performed by a competent representative familiar with the system hardware, software and accessories.

B. The Control System Contractor shall provide 40 total hours of comprehensive training in multiple sessions for system orientation, product maintenance and troubleshooting, programming and engineering. These classes are to be spread out during the 1st year warranty period. The first class starting after final commissioning and the last class is to be in the last month of 1-year warranty period.

C. Provide a detailed User’s Manual for operation of BMS User Interface. At least one physical copy shall be provided to the Owner. In addition, a digital copy (PDF format) shall be available for download via a link within the BMS.

D. Supplemental / alternative training for the operation of the BMS to be provided as instructional video content. Access to the video content must be available around the clock for at least one year after system turnover. This access period allows training for users who operate the BMS outside of business hours.

3.7 WARRANTY PERIOD SERVICES

A. Equipment, materials and workmanship incorporated into the work shall be warranted for a period of one year from the time of system acceptance.

B. Within this period, upon notice by the Owner, any defects in the BMS due to faulty materials, methods of installation or workmanship shall be promptly repaired or replaced by the Control System Contractor at no expense to the Owner.

C. Maintenance of Computer Software Programs: The Control System Contractor shall maintain all software during the standard first year warranty period. In addition, all factory or sub-vendor upgrades to software during the first year warranty period shall be added to the systems, when they become available, at no additional cost. In addition to first year standard warranty, software provided by Control System Contractor shall come with a 1 Year Software Maintenance license. All SNC and BAS Servers are included in this coverage. Labor to implement upgrades in years two through five are not included in standard warranty.

D. Maintenance of Control Hardware: The Control System Contractor shall inspect, repair, replace, adjust, and calibrate, as required, the controllers, control devices and associated peripheral units during the warranty period. The Control System Contractor shall then furnish a report describing the status of the equipment, problem areas (if any) noticed during service work, and description of the corrective actions taken. The report shall clearly certify that all hardware is functioning correctly.

E. Service Period: Calls for service by the Owner shall be honored within 24 hours and are not to be considered as part of routine maintenance.

F. Service Documentation: A copy of the service report associated with each owner-initiated service call shall be provided to the owner.

3.8 BAS SUPPORT SERVICE AGREEMENT

A. Contract shall include onsite and offsite support labor to service and maintain your Niagara based Building Automation System. The labor hours do not expire and can be directed by the owner to address any current control need. An activity log will be emailed to the owner monthly. The log describes who requested the service, hours used, hours remaining, what work was provided and who performed the work.

B. The following work shall be included with the support service agreement:

1. Database maintenance.
2. System review.
3. Control strategy review.
4. Review of systems, graphics, alarms, histories, etc.
5. Ensure proper operation of the Niagara back-up service.

3.9 WARRANTY ACCESS

A. The Owner shall grant to the Control System Contractor reasonable access to the BMS during the warranty period. Remote access to the BMS (for the purpose of diagnostics and troubleshooting, via the Internet, during the warranty period) will be allowed.

3.10 OPERATION & MAINTENANCE MANUALS

A. See Division 1 for requirements. O&M manuals shall include the following elements, as a minimum:

1. As-built control drawings for all equipment.
2. As-built Network Communications Diagram.
3. General description and specifications for all components.
4. Completed Performance Verification sheets.
5. Completed Controller Checkout/Calibration Sheets.

3.11 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Substantial Completion.

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. Dielectric fittings.

1.3 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. Dielectric fittings.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For motorized gas valves and pressure regulators to include in emergency, operation, and maintenance manuals.

1.5 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.

1.6 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.

1.7 PROJECT CONDITIONS

A. Perform site survey, research public utility records, and verify existing utility locations. Contact utility-locating service for area where Project is located.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Minimum Operating-Pressure Ratings:

1. Piping and Valves: 100 psig minimum unless otherwise indicated.
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. Wrought-Steel Welding Fittings: ASTM A234/A234M for butt welding and socket welding.
3. Unions: ASME B16.39, Class 150, malleable iron with brass-to-iron seat, ground joint, and threaded ends.
4. Forged-Steel Flanges and Flanged Fittings: ASME B16.5, minimum Class 150, including bolts, nuts, and gaskets of the following material group, end connections, and facings:

    a. Material Group: 1.1.
    b. End Connections: Threaded or butt welding to match pipe.
    c. Lapped Face: Not permitted underground.
    d. Gasket Materials: ASME B16.20, metallic, flat, asbestos free, aluminum o-rings, and spiral-wound metal gaskets.
    e. Bolts and Nuts: ASME B18.2.1, carbon steel aboveground and stainless-steel underground.

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. Outdoor, Appliance Flexible Connectors: Comply with ANSI Z21.75.
2. Corrugated stainless-steel tubing with polymer coating.
3. Operating-Pressure Rating: 0.5 psig.
4. End Fittings: Zinc-coated steel.
5. Threaded Ends: Comply with ASME B1.20.1.
6. Maximum Length: 72 inches.

B. 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" Article for where each valve type is applied in various services.

B. General Requirements for Metallic Valves, NPS 2-1/2 and Larger: Comply with ASME B16.38.

1. CWP Rating: 125 psig.
2. Flanged Ends: Comply with ASME B16.5 for steel flanges.
3. Tamperproof Feature: Locking feature for valves indicated in "Aboveground Manual Gas Shutoff Valve Schedule" Article.
4. Service Mark: Initials "WOG" shall be 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 “Aboveground Manual Gas Shutoff Valve Schedule" Article.
8. CWP Rating: 600 psig.
9. 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 “Aboveground Manual Gas Shutoff Valve Schedule" Article.
5. Operator: Square head or lug type with tamperproof feature where indicated.
6. Pressure Class: 125 psig.
7. Service: Suitable for natural-gas service with "WOG" indicated on valve body.

E. Cast-Iron, Nonlubricated 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. Mueller Co.
c. Xomox Corporation.

2. Body: Cast iron, complying with ASTM A126, Class B.
3. Plug: Bronze or nickel-plated cast iron.
4. Seat: Coated with thermoplastic.
5. Stem Seal: Compatible with natural gas.
6. Ends: Threaded or flanged as indicated in "Aboveground Manual Gas Shutoff Valve Schedule" Article.
7. Operator: Square head or lug type with tamperproof feature where indicated.
8. Pressure Class: 125 psig.
9. Service: Suitable for natural-gas service with "WOG" indicated on valve body.

2.6 MOTORIZED GAS VALVES

A. Electrically Operated Valves: Comply with UL 429.

1. Basis-of-design Product: Subject to compliance with requirements, provide American Gas Safety, LLC.; AGS GSV Gas Solenoid Valve Safety Shut Off or comparable product by one of the following:

a. Dungs, Karl, Inc.
b. Eclipse Innovative Thermal Technologies.
c. Goyen Valve Corp.
d. Magnatrol Valve Corporation.
e. Parker Hannifin Corporation.
f. Pietro Fiorentini.
g. WATTS.

2. Pilot operated.
3. Body: Brass or aluminum.
4. Seats and Disc: NBR.
5. Springs and Valve Trim: Stainless steel.
6. 120-V ac, 60 Hz, Class B, continuous-duty molded coil, and replaceable.
7. NEMA ICS 6, Type 4, coil enclosure.
8. Normally closed.
9. Visual position indicator.

2.7 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. Line 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. Dormont; a WATTS brand.
d. Eclipse Innovative Thermal Technologies.
e. Fisher Control Valves & Instruments; a brand of Emerson Process Management.
f. Invensys.
g. Itron Gas.
h. Maxitrol Company.
i. Pietro Fiorentini.
j. 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: 10 psig.

C. Appliance Pressure Regulators: Comply with ANSI Z21.18.

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

a. Canadian Meter Company Inc.
b. Dormont; a WATTS brand.
c. Eaton.
d. Harper Wyman Co.
e. Maxitrol Company.
f. Pietro Fiorentini.
g. SCP, Inc.

2. Body and Diaphragm Case: Die-cast aluminum.
3. Springs: Zinc-plated steel; interchangeable.
4. Diaphragm Plate: Zinc-plated steel.
5. Seat Disc: Nitrile rubber.
6. Seal Plug: Ultraviolet-stabilized, mineral-filled nylon.
7. Factory-Applied Finish: Minimum three-layer polyester and polyurethane paint finish.
8. Regulator may include vent limiting device, instead of vent connection, if approved by authorities having jurisdiction.
9. Maximum Inlet Pressure: 2 psig.

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.

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 the International Fuel Gas Code to determine that natural-gas utilization devices are turned off in piping section affected.

C. Comply with the International Fuel Gas Code requirements for prevention of accidental ignition.

3.3 OUTDOOR PIPING INSTALLATION

A. Comply with the International Fuel Gas Code for installation and purging of natural-gas piping.

B. Install fittings for changes in direction and branch connections.

3.4 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.

3.5 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.

3.6 HANGER AND SUPPORT INSTALLATION

A. Comply with requirements for pipe hangers and supports specified in Section 230500 "Common Work Results for HVAC."

3.7 CONNECTIONS

A. Install natural-gas piping electrically continuous, and bonded to gas appliance equipment grounding conductor of the circuit powering the appliance according to NFPA 70.

B. Install piping adjacent to appliances to allow service and maintenance of appliances.

C. 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.

D. Sediment Traps: Install tee fitting with capped nipple in bottom to form drip, as close as practical to inlet of each appliance.

3.8 LABELING AND IDENTIFYING

A. Comply with requirements in Section 230553 "Identification for HVAC Piping and Equipment" for piping and valve identification.

3.9 PAINTING

A. Comply with requirements in Section 099113 "Exterior Painting" for painting exterior natural-gas piping.

B. 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 (flat).
d. Color: Gray.

C. Damage and Touchup: Repair marred and damaged factory-applied finishes with materials and by procedures to match original factory finish.

3.10 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.

3.11 OUTDOOR PIPING SCHEDULE

A. Aboveground natural-gas piping shall be one of the following:

1. Steel pipe with malleable-iron fittings and threaded joints.
2. Steel pipe with wrought-steel fittings and welded joints.

3.12 ABOVEGROUND MANUAL GAS SHUTOFF VALVE SCHEDULE

A. Valves in branch piping for single appliance shall be one of the following:

1. Two-piece, full-port, bronze ball valves with bronze trim.
2. Bronze plug valve.

END OF SECTION

SECTION 232113 - HYDRONIC PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Copper tube and fittings.
2. Steel pipe and fittings.
3. Joining materials.
4. Transition fittings.
5. Dielectric fittings.
6. Bypass chemical feeder.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of the following:

1. Pipe and tube.
2. Fittings.
3. Joining materials.
4. Transition fittings.
5. Bypass chemical feeder.

1.4 QUALITY ASSURANCE

A. Installer Qualifications:

1. Installers of Pressure-Sealed Joints: Installers shall be certified by pressure-seal joint manufacturer as having been trained and qualified to join piping with pressure-seal pipe couplings and fittings.

B. Pipe Welding: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code: Section IX.

1. Comply with ASME B31.9, "Building Services Piping," for materials, products, and installation.
2. Certify that each welder has passed AWS qualification tests for welding processes involved and that certification is current.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Hydronic piping components and installation shall be capable of withstanding the following minimum working pressure and temperature unless otherwise indicated:

1. Hot-Water Heating Piping: 100 psig at 180 deg F
2. Condensate-Drain Piping: 150 deg F.

2.2 COPPER TUBE AND FITTINGS

A. Drawn-Temper Copper Tube: ASTM B88, Type L.

B. DWV Copper Tube: ASTM B306, Type DWV.

C. Wrought-Copper, Solder-Joint Fittings: ASME B16.22, pressure fittings.

D. Wrought Copper Unions: ASME B16.22.

E. Grooved, Mechanical-Joint, Copper Tube Appurtenances:

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

    a. Victaulic Company.

2. Grooved-End Copper Fittings: ASTM B75, copper tube or ASTM B584, bronze castings.
3. Grooved-End-Tube Couplings: To fit copper-tube dimensions; rigid pattern unless otherwise indicated; gasketed fitting EPDM-rubber gasket rated for minimum 230 deg F for use with ferrous housing, and steel bolts and nuts; 300 psig minimum CWP pressure rating.

F. Copper-Tube, Pressure-Seal-Joint Fittings:

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

    a. Elkhart Products Corporation.
    b. Mueller Industries, Inc.
    c. NIBCO INC.
    d. Viega LLC.

2. Fittings: Cast-brass, cast-bronze, or wrought-copper with EPDM O-ring seal in each end.
3. Minimum 200-psig working-pressure rating at 250 deg F.

2.3 STEEL PIPE AND FITTINGS

A. Steel Pipe: ASTM A53/A53M, black steel with plain ends; welded and seamless, Grade B, and wall thickness as indicated in "Piping Applications" Article.

B. Wrought-Steel Fittings: ASTM A234/A234M, wall thickness to match adjoining pipe.

C. Wrought Cast- and Forged-Steel Flanges and Flanged Fittings: ASME B16.5, including bolts, nuts, and gaskets of the following material group, end connections, and facings:

1. Material Group: 1.1.
2. End Connections: Butt welding.
3. Facings: Raised face.

D. Grooved Mechanical-Joint Fittings and Couplings:

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

   a. Victaulic Company.

2. Joint Fittings: ASTM A536, Grade 65-45-12 ductile iron; ASTM A47/A47M, Grade 32510 malleable iron; ASTM A53/A53M, Type F, E, or S, Grade B fabricated steel; or ASTM A106/A106M, Grade B steel fittings with grooves or shoulders constructed to accept grooved-end couplings; with nuts, bolts, locking pin, locking toggle, or lugs to secure grooved pipe and fittings.
3. Couplings: Ductile- or malleable-iron housing and EPDM or nitrile gasket of central cavity pressure-responsive design; with nuts, bolts, locking pin, locking toggle, or lugs to secure grooved pipe and fittings.

E. Steel Pressure-Seal Fittings:

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

   a. Victaulic Company.
   b. Viega LLC.

2. Housing: Steel.
3. O-Rings and Pipe Stop: EPDM.
4. Tools: Manufacturer's special tool.
5. Minimum 300-psig working-pressure rating at 230 deg F.

F. Steel Pipe Nipples: ASTM A733, made of same materials and wall thicknesses as pipe in which they are installed.

2.4 JOINING MATERIALS

A. Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.

1. ASME B16.21, nonmetallic, flat, asbestos free, 1/8-inch maximum thickness unless otherwise indicated.

   a. Full-Face Type: For flat-face, Class 125, cast-iron and cast-bronze flanges.
   b. Narrow-Face Type: For raised-face, Class 250, cast-iron and steel flanges.

B. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.

C. Solder Filler Metals: ASTM B32, lead-free alloys. Include water-flushable flux according to ASTM B813.

D. Welding Filler Metals: Comply with AWS D10.12M/D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

E. Solvent Cements for PVC Piping: ASTM D2564. Include primer according to ASTM F656.

2.5 TRANSITION FITTINGS

A. Plastic-to-Metal Transition Fittings:

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

   a. Charlotte Pipe and Foundry Company.
   b. IPEX USA LLC.
   c. Uponor.
   d. Viega LLC.

2. One-piece fitting with one threaded brass or copper insert and one solvent-cement-joint end of material and wall thickness to match plastic pipe material.

B. Plastic-to-Metal Transition Unions:

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

   a. Charlotte Pipe and Foundry Company.
   b. IPEX USA LLC.
   c. NIBCO INC.
   d. Spears Manufacturing Company.

2. Brass or copper end, solvent-cement-joint end of material and wall thickness to match plastic pipe material, rubber gasket, and threaded union.

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.

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.
    f. Zurn Industries.

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.

D. Dielectric-Flange Insulating Kits:

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

    a. Advance Products & Systems, Inc.
    b. Calpico, Inc.
    c. Central Plastics Company.
    d. Pipeline Seal and Insulator, Inc.

2. Description:

    a. Nonconducting materials for field assembly of companion flanges.
    b. Pressure Rating: 150 psig.
    c. Gasket: Neoprene or phenolic.
    d. Bolt Sleeves: Phenolic or polyethylene.
    e. Washers: Phenolic with steel backing washers.

E. Dielectric Nipples:

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

    a. Elster Perfection Corporation.
    b. Grinnell G-Fire by Johnson Controls company.
    c. Matco-Norca.
    d. Midland Industries.
    e. PPP, Inc.
    f. Precision Plumbing Products.

g. Victaulic Company.

2. Description:

a. Standard: IAPMO PS 66.
b. Electroplated steel nipple, complying with ASTM F1545.
c. Pressure Rating: 300 psig at 225 deg F.
d. End Connections: Male threaded or grooved.
e. Lining: Inert and noncorrosive, propylene.

2.7 BYPASS CHEMICAL FEEDER

A. Description: Welded steel construction; 125-psig working pressure; 2-gal. capacity; with fill funnel and inlet, outlet, and drain valves.

1. Chemicals: Specially formulated, based on analysis of makeup water, to prevent accumulation of scale and corrosion in piping and connected equipment.

PART 3 - EXECUTION

3.1 PIPING APPLICATIONS

A. Hot-water heating piping, aboveground, NPS 2 and smaller, shall be any of the following:

1. Type L, drawn-temper copper tubing, wrought-copper fittings, and soldered or pressure-seal joints.

B. Hot-water heating piping, aboveground, NPS 2-1/2 and larger, shall be any of the following:

1. Type L, drawn-temper copper tubing, wrought-copper fittings, and soldered joints.
2. Schedule 40 steel pipe, wrought-steel fittings and wrought-cast or forged-steel flanges and flange fittings, and welded and flanged joints.
3. Schedule 40 steel pipe; grooved, mechanical joint coupling and fittings; and grooved, mechanical joints.

C. Condensate-Drain Piping, Copper: Type M or Type DWV, drawn-temper copper tubing, wrought-copper fittings, and soldered joints or Schedule 40 PVC plastic pipe and fittings and solvent-welded joints.

3.2 INSTALLATION OF PIPING

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements are used to size pipe and calculate friction loss, expansion, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.

B. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.

C. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

D. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

E. Install piping to permit valve servicing.

F. Install piping at indicated slopes.

G. Install piping free of sags and bends.

H. Install fittings for changes in direction and branch connections.

I. Install piping to allow application of insulation.

J. Select system components with pressure rating equal to or greater than system operating pressure.

K. Install groups of pipes parallel to each other, spaced to permit applying insulation and servicing of valves.

L. Install drains, consisting of a tee fitting, NPS 3/4 ball valve, and short NPS 3/4 threaded nipple with cap, at low points in piping system mains and elsewhere as required for system drainage.

M. Install piping at a uniform grade of 0.2 percent upward in direction of flow.

N. Reduce pipe sizes using eccentric reducer fitting installed with level side up.

O. Install branch connections to mains using tee fittings in main pipe, with the branch connected to the bottom of the main pipe. For up-feed risers, connect the branch to the top of the main pipe.

P. Install valves according to Section 230500 "Common Work Results for HVAC."

Q. Install unions in piping, NPS 2 and smaller, adjacent to valves, at final connections of equipment, and elsewhere as indicated.

R. Install flanges in piping, NPS 2-1/2 and larger, at final connections of equipment and elsewhere as indicated.

S. Install shutoff valve immediately upstream of each dielectric fitting.

T. Comply with requirements in Section 230553 "Identification for HVAC Piping and Equipment" for identifying piping.

U. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section 230500 "Common Work Results for HVAC."

V. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 230500 " Common Work Results for HVAC."

3.3 JOINT CONSTRUCTION

A. Ream ends of pipes and tubes and remove burs. Bevel plain ends of steel pipe.

B. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

C. Soldered Joints: Apply ASTM B813, water-flushable flux, unless otherwise indicated, to tube end. Construct joints according to ASTM B828 or CDA's "Copper Tube Handbook," using lead-free solder alloy complying with ASTM B32.

D. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

E. Welded Joints: Construct joints according to AWS D10.12M/D10.12, using qualified processes and welding operators according to "Quality Assurance" Article.

F. Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.

G. Plastic Piping Solvent-Cemented Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:

1. Comply with ASTM F402 for safe-handling practice of cleaners, primers, and solvent cements.
2. PVC Nonpressure Piping: Join according to ASTM D2855.

H. Grooved Joints: Assemble joints with coupling and gasket, lubricant, and bolts. Cut or roll grooves in ends of pipe based on pipe and coupling manufacturer's written instructions for pipe wall thickness. Use grooved-end fittings and rigid, grooved-end-pipe couplings.

I. Mechanically Formed, Copper-Tube-Outlet Joints: Use manufacturer-recommended tools and procedure, and brazed joints.

J. Pressure-Sealed Joints: Use manufacturer-recommended tools and procedure. Leave insertion marks on pipe after assembly.

3.4 INSTALLATION OF DIELECTRIC FITTINGS

A. Install dielectric fittings in piping at connections of dissimilar metal piping and tubing.

B. Dielectric Fittings for NPS 2 and Smaller: Use dielectric unions.

C. Dielectric Fittings for NPS 2-1/2 to NPS 4: Use dielectric flanges.

3.5 INSTALLATION OF HANGERS AND SUPPORTS

A. Comply with requirements in Section 230500 "Common Work Results for HVAC" for hangers, supports, and anchor devices.

B. Install hangers for copper tubing and steel piping, with maximum horizontal spacing and minimum rod diameters, to comply with MSS-58, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.

C. Install hangers for plastic piping, with maximum horizontal spacing and minimum rod diameters, to comply with manufacturer's written instructions, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.

D. Support horizontal piping within 12 inches of each fitting and coupling.

E. Support vertical runs of copper tubing and steel piping to comply with MSS-58, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.

F. Support vertical runs of CPVC and PVC piping to comply with manufacturer's written instructions, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.

3.6 TERMINAL EQUIPMENT CONNECTIONS

A. Sizes for supply and return piping connections shall be the same as or larger than equipment connections.

B. Install control valves in accessible locations close to connected equipment.

C. Install ports for pressure gauges and thermometers at coil inlet and outlet connections. Comply with requirements in Section 230500 "Common Work Results for HVAC."

3.7 CHEMICAL TREATMENT

A. Perform an analysis of makeup water to determine type and quantities of chemical treatment needed to keep system free of scale, corrosion, and fouling.

B. Install bypass chemical feeders in each hydronic system where indicated.

1. Install in upright position with top of funnel not more than 48 inches above the floor.
2. Install feeder in minimum NPS 3/4 bypass line, from main with full-size, full-port, ball valve in the main between bypass connections.
3. Install NPS 3/4 pipe from chemical feeder drain to nearest equipment drain and include a full-size, full-port, ball valve.

C. Fill system with fresh water and add liquid alkaline compound with emulsifying agents and detergents to remove grease and petroleum products from piping. Circulate solution for a minimum of 24 hours, drain, clean strainer screens, and refill with fresh water.

D. Add initial chemical treatment and maintain water quality in ranges noted above for the first year of operation.

3.8 IDENTIFICATION

A. Identify system components. Comply with requirements for identification materials and installation in Section 230553 "Identification for HVAC Piping and Equipment."

3.9 FIELD QUALITY CONTROL

A. Prepare hydronic piping according to ASME B31.9 and as follows:

1. Leave joints, including welds, uninsulated and exposed for examination during test.
2. Provide temporary restraints for expansion joints that cannot sustain reactions due to test pressure. If temporary restraints are impractical, isolate expansion joints from testing.
3. Flush hydronic piping systems with clean water; then remove and clean or replace strainer screens.
4. Isolate equipment from piping. If a valve is used to isolate equipment, its closure shall be capable of sealing against test pressure without damage to valve. Install blinds in flanged joints to isolate equipment.
5. Install safety valve, set at a pressure no more than one-third higher than test pressure, to protect against damage by expanding liquid or other source of overpressure during test.

B. Perform the following tests on hydronic piping:

1. Use ambient temperature water as a testing medium unless there is risk of damage due to freezing. Another liquid that is safe for workers and compatible with piping may be used.
2. While filling system, use vents installed at high points of system to release air. Use drains installed at low points for complete draining of test liquid.
3. Isolate expansion tanks and determine that hydronic system is full of water.
4. Subject piping system to hydrostatic test pressure that is not less than 1.5 times the system's working pressure. Test pressure shall not exceed maximum pressure for any vessel, pump, valve, or other component in system under test. Verify that stress due to pressure at bottom of vertical runs does not exceed 90 percent of specified minimum yield strength or 1.7 times the "SE" value in Appendix A in ASME B31.9, "Building Services Piping."
5. After hydrostatic test pressure has been applied for at least 10 minutes, examine piping, joints, and connections for leakage. Eliminate leaks by tightening, repairing, or replacing components, and repeat hydrostatic test until there are no leaks.
6. Prepare written report of testing.

C. Perform the following before operating the system:

1. Open manual valves fully.
2. Inspect pumps for proper rotation.
3. Set makeup pressure-reducing valves for required system pressure.
4. Inspect air vents at high points of system and determine if all are installed and operating freely (automatic type), or bleed air completely (manual type).
5. Set temperature controls so all coils are calling for full flow.
6. Inspect and set operating temperatures of hydronic equipment, such as boilers, chillers, cooling towers, to specified values.
7. Verify lubrication of motors and bearings.

END OF SECTION

SECTION 232116 - HYDRONIC 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. Hydronic specialty valves.
2. Air-control devices.
3. Strainers.
4. Connectors.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product:

1. Include construction details and material descriptions for hydronic piping specialties.
2. Include rated capacities, operating characteristics, and furnished specialties and accessories.
3. Include flow and pressure drop curves based on manufacturer's testing for calibrated-orifice balancing valves.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For hydronic piping specialties to include in emergency, operation, and maintenance manuals.

PART 2 - PRODUCTS

2.1 HYDRONIC SPECIALTY VALVES

A. Bronze, Calibrated-Orifice, Balancing Valves:

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

a. Armstrong Pumps, Inc.
b. Bell & Gossett; a Xylem brand.
c. Grinnel G-Fire by Johnson Controls company.
d. Jomar Valve.
e. NIBCO INC.
f. Taco Comfort Solutions.
g. Tour & Andersson; available through Victaulic Company.

h. Victaulic Company.
i. WATTS.

2. Body: Bronze, ball or plug type with calibrated orifice or venturi.
3. Ball: Brass or stainless steel.
4. Plug: Resin.
5. Seat: PTFE.
6. End Connections: Threaded or socket.
7. Pressure Gage Connections: Integral seals for portable differential pressure meter.
8. Handle Style: Lever, with memory stop to retain set position.
9. CWP Rating: Minimum 125 psig.
10. Maximum Operating Temperature: 250 deg F.

B. Cast-Iron or Steel, Calibrated-Orifice, Balancing Valves:

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

a. Armstrong Pumps, Inc.
b. Bell & Gossett; a Xylem brand.
c. Grinnel G-Fire by Johnson Controls company.
d. NIBCO INC.
e. Taco Comfort Solutions.
f. Tour & Andersson; available through Victaulic Company.
g. Victaulic Company.
h. WATTS.

2. Body: Cast-iron or steel body, ball, plug, or globe pattern with calibrated orifice or venturi.
3. Ball: Brass or stainless steel.
4. Stem Seals: EPDM O-rings.
5. Disc: Glass and carbon-filled PTFE.
6. Seat: PTFE.
7. End Connections: Flanged or grooved.
8. Pressure Gage Connections: Integral seals for portable differential pressure meter.
9. Handle Style: Lever, with memory stop to retain set position.
10. CWP Rating: Minimum 125 psig.
11. Maximum Operating Temperature: 250 deg F.

2.2 AIR-CONTROL DEVICES

A. Manual Air Vents:

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

a. AMTROL, Inc.
b. Apollo Valves; a part of Aalberts Integrated Piping Systems.
c. Armstrong Pumps, Inc.
d. Bell & Gossett; a Xylem brand.
e. Taco Comfort Solutions.
f. WATTS.

2. Body: Bronze.
3. Internal Parts: Nonferrous.

4. Operator: Screwdriver or thumbscrew.
5. Inlet Connection: NPS 1/2.
6. Discharge Connection: NPS 1/8.
7. CWP Rating: 150 psig.
8. Maximum Operating Temperature: 225 deg F.

B. Automatic Air Vents:

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

    a. AMTROL, Inc.
    b. Armstrong Pumps, Inc.
    c. Bell & Gossett; a Xylem brand.
    d. Spirotherm, Inc.
    e. Taco Comfort Solutions.
    f. WATTS.

2. Body: Bronze or cast iron.
3. Internal Parts: Nonferrous.
4. Operator: Noncorrosive metal float.
5. Inlet Connection: NPS 1/2.
6. Discharge Connection: NPS 1/4.
7. CWP Rating: 150 psig.
8. Maximum Operating Temperature: 240 deg F.

2.3 STRAINERS

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. Metraflex Company (The).
    d. Titan Flow Control, Inc.
    e. WATTS.

2. Body: ASTM A126, Class B, cast iron with bolted cover and bottom drain connection.
3. End Connections: Threaded ends for NPS 2 and smaller; flanged ends for NPS 2-1/2 and larger.
4. Strainer Screen: Stainless-steel, 60-mesh strainer, or perforated stainless-steel basket.
5. CWP Rating: 125 psig.

2.4 CONNECTORS

A. Stainless-Steel Bellow, Flexible Connectors:

1. Body: Stainless-steel bellows with woven, flexible, bronze, wire-reinforcing protective jacket.
2. End Connections: Threaded or flanged to match equipment connected.
3. Performance: Capable of 3/4-inch misalignment.

4. CWP Rating: 150 psig.
5. Maximum Operating Temperature: 250 deg F.

PART 3 - EXECUTION

3.1 VALVE APPLICATIONS

A. Install shutoff-duty valves at each branch connection to supply mains and at supply connection to each piece of equipment.

B. Install calibrated-orifice, balancing valves at each branch connection to return main.

C. Install check valves at each pump discharge and elsewhere as required to control flow direction.

3.2 HYDRONIC SPECIALTIES INSTALLATION

A. Install manual air vents at high points in piping, at heat-transfer coils, and elsewhere as required for system air venting.

B. Install automatic air vents at high points of system piping in mechanical equipment rooms only. Install manual vents at heat-transfer coils and elsewhere as required for air venting.

END OF SECTION

SECTION 232123 - HYDRONIC PUMPS

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. Close-coupled, in-line centrifugal pumps.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of pump.

1. Include certified performance curves and rated capacities, operating characteristics, furnished specialties, final impeller dimensions, and accessories for each type of product indicated.
2. Indicate pump's operating point on curves.

B. Shop Drawings: For each pump.

1. Show pump layout and connections.
2. Include diagrams for power, signal, and control wiring.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For pumps to include in emergency, operation, and maintenance manuals.

PART 2 - PRODUCTS

2.1 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.

2.2 CLOSE-COUPLED, IN-LINE CENTRIFUGAL PUMPS

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

1. Armstrong Pumps, Inc.
2. Bell & Gossett; a Xylem brand.

3. Grundfos Pumps Corporation.
4. ITT Corporation.
5. PACO Pumps; Grundfos Pumps Corporation, USA.
6. Patterson Pump Company; a Gorman-Rupp company.
7. Taco Comfort Solutions, Inc.

B. Description: Factory-assembled and -tested, centrifugal, overhung-impeller, close-coupled, in-line pump as defined in HI 1.1-1.2 and HI 1.3; designed for installation with pump and motor shafts mounted horizontally or vertically.

C. Pump Construction:

1. Casing: Radially split, cast iron, with threaded gauge tappings at inlet and outlet, replaceable bronze wear rings, and threaded companion-flange connections.
2. Impeller: brass, bronze, or glass filled; statically and dynamically balanced, keyed to shaft, and secured with a locking cap screw. For constant-speed pumps, trim impeller to match specified performance.
3. Pump Shaft Sleeve: Non-ferrous.
4. Pump Stub Shaft: Carbon steel SAE1144 or stainless steel.
5. Seal: Mechanical seal consisting of carbon rotating ring against a ceramic seat held by a stainless steel spring, and EPDM rubber bellows and gasket. Include water slinger on shaft between motor and seal.
6. Seal Flushing: Flush, cool, and lubricate pump seal by directing pump discharge water to flow over the seal.

D. Shaft Coupling: Rigid, axially-split spacer coupling to allow service of pump seal without disturbing pump or motor.

E. Motor: Permanently lubricated ball bearings sized to offset the additional bearing loads associated with the closed-coupled pump design. Motor shall be non-overloading at any point on the pump curve. Shall comply with NEMA specifications. Totally enclosed, fan cooled enclosure. Premium efficiency.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine roughing-in for piping systems to verify actual locations of piping connections before pump installation.

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

3.2 PUMP INSTALLATION

A. Comply with HI 1.4 for horizontal pump installation and HI 2.4 for vertical pump installation.

B. Install pumps to provide access for periodic maintenance including removing motors, impellers, couplings, and accessories.

C. Independently support pumps and piping so weight of piping is not supported by pumps and weight of pumps is not supported by piping.

D. Equipment Mounting: Install in-line pumps with continuous-thread hanger rods and **elastomeric** hangers of size required to support weight of in-line pumps.

3.3 ALIGNMENT

A. Perform alignment service. When required by manufacturer to maintain warranty coverage, engage a factory-authorized service representative to perform it.

B. Comply with requirements in HI standards for alignment of pump and motor shaft.

C. Comply with pump and coupling manufacturers' written instructions.

3.4 PIPING CONNECTIONS

A. Comply with requirements for piping specified in Section 232113 "Hydronic Piping" and Section 232116 "Hydronic Piping Specialties." Drawings indicate general arrangement of piping, fittings, and specialties.

B. Where installing piping adjacent to pump, allow space for service and maintenance.

C. Connect piping to pumps. Install valves that are same size as piping connected to pumps.

D. Install suction and discharge pipe sizes equal to or greater than diameter of pump nozzles.

E. Install pressure gauges on pump suction and discharge or at integral pressure-gauge tapping, or install single gauge with multiple-input selector valve.

3.5 ELECTRICAL CONNECTIONS

A. Connect wiring in accordance with Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

B. Ground equipment in accordance with 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.

3.6 CONTROL CONNECTIONS

A. Install control and electrical power wiring to field-mounted control devices.

B. Connect control wiring in accordance with Section 260523 "Control-Voltage Electrical Power Cables."

3.7 STARTUP SERVICE

A. Engage a factory-authorized service representative to perform startup service.

1. Complete installation and startup checks in accordance with manufacturer's written instructions.
2. Check piping connections for tightness.
3. Clean strainers on suction piping. Use startup strainer for initial startup.
4. Perform the following startup checks for each pump before starting:

    a. Verify that pump is free to rotate by hand and that pump for handling hot liquid is free to rotate with pump hot and cold. If pump is bound or drags, do not operate until cause of trouble is determined and corrected.
    b. Verify that pump is rotating in correct direction.

5. Prime pump by opening suction valves and closing drains and prepare pump for operation.
6. Start motor.
7. Open discharge valve slowly.

3.8 FIELD QUALITY CONTROL

A. Perform tests and inspections with the assistance of a factory-authorized service representative.

B. Hydronic pumps will be considered defective if they do not pass tests and inspections.

C. Prepare test and inspection reports.

3.9 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain hydronic pumps.

END OF SECTION

SECTION 232300 - REFRIGERANT 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. Refrigerant pipes and fittings.
2. Refrigerant piping valves and specialties.
3. Refrigerants.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of valve, refrigerant piping, and piping specialty.

1. Include pressure drop, based on manufacturer's test data, for the following:

a. Thermostatic expansion valves.
b. Solenoid valves.
c. Hot-gas bypass valves.
d. Filter dryers.
e. Strainers.
f. Pressure-regulating valves.

B. Shop Drawings:

1. Show layout of refrigerant piping and specialties, including pipe, tube, and fitting sizes; flow capacities; valve arrangements and locations; slopes of horizontal runs; oil traps; double risers; wall and floor penetrations; and equipment connection details.
2. Show piping size and piping layout, including oil traps, double risers, specialties, and pipe and tube sizes to accommodate, as a minimum, equipment provided, elevation difference between compressor and evaporator, and length of piping to ensure proper operation and compliance with warranties of connected equipment.
3. Show interface and spatial relationships between piping and equipment.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For refrigerant valves and piping specialties to include in maintenance manuals.

1.5 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel according to 2010 ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."

B. Comply with ASHRAE 15, "Safety Code for Refrigeration Systems."

C. Comply with ASME B31.5, "Refrigeration Piping and Heat Transfer Components."

1.6 PRODUCT STORAGE AND HANDLING

A. Store piping with end caps in place to ensure that piping interior and exterior are clean when installed.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Line Test Pressure for Refrigerant R-410A:

1. Suction Lines for Air-Conditioning Applications: 300 psig.
2. Suction Lines for Heat-Pump Applications: 535 psig.
3. Hot-Gas and Liquid Lines: 535 psig.

2.2 COPPER TUBE AND FITTINGS

A. Copper Tube: ASTM B 280, Type ACR.

B. Wrought-Copper Fittings: ASME B16.22.

C. Wrought-Copper Unions: ASME B16.22.

D. Solder Filler Metals: ASTM B 32. Use 95-5 tin antimony or alloy HB solder to join copper socket fittings on copper pipe.

E. Brazing Filler Metals: AWS A5.8/A5.8M.

F. Flexible Connectors:

1. Body: Tin-bronze bellows with woven, flexible, tinned-bronze-wire-reinforced protective jacket.
2. End Connections: Socket ends.
3. Offset Performance: Capable of minimum 3/4-inch misalignment in minimum 7-inch-long assembly.
4. Working Pressure Rating: Factory test at minimum 500 psig.
5. Maximum Operating Temperature: 250 deg F.

2.3 VALVES AND SPECIALTIES

A. Diaphragm Packless Valves:

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

a. Danfoss Inc.

b. Heldon Products; Henry Technologies.
c. Parker Hannifin Corp.
d. Paul Mueller Company.

2. Body and Bonnet: Forged brass or cast bronze; globe design with straight-through or angle pattern.
3. Diaphragm: Phosphor bronze and stainless steel with stainless-steel spring.
4. Operator: Rising stem and hand wheel.
5. Seat: Nylon.
6. End Connections: Socket, union, or flanged.
7. Working Pressure Rating: 500 psig.
8. Maximum Operating Temperature: 275 deg F.

B. Packed-Angle Valves:

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

a. Danfoss Inc.
b. Heldon Products; Henry Technologies.
c. Parker Hannifin Corp.
d. Paul Mueller Company.

2. Body and Bonnet: Forged brass or cast bronze.
3. Packing: Molded stem, back seating, and replaceable under pressure.
4. Operator: Rising stem.
5. Seat: Nonrotating, self-aligning polytetrafluoroethylene.
6. Seal Cap: Forged-brass or valox hex cap.
7. End Connections: Socket, union, threaded, or flanged.
8. Working Pressure Rating: 500 psig.
9. Maximum Operating Temperature: 275 deg F.

C. Check 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. Danfoss Inc.
c. Emerson Climate Technologies.
d. Heldon Products; Henry Technologies.
e. Parker Hannifin Corp.
f. Paul Mueller Company.

2. Body: Ductile iron, forged brass, or cast bronze; globe pattern.
3. Bonnet: Bolted ductile iron, forged brass, or cast bronze; or brass hex plug.
4. Piston: Removable polytetrafluoroethylene seat.
5. Closing Spring: Stainless steel.
6. Manual Opening Stem: Seal cap, plated-steel stem, and graphite seal.
7. End Connections: Socket, union, threaded, or flanged.
8. Maximum Opening Pressure: 0.50 psig.
9. Working Pressure Rating: 500 psig.
10. Maximum Operating Temperature: 275 deg F.

D. Service Valves:

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

    a. Danfoss Inc.
    b. Emerson Climate Technologies.
    c. Heldon Products; Henry Technologies.
    d. Parker Hannifin Corp.
    e. Paul Mueller Company.
    f. RectorSeal HVAC; a CSW Industrials Company.
    g. Refrigeration Sales, Inc.

2. Body: Forged brass with brass cap including key end to remove core.
3. Core: Removable ball-type check valve with stainless-steel spring.
4. Seat: Polytetrafluoroethylene.
5. End Connections: Copper spring.
6. Working Pressure Rating: 500 psig.

E. Solenoid Valves: Comply with AHRI 760 and UL 429; listed and labeled by a National Recognized Testing Laboratory (NRTL).

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

    a. Danfoss Inc.
    b. Emerson Climate Technologies.
    c. Heldon Products; Henry Technologies.
    d. Parker Hannifin Corp.
    e. Paul Mueller Company.

2. Body and Bonnet: Plated steel.
3. Solenoid Tube, Plunger, Closing Spring, and Seat Orifice: Stainless steel.
4. Seat: Polytetrafluoroethylene.
5. End Connections: Threaded.
6. Electrical: Molded, watertight coil in NEMA 250 enclosure of type required by location with 1/2-inch conduit adapter, and 24-V ac coil.
7. Working Pressure Rating: 400 psig.
8. Maximum Operating Temperature: 240 deg F.

F. Safety Relief Valves: Comply with 2010 ASME Boiler and Pressure Vessel Code; listed and labeled by an NRTL.

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

    a. Danfoss Inc.
    b. Heldon Products; Henry Technologies.
    c. Parker Hannifin Corp.
    d. Paul Mueller Company.

2. Body and Bonnet: Ductile iron and steel, with neoprene O-ring seal.
3. Piston, Closing Spring, and Seat Insert: Stainless steel.
4. Seat: Polytetrafluoroethylene.
5. End Connections: Threaded.
6. Working Pressure Rating: 400 psig.
7. Maximum Operating Temperature: 240 deg F.

G. Thermostatic Expansion Valves: Comply with AHRI 750.

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

    a. Danfoss Inc.
    b. Emerson Climate Technologies.
    c. Heldon Products; Henry Technologies.
    d. Paul Mueller Company.

2. Body, Bonnet, and Seal Cap: Forged brass or steel.
3. Diaphragm, Piston, Closing Spring, and Seat Insert: Stainless steel.
4. Packing and Gaskets: Non-asbestos.
5. Capillary and Bulb: Copper tubing filled with refrigerant charge.
6. Suction Temperature: 40 deg F.
7. Superheat: Adjustable.
8. Reverse-flow option (for heat-pump applications).
9. End Connections: Socket, flare, or threaded union.
10. Working Pressure Rating: 700 psig.

H. Hot-Gas Bypass Valves: Comply with UL 429; listed and labeled by an NRTL.

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

    a. Danfoss Inc.
    b. Heldon Products; Henry Technologies.
    c. Parker Hannifin Corp.

2. Body, Bonnet, and Seal Cap: Ductile iron or steel.
3. Diaphragm, Piston, Closing Spring, and Seat Insert: Stainless steel.
4. Packing and Gaskets: Non-asbestos.
5. Solenoid Tube, Plunger, Closing Spring, and Seat Orifice: Stainless steel.
6. Seat: Polytetrafluoroethylene.
7. Equalizer: Internal or external.
8. Electrical: Molded, watertight coil in NEMA 250 enclosure of type required by location with 1/2-inch conduit adapter and 24-V ac coil.
9. End Connections: Socket.
10. Throttling Range: Maximum 5 psig.
11. Working Pressure Rating: 500 psig.
12. Maximum Operating Temperature: 240 deg F.

I. Straight-Type Strainers:

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

    a. Danfoss Inc.
    b. Heldon Products; Henry Technologies.
    c. Parker Hannifin Corp.

2. Body: Welded steel with corrosion-resistant coating.
3. Screen: 100-mesh stainless steel.
4. End Connections: Socket or flare.
5. Working Pressure Rating: 500 psig.

6. Maximum Operating Temperature: 275 deg F.

J. Angle-Type Strainers:

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

    a. Danfoss Inc.
    b. Heldon Products; Henry Technologies.
    c. Parker Hannifin Corp.

2. Body: Forged brass or cast bronze.
3. Drain Plug: Brass hex plug.
4. Screen: 100-mesh monel.
5. End Connections: Socket or flare.
6. Working Pressure Rating: 500 psig.
7. Maximum Operating Temperature: 275 deg F.

K. Moisture/Liquid Indicators:

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

    a. Danfoss Inc.
    b. Emerson Climate Technologies.
    c. Heldon Products; Henry Technologies.
    d. Parker Hannifin Corp.

2. Body: Forged brass.
3. Window: Replaceable, clear, fused glass window with indicating element protected by filter screen.
4. Indicator: Color coded to show moisture content in parts per million (ppm).
5. Minimum Moisture Indicator Sensitivity: Indicate moisture above 60 ppm.
6. End Connections: Socket or flare.
7. Working Pressure Rating: 500 psig.
8. Maximum Operating Temperature: 240 deg F.

L. Replaceable-Core Filter Dryers: Comply with AHRI 730.

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

    a. Danfoss Inc.
    b. Emerson Climate Technologies.
    c. Heldon Products; Henry Technologies.
    d. Parker Hannifin Corp.

2. Body and Cover: Painted-steel shell with ductile-iron cover, stainless-steel screws, and neoprene gaskets.
3. Filter Media: 10 micron, pleated with integral end rings; stainless-steel support.
4. Desiccant Media: Activated alumina.
5. Designed for reverse flow (for heat-pump applications).
6. End Connections: Socket.
7. Access Ports: NPS 1/4 connections at entering and leaving sides for pressure differential measurement.

8. Maximum Pressure Loss: 2 psig.
9. Working Pressure Rating: 500 psig.
10. Maximum Operating Temperature: 240 deg F.

M. Permanent Filter Dryers: Comply with AHRI 730.

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

    a. Danfoss Inc.
    b. Emerson Climate Technologies.
    c. Heldon Products; Henry Technologies.
    d. Parker Hannifin Corp.

2. Body and Cover: Painted-steel shell.
3. Filter Media: 10 micron, pleated with integral end rings; stainless-steel support.
4. Desiccant Media: Activated alumina.
5. Designed for reverse flow (for heat-pump applications).
6. End Connections: Socket.
7. Access Ports: NPS 1/4 connections at entering and leaving sides for pressure differential measurement.
8. Maximum Pressure Loss: 2 psig.
9. Working Pressure Rating: 500 psig.
10. Maximum Operating Temperature: 240 deg F.

N. Mufflers:

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

    a. Danfoss Inc.
    b. Emerson Climate Technologies.
    c. Heldon Products; Henry Technologies.

2. Body: Welded steel with corrosion-resistant coating.
3. End Connections: Socket or flare.
4. Working Pressure Rating: 500 psig.
5. Maximum Operating Temperature: 275 deg F.

O. Receivers: Comply with AHRI 495.

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

    a. Heldon Products; Henry Technologies.

2. Comply with 2010 ASME Boiler and Pressure Vessel Code; listed and labeled by an NRTL.
3. Comply with UL 207; listed and labeled by an NRTL.
4. Body: Welded steel with corrosion-resistant coating.
5. Tappings: Inlet, outlet, liquid level indicator, and safety relief valve.
6. End Connections: Socket or threaded.
7. Working Pressure Rating: 500 psig.
8. Maximum Operating Temperature: 275 deg F.

P. Liquid Accumulators: Comply with AHRI 495.

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

a. Emerson Climate Technologies.
b. Heldon Products; Henry Technologies.
c. Parker Hannifin Corp.

2. Body: Welded steel with corrosion-resistant coating.
3. End Connections: Socket or threaded.
4. Working Pressure Rating: 500 psig.
5. Maximum Operating Temperature: 275 deg F.

2.4 REFRIGERANTS

A. ASHRAE 34, R-410A: Pentafluoroethane/Difluoromethane.

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

a. Arkema Inc.
b. DuPont Fluorochemicals Div.
c. Genetron Refrigerants; Honeywell International Inc.
d. Mexichem Fluor Inc.

PART 3 - EXECUTION

3.1 PIPING APPLICATIONS FOR REFRIGERANT R-410A

A. Suction Lines NPS 1-1/2 and Smaller for Conventional Air-Conditioning Applications: Copper, Type ACR, annealed-temper tubing and wrought-copper fittings with brazed or soldered joints.

B. Hot-Gas and Liquid Lines, and Suction Lines for Heat-Pump Applications: Copper, Type ACR, annealed- or drawn-temper tubing and wrought-copper fittings with brazed or soldered joints.

C. Safety-Relief-Valve Discharge Piping: Copper, Type ACR, annealed- or drawn-temper tubing and wrought-copper fittings with brazed or soldered joints.

3.2 VALVE AND SPECIALTY APPLICATIONS

A. Install diaphragm packless valves in suction and discharge lines of compressor.

B. Install service valves for gage taps at inlet and outlet of hot-gas bypass valves and strainers if they are not an integral part of valves and strainers.

C. Install a check valve at the compressor discharge and a liquid accumulator at the compressor suction connection.

D. Except as otherwise indicated, install diaphragm packless valves on inlet and outlet side of filter dryers.

E. Install a full-size, three-valve bypass around filter dryers.

F. Install solenoid valves upstream from each expansion valve and hot-gas bypass valve. Install solenoid valves in horizontal lines with coil at top.

G. Install thermostatic expansion valves as close as possible to distributors on evaporators.

1. Install valve so diaphragm case is warmer than bulb.
2. Secure bulb to clean, straight, horizontal section of suction line using two bulb straps. Do not mount bulb in a trap or at bottom of the line.
3. If external equalizer lines are required, make connection where it will reflect suction-line pressure at bulb location.

H. Install safety relief valves where required by 2010 ASME Boiler and Pressure Vessel Code. Pipe safety-relief-valve discharge line to outside according to ASHRAE 15.

I. Install moisture/liquid indicators in liquid line at the inlet of the thermostatic expansion valve or at the inlet of the evaporator coil capillary tube.

J. Install strainers upstream from and adjacent to the following unless they are furnished as an integral assembly for the device being protected:

1. Solenoid valves.
2. Thermostatic expansion valves.
3. Hot-gas bypass valves.
4. Compressor.

K. Install filter dryers in liquid line between compressor and thermostatic expansion valve.

L. Install receivers sized to accommodate pump-down charge.

M. Install flexible connectors at compressors.

3.3 PIPING INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems; indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Shop Drawings.

B. Install refrigerant piping according to ASHRAE 15.

C. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.

D. 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.

E. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

F. Install piping adjacent to machines to allow service and maintenance.

G. Install piping free of sags and bends.

H. Install fittings for changes in direction and branch connections.

I. Select system components with pressure rating equal to or greater than system operating pressure.

J. Install piping as short and direct as possible, with a minimum number of joints, elbows, and fittings.

K. Arrange piping to allow inspection and service of refrigeration equipment. Install valves and specialties in accessible locations to allow for service and inspection.

L. Install refrigerant piping in rigid or flexible conduit in locations where exposed to mechanical injury.

M. Slope refrigerant piping as follows:

1. Install horizontal hot-gas discharge piping with a uniform slope downward away from compressor.
2. Install horizontal suction lines with a uniform slope downward to compressor.
3. Install traps and double risers to entrain oil in vertical runs.
4. Liquid lines may be installed level.

N. When brazing or soldering, remove solenoid-valve coils and sight glasses; also remove valve stems, seats, and packing, and accessible internal parts of refrigerant specialties. Do not apply heat near expansion-valve bulb.

O. Before installation of steel refrigerant piping, clean pipe and fittings using the following procedures:

1. Shot blast the interior of piping.
2. Remove coarse particles of dirt and dust by drawing a clean, lintless cloth through tubing by means of a wire or electrician's tape.
3. Draw a clean, lintless cloth saturated with trichloroethylene through the tube or pipe. Continue this procedure until cloth is not discolored by dirt.
4. Draw a clean, lintless cloth, saturated with compressor oil, squeezed dry, through the tube or pipe to remove remaining lint. Inspect tube or pipe visually for remaining dirt and lint.
5. Finally, draw a clean, dry, lintless cloth through the tube or pipe.
6. Safety-relief-valve discharge piping is not required to be cleaned but is required to be open to allow unrestricted flow.

P. Install piping with adequate clearance between pipe and adjacent walls and hangers or between pipes for insulation installation.

Q. Identify refrigerant piping and valves according to Section 230553 "Identification for HVAC Piping and Equipment."

R. Install sleeves for piping penetrations of walls, ceilings, and floors.

S. Install escutcheons for piping penetrations of walls, ceilings, and floors.

3.4 PIPE JOINT CONSTRUCTION

A. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

B. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

C. Fill pipe and fittings with an inert gas (nitrogen or carbon dioxide), during brazing or welding, to prevent scale formation.

D. Soldered Joints: Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook."

E. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," Chapter "Pipe and Tube."

1. Use Type BCuP (copper-phosphorus) alloy for joining copper socket fittings with copper pipe.
2. Use Type BAg (cadmium-free silver) alloy for joining copper with bronze or steel.

F. Threaded Joints: Thread steel 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 to restore full ID. Join pipe fittings and valves as follows:

1. Apply appropriate tape or thread compound to external pipe threads unless dry-seal threading is specified.
2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

G. Welded Joints: Construct joints according to AWS D10.12M/D10.12.

3.5 INSTALLATION OF HANGERS AND SUPPORTS

A. Comply with Section 230500 "Common Work Results for HVAC" for hangers, supports, and anchor devices.

B. Install the following pipe attachments:

1. Adjustable steel clevis hangers for individual horizontal runs less than 20 feet long.
2. Roller hangers and spring hangers for individual horizontal runs 20 feet or longer.
3. Pipe Roller: MSS SP-58, Type 44 for multiple horizontal piping 20 feet or longer, supported on a trapeze.
4. Spring hangers to support vertical runs.
5. Copper-clad hangers and supports for hangers and supports in direct contact with copper pipe.

C. Install hangers for copper tubing, 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 within 12 inches of each fitting.

E. Support vertical runs of copper tubing to comply with MSS-58, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.

3.6 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. Comply with ASME B31.5, Chapter VI.
2. Test refrigerant piping, specialties, and receivers. Isolate compressor, condenser, evaporator, and safety devices from test pressure if they are not rated above the test pressure.
3. Test high- and low-pressure side piping of each system separately at not less than the pressures indicated in "Performance Requirements" Article.

    a. Fill system with nitrogen to the required test pressure.
    b. System shall maintain test pressure at the manifold gage throughout duration of test.
    c. Test joints and fittings with electronic leak detector or by brushing a small amount of soap and glycerin solution over joints.
    d. Remake leaking joints using new materials, and retest until satisfactory results are achieved.

B. Prepare test and inspection reports.

3.7 SYSTEM CHARGING

A. Charge system using the following procedures:

1. Install core in filter dryers after leak test but before evacuation.
2. Evacuate entire refrigerant system with a vacuum pump to 500 micrometers. If vacuum holds for 12 hours, system is ready for charging.
3. Break vacuum with refrigerant gas, allowing pressure to build up to 2 psig.
4. Charge system with a new filter-dryer core in charging line.

3.8 ADJUSTING

A. Adjust thermostatic expansion valve to obtain proper evaporator superheat.

B. Adjust high- and low-pressure switch settings to avoid short cycling in response to fluctuating suction pressure.

C. Adjust set-point temperature of air-conditioning or chilled-water controllers to the system design temperature.

D. Perform the following adjustments before operating the refrigeration system, according to manufacturer's written instructions:

1. Open shutoff valves in condenser water circuit.
2. Verify that compressor oil level is correct.
3. Open compressor suction and discharge valves.
4. Open refrigerant valves except bypass valves that are used for other purposes.
5. Check open compressor-motor alignment and verify lubrication for motors and bearings.

E. Replace core of replaceable filter dryer after system has been adjusted and after design flow rates and pressures are established.

END OF SECTION

SECTION 233113 - METAL DUCTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Single-wall rectangular ducts and fittings.
2. Single-wall round ducts and fittings.
3. Sheet metal materials.
4. Duct liner.
5. Sealants and gaskets.
6. Hangers and supports.

B. Related Sections:

1. Section 230593 "Testing, Adjusting, and Balancing for HVAC" for testing, adjusting, and balancing requirements for metal ducts.
2. Section 233300 "Air Duct Accessories" for dampers, sound-control devices, duct-mounting access doors and panels, turning vanes, and flexible ducts.

1.3 DEFINITIONS

1.4 ACTION SUBMITTALS

A. 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 and bottom of ducts.
5. Dimensions of main duct runs from building grid lines.
6. Fittings.
7. Reinforcement and spacing.
8. Seam and joint construction.
9. Penetrations through fire-rated and other partitions.
10. Equipment installation based on equipment being used on Project.
11. Locations for duct accessories, including dampers, turning vanes, and access doors and panels.
12. Hangers and supports, including methods for duct and building attachment and vibration isolation.

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, duct liner, 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."

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. Liner Adhesive: As recommended by insulation manufacturer and complying with 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 have a VOC content of 80 g/L or less.
    b. 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, minimum 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: minimum 3 inches.
3. Sealant: Modified styrene acrylic.
4. Water resistant.
5. Mold and mildew resistant.
6. Maximum Static-Pressure Class: 10-inch wg, positive and negative.
7. Service: Indoor and outdoor.
8. Service Temperature: Minus 40 to plus 200 deg F.
9. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum.
10. Sealant shall have a VOC content of 420 g/L or less.
11. Sealant shall comply with the testing and product requirements

C. Water-Based Joint and Seam Sealant:

1. Application Method: Brush on.
2. Solids Content: Minimum 65 percent.
3. Shore A Hardness: Minimum 20.
4. Water resistant.
5. Mold and mildew resistant.
6. VOC: Maximum 75 g/L (less water).
7. Maximum Static-Pressure Class: 10-inch wg, positive and negative.
8. Service: Indoor or outdoor.
9. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum sheets.

D. Solvent-Based Joint and Seam Sealant:

1. Application Method: Brush on.
2. Base: Synthetic rubber resin.
3. Solvent: Toluene and heptane.
4. Solids Content: Minimum 60 percent.
5. Shore A Hardness: Minimum 60.
6. Water resistant.
7. Mold and mildew resistant.
8. Sealant shall have a VOC content of 420 g/L or less.
9. Sealant shall comply with the testing and product requirements
10. Maximum Static-Pressure Class: 10-inch wg, positive or negative.
11. Service: Indoor or outdoor.
12. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum sheets.

E. Flanged Joint Sealant: Comply with ASTM C920.

1. General: Single-component, acid-curing, silicone, elastomeric.
2. Type: S.

3. Grade: NS.
4. Class: 25.
5. Use: O.
6. Sealant shall have a VOC content of 420 g/L or less.
7. Sealant shall comply with the testing and product requirements

F. Flange Gaskets: Butyl rubber, neoprene, or EPDM polymer with polyisobutylene plasticizer.

G. Round Duct Joint O-Ring Seals:

1. Seal shall provide maximum leakage class of 3 cfm/100 sq. ft. at 1-inch wg and shall be rated for 10-inch wg static-pressure class, positive or negative.
2. EPDM O-ring to seal in concave bead in coupling or fitting spigot.
3. Double-lipped, EPDM O-ring seal, mechanically fastened to factory-fabricated couplings and fitting spigots.

2.7 HANGERS AND SUPPORTS

A. Hanger Rods for Noncorrosive Environments: Galvanized-steel rods and nuts.

B. Strap and Rod Sizes: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 5-1, "Rectangular Duct Hangers Minimum Size," and Table 5-2, "Minimum Hanger Sizes for Round Duct."

C. Steel Cables for Galvanized-Steel Ducts: Galvanized steel complying with ASTM A603.

D. Steel Cable End Connections: Galvanized-steel assemblies with brackets, swivel, and bolts designed for duct hanger service; with an automatic-locking and clamping device.

E. Duct Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials.

F. Trapeze and Riser Supports:

1. Supports for Galvanized-Steel Ducts: Galvanized-steel shapes and plates.

PART 3 - EXECUTION

3.1 DUCT INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of duct system. Indicated duct locations, configurations, and arrangements were used to size ducts and calculate friction loss for air-handling equipment sizing and for other design considerations. Install duct systems as indicated unless deviations to layout are approved on Shop Drawings and coordination drawings.

B. Install ducts in accordance with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" unless otherwise indicated.

C. Install ducts in maximum practical lengths with fewest possible joints.

D. Install factory- or shop-fabricated fittings for changes in direction, size, and shape and for branch connections.

E. Unless otherwise indicated, install ducts vertically and horizontally, and parallel and perpendicular to building lines.

F. Install ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building.

G. Install ducts with a clearance of 1 inch, plus allowance for insulation thickness.

H. 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 heating coils, cooling coils, air filters, dampers, and all other duct-mounted accessories in air ducts where indicated on Drawings.

K. 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."

L. 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.

M. 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. Building Attachments: Concrete inserts, powder-actuated fasteners, or structural-steel fasteners appropriate for construction materials to which hangers are being attached.

1. Where practical, install concrete inserts before placing concrete.
2. Install powder-actuated concrete fasteners after concrete is placed and completely cured.
3. Use powder-actuated concrete fasteners for standard-weight aggregate concretes or for slabs more than 4 inches thick.
4. Do not use powder-actuated concrete fasteners for lightweight-aggregate concretes or for slabs less than 4 inches thick.
5. Do not use powder-actuated concrete fasteners for seismic restraints.

C. Hanger Spacing: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 5-1, "Rectangular Duct Hangers Minimum Size," and Table 5-2, "Minimum Hanger Sizes for Round Duct," for maximum hanger spacing; install hangers and supports within 24 inches of each elbow and within 48 inches of each branch intersection.

D. Hangers Exposed to View: Threaded rod and angle or channel supports.

E. Support vertical ducts with steel angles or channel secured to the sides of the duct with welds, bolts, sheet metal screws, or blind rivets; support at each floor and at a maximum intervals of 16 feet.

F. Install upper attachments to structures. Select and size upper attachments with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

3.5 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 PAINTING

A. Paint interior of metal ducts that are visible through registers and grilles and that do not have duct liner. Apply one coat of flat, black, latex paint over a compatible galvanized-steel primer. Paint materials and application requirements are specified in Section 099113 "Exterior Painting" and Section 099123 "Interior Painting."

3.7 DUCT LINER INSTALLATION

A. When not noted to be lined for conductivity, the first 25 feet of supply and return duct at all air handling equipment shall be lined with 1/2 inch duct liner for sound absorption. The acoustical liner shall be installed even where duct wrap may be required.

B. Linings shall be interrupted at the area of operation of a fire damper and at not less than 6 inches upstream of and 6 inches downstream of electric-resistance and fuel-burning heaters in a duct system. Metal nosings or sleeves shall be installed over exposed duct liner edges that face opposite the direction of airflow.

3.8 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. Disassemble, reassemble, and seal segments of systems to accommodate leakage testing and for compliance with test requirements.
3. 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.
4. Test for leaks before applying external insulation.
5. 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.

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.

3.9 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.

3.10 STARTUP

A. Air Balance: Comply with requirements in Section 230593 "Testing, Adjusting, and Balancing for HVAC."

3.11 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.

2. Ducts Connected to Air-Handling Units:

a. Pressure Class: Positive or 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.

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 and Flat Oval: 4.

3. Ducts Connected to Equipment Not Listed Above:

a. Pressure Class: Positive or negative 2-inch wg.
b. Minimum SMACNA Seal Class: B.
c. SMACNA Leakage Class for Rectangular: 8.
d. SMACNA Leakage Class for Round and Flat Oval: 4.

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 or Flexible elastomeric, 1/2 inch thick.
2. Return-Air Ducts: Fibrous glass, Type I or Flexible elastomeric, 1/2 inch thick.
3. Exhaust-Air Ducts: Fibrous glass, Type I or Flexible elastomeric, 1/2 inch thick.
4. Supply Fan Plenums: Fibrous glass, Type I or Flexible elastomeric, 1/2 inch thick.
5. Return- and Exhaust-Fan Plenums: Fibrous glass, Type I or Flexible elastomeric, 1/2 inch thick.
6. Transfer Ducts: Fibrous glass, Type I or Flexible elastomeric, 1/2 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**] [**Welded**].

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. Manual volume dampers/balancing dampers.
2. Control dampers.
3. Fire dampers.
4. Flange connectors.
5. Duct-mounted access doors.
6. Flexible connectors.
7. Duct accessory hardware.

B. Related Requirements:

1. Section 233346 "Flexible Ducts" for insulated and non-insulated flexible ducts.
2. Section 233723 "HVAC Gravity Ventilators" for roof-mounted ventilator caps.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For duct accessories. Include plans, elevations, sections, details, and attachments to other work.

1. Detail duct accessories' fabrication and installation in ducts and other construction. Include dimensions, weights, loads, and required clearances; and method of field assembly into duct systems and other construction. Include the following:

a. Special fittings.
b. Manual volume damper installations.
c. Control-damper installations.
d. Fire-damper installations, including sleeves.
e. Include diagrams for power, signal, and control wiring.

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 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.

2.3 CONTROL DAMPERS

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

1. Greenheck Fan Corporation.

    a. VCD-23

2. McGill AirFlow LLC.

    a. VC1 (Parallel Blade)
    b. VC2 (Opposed Blade)

3. Nailor Industries Inc.

    a. 1010 (Parallel Blade)
    b. 1020 (Opposed Blade)

4. Pottorff.

a. CD-41 (Parallel Blade)
b. CD-42 (Opposed Blade)

5. United Enertech.

a. CD-111 (Parallel Blade)
b. CD-110 (Opposed Blade)

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 I: Leakage shall not exceed 8 cfm/sq. ft. against 4-inch wg differential static pressure.

3. Pressure Drop: Maximum 0.07-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 2000 fpm.
5. Temperature: Minus 25 to plus 150 deg F.
6. Pressure Rating: Low to medium pressure and velocity systems. Up to 4 in. wg pressure differential.

D. Construction:

1. Suitable for horizontal or vertical airflow applications.
2. Frames:

a. Hat, U, or angle shaped.
b. Material: Galvanized steel, minimum 16 gauge thick.
c. Mitered and welded or interlocking, gusseted corners.
d. Flanges for attaching to walls and flangeless frames for installing in ducts.

3. Blades:

a. Multiple blade with maximum blade width of 4 to 6 inches.
b. Type: 3V.
c. Material: Galvanized steel.
d. Thickness: Minimum 16 gauge.

4. Blade Edging Seals:

a. Replaceable closed-cell neoprene, PVC, or thermoplastic elastomer (TPE).

5. Blade Jamb Seal: Flexible stainless steel, compression type.
6. Blade Axles: 1/2-inch diameter; plated or stainless steel.

7. Blade-Linkage Hardware: Zinc-plated steel and brass; ends sealed against blade bearings. Linkage mounted out of air stream.
8. Bearings:

    a. Molded synthetic.
    b. Dampers mounted with vertical blades to have thrust bearings at each end of every blade.

E. Damper Actuator - Electric:

1. Electric - 24 V ac.
2. UL 873, plenum rated.
3. Two position with fail-safe spring return.

    a. Sufficient motor torque and spring torque to drive damper fully open and fully closed with adequate force to achieve required damper seal.
    b. Minimum 90-degree drive rotation.

4. Clockwise or counterclockwise drive rotation as required for application.
5. Environmental Operating Range:

    a. Temperature: Minus 40 to plus 130 deg F.
    b. Humidity: 5 to 95 percent relative humidity noncondensing.

6. Environmental enclosure: NEMA 2.
7. Actuator to be factory mounted and provided with a single-point wiring connection.

2.4 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.

2.5 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.

2.6 DUCT-MOUNTED ACCESS DOORS

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

1. Aire Technologies.
2. Arrow United Industries.
3. Cesco Products; a division of MESTEK, Inc.
4. CL WARD LLC.
5. Ductmate Industries, Inc.
6. Duro Dyne Inc.
7. Elgen Manufacturing.
8. Flexmaster U.S.A., Inc.
9. Greenheck Fan Corporation.
10. McGill AirFlow LLC.
11. Ruskin Company.
12. United Enertech.
13. Ward Industries; a brand of Hart & Cooley, Inc.

B. Duct-Mounted Access Doors: Fabricate access panels in accordance with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"; Figure 7-2 (7-2M), "Duct Access Doors and Panels," and Figure 7-3, "Access Doors - Round Duct."

1. Door:

   a. Double wall, rectangular.
   b. Galvanized sheet metal with insulation fill and thickness as indicated for duct pressure class.
   c. 24-gauge-thick galvanized steel door panel.
   d. Hinges and Latches: 1-by-1-inch butt or piano hinge and cam latches.
   e. Fabricate doors airtight and suitable for duct pressure class.

2. Frame: Galvanized sheet steel, with bend-over tabs and foam gaskets.

   a. 24-gauge-thick galvanized steel or 0.032-inch-thick aluminum frame.

3. Number of Hinges and Locks:

   a. Access Doors Less Than 12 Inches Square: No hinges and two sash locks.
   b. Access Doors up to 18 Inches Square: Two hinges and two sash locks.
   c. Access Doors up to 24 by 48 Inches: Continuous and two compression latches.
   d. Access Doors Larger Than 24 by 48 Inches: Continuous and two compression latches with outside and inside handles.

2.7 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.

2.8 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.

2.9 MATERIALS

A. Galvanized Sheet Steel: Comply with ASTM A653/A653M.

1. Galvanized Coating Designation: G90.
2. Exposed-Surface Finish: Mill phosphatized.

B. Reinforcement Shapes and Plates: Galvanized-steel reinforcement where installed on galvanized sheet metal ducts; compatible materials for aluminum and stainless steel ducts.

C. Tie Rods: Galvanized steel, 1/4-inch minimum diameter for lengths 36 inches or less; 3/8-inch minimum diameter for lengths longer than 36 inches.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install duct accessories in accordance with applicable details in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for metal ducts and in NAIMA AH116 for fibrous-glass ducts.

B. Install duct accessories of materials suited to duct materials; use galvanized-steel accessories in galvanized-steel and fibrous-glass ducts, stainless steel accessories in stainless steel ducts, and aluminum accessories in aluminum ducts.

C. Install backdraft dampers at inlet of exhaust fans or exhaust ducts as close as possible to exhaust fan unless otherwise indicated.

D. Where multiple damper sections are necessary to achieve required dimensions, provide reinforcement to fully support damper assembly when fully closed at full system design static pressure.

E. Install volume dampers at points on supply, return, and exhaust systems where branches extend from larger ducts. Where dampers are installed in ducts having duct liner, install dampers with hat channels of same depth as liner, and terminate liner with nosing at hat channel.

1. Install steel volume dampers in steel ducts.
2. Install aluminum volume dampers in aluminum ducts.

F. Set dampers to fully open position before testing, adjusting, and balancing.

G. Install test holes at fan inlets and outlets and elsewhere as indicated and as needed for testing and balancing.

H. Install fire dampers in accordance with UL listing.

I. Install duct access doors on sides of ducts to allow for inspecting, adjusting, and maintaining accessories and equipment at the following locations:

1. On both sides of duct coils.
2. Upstream and downstream from duct filters.
3. At outdoor-air intakes and mixed-air plenums.
4. At drain pans and seals.
5. Downstream from manual volume dampers, control dampers, backdraft dampers, and equipment.
6. Adjacent to and close enough to fire or smoke dampers, to reset or reinstall fusible links. Access doors for access to fire or smoke dampers having fusible links shall be pressure relief access doors and shall be outward operation for access doors installed upstream from dampers and inward operation for access doors installed downstream from dampers.
7. At each change in direction and at maximum 50-ft. spacing.
8. Upstream and downstream from turning vanes.
9. Control devices requiring inspection.
10. Elsewhere as indicated.

J. Install access doors with swing against duct static pressure.

K. Access Door Sizes:

1. One-Hand or Inspection Access: 8 by 5 inches.
2. Two-Hand Access: 12 by 6 inches.
3. Head and Hand Access: 18 by 10 inche.
4. Head and Shoulders Access: 21 by 14 inches.
5. Body Access: 25 by 14 inches.
6. Body plus Ladder Access: 25 by 17 inches.

L. Label access doors according to Section 230553 "Identification for HVAC Piping and Equipment" to indicate the purpose of access door.

M. Install flexible connectors to connect ducts to equipment.

N. For fans developing static pressures of 5 inches wg and more, cover flexible connectors with loaded vinyl sheet held in place with metal straps.

O. 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. Ceiling-mounted ventilators.

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.

B. Shop Drawings:

1. Include plans, elevations, sections, and attachment 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 HVAC power ventilators to include in normal and emergency operation, and maintenance manuals.

PART 2 - PRODUCTS

2.1 CEILING-MOUNTED VENTILATORS

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

1. Acme Engineering & Manufacturing Corp.
2. American Coolair Corporation.
3. Broan-NuTone LLC.
4. Carnes Company.
5. FloAire National.
6. Greenheck Fan Corporation.
7. JencoFan.
8. Loren Cook Company.
9. Panasonic Corporation of North America.
10. PennBarry.
11. S & P USA Ventilation Systems, LLC.

B. Housing: Steel, lined with acoustical insulation.

C. Fan Wheel: Centrifugal wheels directly mounted on motor shaft. Fan shrouds, motor, and fan wheel removable for service.

D. Back-draft damper: Integral.

E. Grille: Plastic, louvered grille with flange on intake and thumbscrew or spring retainer attachment to fan housing.

F. Electrical Requirements: Junction box for electrical connection on housing and receptacle for motor plug-in.

G. Accessories:

1. Manual Starter Switch: Single-pole rocker switch assembly with cover and pilot light.
2. Manufacturer's standard roof jack or wall cap, and transition fittings.

2.2 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. Ceiling Units: Suspend units from structure; use steel wire or metal straps.

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

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 233600 - AIR TERMINAL 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. Modulating, single-duct air terminal units.
2. Casing liner.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of air terminal unit.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for air terminal units.
2. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.
3.

B. Shop Drawings: For air terminal units.

1. Include plans, elevations, sections, and mounting details.
2. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
3. Include diagrams for power, signal, and control wiring.
4. Hangers and supports, including methods for duct and building attachment.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For air terminal units to include in emergency, operation, and maintenance manuals.

1. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:

a. Instructions for resetting minimum and maximum air volumes.
b. Instructions for adjusting software set points.

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 5 - "Systems and Equipment" and Section 7 - "Construction and System Start-up."

C. ASHRAE Compliance: Applicable requirements in ASHRAE/IES 90.1, "Section 6 - Heating, Ventilating, and Air Conditioning."

2.2 MODULATING, SINGLE-DUCT AIR TERMINAL UNITS

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

1. Anemostat Products; a Mestek company.
2. Carnes Company.
3. Carrier Corporation.
4. ENVIRO-TEC; by Johnson Controls, Inc.
5. Johnson Controls.
6. Krueger-HVAC, a division of Air System Components; Johnson Controls, Inc.
7. METALAIRE, Inc.
8. Nailor Industries Inc.
9. Price Industries.
10. Titus, a division of Air System Components; Johnson Controls, Inc.
11. Trane.
12. Tuttle & Bailey, a division of Air System Components; Johnson Controls, Inc.

B. Configuration: Volume-damper assembly inside unit casing with control components inside a protective metal shroud.

C. Casing: 0.034-inch-(22 gauge) thick galvanized steel, single wall.

1. Casing Liner: Comply with requirements in "Casing Liner" Article for fibrous-glass duct liner.
2. Air Inlet: Round stub connection or S-slip and drive connections for duct attachment.
3. Air Outlet: S-slip and drive connections.
4. Access: Removable panels for access to parts requiring service, adjustment, or maintenance; with airtight gasket.
5. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.

D. Regulator Assembly: System-air-powered bellows section incorporating polypropylene bellows for volume regulation and thermostatic control. Bellows shall operate at temperatures from zero to 140 deg F, shall be impervious to moisture and fungus, shall be suitable for 10-inch wg static pressure, and shall be factory tested for leaks.

E. Volume Damper: Galvanized steel with peripheral gasket and self-lubricating bearings.

1. Maximum Damper Leakage: AHRI 880 rated, 2 percent of nominal airflow at 3-inch wg inlet static pressure.
2. Damper Position: Normally open.

F. Hydronic Heating Coils: Copper tube, with mechanically bonded aluminum fins spaced no closer than 0.1 inch, and rated for a minimum working pressure of 200 psig and a maximum entering-water temperature of 220 deg F. Include manual air vent and drain valve. Provide hydronic heating coils for air terminal units scheduled on Drawings.

G. Control devices shall be compatible with temperature controls system specified in Section 230923 "Building Automation Systems for HVAC."

1. Electronic Damper Actuator: 24 V, powered open, non-spring return.
2. Electronic Thermostat: Wall-mounted electronic type with temperature set-point display in Fahrenheit.
3. Electronic Velocity Controller: Factory calibrated and field adjustable to minimum and maximum air volumes; shall maintain constant airflow dictated by thermostat within 5 percent of set point while compensating for inlet static-pressure variations up to 4-inch wg; and shall have a multipoint velocity sensor at air inlet.
4. Terminal Unit Controller: Pressure-independent, variable-air-volume (VAV) controller with electronic airflow transducer with multipoint velocity sensor at air inlet, factory calibrated to minimum and maximum air volumes, and having the following features:

    a. Occupied and unoccupied operating mode.
    b. Remote reset of airflow or temperature set points.
    c. Adjusting and monitoring with portable terminal.
    d. Communication with temperature-control system specified in Section 230923 "Building Automation Systems for HVAC."

5. Room Sensor: Wall mounted with temperature set-point adjustment and access for connection of portable operator terminal.

H. Controls:

1. Suitable for operation with duct pressures between 0.25- and 3.0-inch wg inlet static pressure.
2. System-powered, wall-mounted thermostat.

2.3 CASING LINER

A. Casing Liner: Fibrous-glass duct liner, complying with ASTM C1071, NFPA 90A, or NFPA 90B; and with NAIMA AH124, "Fibrous Glass Duct Liner Standard."

1. Minimum Thickness: 1/2 inch.

    a. Maximum Thermal Conductivity:

        1) Type I, Flexible: 0.27 Btu x in./h x sq. ft. x deg F at 75 deg F mean temperature.
        2) Type II, Rigid: 0.23 Btu x in./h x sq. ft. x deg F at 75 deg F mean temperature.

2.4 SOURCE QUALITY CONTROL

A. Factory Tests: Test assembled air terminal units according to AHRI 880.

1. Label each air terminal unit with plan number, nominal airflow, maximum and minimum factory-set airflows, and AHRI certification seal.

PART 3 - EXECUTION

3.1 HANGER AND SUPPORT INSTALLATION

A. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Ch. 5, "Hangers and Supports" and with Section 230500 "Common Work Results for HVAC."

B. Building Attachments: Concrete inserts, powder-actuated fasteners, or structural-steel fasteners appropriate for construction materials to which hangers are being attached.

C. Hangers Exposed to View: Threaded rod and angle or channel supports.

D. Install upper attachments to structures. Select and size upper attachments with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

3.2 TERMINAL UNIT INSTALLATION

A. Install air terminal units according to NFPA 90A, "Standard for the Installation of Air Conditioning and Ventilating Systems."

B. Install air terminal units level and plumb. Maintain sufficient clearance for normal service and maintenance.

C. Install wall-mounted thermostats.

3.3 PIPING CONNECTIONS

A. Where installing piping adjacent to air terminal unit, allow space for service and maintenance.

B. Hot-Water Piping: Comply with requirements in Section 232113 "Hydronic Piping" and Section 232116 Hydronic Piping Specialties," and connect heating coils to supply with shutoff valve, strainer, control valve, and union or flange; and to return with balancing valve and union or flange.

3.4 DUCTWORK CONNECTIONS

A. Comply with requirements in Section 233113 "Metal Ducts" for connecting ducts to air terminal units.

B. Make connections to air terminal units with flexible connectors complying with requirements in Section 233300 "Air Duct Accessories."

3.5 ELECTRICAL CONNECTIONS

A. Install field power to each air terminal unit electrical power connection. Coordinate with air terminal unit manufacturer and installers.

B. Connect wiring in accordance with Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

C. Ground equipment in accordance with Section 260526 "Grounding and Bonding for Electrical Systems."

D. Install electrical devices furnished by manufacturer, but not factory mounted, in accordance with 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 in accordance with Section 260523 "Control-Voltage Electrical Power Cables."

3.7 IDENTIFICATION

A. Label each air terminal unit with plan number, nominal airflow, and maximum and minimum factory-set airflows. Comply with requirements in Section 230553 "Identification for HVAC Piping and Equipment" for equipment labels and warning signs and labels.

3.8 FIELD QUALITY CONTROL

A. Perform the following tests and inspections with the assistance of a factory-authorized service representative:

1. After installing air terminal units and after electrical circuitry has been energized, test for compliance with requirements.
2. Leak Test: After installation, fill water coils 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 motor rotation and unit operation.
4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

B. Air terminal unit will be considered defective if it does not pass tests and inspections.

C. Prepare test and inspection reports.

3.9 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. Verify that inlet duct connections are as recommended by air terminal unit manufacturer to achieve proper performance.
3. Verify that controls and control enclosure are accessible.
4. Verify that control connections are complete.
5. Verify that nameplate and identification tag are visible.
6. Verify that controls respond to inputs as specified.

3.10 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain air terminal units.

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. Square ceiling diffusers.
2. Perforated diffusers.
3. Louver face diffusers.
4. Linear slot diffusers.

B. Related Requirements:

1. Section 233300 "Air Duct Accessories" for fire and smoke dampers and volume-control dampers not integral to diffusers.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Data Sheet: Indicate materials of construction, finish, and mounting details; and performance data including throw and drop, static-pressure drop, and noise ratings.
2. Diffuser Schedule: Indicate drawing designation, room location, quantity, model number, size, and accessories furnished.

PART 2 - PRODUCTS

2.1 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: Three- and four-cone.

G. Mounting: T-bar.

H. Pattern: Adjustable.

I. Dampers: Radial opposed blade, see schedule and plans for locations.

2.2 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 12 inches, 24 by 24 inches.

F. Duct Inlet: See plans for round or square neck and size.

G. Face Style: Flush.

H. Mounting: T-bar.

I. Pattern Controller: None.

J. Dampers: Radial opposed blade, see schedule and plans for locations.

2.3 LOUVER FACE 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. 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: Baked enamel, white.

E. Mounting: Surface.

F. Pattern: One-way core style.

2.4 LINEAR SLOT 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. Krueger-HVAC, a division of Air System Components; Johnson Controls, Inc.
5. METALAIRE, Inc.
6. Nailor Industries Inc.
7. Price Industries.
8. Titus, a division of Air System Components; Johnson Controls, Inc.
9. Tuttle & Bailey; a division of Air System Components; Johnson Controls, Inc.

B. Devices shall be specifically designed for variable-air-volume flows.

C. Material - Shell: Steel, insulated plenum.

D. Material - Pattern Controller and Tees: Aluminum.

E. Finish - Face and Shell: Baked enamel, black.

F. Finish - Pattern Controller: Baked enamel, black.

G. Finish - Tees: Baked enamel, white.

H. Slot Width: 1 inch.

I. Number of Slots: Two.

J. Length: 48 inches.

K. Accessories: T-bar clips.

2.5 SOURCE QUALITY CONTROL

A. Verification of Performance: Rate diffusers according to ASHRAE 70, "Method of Testing for Rating the Performance of Air Outlets and Inlets."

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas where diffusers are installed for compliance with requirements for installation tolerances and other conditions affecting performance of equipment.

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

3.2 INSTALLATION

A. Install diffusers level and plumb.

B. Ceiling-Mounted Outlets and Inlets: Drawings indicate general arrangement of ducts, fittings, and accessories. Air outlet and inlet locations have been indicated to achieve design requirements for air volume, noise criteria, airflow pattern, throw, and pressure drop. Make final locations where indicated, as much as practical. For units installed in lay-in ceiling panels, locate units in the center of panel. Where architectural features or other items conflict with installation, notify Architect for a determination of final location.

C. Install diffusers with airtight connections to ducts and to allow service and maintenance of dampers, air extractors, and fire dampers.

3.3 ADJUSTING

A. After installation, adjust diffusers to air patterns indicated, or as directed, before starting air balancing.

END OF SECTION

SECTION 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 236200 - PACKAGED COMPRESSOR AND CONDENSER 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. Compressor and condenser units, air cooled, 1 to 5 tons.

1.3 ACTION SUBMITTALS

A. Product Data: For each compressor and condenser unit.

1. Include rated capacities, operating characteristics, and furnished specialties and accessories.
2. Include equipment dimensions, weights and structural loads, required clearances, method of field assembly, components, and location and size of each field connection.

B. Shop Drawings: For compressor and condenser units.

1. Include plans, elevations, sections, and attachment details.
2. Include diagrams for power, signal, and control wiring.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For compressor and condenser units to include in emergency, operation, and maintenance manuals.

1.5 COORDINATION

A. Coordinate sizes and locations of bases.

B. Coordinate installation of roof curbs, equipment supports, and roof penetrations. These items are specified in Section 077200 "Roof Accessories."

C. Coordinate location of piping and electrical rough-ins.

1.6 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of compressor and condenser units that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Compressor failure.
b. Condenser coil leak.

2. Warranty Period: Five years from date of Substantial Completion.
3. Warranty Period (Compressor Only): Five years from date of Substantial Completion.
4. Warranty Period (Components Other Than Compressor): Five years from date of Substantial Completion.
5. Warranty Period (Condenser Coil Only): Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fabricate and label refrigeration system in accordance with ASHRAE 15 and ASHRAE 34.

B. ASHRAE/IES 90.1 Compliance: Applicable requirements in ASHRAE/IES 90.1, Section 6, "Heating, Ventilating, and Air-Conditioning."

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.

2.2 COMPRESSOR AND CONDENSER UNITS, AIR COOLED, 1 TO 5 TONS

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

1. Carrier Corporation; a unit of United Technologies Corp.
2. Trane.
3. YORK; a Johnson Controls company.

A. Description: Factory assembled and tested; consisting of compressor, condenser coil, fan, motors, refrigerant reservoir, and operating controls.

B. Compressor Type: Scroll, hermetically sealed, with rubber vibration isolators.

1. Motor: Single speed, and includes thermal- and current-sensitive overload devices, start capacitor, relay, and contactor.
2. Single-speed Compressor: Include manual-reset, high-pressure switch and automatic-reset, low-pressure switch.
3. Accumulator: Suction tube.

C. Refrigerant: R-454B, R-32.

D. Condenser Coil: Seamless copper-tube, aluminum-fin coil; with removable drain pan and brass service valves with service ports.

E. Condenser Fan: Direct-drive, metal propeller fan; with permanently lubricated, totally enclosed fan motor with thermal-overload protection.

F. Accessories:

1. Crankcase heater.

2. Cycle Protector: Automatic-reset timer to prevent rapid compressor cycling.
3. Filter-dryer.
4. High-Pressure Switch: Automatic-reset switch cycles compressor off on high refrigerant pressure.
5. Liquid-line solenoid.
6. Low-Pressure Switch: Automatic-reset switch cycles compressor off on low refrigerant pressure.
7. Plastic mounting base.
8. Precharged and preinsulated suction and liquid tubing.
9. Thermostatic expansion valve for installation at evaporator coil.
10. Fixed orifice for installation at evaporator coil.
11. Time-Delay Relay: Continues operation of evaporator fan after compressor shuts off.

G. Unit Casing: Galvanized steel, finished with baked powder-coat; with removable panels for access to controls, weep holes for water drainage, and mounting holes in base. Mount service valves, fittings, and gauge ports on exterior of casing.

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 compressor and condenser units.

B. Examine roughing-in for refrigerant piping systems to verify actual locations of piping connections before equipment installation.

C. Examine roofs for suitable conditions where compressor and condenser units will be installed.

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

3.2 INSTALLATION

A. Install units level and plumb, firmly anchored in locations indicated.

B. Install roof-mounting units on composite pads.

C. Maintain manufacturer's recommended clearances for service and maintenance.

D. Loose Components: Install piping specialties, electrical components, devices, and accessories that are not factory mounted.

3.3 PIPING CONNECTIONS

A. Comply with requirements for piping in Section 232300 "Refrigerant Piping." Drawings indicate general arrangement of piping, fittings, and specialties.

B. Where installing piping adjacent to equipment, allow space for service and maintenance.

C. Connect precharged refrigerant tubing to unit's quick-connect fittings. Install tubing so it does not interfere with access to unit. Install furnished accessories.

D. Connect refrigerant piping to air-cooled compressor and condenser units; maintain required access to unit. Install furnished field-mounted accessories. Refrigerant piping and specialties are specified in Section 232300 "Refrigerant Piping."

3.4 ELECTRICAL CONNECTIONS

A. Connect wiring in accordance with Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

B. Ground equipment in accordance with 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 CONTROL CONNECTIONS

A. Install control and electrical power wiring to field-mounted control devices.

B. Connect control wiring in accordance with Section 260523 "Control-Voltage Electrical Power Cables."

3.6 FIELD QUALITY CONTROL

A. Perform the following tests and inspections with the assistance of a factory-authorized service representative:

1. Perform each visual and mechanical inspection and electrical test. Certify compliance with test parameters.
2. Leak Test: After installation, charge system with refrigerant and oil and test for leaks. Repair leaks, replace lost refrigerant and oil, and retest until no leaks exist.
3. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor operation and unit operation, product capability, and compliance with requirements.
4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
5. Verify manufacturer's required airflow over coils.

B. Verify that vibration isolation and flexible connections prevent vibration transmission to structure.

C. Compressor and condenser units will be considered defective if they do not pass tests and inspections.

D. Prepare test and inspection reports.

END OF SECTION

SECTION 237223.29 - PACKAGED, OUTDOOR, 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, outdoor, energy-recovery units.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include packaged, outdoor, 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, outdoor, fixed-plate, energy-recovery units.

1. Include plans, elevations, sections, details, and mounting details.
2. Include details of equipment assemblies. Indicate dimensions, weights, loads, lifting requirements, 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 packaged, outdoor, fixed-plate, energy-recovery equipment to include in maintenance manuals.

1.5 COORDINATION

A. Coordinate sizes and locations of building openings and duct connections with actual equipment provided.

1.6 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of packaged, outdoor, fixed-plate, energy-recovery units that fail in materials or workmanship within specified warranty period.

1. Warranty Period for Packaged Energy-Recovery Units: One year from date of Substantial Completion.
2. Warranty Period for Fixed-Plate Heat Exchangers: Ten years from date of Substantial Completion.

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 1815 or UL 1812.
2. Electric coils shall comply with requirements in UL 1995.

E. Comply with ASTM E84 or UL 723.

2.2 PACKAGED, OUTDOOR, FIXED-PLATE, TOTAL HEAT, ENERGY-RECOVERY UNITS

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

1. Greenheck Fan Corporation.
2. Lifebreath; a division of Airia Brands.
3. Renewaire.
4. Venmar CES Inc.

B. Source Limitations: Obtain packaged, outdoor, fixed-plate, energy-recovery units from single manufacturer.

C. Surfaces in Contact with Airstream: Comply with requirements in ASHRAE 62.1.

D. Housing: Manufacturer's standard construction with corrosion-protection coating and exterior finish, gasketed, hinged access doors or removable panels with neoprene gaskets for inspection and access to internal parts, minimum 1-inch thick, expanded polystyrene foam thermal insulation, knockouts for electrical and piping connections, exterior drain connection, and lifting lugs.

E. Fixed-Plate, Heat Exchanger:

1. Casing: Aluminum.
2. Drain Pan: Same material as casing, with drain connections on exhaust and supply side.

    a. Comply with requirements in ASHRAE 62.1.

3. Plates: Evenly spaced, sealed, and arranged for cross-flow.

    a. Plate Material: Embossed aluminum.

F. Supply and Exhaust Fans: Forward-curved centrifugal fan with spring isolators of 1-inch static deflection.

1. Motors and Drives: Direct driven.

G. Filters:

1. Description: Cleanable wire mesh at outside air intake and pleated factory-fabricated, self-supported, disposable air filters with holding frames.
2. UL Compliance: Comply with UL 900.
3. Media: Interlaced glass fibers sprayed with nonflammable adhesive.
4. Filter Media Frame: Beverage board with perforated metal retainer or metal grid on outlet side.
5. Filter-Mounting Frames: Arranged with access doors or panels on both sides of unit. Filters shall be removable from one side or lift out from access plenum.

H. Electric Coils:

1. Casing Assembly: Slip-in type with galvanized-steel frame.
2. Access: Fabricate coil section to allow removal and replacement of coil and to allow in-place access for service.
3. Open Heating Elements: Resistance wire of 80 percent nickel and 20 percent chromium supported and insulated by floating ceramic bushings recessed into casing openings, fastened to supporting brackets, and mounted in galvanized-steel frame.
4. Overtemperature Protection: Disk-type, automatically resetting, thermal-cutout safety device; serviceable through terminal box without removing heater from coil section.
5. Secondary Protection: Load-carrying, manually resetting or manually replaceable thermal cutouts; factory wired in series with each heater stage.
6. Control Panel: Unit mounted with disconnecting means and overcurrent protection.

    a. Magnetic contactor.
    b. Solid-state, stepless SCR controller.
    c. Time-delay relay.
    d. Airflow proving switch.

I. 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 nonfused disconnect switches.

2.3 CONTROLS

A. Control Panel: Solid-state, programmable, microprocessor-based control unit for wall mounting. Integrate to BACnet, LonWorks, or Modbus, as specified in Section 230923 "Building Automation Controls."

B. Starting relay, factory mounted and wired, and manual motor starter for field wiring.

C. Dry-bulb temperature sensor.

D. Dirty filter switch.

E. Low-Voltage Transformer: Integral transformer to provide control voltage to unit from primary incoming electrical service.

F. Electric Coil Controls:

1. Factory-mounted sensor in outside-air intake with sensor adjustment located in control panel to control electric coil and maintain minimum entering temperature, to avoid frost formation.

2.4 SOURCE QUALITY CONTROL

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by 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 (IP).

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 in accordance with AMCA 210 and ASHRAE 51.

D. Fan Sound Ratings: Comply with AMCA 301 or AHRI 260 (IP).

E. UL Compliance:

1. Packaged, Fixed-Plate, Energy-Recovery Units: Comply with requirements in UL 1812.
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, outdoor, fixed-plate, energy-recovery unit installation. Replace 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 OF PACKAGED, OUTDOOR, FIXED-PLATE, ENERGY-RECOVERY UNITS

A. Install packaged, outdoor, 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 equipment fans until temporary or permanent filters are in place. Replace temporary filters used during construction and testing with new, clean filters prior to final inspection.

3.3 DUCTWORK CONNECTIONS

A. Comply with requirements for ductwork in accordance with 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 by manufacturer, but not factory mounted, in accordance with NFPA 70 and NECA 1.

B. Connect wiring in accordance with Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

C. Ground equipment in accordance with Section 260526 "Grounding and Bonding for Electrical Systems."

3.5 CONTROL CONNECTIONS

A. Install control and electrical power wiring to field-mounted control devices.

B. Connect control wiring in accordance with Section 260523 "Control-Voltage Electrical Power Cables."

3.6 STARTUP SERVICE

A. Engage factory-authorized service representative to perform startup service.

1. Complete installation and startup checks in accordance with manufacturer's written instructions.

3.7 ADJUSTING

A. Adjust moving parts to function smoothly, and lubricate as recommended by manufacturer.

B. Adjust initial temperature and humidity setpoints.

C. Set field-adjustable switches and circuit-breaker trip ranges as indicated.

3.8 FIELD QUALITY CONTROL

A. Perform tests and inspections with assistance of 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, outdoor, fixed-plate, energy-recovery units will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

3.9 DEMONSTRATION

A. Engage 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, small-capacity, rooftop air-conditioning units (RTUs) with the following components:

1. Casings.
2. Fans, drives, and motors.
3. Coils.
4. Refrigerant circuit components.
5. Air filtration.
6. Gas furnaces.
7. Dampers.
8. Electrical power connections.
9. Controls.
10. Roof curbs.
11. Accessories.

1.3 ACTION SUBMITTALS

A. Product Data:

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, small-capacity, 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.

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 for Parts: One year from date of Substantial Completion.
2. Warranty Period for Compressor: 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. Double-Wall Construction:

1. Outside Casing Wall: Galvanized steel, minimum 18 gauge thick with manufacturer's standard finish, with pitched roof panels and knockouts with grommet seals for electrical and piping connections and lifting lugs.
2. Inside Casing Wall: G90-coated galvanized steel, 0.034 inch thick.
3. Floor Plate: G90 galvanized steel, minimum 18 gauge thick.
4. Casing Insulation:

    a. Materials: Injected polyurethane foam insulation.
    b. Casing Panel R-Value: Minimum 13.
    c. Insulation Thickness: 2 inches.
    d. Thermal Break: Provide continuity of insulation with no through-casing metal in casing walls, floors, or roof of unit.

C. Airstream Surfaces: Surfaces in contact with airstream shall comply with requirements in ASHRAE 62.1.

D. Static-Pressure Classifications:

1. Total of 5-inch wg.

E. Panels and Doors:

1. Panels:

    a. Fabrication: Formed and reinforced with same materials and insulation thickness as casing.
    b. Fasteners: Two or more camlock type for panel lift-out operation. Arrangement shall allow panels to be opened against air-pressure differential.
    c. Gasket: Neoprene, applied around entire perimeters of panel frames.
    d. Size: Large enough to allow inspection and maintenance of air-handling unit's internal components.

2. Access Doors:

    a. Hinges: A minimum of two ball-bearing hinges or stainless steel piano hinge and two wedge-lever-type latches, operable from inside and outside. Arrange doors to be opened against air-pressure differential.
    b. Gasket: Neoprene, applied around entire perimeters of panel frames.
    c. Size: Large enough to allow inspection and maintenance of air-handling unit's internal components.

F. Condensate Drain Pans:

1. Location: Each type of cooling coil.
2. Construction:

    a. Single-wall, stainless steel sheet.

3. Drain Connection:

    a. Located at lowest point of pan and sized to prevent overflow. Terminate with threaded nipple on one end of pan.

4. Slope: Minimum 0.125-in./ft. slope, to comply with ASHRAE 62.1, in at least two planes to collect condensate from cooling coils (including coil piping connections, coil headers, and return bends) and to direct water toward drain connection.
5. Length: Extend drain pan downstream from leaving face for distance to comply with ASHRAE 62.1.
6. Width: Entire width of water producing device.
7. Depth: A minimum of 2 inches deep.

2.4 FANS, DRIVES, AND MOTORS

A. Fan and Drive Assemblies: Statically and dynamically balanced and designed for continuous operation at maximum-rated fan speed and motor horsepower.

B. Supply-Air Fans: Centrifugal, rated according to AMCA 210; galvanized or painted steel; mounted on solid-steel shaft.

1. Shafts: With field-adjustable alignment.

    a. Turned, ground, and polished hot-rolled steel with keyway.

2. Housings: Formed- and reinforced-steel panels to form curved scroll housings with shaped cutoff and spun-metal inlet bell.

    a. Bracing: Steel angle or channel supports for mounting and supporting fan scroll, wheel, motor, and accessories.

3. Centrifugal Fan Wheels: Inlet flange, backplate, and shallow blades with inlet and tip curved forward in direction of airflow and mechanically fastened to flange and backplate; steel or aluminum hub swaged to backplate and fastened to shaft with setscrews.
4. Mounting: For internal vibration isolation. Factory-mount fans with manufacturer's standard vibration isolation mounting devices having a minimum static deflection of 1 inch.
5. Shaft Lubrication Lines: Extended to a location outside the casing.
6. Flexible Connector: Factory fabricated with a fabric strip minimum 3-1/2 inches wide, attached to two strips of minimum 2-3/4-inch-wide by 0.028-inch-thick, galvanized-steel sheet.

    a. Flexible Connector Fabric: Glass fabric, double coated with neoprene. Fabrics, coatings, and adhesives shall comply with UL 181, Class 1.

C. Drives, Direct: Factory-mounted, direct drive.

D. Condenser-Coil Fan: Variable-speed propeller, mounted on shaft of permanently lubricated ECM motors.

E. Relief-Air Fan: Forward curved or backward inclined, shaft mounted on permanently lubricated motor.

F. Motors:

1. Motor Sizes: Minimum size as indicated. If not indicated, large enough so driven load will not require motor to operate in service factor range above 1.0.
2. Enclosure Type: Open, dripproof.
3. Enclosure Materials: Cast iron.
4. Efficiency: Premium efficient as defined in NEMA MG 1.
5. Controllers, Electrical Devices, and Wiring: Comply with requirements for electrical devices and connections specified in electrical Sections.

2.5 COILS

A. General Requirements for Coils:

1. Comply with AHRI 410.
2. Fabricate coils section to allow for removal and replacement of coil for maintenance and to allow in-place access for service and maintenance of coil(s).
3. Coils shall not act as structural component of unit.

B. Supply-Air Refrigerant Coil:

1. Tubes: Copper.
2. Fins:

    a. Material: Aluminum.
    b. Fin Spacing: Maximum 15 fins per inch.

3. Fin and Tube Joints: Mechanical bond.
4. Headers: Seamless-copper headers with brazed connections.
5. Frames: Galvanized steel.
6. Coatings: None.
7. Ratings: Designed, tested, and rated according to ASHRAE 33 and AHRI 410.

    a. Working Pressure: Minimum 300 psig.

2.6 REFRIGERANT CIRCUIT COMPONENTS

A. Compressor: Hermetic, variable-speed scroll, mounted on vibration isolators; with internal overcurrent and high-temperature protection, internal pressure relief, and crankcase heater.

B. Refrigeration Specialties:

1. Refrigerant: R-454B or R-32.
2. Expansion valve with replaceable thermostatic element.
3. Refrigerant filter/dryer.
4. Manual-reset high-pressure safety switch.
5. Minimum off-time relay.

6. Automatic-reset compressor motor thermal overload.
7. Brass service valves installed in compressor suction and liquid lines.

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 DAMPERS

A. Outdoor- and Return-Air Dampers: Low-leakage, double-skin, airfoil-blade, galvanized-steel dampers with compressible jamb seals and extruded-vinyl blade edge seals in parallel-blade arrangement with zinc-plated steel operating rods rotating in sintered bronze or nylon bearings mounted in a single galvanized-steel frame, and with operating rods connected with a common linkage. Leakage rate shall not exceed 4 cfm/sq. ft. at 1-inch wg and 8 cfm/sq. ft. at 4-inch wg.

2.9 ELECTRICAL POWER CONNECTIONS

A. RTU shall have a single connection of power to unit with unit-mounted disconnect switch accessible from outside unit and control-circuit transformer with built-in overcurrent protection.

2.10 CONTROLS

A. Control equipment and sequence of operation are specified in Section 230923 "Building Automation Systems for HVAC."

B. DDC Controller:

1. Provide a complete integrated microprocessor based DDC system to control all unit functions including temperature control, scheduling, monitoring, unit safety protection, including compressor minimum run and minimum off times, and diagnostics. This system shall consist of all required temperature sensors, pressure sensors, controller and keypad/display operator interface. All MCBs and sensors shall be factory mounted, wired and tested.

2. The standalone DDC controllers shall not be dependent on communications with any on-site or remote PC or master control panel for proper unit operation. The microprocessor shall maintain existing set points and operate standalone if the unit loses either direct connect or network communications. The microprocessor memory shall be protected from voltage fluctuations as well as any extended power failures. All factory and user set schedules and control points shall be maintained in nonvolatile memory. No settings shall be lost, even during extended power shutdowns.

3. The DDC control system shall permit starting and stopping of the unit locally or remotely. The control system shall be capable of providing a remote alarm indication. The unit control system shall provide for outside air damper actuation, emergency shutdown, remote heat enable/disable, remote cool enable/ disable, heat indication, cool indication, and fan operation.

4. All digital inputs and outputs shall be protected against damage from transients or incorrect voltages. All field wiring shall be terminated at a separate, clearly marked terminal strip.

5. The DDC controller shall have a built-in time schedule. The schedule shall be programmable from the unit keypad interface. The schedule shall be maintained in nonvolatile memory to insure that it is not lost during a power failure. There shall be one start/stop per day and a separate holiday schedule. The controller shall accept up to 16 holidays each with up to a 5-day duration. Each unit shall also have the ability to accept a time schedule via BAS network communication.

6. The keypad interface shall allow convenient navigation and access to all control functions. The unit keypad/display character format shall be 4 lines × 20 characters. All control settings shall be password protected against unauthorized changes. For ease of service, the display format shall be English language readout. Coded formats with lookup tables will not be accepted. The user interaction with the display shall provide the following information as a minimum:

    a. Return air temperature.
    b. Discharge air temperature.
    c. Outdoor air temperature.
    d. Space air temperature.
    e. Outdoor enthalpy, high/low.
    f. Compressor suction temperature and pressure
    g. Compressor head pressure and temperature
    h. Expansion valve position
    i. Condenser fan speed
    j. Inverter compressor speed
    k. Dirty filter indication.
    l. Airflow verification.
    m. Cooling status.
    n. Control temperature (Changeover).
    o. VAV box output status.
    p. Cooling status/capacity.
    q. Unit status.
    r. All time schedules.
    s. Active alarms with time and date.
    t. Previous alarms with time and date.
    u. Optimal start
    v. Supply fan and exhaust fan speed.
    w. System operating hours.

        1) Fan
        2) Exhaust fan
        3) Cooling
        4) Inndividual compressor
        5) Heating f. Economizer
        6) Tenant override

x. The user interaction with the keypad shall provide the following:

1) Controls mode

a) Off manual
b) Auto
c) Heat/Cool
d) Cool only
e) Heat only
f) Fan only

2) Occupancy mode

a) Auto
b) Occupied
c) Unoccupied
d) Tenant override

3) Unit operation changeover control

a) Return air temperature
b) Space temperature
c) Network signal

4) Cooling and heating change-over temperature with deadband
5) Cooling discharge air temperature (DAT)
6) Supply reset options

a) Return air temperature
b) Outdoor air temperature
c) Space temperature
d) Airflow (VAV)
e) Network signal
f) External (0-10 vdc)
g) External (0-20 mA)

7) Temperature alarm limits

a) High supply air temperature
b) Low supply air temperature
c) High return air temperature

8) Lockout control for compressors.
9) Compressor interstage timers
10) Night setback and setup space temperature.
11) Building static pressure.
12) Economizer changeover

a) Enthalpy
b) Drybulb temperature

13) Currently time and date
14) Tenant override time
15) Occupied/unoccupied time schedule
16) One event schedule

17) Holiday dates and duration
18) Adjustable set points

y. Service mode

1) Timers normal (all time delays normal)
2) Timers fast (all time delays 20 sec)

z. If the unit is to be programmed with a night setback or setup function, an optional space sensor shall be provided. Space sensors shall be available to support field selectable features. Sensor options shall include:

1) Zone sensor with tenant override switch
2) Zone sensor with tenant override switch plus heating and cooling set point adjustment. (Space Comfort Control systems only)

aa. To increase the efficiency of the cooling system the DDC controller shall include a discharge air temperature reset program for part load operating conditions. The discharge air temperature shall be controlled between a minimum and a maximum discharge air temperature (DAT) based on one of the following inputs:

1) Airflow
2) Outside air temperature
3) Space temperature
4) Return air temperature
5) External signal of 1-5 vdc
6) External signal of 0-20 mA
7) Network signal

C. Interface Requirements for HVAC Instrumentation and Control System:

1. Interface relay for scheduled operation.
2. Interface relay to provide indication of fault at the central workstation and diagnostic code storage.
3. Provide BACnet compatible interface for central HVAC control workstation for the following:

a. Adjusting set points.
b. Monitoring supply fan start, stop, and operation.
c. Inquiring data to include outdoor-air damper position, supply- and room-air temperature.
d. Monitoring occupied and unoccupied operations.
e. Monitoring constant and variable motor loads.
f. Monitoring variable-frequency drive operation.
g. Monitoring cooling load.
h. Monitoring economizer cycles.
i. Monitoring air-distribution static pressure and ventilation air volume.

2.11 ROOF CURBS

A. Materials: Galvanized steel with corrosion-protection coating, watertight gaskets, and factory-installed wood nailer; complying with NRCA standards.

1. Curb Insulation and Adhesive: Comply with NFPA 90A or NFPA 90B.

a. Materials: ASTM C1071, Type I or II.
b. Thickness: 2 inches.

2. Application: Factory applied with adhesive and mechanical fasteners to the internal surface of curb.

a. Liner Adhesive: Comply with ASTM C916, Type I.
b. Mechanical Fasteners: Galvanized steel, suitable for adhesive attachment, mechanical attachment, or welding attachment to duct without damaging liner when applied as recommended by manufacturer and without causing leakage in cabinet.
c. Liner materials applied in this location shall have airstream surface coated with a temperature-resistant coating or faced with a plain or coated fibrous mat or fabric depending on service air velocity.
d. Liner Adhesive: Comply with ASTM C916, Type I.

B. Curb Dimensions: Minimum height of 14 inches.

2.12 ACCESSORIES

A. Duplex, 115-V, ground-fault-interrupter outlet with 15-A overcurrent protection. Include transformer if required. Outlet shall be energized even if the unit main disconnect is open.

B. Filter differential pressure switch with sensor tubing on either side of filter. Set for final filter pressure loss.

C. Factory- or field-installed, demand-controlled ventilation.

D. Safeties:

1. Smoke detector.
2. Condensate overflow switch.
3. Phase-loss protection.
4. High and low pressure control.

E. Coil guards of painted, galvanized-steel wire.

F. Outdoor-air intake weather hood.

2.13 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.

2.14 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.

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" or AHRI Guideline B. Install RTUs on curbs and coordinate roof penetrations and flashing with roof construction specified in Section 077200 "Roof Accessories." Secure RTUs to upper curb rail, and secure curb base to roof framing 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 piping to unit mounted on vibration isolators with flexible connectors.

D. Connect condensate drain pans using NPS 1-1/4, ASTM B88, Type M copper tubing. Extend to nearest equipment or roof drain. Construct deep trap at connection to drain pan and install cleanouts at changes in direction.

E. Hot-Water Piping: Comply with applicable requirements in Section 232113 "Hydronic Piping" and Section 232116 "Hydronic Piping Specialties." Install shutoff valve and union or flange at each coil supply connection. Install balancing valve and union or flange at each coil return connection.

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. Connect supply ducts to RTUs with flexible duct connectors specified in Section 233300 "Air Duct Accessories."

3.5 ELECTRICAL CONNECTIONS

A. Connect electrical wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

B. Ground equipment according to Section 260526 "Grounding and Bonding for Electrical Systems."

C. Install electrical devices furnished by manufacturer, but not factory mounted, according to NFPA 70 and NECA 1.

3.6 CONTROL CONNECTIONS

A. Install control and electrical power wiring to field-mounted control devices.

B. Connect control wiring according to Section 260523 "Control-Voltage Electrical Power Cables."

3.7 STARTUP SERVICE

A. Engage a factory-authorized service representative to perform startup service.

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 compressor, coils, and fans.
4. Inspect internal insulation.
5. Verify that labels are clearly visible.
6. Verify that clearances have been provided for servicing.
7. Verify that controls are connected and operable.
8. Verify that filters are installed.
9. Clean condenser coil and inspect for construction debris.
10. Remove packing from vibration isolators.
11. Inspect operation of barometric relief dampers.
12. Verify lubrication on fan and motor bearings.
13. Inspect fan-wheel rotation for movement in correct direction without vibration and binding.

14. 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.

15. Inspect and record performance of interlocks and protective devices; verify sequences.
16. Operate unit for an initial period as recommended or required by manufacturer.
17. Calibrate thermostats.
18. Adjust and inspect high-temperature limits.
19. Inspect outdoor-air dampers for proper stroke and interlock with return-air dampers.
20. 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.

21. Inspect controls for correct sequencing of heating, mixing dampers, refrigeration, and normal and emergency shutdown.
22. 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.

23. 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.

24. After startup and performance testing and prior to Substantial Completion, replace existing filters with new filters.

3.8 ADJUSTING

A. Adjust damper linkages for proper damper operation.

B. Comply with requirements in Section 230593 "Testing, Adjusting, and Balancing for HVAC" for air-handling system testing, adjusting, and balancing.

C. Occupancy Adjustments: When requested within 12 months from date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to two visits to Project during other-than-normal occupancy hours for this purpose.

3.9 CLEANING

A. After completing system installation and testing, adjusting, and balancing RTUs and air-distribution systems, clean RTUs internally to remove foreign material and construction dirt and

dust. Clean fan wheels, cabinets, dampers, coils, and filter housings, and install new, clean filters.

3.10 FIELD QUALITY CONTROL

A. Perform 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.

3.11 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain RTUs.

END OF SECTION

SECTION 238126 - SPLIT-SYSTEM AIR-CONDITIONERS

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 split-system air-conditioning and heat-pump units consisting of separate evaporator-fan and compressor-condenser components.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include rated capacities, operating characteristics, and furnished specialties and accessories. Include performance data in terms of capacities, outlet velocities, static pressures, sound power characteristics, motor requirements, and electrical characteristics.

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
2. Wiring Diagrams: For power, signal, and control wiring.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For split-system air-conditioning units to include in emergency, operation, and maintenance manuals.

1.5 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. ASHRAE Compliance:

1. Fabricate and label refrigeration system to comply with ASHRAE 15, "Safety Standard for Refrigeration Systems."
2. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 4 - "Outdoor Air Quality," Section 5 - "Systems and Equipment," Section 6 - " Procedures," and Section 7 - "Construction and System Start-up."

C. ASHRAE/IES Compliance: Applicable requirements in ASHRAE/IES 90.1.

1.6 COORDINATION

A. Coordinate sizes and locations of roof curbs, equipment supports, and roof penetrations with actual equipment provided.

1.7 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of split-system air-conditioning units that fail in materials or workmanship within specified warranty period.

1. Warranty Period:

a. For Compressor: **Five** years from date of Substantial Completion.
b. For Parts: Five years from date of Substantial Completion.
c. For Labor: One year 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. Carrier Corporation.
2. Daikin.
3. Lennox Industries, Inc.; Lennox International.
4. Mitsubishi Electric & Electronics USA, Inc.
5. Samsung HVAC.
6. Sanyo North America Corporation.
7. Trane.
8. YORK; a Johnson Controls company.

2.2 INDOOR UNITS (5 TONS LESS)

A. Ceiling Cassette Components:

1. Chassis: Galvanized steel with flanged edges, removable panels for servicing, and insulation on back of panel.
2. Insulation: Polystyrene or faced, glass-fiber duct liner.
3. Refrigerant Coil: Copper tube, with mechanically bonded aluminum fins and thermal-expansion valve. Comply with ARI 206/110.
4. Refrigerant type: R454B or R32.
5. Fan: Forward-curved, double-width wheel of galvanized steel; directly connected to motor.
6. Fan Motors:

a. Multitapped, multispeed with internal thermal protection and permanent lubrication.
b. Wiring Terminations: Connect motor to chassis wiring with plug connection.

7. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.

8. Filters: Poly, permanent, cleanable.
9. Built-in condensate lift.
10. Decorative ceiling panel with independent vane angle settings.
11. Ventilation air intake supported.

2.3 OUTDOOR UNITS (5 TONS OR LESS)

A. Air-Cooled, Compressor-Condenser Components:

1. Casing: Steel, finished with baked enamel in manufacturer's standard color, with removable panels for access to controls, weep holes for water drainage, and mounting holes in base. Provide brass service valves, fittings, and gage ports on exterior of casing.
2. Compressor: Hermetically sealed with crankcase heater and mounted on vibration isolation device. Compressor motor shall have thermal- and current-sensitive overload devices, start capacitor, relay, and contactor.

    a. Compressor Type: Twin rotary.
    b. Two-speed compressor motor with manual-reset high-pressure switch and automatic-reset low-pressure switch.
    c. Refrigerant: R-454B or R32.
    d. Refrigerant Coil: Copper tube, with mechanically bonded aluminum fins and liquid subcooler. Comply with ARI 206/110.

3. Heat-Pump Components: Reversing valve and low-temperature-air cutoff thermostat.
4. Fan: Aluminum-propeller type, directly connected to motor.
5. Motor: Permanently lubricated, with integral thermal-overload protection.
6. Low Ambient Kit: Wind baffle permits cooling operation down to 0 deg F.
7. Mounting Base: Polyethylene.
8. Built in base pan heater.
9. Reverse cycle defrost.

2.4 ACCESSORIES

A. Thermostat: Low voltage with subbase to control compressor and evaporator fan.

B. Automatic-reset timer to prevent rapid cycling of compressor.

C. Refrigerant Line Kits: Soft-annealed copper suction and liquid lines factory cleaned, dried, pressurized, and sealed; factory-insulated suction line with flared fittings at both ends.

D. Drain Hose/PVC pipe: For condensate.

E. Monitoring:

1. Monitor constant and variable motor loads.
2. Monitor variable-frequency-drive operation.
3. Monitor economizer cycle.
4. Monitor cooling load.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install units level and plumb.

B. Install evaporator-fan components using manufacturer's standard mounting devices securely fastened to building structure.

C. Install roof mounted, compressor-condenser components on polyethylene mounting base.

D. Install and connect precharged refrigerant tubing to component's quick-connect fittings. Install tubing to allow access to unit.

3.2 CONNECTIONS

A. Piping installation requirements are specified in other Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Where piping is installed adjacent to unit, allow space for service and maintenance of unit.

3.3 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.

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 motor rotation and unit operation.
3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

B. Remove and replace malfunctioning units and retest as specified above.

C. Prepare test and inspection reports.

3.4 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.

3.5 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain units.

END OF SECTION

SECTION 238216.11 - HYDRONIC AIR COILS

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. Hydronic air coils.

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 each air coil.
2. Include rated capacities, operating characteristics, and pressure drops for each air coil.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For air coils to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. ASHRAE 62.1 Compliance: Comply with applicable requirements in ASHRAE 62.1, Section 5, "Systems and Equipment," and Section 7, "Construction and Startup."

B. Performance Ratings: Tested and rated in accordance with AHRI 410 and ASHRAE 33.

C. Minimum Working-Pressure/Temperature Ratings: 200 psig/300 deg F.

2.2 HYDRONIC AIR COILS

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

1. Aerofin.
2. Carrier Corporation.
3. Coil Company, LLC.
4. Greenheck Fan Corporation.

5. Modine Commercial and Industrial Solutions.
6. Trane.
7. USA Coil & Air.

B. Source Limitations: Obtain hydronic coils from single source from single manufacturer.

C. Description: Coils constructed of staggered tubes mechanically expanded into continuous collars that are die-formed into the coil fins; self-venting; counterflow design of air to fluid.

D. Tubes:

1. Material: Copper.
2. Nominal Diameter: Minimum 1/2 inch before expanding, selected to provide performance indicated.
3. Nominal Wall Thickness: As required by performance, minimum 0.016 inch thick.
4. Return Bends: 180-degree bends; material and nominal diameter to match tubes.
5. Fluid Velocity at Design Flow Rate:

    a. Maximum: 6 fps.
    b. Minimum: 3 fps.

E. Fins:

1. Type: Plate.
2. Materials:

    a. Aluminum: 0.0055 inch thick.

3. Spacing: Maximum 12 fins per inch.
4. Collars: Full collars for accurate fin spacing and maximum tube contact while leaving no surface of tube exposed.
5. Configuration: Fin type as required by performance requirements.
6. Fin and Tube Joint: Mechanical bond.

F. Headers:

1. Material: Copper.
2. Tube-to-Header Connections: Tube-to-header holes to intrude inward, so landed surface area is 3 times the core tube thickness, to provide enhanced-header-to-tube joint integrity. Evenly extend tubes within the ID of the header no more than 0.12 inch.
3. Header Top and Bottom Caps: End caps to be die-formed and installed on the ID of header, such that the landed surface area is 3 times the header wall thickness.
4. Drains: Include low point of supply header with a NPS 1/2 drain connection.
5. Vents: Include high point of return header with a NPS 1/2 vent connection.
6. Supply and Return Connections: Copper pipe; threaded, same end of coil.
7. Protect opening of supply, return, vent, and drain connections with a threaded cap to prevent entry of dirt into coil.
8. Fluid Velocity at Design Flow Rate: Maximum of 6 fps.

G. Casings and Tube Sheets:

1. Depth: Extend coil casing and tube sheets a minimum of 1/2 inch beyond face of fins on both entering and leaving sides.
2. Materials:

a. Stainless steel, Type 304, No. 2D finish, ASTM A240/A240M.
b. Galvanized steel, ASTM A653/A653M, G90 coating.
c. Copper, ASTM B152/B152M.

H. Top and Bottom Casings:

1. Flange face minimum of 1-1/2 inches; double-flange edge for rigidity and ease of removal with secondary flange face minimum of 1/2 inch.
2. Thickness:

a. Coils with Fin Length of Up to 72 Inches: Minimum of 16 gauge thick.

I. End Tube Sheets:

1. Tube sheet holes rolled to prevent chaffing of tubes during thermal expansion and contraction.
2. Flange face minimum of 1-1/2 inches.
3. Thickness: Minimum of 16 gauge thick.

J. Holes: Include number, size, and location of holes in casing and end tube sheets required for coil installation.

K. Hardware: Use hex-head bolts, nuts, and washers constructed of Type 304 or Type 316 stainless steel.

L. Nameplate: Aluminum or stainless steel nameplate with brass or stainless steel chain for each coil, with the following data engraved or embossed:

1. Manufacturer name, address, telephone number, and website address.
2. Manufacturer model number.
3. Serial number.
4. Manufacturing date.
5. Coil identification (indicated on Drawings).
6. Coil fin length.
7. Coil fin height.
8. Coil casing material and thickness.
9. Coil fin material and thickness.
10. Coil tube material and thickness.
11. Coil header material and thickness.

M. Coating: None.

2.3 MATERIALS

A. Aluminum: ASTM B209.

B. Copper Tube: ASTM B75/ASTM 75M annealed temper or ASTM B280 drawn temper.

C. Copper Sheet: ASTM B152.

D. Steel:

1. Pipe Connections: ASTM A53/A53M.

2.4 SOURCE QUALITY CONTROL

A. Hydronic Coils: Factory tested with air while coil is completely submerged underwater to design pressure indicated, but not less than 300-psig internal pressure.

B. Coils to display a tag with inspector's identification as proof of testing.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine ducts, plenums, and casings to receive air coils for compliance with requirements for installation tolerances and other conditions affecting coil performance.

B. Examine roughing-in for piping systems to verify actual locations of piping connections before coil installation.

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

3.2 INSTALLATION

A. Install coils level and plumb.

B. Install coils in metal ducts and casings constructed in accordance with SMACNA's "HVAC Duct Construction Standards, Metal and Flexible."

C. Straighten bent fins on air coils.

D. Clean coils using materials and methods recommended in writing by manufacturers, and clean inside of casings and enclosures to remove dust and debris.

3.3 PIPING CONNECTIONS

A. Piping installation requirements are specified in other Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to coils to allow service and maintenance.

C. Connect water piping with unions and shutoff valves to allow coils to be disconnected without draining piping. Piping specialties are specified in Section 232116 "Hydronic Piping Specialties."

END OF SECTION

SECTION 238223 - UNIT 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 unit ventilators and accessories with the following heating and cooling features:

1. Hydronic heating coil.
2. Direct-expansion refrigerant cooling coil.

B. Related Requirements:

1. Section 230500 “Common Work Results for HVAC.”
2. Section 230719 “HVAC Piping Insulation.”
3. Section 232113 “Hydronic Piping.”
4. Section 232116 “Hydronic Piping Specialties.”
5. Section 232300 “Refrigerant Piping.”
6. Section 236200 “Packaged Compressor and Condenser Units.”

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product

1. Include rated capacities, operating characteristics, and furnished specialties and accessories for each unit type and configuration.

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. Detail anchorages and attachments to structure and to supported equipment.
4. Include diagrams for power, signal, and control wiring

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For unit ventilators to include in emergency, operation, and maintenance manuals.

1. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:

a. Maintenance schedules and repair part lists for motors, coils, integral controls, and filters.

1.5 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Unit Ventilator Filters: Furnish one spare filter for each filter installed.

1.6 QUALITY ASSURANCE

A. Comply with NFPA 70.

B. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 5 - "Systems and Equipment" and Section 7 - "Construction and Startup."

C. ASHRAE/IES 90.1 Compliance: Applicable requirements in ASHRAE/IES 90.1, Section 6 - "Heating, Ventilating, and Air-Conditioning."

1.7 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of condensing units that fail in materials or workmanship within specified warranty period.

1. Warranty Period Parts: One year from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Factory-packaged and -tested units rated according to AHRI 840, ASHRAE 33, and UL 1995.

2.2 MANUFACTURERS

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

1. Airedale; a subsidiary of Modine Manufacturing Company.
2. Carrier Corporation.
3. Daikin Applied.
4. Trane.

2.3 MANUFACTURED UNITS

A. Description: Unit ventilators consisting of finished cabinet, filter, cooling coil, drain pan, supply-air fan and motor in blow- or draw-through configuration, and hydronic cooling coil.

1. Unit Ventilator Coil Configurations: Row split.

a. Number of Heating Coils: One with two-pipe system.
b. Number of Cooling Coils: One with two-pipe system.

2.4 CABINETS

A. Insulation: Minimum 1/2-inch-thick, coated glass fiber complying with ASTM C1071 and attached with adhesive complying with ASTM C916.

1. Surface-Burning Characteristics: Insulation and adhesive shall have a combined maximum flame-spread index of 25 and smoke-developed index of 50 when tested according to ASTM E84 by a qualified testing agency.
2. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.
3. Insulate all outside air plenums with a minimum of 1” duct liner when not furnished pre-insulated from the manufacturer. Insulation shall be installed in such a manner as to provide complete thermal isolation of all outside air surfaces from other portions of the equipment.

B. Coil Section Insulation: Insulate coil section according to Section 230616 "HVAC Equipment Insulation."

1. Surface-Burning Characteristics: Insulation and adhesive shall have a combined maximum flame-spread index of 25 and smoke-developed index of 50 when tested according to ASTM E84 by a qualified testing agency.
2. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.

C. Main and Auxiliary Drain Pans: Non-corrosive, formed as required by ASHRAE 62.1. Drain pans shall be removable.

D. Cabinet Frame and Access Panels: Welded-steel frame with removable panels fastened with hex-head tamperproof fasteners.

E. Cabinet Finish: Powder coat, in manufacturer's standard color as selected by Architect.

F. Indoor-Supply-Air Grille: Angled steel.

G. Return-Air Inlet: Front toe space.

H. End Panels: Matching material and finish of unit ventilator.

I. Outdoor-Air Wall Box: Minimum 0.1265-inch-thick, aluminum, rain-resistant louver and box with integral eliminators and bird screen.

1. Louver Configuration: Vertical, rain-resistant louver.
2. Louver Material: Aluminum.
3. Bird Screen: 1/2-inch mesh screen on interior side of louver.

4. Decorative Grille: On outside of intake.
5. Finish: Baked enamel, color as selected by Architect from manufacturer's custom colors.

2.5 COILS

A. Test and rate unit ventilator coils according to ASHRAE 33.

B. Hydronic Coils: Copper tube, with mechanically bonded aluminum fins spaced no closer than 0.1 inch, rated for a minimum working pressure of 200 psig and a maximum entering-water temperature of 220 deg F. Include manual air vent and drain valve.

C. Indoor Refrigerant Coils: Copper tube, with mechanically bonded aluminum fins spaced no closer than 0.1 inch, and brazed joints at fittings. Comply with AHRI 210/240, and leak test to minimum 450 psig for a minimum 300-psig working pressure. Include thermal expansion valve.

2.6 INDOOR FAN

A. Fan and Motor Board: Removable.

1. Fan: Forward curved, double width, centrifugal; directly connected to motor. Thermoplastic or painted-steel wheels, and aluminum, painted-steel, or galvanized-steel fan scrolls.
2. Fan Shaft and Bearings: Hollow-steel shaft with permanently lubricated, resiliently mounted bearings.
3. Motor: Permanently lubricated, multispeed, resiliently mounted on motor board.
4. Wiring Termination: Connect motor to chassis wiring with plug connection.

2.7 DAMPERS

A. Mixing Dampers: Galvanized-steel blades with edge and end seals and nylon bearings; with electric actuator.

B. Outdoor-Air Dampers: Galvanized-steel blades with edge and end seals and nylon bearings; with electric actuator.

C. Comply with ASHRAE/IES 90.1.

2.8 ACCESSORIES

A. Insulated false back with gasket seals on wall and outdoor-air plenum.

1. Insulation: Minimum 1-inch-thick, coated glass fiber complying with ASTM C1071 and attached with adhesive complying with ASTM C916.

a. Surface-Burning Characteristics: Insulation and adhesive shall have a combined maximum flame-spread index of 25 and smoke-developed index of 50 when tested according to ASTM E84 by a qualified testing agency.
b. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.

B. Filters: MERV 8

2.9 BASIC UNIT CONTROLS

A. Basic Unit Controls:

1. Control voltage transformer.
2. Wall-mounting thermostat with the following features.

a. Heat-cool-off switch.
b. Fan on-auto switch.
c. Fan-speed switch.
d. Manual changeover.
e. Adjustable deadband.
f. Exposed set point.
g. Exposed indication.
h. Degree F indication.

3. Unoccupied-period-override push button.
4. Data entry and access port.

a. Input data includes room temperature, and humidity set points and occupied and unoccupied periods.
b. Output data includes room temperature and humidity, supply-air temperature, entering-water temperature, operating mode, and status.

B. DDC Terminal Controller.

C. Building Automation System (BAS) Interface.

D. Electrical Connection: Factory wire motors and controls for a single electrical connection.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas, with Installer present, to receive unit ventilators for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine roughing-in for piping and electrical connections to verify actual locations before unit ventilator installation.

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

3.2 INSTALLATION

A. Install unit ventilators to comply with NFPA 90A.

B. Verify location of thermostats and other exposed control sensors with Drawings and room details before installation. Install devices 48 inches above finished floor.

C. Comply with requirements in Section 236200 "Packaged Compressor and Condenser Units" for condensing units matched to refrigerant cooling coil packaged in unit ventilators.

3.3 CONNECTIONS

A. Piping installation requirements are specified in other Sections. Drawings indicate general arrangement of piping, fittings, and specialties. Specific connection requirements are as follows:

1. Install piping within dedicated end compartments to allow service and maintenance.
2. Connect condensate drain to indirect waste.

B. Install refrigerant piping as required by Section 232300 "Refrigerant Piping," and add refrigerant as required to compensate for length of piping.

C. Connect supply-air and return-air ducts to unit ventilators with flexible duct connectors specified in Section 233300 "Air Duct Accessories." Comply with safety requirements in UL 1995 for duct connections.

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."

3.4 FIELD QUALITY CONTROL

A. Perform the following tests and inspections with the assistance of a factory-authorized service representative:

1. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
2. Test and adjust controls and safety devices. Replace damaged and malfunctioning controls and equipment.

B. Remove and replace malfunctioning units and retest as specified above.

C. Prepare test and inspection reports.

3.5 ADJUSTING

A. Adjust initial temperature and humidity set points.

B. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to two visits to Project during other-than-normal occupancy hours for this purpose.

3.6 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain unit ventilators.

END OF SECTION

SECTION 238236 - FINNED-TUBE RADIATION HEATERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes hydronic, finned-tube radiation heaters.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include rated capacities, operating characteristics, furnished specialties, and accessories.

PART 2 - PRODUCTS

2.1 HOT-WATER FINNED-TUBE RADIATION HEATERS

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

1. Sterling HVAC Products; a Mestek company.
2. Trane.
3. Vulcan Radiator; A Mestek, Inc. company.
4. Zehnder Rittling.

B. Performance Ratings: Rate finned-tube radiation heaters according to Hydronics Institute's "I=B=R Testing and Rating Standard for Finned-Tube (Commercial) Radiation."

C. Heating Elements: Copper tubing mechanically expanded into flanged collars of evenly spaced aluminum fins resting on element supports. One end of tube shall be belled.

1. Tube Diameter: NPS 3/4.
2. Fin Size: 4-1/4 by 3-5/8 inches.

D. Element Supports: Ball-bearing cradle type to permit longitudinal movement on enclosure brackets.

E. Front Panel: 16-gauge steel.

F. Wall-Mounted Back Panel: 20-gauge steel, full height, with full-length channel support for front panel without exposed fasteners.

G. Support Brackets: Locate at maximum 36-inch spacing to support front panel and element.

H. Finish: Baked powder coated polyester paint finish in manufacturer's standard color as selected by Architect.

I. Access Doors: Factory made, permanently hinged with tamper-resistant fastener, minimum size 6 by 7 inches, integral with enclosure.

J. Enclosure Style: Sloped top.

1. Top Outlet Grille: Extruded-aluminum linear bar grille; pencil-proof bar spacing.

a. Mill-finish aluminum.
b. Anodized finish, color as selected by Architect from manufacturer's standard colors.
c. Painted to match enclosure.

2. Enclosure Height: 14 inches.
3. Enclosure Depth: 5-5/16 inches.

K. Accessories: Filler sections, corners, relay sections, and splice plates all matching the enclosure and grille finishes.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas to receive finned-tube radiation heaters for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine roughing-in for hydronic-piping connections to verify actual locations before installation of finned-tube radiation heaters.

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

3.2 FINNED-TUBE RADIATION HEATER INSTALLATION

A. Install units level and plumb.

B. Install enclosure continuously around corners, using outside and inside corner fittings.

C. Join sections with splice plates and filler pieces to provide continuous enclosure.

D. Install access doors for access to valves.

E. Install enclosure continuously from wall to wall.

F. Terminate enclosures with manufacturer's end caps except where enclosures are indicated to extend to adjoining walls.

G. Install valves within reach of access door provided in enclosure.

H. Install air-seal gasket between wall and recessed flanges or front cover of fully recessed unit.

3.3 CONNECTIONS

A. Piping installation requirements are specified in Section 232113 "Hydronic Piping" and Section 232116 "Hydronic Piping Specialties." Drawings indicate general arrangement of piping, fittings, and specialties.

B. Connect hot-water finned-tube radiation heaters and components to piping according to Section 232113 "Hydronic Piping" and Section 232116 "Hydronic Piping Specialties."

1. Install shutoff valves on inlet and outlet, and balancing valve on outlet.

C. Install piping adjacent to finned-tube radiation heaters to allow service and maintenance.

3.4 FIELD QUALITY CONTROL

A. Perform the following field tests and inspections:

1. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

B. Units will be considered defective if they do not pass tests and inspections.

C. Prepare test and inspection reports.

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 hot-water coils.

1.3 DEFINITIONS

A. CWP: Cold working pressure.

B. DDC: Direct digital control.

C. PTFE: Polytetrafluoroethylene plastic.

D. TFE: Tetrafluoroethylene plastic.

1.4 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 piping valves and specialties.
7. Indicate location and arrangement of integral controls.
8. Wiring Diagrams: Power, signal, and control wiring.

1.5 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. Modine Manufacturing.
2. Sterling Commercial Hydronics; A Mestek Company.
3. Trane.
4. Vulcan Radiator; A Mestek Company.
5. Zehnder Rittling.

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 COIL SECTION INSULATION

A. Insulation Materials: ASTM C1071; surfaces exposed to airstream shall have aluminum-foil facing to prevent erosion of glass fibers.

1. Thickness: 1/2 inch.
2. Thermal Conductivity (k-Value): 0.26 Btu x in./h x sq. ft. at 75 deg F mean temperature.
3. Fire-Hazard Classification: Maximum flame-spread index of 25 and smoke-developed index of 50 when tested according to ASTM E84.
4. Adhesive: Comply with ASTM C916 and with NFPA 90A or NFPA 90B.
5. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.

2.5 CABINETS

A. Material: Steel with baked-enamel finish with manufacturer's standard paint, in color selected by Architect.

1. Vertical Unit, Exposed Front Panels: Minimum 0.0528-inch-thick galvanized sheet steel, removable panels with channel-formed edges secured with tamperproof cam fasteners.

2. Horizontal Unit, Exposed Bottom Panels: Minimum 0.0528-inch-thick galvanized sheet steel, removable panels secured with tamperproof cam fasteners and safety chain.
3. Recessed Flanges: Steel, finished to match cabinet.
4. Control Access Door: Key operated.
5. Base: Minimum 0.0528-inch-thick steel, finished to match cabinet, 4 inches high with leveling bolts.
6. Extended Piping Compartment: 8-inch-wide piping end pocket.
7. False Back: Minimum 0.0428-inch-thick steel, finished to match cabinet.

2.6 FILTERS

A. Minimum Efficiency Reporting Value and Average Arrestance: According to ASHRAE 52.2.

B. Minimum Efficiency Reporting Value: According to ASHRAE 52.2.

C. Material: Washable Foam, MERV 3.

D. Material: Glass fiber treated with adhesive, MERV 5.

E. Material: Pleated cotton-polyester media, MERV 7.

2.7 COILS

A. Hot-Water Coil: Copper tube, with mechanically bonded aluminum fins spaced no closer than 0.1 inch and rated for a minimum working pressure of 200 psig and a maximum entering-water temperature of 220 deg F. Include manual air vent and drain.

2.8 CONTROLS

A. Fan and Motor Board: Removable.

1. Fan: Forward curved, double width, centrifugal, directly connected to motor; thermoplastic or painted-steel wheels and aluminum, painted-steel, or galvanized-steel fan scrolls.
2. Motor: Permanently lubricated, multispeed; resiliently mounted on motor board. Comply with requirements in Section 230513 "Common Motor Requirements for HVAC Equipment."
3. Wiring Terminations: Connect motor to chassis wiring with plug connection.

B. Control devices and operational sequences are specified in Section 230923 "Direct Digital Control (DDC) System for HVAC" and Section 230993.11 "Sequence of Operations for HVAC DDC."

C. Basic Unit Controls:

1. Control voltage transformer.
2. Wall-mounted thermostat with the following features:

    a. Heat-off switch.
    b. Fan on-auto switch.
    c. Manual fan-speed switch.
    d. Adjustable deadband.

e. Exposed set point.
f. Exposed indication.
g. Deg F indication.

3. Wall-mounted temperature sensor.
4. Unoccupied period override push button.
5. Data entry and access port.

a. Input data includes room temperature and occupied and unoccupied periods.
b. Output data includes room temperature, supply-air temperature, entering-water temperature, operating mode, and status.

D. DDC Terminal Controller:

1. Scheduled Operation: Occupied and unoccupied periods on seven-day clock with a minimum of four programmable periods per day.
2. Unoccupied Period Override: Two hours.
3. Unit Supply-Air Fan Operations:

a. Occupied Periods: Fan runs continuously.
b. Unoccupied Periods: Fan cycles to maintain setback room temperature.

4. Heating-Coil Operations:

a. Occupied Periods: Modulate control valve provide heating if room temperature falls below thermostat set point.
b. Unoccupied Periods: Start fan an modulate control valve if room temperature falls below setback temperature.

5. Controller shall have volatile-memory backup.

E. Interface with DDC System for HVAC Requirements:

1. Interface relay for scheduled operation.
2. Interface relay to provide indication of fault at central workstation.
3. Interface shall be BAC-net or LonWorks compatible for central DDC system for HVAC workstation and include the following functions:

a. Adjust set points.
b. Cabinet unit-heater start, stop, and operating status.
c. Data inquiry, including supply-air and room-air temperature.
d. Occupied and unoccupied schedules.

F. Electrical Connection: Factory-wired motors and controls for a single field connection.

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 piping and 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 wall boxes in finished wall assembly; seal and weatherproof. Joint-sealant materials and applications are specified in Section 079200 "Joint Sealants."

B. Install cabinet unit heaters to comply with NFPA 90A.

C. Suspend cabinet unit heaters from structure with elastomeric hangers. Vibration isolators are specified in Section 230548.13 "Vibration Controls for HVAC."

D. Install wall-mounted thermostats and switch controls in electrical outlet boxes at heights to match lighting controls. Verify location of thermostats and other exposed control sensors with Drawings and room details before installation.

E. Install new filters in each fan-coil unit within two weeks of Substantial Completion.

3.3 CONNECTIONS

A. Piping installation requirements are specified in Section 232113 "Hydronic Piping," Section 232116 "Hydronic Piping Specialties." Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to machine to allow service and maintenance.

C. Comply with safety requirements in UL 1995.

D. Unless otherwise indicated, install union and gate or ball valve on supply-water connection and union and calibrated balancing valve on return-water connection of cabinet unit heater. Hydronic specialties are specified in Section 232113 "Hydronic Piping" and Section 232116 "Hydronic Piping Specialties."

E. Unless otherwise indicated, install union and gate or ball valve on steam-supply connection and union, strainer, steam trap, and gate or ball valve on condensate-return connection of cabinet unit heater. Steam specialties are specified in Section 232216 "Steam and Condensate Heating Piping Specialties."

F. Ground equipment according to Section 260526 "Grounding and Bonding for Electrical Systems."

G. 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 238239.13

SECTION 238239.16 - PROPELLER 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 propeller unit heaters with hot-water 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 piping valves and specialties.
7. Indicate location and arrangement of integral controls.
8. Wiring Diagrams: Power, signal, and control wiring.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For propeller 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. Airtherm; a Mestek company.
2. CCI Thermal Technologies, Inc.
3. Engineered Air.
4. Rosemax Products.
5. Trane.

2.2 DESCRIPTION

A. Assembly including casing, coil, fan, and motor in horizontal discharge configuration with adjustable discharge louvers.

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 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 HOUSINGS

A. Finish: Manufacturer's standard baked enamel applied to factory-assembled and -tested propeller unit heaters before shipping.

B. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.

C. Discharge Louver: Adjustable fin diffuser for horizontal units and conical diffuser for vertical units.

2.5 COILS

A. General Coil Requirements: Test and rate hot-water propeller unit-heater coils according to ASHRAE 33.

B. Hot-Water Coil: Copper tube, minimum 0.025-inch wall thickness, with mechanically bonded aluminum fins spaced no closer than 0.1 inch and rated for a minimum working pressure of 200 psig and a maximum entering-water temperature of 325 deg F, with manual air vent. Test for leaks to 350 psig underwater.

2.6 FAN AND MOTOR

A. Fan: Propeller type with aluminum wheel directly mounted on motor shaft in the fan venturi.

B. Motor: Permanently lubricated, totally enclosed, with thermal overload protection. Shaded pole, sleeve bearing. Class “B” insulation.

2.7 CONTROLS

A. Control Devices:

1. Wall-mounted thermostat.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas to receive propeller unit heaters for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine roughing-in for piping and electrical connections to verify actual locations before unit-heater installation.

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

3.2 INSTALLATION

A. Install propeller unit heaters to comply with NFPA 90A.

B. Install propeller unit heaters level and plumb.

C. Suspend propeller unit heaters from structure with all-thread hanger rods. Hanger rods and attachments to structure are specified in Section 230500 "Common Work Results for HVAC."

D. Install wall-mounted thermostats and switch controls in electrical outlet boxes at heights to match lighting controls. Verify location of thermostats and other exposed control sensors with Drawings and room details before installation.

3.3 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties. Piping installation requirements are specified in the following Sections:

1. Section 232113 "Hydronic Piping."
2. Section 232116 "Hydronic Piping Specialties."

B. Install piping adjacent to machine to allow service and maintenance.

C. Comply with safety requirements in UL 1995.

D. Unless otherwise indicated, install union and gate or ball valve on supply-water connection and union and calibrated balancing valve on return-water connection of propeller unit heater. Hydronic specialties are specified in Section 232113 "Hydronic Piping" and Section 232116 "Hydronic Piping Specialties."

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. 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.

B. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to two visits to Project during other-than-normal occupancy hours for this purpose.

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 INSTALLATION

A. Grounding Conductors: Route along shortest and straightest paths possible, unless otherwise indicated. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.
B. Bonding Straps and Jumpers: Install so vibration by equipment mounted on vibration isolation hangers and supports is not transmitted to rigidly mounted equipment. Bond straps directly to the basic structure taking care not to penetrate any adjacent parts. Install straps only in locations accessible for maintenance.
C. Ground Rods: Install at least three rods spaced at least one-rod length from each other and located at least the same distance from other grounding electrodes.
D. Metal Water Service Pipe: Provide insulated copper grounding conductors, in conduit, from building's main service equipment, or grounding bus, to main metal water service entrances to building. Connect grounding conductors to main metal water service pipes by grounding clamp connectors. Where a dielectric main water fitting is installed, connect grounding conductor to street side of fitting. Bond metal grounding conductor conduit or sleeve to conductor at each end.
E. Water Meter Piping: Use braided-type bonding jumpers to electrically bypass water meters. Connect to pipe with grounding clamp connectors.
F. Bond interior metal piping systems and metal air ducts to equipment grounding conductors of associated pumps, fans, blowers, electric heaters, and air cleaners. Use braided-type bonding straps.
G. Bond each aboveground portion of gas piping system upstream from equipment shutoff valve.

3.4 CONNECTIONS

A. General: Make connections so galvanic action or electrolysis possibility is minimized. Select connectors, connection hardware, conductors, and connection methods so metals in direct contact will be galvanically compatible.

    1. Use electroplated or hot-tin-coated materials to ensure high conductivity and to make contact points closer to order of galvanic series.
    2. Make connections with clean, bare metal at points of contact.
    3. Make aluminum-to-steel connections with stainless-steel separators and mechanical clamps.
    4. Make aluminum-to-galvanized steel connections with tin-plated copper jumpers and mechanical clamps.
    5. Coat and seal connections having dissimilar metals with inert material to prevent future penetration of moisture to contact surfaces.

B. Exothermic-Weld Connections: Comply with the manufacturer's written instructions. Weld that are puffed up or that show convex surfaces indicating improper cleaning are not acceptable.
C. Equipment Grounding Conductor Terminations: For No. 8 AWG and larger, use pressure-type grounding lugs. No. 10 AWG and smaller grounding conductors may be terminated with winged pressure-type connectors.
D. Non-contact Metal Raceway Terminations: If metallic raceways terminate at metal housings without mechanical and electrical connection to housing, terminate each conduit with a grounding bushing. Connect grounding bushings with a bare grounding conductor to grounding bus or terminal in housing. Bond electrically non-continuous conduits at entrances and exits with grounding bushings and bare grounding conductors unless otherwise indicated.

E. Tighten screws and bolts for grounding and bonding connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A.
F. Compression-Type Connections: Use hydraulic compression tools to provide correct circumferential pressure for compression connectors. Use tools and dies recommended by connector manufacturer. Provide embossing die code or other standard method to make a visible indication that a connector has been adequately compressed on grounding conductor.
G. Moisture Protection: If insulated grounding conductors are connected to grounding buses, insulate entire area of connection and seal against moisture penetration of insulation and cable.

3.5 UNDERGROUND DISTRIBUTION SYSTEM GROUNDING

A. Pad-Mounted Transformers and Switches: Install two ground rods and counterpoise circling pad. Ground pad-mounted equipment and noncurrent-carrying metal items associated with substations by connecting them to underground cable and grounding electrodes. Use tinned-copper conductor not less than No. 2 AWG for counterpoise and for taps to equipment ground pad. Bury counterpoise not less than 18 inches below grade and 6 inches from the foundation.

3.6 FIELD QUALITY CONTROL

A. Testing: Perform the following field quality-control testing:

1. After installing grounding system but before permanent electrical circuitry has been energized, test for compliance with requirements.
2. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Architect promptly and include recommendations to reduce round resistance.
3. Test completed grounding system at each location where a maximum ground-resistance level is specified, at service disconnect enclosure grounding terminal, and at ground test wells. Measure ground resistance not less than two full days after the last trace of precipitation, and without the soil being moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground-resistance. Perform tests, by the fall-of-potential method according to IEEE 81.
4. Provide drawings locating each ground rod and ground rod assembly and other grounding electrodes, identify each by letter in alphabetical order, and key to the record of tests and observations. Include the number of rods driven and their depth at each location and include observations of weather and other phenomena that may affect test results. Describe measures taken to improve test results.

a) Equipment Rated 500 kVA and Less: 10 ohms.
b) Pad-Mounted Switching Equipment: 5 ohms.

END OF SECTION

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 208-240 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
E. Leviton
F. P&S

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
E. Leviton
F. P&S

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 263213
PACKAGED ENGINE GENERATOR 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 SECTION INCLUDES

A. Packaged industrial engine generator system, systems designed for commercial applications will not be accepted.
B. Critical exhaust silencer and fittings.
C. Fuel fittings.
D. Battery and charger.

1.4 RELATED SECTIONS

A. Section 263653: Automatic transfer switches.

1.5 REFERENCES

A. ANSI/NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).
B. ANSI/NEMA MG 1 - Motors and generators.
C. ANSI/NEMA 70 - National Electrical Code.
D. ANSI/NEMA AB 1 - Molded Case Circuit Breakers.

1.6 SYSTEM DESCRIPTION

A. Industrial engine generator system to provide source of power systems designed for commercial applications will not be accepted.
B. System capacity: 35 KW, 44 KVA at elevation of 600 feet above sea level, and ambient temperature between -40 degrees and +122 degrees F continuous rating using engine-mounted radiator.
C. Operation: In accordance with ANSI/NFPA 99.

1.7 SUBMITTALS

A. Submit shop drawings and product data under provisions of Division 1 – General Requirements.
B. Submit shop drawings showing plan and elevation views with overall and interconnection point dimensions, fuel consumption rate curves at various loads, ventilation and combustion air requirements, and electrical diagrams including schematic and interconnection diagrams.
C. Submit product data showing dimensions, weights ratings, interconnection points, and internal wiring diagrams for engine, generator, control panel, battery, battery rack, battery charger, exhaust silencer, and vibration isolators.
D. Submit manufacturer's installation instructions under provisions of Division 1 – General Requirements.

1.8 PROJECT RECORD DOCUMENTS

A. Submit record documents under provisions of Division 1 – General Requirements.
B. Accurately record location of engine generator and mechanical and electrical connections.

1.9 OPERATION AND MAINTENANCE DATA

A. Submit operation and maintenance data under provisions of Division 1 – General Requirements.
B. Include instructions for normal operation, routine maintenance requirements, service manuals for engine and day tank, oil sampling and analysis for engine wear, and emergency maintenance procedures.

1.10 QUALIFICATIONS

A. Manufacturer: Company specializing in packaged engine generator system with minimum five years documented experience.
B. Supplier: Authorized distributor of engine generator manufacturer with service facilities within 150 miles of project site.

1.11 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.
C. Accept packaged engine generator set and accessories on site in crates and verify damage.
D. Protect equipment from dirt and moisture by securely wrapping in heavy plastic.

1.12 WARRANTY

A. Provide one year warranty under provisions of Division 1 – General Requirements.

1.13 MAINTENANCE SERVICE

A. Furnish service and maintenance of packaged engine generator system for one year from Date of Substantial Completion.

1.14 EXTRA MATERIALS

A. Submit maintenance materials under provisions of Division 1 – General Requirements.
B. Furnish one set of tools required for preventative maintenance of engine generator system. Package tools in adequately sized metal tool box.
C. Provide two additional sets of each fuel, oil, and air filter element required for the engine generator system.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Kohler.
B. ONAN.
C. Cummins.
D. Generac.
E. Caterpillar
F. Substitutions: Under provisions of Division 1 – General Requirements.

2.2 ENGINE

A. Type: Water-cooled inline or V-type, four stroke cycle, electric ignition internal combustion engine.
B. Rating: Sufficient to operate at 10 percent overload for one hour at specified elevation and ambient limits.
C. Fuel System: Appropriate for use of natural gas at 7”-14” W.C. pressure.
D. Engine Speed: 1800 rpm.
E. Governor: Isochronous type to maintain engine speed within 0.5 percent, steady state, and 5 percent, no load to full load, with recovery to steady state within 2 seconds following sudden load changes.
F. Safety Devices: Engine shutdown on high water temperature, low oil pressure, overspeed, and engine overcrank. Limits as selected by manufacturer.
G. Engine Starting: DC starting system with positive engagement, number and voltage of starter motors in accordance with manufacturer's instructions. Include remote starting control circuit, with MANUAL-OFF-REMOTE selector switch on engine-generator control panel.
H. Radiator: Radiator using glycol coolant, with blower type fan, sized to maintain safe engine temperature in ambient temperature of 110 degrees F (43 degrees C). Radiator Air Flow Restriction: 0.5 inches of water (9.34 mm of mercury), maximum.
I. Engine Accessories: Fuel filter, lube oil filter, intake air filter, lube oil cooler, fuel transfer pump, fuel priming pump, gear-driven water pump. Include fuel pressure gage, water temperature gage, and lube oil pressure gage on engine-generator control panel.
J. Mounting: Provide unit with suitable spring-type vibration isolators and mount on structural

1. steel base.

2.3 GENERATOR

A. Generator: ANSI/NEMA MG 1; three phase, four pole, reconnectable brushless synchronous generator with brushless exciter.
B. Ratings: 35 KW, 44 KVA, at 0.8 power factor, 208Y/120 volts, 3 phase, 4 wire 60 Hz at 1800 rpm.
C. Insulation: ANSI/NEMA MG 1, Class F.
D. Temperature Rise: 105 degrees C continuous.
E. Enclosure: Aluminum Level 2 sound attenuated enclosure.
F. Voltage Regulation: Include generator-mounted volts per Hertz exciter-regulator to match engine and generator characteristics, with voltage regulation +/- one percent from no load to full load. Include manual controls to adjust voltage drop +/- 5 percent voltage level, and voltage gain.

2.4 ACCESSORIES

A. Exhaust Silencer: Critical exhaust type silencer, with muffler companion flanges and flexible stainless steel exhaust fitting, suitable for horizontal orientation, sized in accordance with engine manufacturer's instructions, installed within the weatherproof enclosure.
B. Batteries: Heavy duty, diesel starting type lead-acid storage batteries, 170 ampere-hours minimum capacity. Match battery voltage to starting system. Include necessary cables and clamps.
C. Battery Warmer.
C. Battery Tray: Plastic coated metal or wooden tray treated for electrolyte resistance, constructed to contain spillage of electrolyte.
D. Battery Charger: Current limiting type designed to float at 2.17 volts per ceil and equalize at 2.33 volts per cell. Include overload protection, full wave rectifier, DC voltmeter and ammeter, and 120 volts AC fused input. Mounted enclosure to meet ANSI/NEMA 250, Type 1 requirements.

E. Line Circuit Breaker: NEMA AB I molded case circuit breaker on generator output with integral thermal and instantaneous magnetic trip in each pole; sized in accordance with ANSI/NFPA 70. Including battery-voltage operated shunt trip, connection to open circuit breaker on engine failure. Mount unit in enclosure to meet ANSI/NEMA 250, Type 1 requirements.

F. Engine-Generator Control Panel: ANSI/NEMA 250, Type 1 generator mounted control panel enclosure with engine and generator controls and indicators. Include provision for padlock and the following equipment and features:

1. Frequency Meter: 45-65 Hz range, 3-1/2 inch (89 mm) dial.
2. AC Output Voltmeter: 3-1/2 inch (89 mm) dial, 2 percent accuracy, with phase selector switch.
3. AC Output Ammeter: 3-1/2 inch (89 mm) dial, 2 percent accuracy, with phase selector switch.
4. Output voltage adjustment.
5. Push-to-test indicator lamps, one each for low oil pressure, high water temperature, overspeed, and overcrank.
6. Engine start/stop selector switch.
7. Engine running time meter.
8. Oil pressure gage.
9. Water temperature gage.
10. Auxiliary Relay: 3PDT, operates when engine runs, with contact terminals prewired to terminal strip.
11. Remote Alarm Contacts; Pre-wire SPCT contacts to terminal strip for remote alarm functions required by ANSI/NFPA 99.

G. Exercise Timer: Provide timing system to automatically exercise generator set monthly for a duration of 30 minutes per month. Exercise shall take place on the first day of each month.

H. Spring vibration isolators.

2.5 ENGINE ALARM PANEL

A. Incorporate in generator control panel complete with generator OFF-START-AUTO selector switch red indicating light and illuminated annunciators with engraved nameplates reading:

1. High water temperature alarm.
2. Low oil pressure shut down.
3. High water temperature shut down.
4. Overspeed shut down.
5. Low coolant temperature.

B. Provide remote annunciator panel with all alarms listed in the engine alarm panel specification above to be located near transfer switch.

C. Provide a generator emergency shut-down switch to be located as indicated on plans.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that surfaces are ready to receive work and field dimensions are as shown on Drawings.

B. Verify that required utilities are available in proper location and ready for use.

C. Beginning of installation means installer accepts existing conditions.

3.2 INSTALLATION

A. Install in accordance with manufacturer's instructions.

3.3 FIELD QUALITY CONTROL

A. Field inspection and testing will be performed under provisions of Division 1 – General Requirements.
B. Provide full load test utilizing portable test bank, if required, for four hours minimum. Simulate power failure including operation of transfer switch, automatic starting cycle, and automatic shutdown, and return to normal.
C. During test, record the following at 20 minute intervals:

1. Kilowatts.
2. Amperes.
3. Voltage.
4. Coolant temperature.
5. Room temperature.
6. Frequency.
7. Oil pressure.

D. Test alarm and shutdown circuits by simulating conditions.

3.4 MANUFACTURER'S FIELD SERVICES

A. Prepare, start, test, and adjust systems under provisions of Division 1 – General Requirements.

3.5 ADJUSTING

A. Adjust generator output voltage and engine speed.

3.6 CLEANING

A. Clean work under provisions of Division 1 – General requirements.
B. Clean engine and generator surfaces. Replace oil and fuel filters.

3.7 DEMONSTRATION

A. Provide systems demonstration under provisions of Division 1 – General Requirements.
B. Describe loads connected to system and restrictions for future load additions.
C. Simulate power outage by interrupting normal source and demonstrate that system operates to provide power.

END OF SECTION 26 32 13

SECTION 263653
TRANSFER SWITCH

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the contract, including general and Supplementary Conditions and Division I 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, except for 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/Engineer.
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/Engineer for resolution.

1.3 SECTION INCLUDES

A. Automatic transfer switch.

1.4 REFERENCES

A. UL 1008 - Standard for Automatic Transfer Switches
B. NFPA 70 - National Electrical Code, including use in emergency and standby systems in accordance with Articles 517, 700, 701 and 702
C. NFPA 110 - Standard for Emergency and Standby Power Systems
D. IEEE Standard 446 - IEEE Recommended Practice for Emergency and Standby Power Systems (orange Book)
E. IEEE Standard 241 - IEEE Recommended Practice for Electric Power Systems in Commercial Buildings (Gray Book)
F. NEMA Standard 1 C52-447 - AC Automatic Transfer Switches
G. IEC - Standard for Automatic Transfer Switches.

1.5 SUBMITTALS

A. Submit product data under provisions of Division 1 – General Requirements.
B. Submit product data for transfer switches showing overall dimensions, electrical connections, electrical ratings, and environmental requirements.

1.6 OPERATION AND MAINTENANCE DATA

A. Submit operation and maintenance data under provisions of Division 1 – General Requirements.

B. Include instructions for operating equipment.
C. Include instructions for operating equipment under emergency conditions.
D. Document ratings of equipment and each major component.
E. Include routine preventive maintenance and lubrication schedule.
F. List special tools, maintenance materials, and replacement parts.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. ASCO
B. Cummins (ONAN)
C. Generac
D. Kohler

2.2 AUTOMATIC TRANSFER SWITCH

A. Description: NEMA ICS 2; automatic transfer switch.
B. Configuration: Electrically-operated, mechanically-held transfer switch.

2.3 RATINGS

A. Ratings: NEMA ICS 2; as follows:

1. Voltage: 120/208 volts, three phase, four wire, 60 Hz.
2. Switched Poles: 3

a. A neutral conductor terminal plate with fully-rated AL-CU pressure connectors shall be provided.

3. Load Inrush Rating: Combination load.
4. Continuous Rating: ATS, 150 amperes.
5. Interrupting Capacity: 100 percent of continuous rating.
6. Withstand Current Rating: 30,000 rms symmetrical amperes, when used with molded case circuit breaker.
7. The ATS shall be rated to withstand and close-on the available rms symmetrical short circuit current at the ATS terminals with molded case circuit breaker.

a.

Switch Rating	Minimum WCR with "any breaker" rating
ATS 150A	30,000

8. Lugs to terminate equipment grounding conductors shall be provided.

2.4 AUTOMATIC SEQUENCE CF OPERATION

A. Initiate Time Delay to Start Alternate Source Engine Generator: Upon initiation by normal source monitor, when the voltage drops below 70%.
B. Time Delay to Start Alternate Source Engine Generator: 0 to 6 seconds, adjustable.
C. Initiate Transfer Load to Alternate Source: Upon initiation by normal source monitor and permission by alternate source monitor. Transfer time shall be 1/6 second or less.
D. Time Delay Before Transfer to Alternate Power Source: 0 to 5 minutes, adjustable.
E. Initiate Retransfer Load to Normal Source: Upon permission by normal source monitor, when voltage restores to 90%.
F. Time Delay Before Re-Transfer to Normal Power: 0 to 30 minutes, adjustable; bypass time delay in event of alternate source failure.
G. Time Delay Before Engine Shut Down: 5 to 15 minutes, adjustable, of unloaded operation.

2.5 MICROPROCESSOR CONTROL MODE

A. The control module shall direct the operation of the transfer switch. The module's sensing

and logic shall be controlled by a built-in microprocessor for maximum reliability, minimum maintenance, and inherent digital communications capability. The control module shall be connected to the transfer switch by an interconnecting wiring harness. The harness shall include a keyed disconnect plug to enable the control module to be disconnected from the transfer switch for routine maintenance.

B. The control module shall be completely enclosed with a protective cover and be mounted separately from the transfer switch unit for safety and ease of maintenance. Sensing and control logic shall be provided on plug-in printed circuit boards for maximum reliability. Interfacing relays shall be industrial control grade plug-in type with dust covers. All relays shall be identical to minimize the number of unique parts.

C. The control panel shall meet or exceed the voltage surge withstand capability in accordance with IEEE Standard 472-1974 (ANSI C37.90a-1974) and the impulse withstand voltage test in accordance with the proposed NEMA Standard ICS 1-109.

2.6 ENCLOSURE

A. Enclosure: ICS 6; Type 1

2.7 ACCESSORIES

A. Indicating Lights: Mount in cover of enclosure to indicate NORMAL SOURCE AVAILABLE, ALTERNATE SOURCE AVAILABLE, SWITCH POSITION. Normal and emergency availability as determined by Pick up and Drop out sensors.

B. Test Switch: Mount in cover of enclosure to simulate failure of normal source.

C. Transfer switch shall be sized to accommodate bottom entry of three sets of #1/0 conductors, two form the sources, and one to the load.

D. Transfer Switch Auxiliary Contacts: I normally open; 1 normally closed.

E. The voltage of each phase of the normal source shall be monitored with pickup adjustable from 85% to 100% and dropout adjustable from 75% to 98% of pickup setting, both in increments of 1%. and shall be fully field adjustable without the use of any tools, meters or power supplies or power supplies. Repetitive accuracy of settings shall be +/-2% or better over an operating temperature range of +/-20 degrees C to 70 degrees C. Factory set to pickup at 90% and dropout at 85%.

F. Single-phase voltage sensing of the emergency source shall be provided, with a pickup adjustable from 85% to 100% (and dropout fixed at 84% to 86% of pickup), and frequency sensing with pickup adjustable from 90% to 100% (and dropout fixed at 87% to 89% of pickup). Both pickup settings shall be fully field-adjustable in 1% increments without the use of any tools, meters or power supplies. Repetitive accuracy of settings shall be -/-2% or better over an operating temperature range of +/-20 degrees C to 70 degrees C. Factory set to pick up at 90% voltage and 95% frequency.

G. In-Phase Monitor: Inhibit transfer until source and load are within 15 electrical degrees.' An in-phase monitor shall be built-in to the ATS and shall control transfer so that motor load inrush currents do not exceed normal starting currents, to avoid nuisance tripping of circuit breakers and possible mechanical damage to motor couplings. The in-phase monitor shall operate without external control of electrical loads and without any external control of the power sources. The monitor shall compare the phase relationship and frequency difference between the normal and emergency sources and permit transfer the first time the sources are within 15 electrical degrees and only if transfer can be accomplished within 60 electrical degrees as determined by monitoring the frequency difference. In-phase transfer shall be accomplished if both sources are within 2 Hz of nominal frequency and 70% or more of nominal voltage. The in-phase monitor shall be microprocessor design and automatically adjust the transfer firing angle to the transfer switch, as a function of differential frequency, to achieve transfer as close to 0 phase angle difference as possible.

H. Provide selective load disconnect control circuit (24 VDC output) to operate 0 to 5 minutes (field adjustable) before transfer of the automatic transfer switch and to reset 0-5 minutes (field adjustable) after transfer, in either direction. The two time delays shall be independently adjustable. This circuit shall be supplied on all transfer switches.

2.8 SERVICE

A. The ATS manufacturer shall maintain a local service center capable of emergency service or routine preventive maintenance and shall offer preventive maintenance contracts. The manufacturer shall maintain records of each switch, by serial number, for a minimum of 20 years.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that surfaces are ready to receive work.
B. Verify field measurements are as instructed by manufacturer.
C. Verify that required utilities are available, in proper location, and ready for use.
D. Beginning of installation means acceptance of existing conditions.

3.2 INSTALLATION

A. Install in accordance with manufacturer's instructions.

END OF SECTION 26 36 53

SECTION 264313
SURGE PROTECTIVE DEVICE (SPD)
FORMERLY KNOWN AS
TRANSIENT VOLTAGE SURGE SUPPRESSION (TVSS))

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes: Surge Protective Devices (SPD) formerly known as Transient Voltage Surge Suppression (TVSS) for Branch Panel applications.

1.02 REFERENCES

A. ANSI/IEEE C.62.41 and C62.45
B. UL 1449 – Most Recent Edition
C. UL 1283
D. NEC – NFPA 70
E. NFPA
F. OSHA
G. IEEE Std. 1100

1.03 SUBMITTALS

A. Shop Drawings: Provide Shop Drawings with wiring diagrams, installation information, testing and maintenance procedures, and operational information for the transient protection system. Shop Drawings shall be submitted to Engineer for approval before starting actual fabrication.
B. Submittals for Approval: Provide the following test data submittals:

1. Manufacturer will provide UL-1449, Most Recent Edition ULiQ data showing the Voltage Protection Rating (VPR) and “Engineering Considerations” for the specific catalog number submitted.
2. Per the requirements of NEC Article 285.6 (See Article 242 for 2020 NEC), the devices shall be marked with the short circuit current rating. This rating shall meet or exceed the available fault current. Test data shall be provided to demonstrate the short circuit current rating has been tested on a complete device.
3. Submit test report data clearly demonstrating the maximum surge current rating has been tested on a COMPLETE SPD unit including all necessary fusing/overcurrent protection, thermal disconnects, integral disconnects and monitoring systems. Manufacturers who cannot provide this data will not be approved.
4. Submit data demonstrating that the SPD unit is capable of surviving the specified minimum repetitive surge current rating. The rating is based on surviving a specified number of ANSI/IEEE C62.41, Category C-High (10kA) impulses without failure or degradation in performance characteristics of more than 10%.

5. Written detailed response to each paragraph of the specification indicating that the proposed product meets or exceeds this specification. If specific paragraphs are not met, provide written explanation as to why not.

PART 2 PRODUCTS

1.04 ENVIRONMENTAL

A. General Requirements:

1. No audible noise shall be generated.
2. No appreciable magnetic fields shall be generated. System shall be capable of use directly in computer rooms in any location without danger to disc units, disk packs, or tapes.
3. Operating Conditions:

   a. 30 – 130 Degrees F
   b. 15 – 85 Percent Humidity Non-Condensing

B. Enclosure: The unit shall have a heavy duty NEMA 12 dust-tight, drip-tight enclosure.

1.05 GENERAL REQUIREMENTS

A. The manufacturer shall provide a surge protective device that is classified by UL-1449, as a Type 1 or 2 device.
B. SPD shall be rated for a 208Y/120 volt, 60 Hertz, 3-phase, 4-wire system and shall be connected in parallel with the branch panels as indicated on electrical schedules sheet.
C. Nominal Current Discharge Level (I_n): The peak value of surge current through the SPD, selected by the manufacturer, having a current wave-shape of 8x20ms where the SPD remains functional after 15 surges shall be 20kA per mode.
D. Quality: The manufacturer shall be ISO 9001 certified, demonstrating world-class quality systems for the design and manufacture of the SPD units.
E. Unit shall be UL 1449, Most Recent Edition Listed. An SPD that is a UL “Recognized” component will not be accepted.
F. Each surge suppression element (MOV) shall utilized a stacked MOV design.
G. Unit shall include solid-state, long-life externally mounted LED visual status indicators that indicate the on-line status and operational integrity of each phase of the unit.
H. Unit shall have a Form C summary alarm output contact rated for at least 1 amp at 120VAC for remote annunciation of SPD status.
I. Unit shall have a surge/TOV counter with time & date stamp.

1.06 MANUFACTURERS AND PRODUCT REQUIREMENTS

A. Acceptable Manufacturers: Subject to compliance with requirements of the Contract Documents, acceptable manufacturers are as follows:

1. Raycap: RSE Series

Branch Panel SPD Device Selection						
System Voltage	Switchboard Amps	**SPD Model**	Surge Rating	Protection Modes	Max Breaker Amps	Time Stamp Event Monitoring
208/120V Wye	Up to 400A	RSE-2-120-3Y-A-05-E-F-S	50kA/Mode	L-N, L-G, N-G	30-100	Yes
208/120V Wye	400A-2000A	RSE-2-120-3Y-A-10-E-F-S	100kA/Mode	L-N, L-G, N-G	60-125	Yes
480/277V Wye	Up to 400A	RSE-2-277-3Y-A-05-E-F-S	50kA/Mode	L-N, L-G, N-G	30-100	Yes
480/277V Wye	400A-2000A	RSE-2-277-3Y-A-10-E-F-S	100kA/Mode	L-N, L-G, N-G	60-125	Yes

B. Unit shall provide maximum UL 1449, Voltage Protection Rating (VPR) for 208Y/120 Volt systems as follows:

1. L-N = 600V
2. L-G = 600V
3. N-G = 600V
4. L-L = 1000V

C. Unit shall provide maximum UL 1449, Voltage Protection Rating (VPR) for 480Y/277 Volt systems as follows:

1. L-N = 1000V
2. L-G = 1200V
3. N-G = 1200V
4. L-L = 1800V

D. Unit shall have a maximum surge current rating of 100,000 amperes L-N, 100,000 amperes L-G, and 100,000 amperes N-G, based on ANSI/IEEE C62.41 standard 8 by 20 microsecond current waveform.

E. Unit shall include dry contacts, LEDs, audible alarm, and a surge/TOV counter w/ time & date stamp.

F. The SPD will be connected to the panelboard bus bar through a dedicated 30 amp breaker provided by the equipment manufacturer.

G. Warranty: Manufacturer shall provide a product warranty for a period of not less than 10 years from date of installation.

PART 3 EXECUTION

1.07 INSTALLATION

A. General Requirements:

1. Contractor shall install suppression system immediately next to or on top of service equipment where so approved by the Engineer:
2. Conductors between suppressor and point of attachment to service equipment shall be sized in accordance with manufacturer's Shop Drawings and conductor lengths shall be as short as possible, preferably not exceeding 24".

B. Grounding: Suppressor ground shall be bonded to the equipment grounding conductor and service entrance ground.

END OF SECTION 26 43 13

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. Luminaire 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, where applicable.
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 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 26 56 00
EXTERIOR LIGHTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and General Provisions of the Contract, including General and Supplementary Conditions and Division 1 specification sections, apply to work of this section.
B. Provide all items, articles, materials, operations or methods listed, mentioned or scheduled on drawings and/or herein, including all labor, materials, equipment and incidentals necessary and required for their completion.
C. The items in this section are supplementary to the requirements set forth in other portions of the specifications as indicated under Item "A" above.

1.2 DRAWINGS

A. The drawings show the location and general arrangement of equipment, electrical systems and related items. They shall be followed as closely as elements of the construction will permit.
B. Examine the drawings of other trades and verify the conditions governing the work on the job site. Arrange work accordingly, providing such fittings, conduit, junction boxes and accessories as may be required to meet such conditions.
C. Deviations from the drawings, with the exception of minor changes in routing and other such incidental changes that do not affect the functioning or serviceability of the systems, shall not be made without the written approval of the Architect.
D. The architectural and structural drawings take precedence in all matters pertaining to the building structure, mechanical drawings in all matters pertaining to mechanical trades and electrical drawings in all matters pertaining to electrical trades. Where there are conflicts or differences between the drawings for the various trades, report such conflicts or differences to the Architect for resolution.

1.3 WORK INCLUDED

A. Exterior Luminaries and accessories.

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 EXTERIOR LUMINARIES AND ACCESSORIES

A. Enclosures: Complete with gaskets to form weatherproof assembly.
B. Provide low temperature ballasts, with reliable starting to -20 degrees.

2.2 LED LUMINAIRES

A. General: Except as otherwise indicated, provide LED luminaires, of types and sizes

indicated on fixture schedules.

B. Material and specifications for each luminaire are as follows:

1. Each luminaire shall consist of an assembly that utilizes LEDs as the light source. In addition, a complete luminaire shall consist of a housing, LED array, and electronic driver (power supply).
2. Each luminaire shall be rated for a minimum operational life of 50,000 hours. This life rating must be conducted at 40C ambient temperature.
3. The rated operating temperature range shall be -30°C to +40°C.
4. Each luminaire is capable of operating above 100°F [37°C], but not expected to comply with photometric requirements at elevated temperatures.
5. Photometry must be compliant with IESNA LM-79 and shall be conducted at 25°C ambient temperature.
6. The individual LEDs shall be constructed such that a catastrophic loss or the failure of one LED will not result in the loss of the entire luminaire.
7. Luminare shall be constructed such that LED modules may be replaced or repaired without replacement of whole luminaire.
8. Each luminaire shall be listed with Underwriters Laboratory, Inc. under UL1598 for luminaires, or an equivalent standard from a nationally recognized testing laboratory.

B. Technical Requirements

1. Electrical

a. Power Consumption: Maximum power consumption allowed for the luminaire shall be determined by application. The luminaire shall not consume power in the off state.
b. Operation Voltage: The luminaire shall operate from a 60 HZ ±3 HZ AC line over a voltage ranging from 108 VAC to 305 VAC. The fluctuations of line voltage shall have no visible effect on the luminous output.
c. Power Factor: The luminaire shall have a power factor of 0.90 or greater.
d. THD: Total harmonic distortion (current and voltage) induced into an AC power line by a luminaire shall not exceed 20 percent.
e. Surge Suppression: The luminaire onboard circuitry shall include fused surge protection devices (SPD) to withstand high repetition noise transients as a result of utility line switching, nearby lightning strikes, and other interference. The SPD shall protect the luminaire from damage and failure for common mode transient peak voltages up to 10 kV (minimum) and transient peak currents up to 5 kA (minimum). SPD shall conform to UL 1449 depending of the components used in the design. SPD performance shall be tested per the procedures in ANSI/IEEE C62.41-1992 (or current edition) for category C (standard). The SPD shall fail in such a way as the Luminaire will no longer operate. The SPD shall be field replaceable.
f. Each Luminaire shall have integral UL Listed Class II power supplies. Class I power supplies will not be acceptable.
g. Operational Performance: The LED circuitry shall prevent visible flicker to the unaided eye over the voltage range specified above.
h. RF Interference: LED Drivers must meet Class A emission limits referred in Federal Communications Commission (FCC) Title 47, Subpart B, Section 15 regulations concerning the emission of electronic noise.
i. Drivers shall have a Class A sound rating.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install lamps in luminaries and lampholders.
B. Support surface-mounted luminaries from building structure.
C. Install recessed luminaries to permit removal from below. Use plaster frames and install grid clips as applicable.

3.2 RELAMPING

A. Relamp luminaries which have failed lamps at completion of Work.

3.3 ADJUSTING AND CLEANING

A. Align luminaries and clean lenses and diffusers at completion of Work. Clean paint splatters, dirt, and debris from installed luminaries.
B. Touch up luminary finish at completion of Work.

END OF SECTION 26 56 00

SECTION 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 27 15 13
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 for 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. CommScope #M11SP, or equal.

2.2 COVER PLATES

A. Face Plate: CommScope #M14L-262, or equal.

2.3 DATA CABLE (CATEGORY 6)

A. General Cable GenSPEED 6 Category 6 cable, white in color. Provide 2' patch cords. CommScope/Uniprise UC1BBB2, or equal. Plenum rated cable or conduit must be used in plenum areas indicated on mechanical plans.

2.4 DATA JACK (CATEGORY 6)

A. CommScope/Uniprise UNJ600-BL, or equal.

2.5 DATA PATCH PANEL

A. CommScope/Uniprise UNP-6-DM-1U-24, or equal.

2.6 WALL MOUNTED EQUIPMENT RACK

A. See plans for rack locations. Wall mounted rack to be provided by owner, installed by contractor.

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 27000 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.

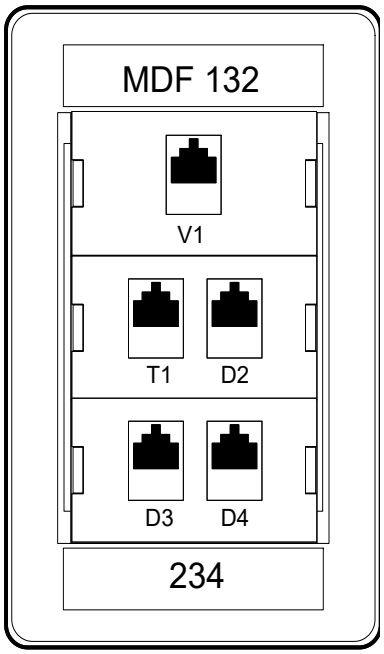
3.2 GENERAL WIRING METHODS.

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. Must provide 25 year manufacturer's warranty. Must be one manufacturer for both cabling and connectivity.

END OF SECTION 27 15 13

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 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.

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.

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 321313
CONCRETE PAVING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes exterior cast-in-place concrete materials for the following:
   1. Sidewalks.
   2. Concrete Pads.

1.2 RELATED WORK

A. Examine Contract Documents for requirements that affect work of this section. Other specification sections that directly relate to work of this Section include, but are not limited to:
   1. Section 033000 – Cast in Place Concrete
   2. Section 312000 – Earth Moving
   3. Section 321374 – Concrete Paving Joint Sealants

1.3 REFERENCES:

A. MDOT – Michigan Department of Transportation, "Standard Specifications for Construction", latest edition.

B. ASTM - American Society of Testing Materials, latest edition.

1.4 SUBMITTALS

A. Concrete Mix Designs: Provide job-mix formula prepared by independent AASHTO Accredited lab or approved by MDOT

B. Concrete Test Specimens: Deliver to the place of inspection and testing.

C. Certification of quality by producer for the following:
   1. Cementitious materials
   2. Admixtures
   3. Aggregates

D. Curing Compound Concrete Test Results: For each specimen.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Manufacturer of ready-mixed concrete products who complies with ASTM C 94/C 94M requirements for production facilities and equipment.

B. ACI Publications: Comply with ACI 301, "Specification for Structural Concrete," unless modified by requirements in the Contract Documents.

PART 2 - PRODUCTS

2.1 MATERIALS:

A. Plain-Steel Welded Wire Reinforcement: Conform to MDOT 905.06.

B. Concrete sidewalks and slabs: Unless otherwise specified use concrete Grade 3500. Conform to MDOT 803.02, 701.02, 6 sacks per cubic yard minimum.

C. Concrete Joint Filler: Conform to MDOT 914.03 and 914.04 A.

2.2 CONCRETE MIXTURES

A. Prepare design mixtures, proportioned according to ACI 301, with the following properties.
   1. Compressive Strength (28 Days): 3500 psi.
   2. Slump Limit: 4 inches plus or minus 1 inch.
   3. Air Content: 6 percent plus or minus 1.5 percent.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Proof-roll prepared subbase surface below concrete pavements with heavy pneumatic-tired equipment to identify soft pockets and areas of excess yielding.

B. Examine areas and conditions, with paver present, for compliance with requirements for correct and level finished grade and other conditions affecting performance. Notify the contractor of conditions detrimental to the proper and timely installation and completion of the work.

C. Do not proceed with the work until unsatisfactory conditions have been corrected by the contractor in a manner acceptable and to the satisfaction of the Engineer or Owner's Representative.

D. Beginning of installation means acceptance of existing conditions.

3.2 EDGE FORMS AND SCREED CONSTRUCTION

A. Set, brace, and secure edge forms, bulkheads, and intermediate screed guides for pavement to required lines, grades, and elevations. Install forms to allow continuous progress of work and so forms can remain in place at least 24 hours after concrete placement.

B. Clean forms after each use and coat with form-release agent to ensure separation from concrete without damage.

3.3 STEEL REINFORCEMENT

A. General: Comply with CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.

3.4 JOINTS

A. General: Form construction, isolation, and contraction joints and tool edgings true to line with faces perpendicular to surface plane of concrete. Construct transverse joints at right angles to centerline, unless otherwise indicated.

B. Construction Joints: Set construction joints at side and end terminations of pavement and at locations where pavement operations are stopped for more than one-half hour unless pavement terminates at isolation joints.

C. Isolation Joints: Form isolation joints of preformed joint-filler strips abutting concrete curbs, catch basins, manholes, inlets, structures, walks, other fixed objects, and where indicated.

D. Contraction Joints: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of the concrete thickness to match jointing of existing adjacent concrete pavement.

E. Edging: Tool edges of pavement, gutters, curbs, and joints in concrete after initial floating with an edging tool to a 1/4-inch radius. Repeat tooling of edges after applying surface finishes. Eliminate tool marks on concrete surfaces.

3.5 CONCRETE PLACEMENT

A. Moisten subbase to provide a uniform dampened condition at time concrete is placed.

B. Comply with ACI 301 requirements for measuring, mixing, transporting, and placing concrete.

C. Deposit and spread concrete in a continuous operation between transverse joints. Do not push or drag concrete into place or use vibrators to move concrete into place.

D. Screed pavement surfaces with a straightedge and strike off.

E. Commence initial floating using bull floats or darbies to impart an open textured and uniform surface plane before excess moisture or bleed water appears on the surface. Do not further disturb concrete surfaces before beginning finishing operations or spreading surface treatments.

3.6 FLOAT FINISHING

A. General: Do not add water to concrete surfaces during finishing operations.

B. Float Finish: Begin the second floating operation when bleed-water sheen has disappeared and concrete surface has stiffened sufficiently to permit operations. Float surface with power-driven floats, or by hand floating if area is small or inaccessible to power units. Finish surfaces to true planes. Cut down high spots and fill low spots. Refloat surface immediately to uniform granular texture.
   1. Burlap Finish: Drag a seamless strip of damp burlap across float-finished concrete, perpendicular to line of traffic, to provide a uniform, gritty texture.
   2. Medium-to-Fine-Textured Broom Finish: Draw a soft bristle broom across float-finished concrete surface perpendicular to line of traffic to provide a uniform, fine-line texture.
   3. Medium-to-Coarse-Textured Broom Finish: Provide a coarse finish by striating float-finished concrete surface 1/16 to 1/8 inch deep with a stiff-bristled broom, perpendicular to line of traffic.

C. Slip-Resistive Aggregate Finish: Before final floating, spread slip-resistive aggregate finish on pavement surface according to manufacturer's written instructions.
   1. Cure concrete with curing compound recommended by slip-resistive aggregate manufacturer. Apply curing compound immediately after final finishing.
   2. After curing, lightly work surface with a steel wire brush or abrasive stone and water to expose nonslip aggregate.

3.7 CONCRETE PROTECTION AND CURING

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.

B. Comply with ACI 306.1 for cold-weather protection.

C. Evaporation Retarder: Apply evaporation retarder to concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.

D. Begin curing after finishing concrete but not before free water has disappeared from concrete surface.

E. Curing Methods: Cure concrete by moisture curing, moisture-retaining-cover curing curing compound or a combination of these methods.

3.8 PAVEMENT TOLERANCES

A. Comply with tolerances of ACI 117 and as follows:
   1. Elevation: 1/4 inch.
   2. Thickness: Plus 3/8 inch, minus 1/4 inch.
   3. Surface: Gap below 10-foot- long, unleveled straightedge not to exceed 1/4 inch.
   4. Joint Spacing: 3 inches.
   5. Contraction Joint Depth: Plus 1/4 inch, no minus.
   6. Joint Width: Plus 1/8 inch, no minus.

3.9 TESTING AND INSPECTION:

A. Observation: By Owner’s designated authorized representative.
   1. Inspection of forms by Owner’s representative is required prior to pouring concrete.

B. Acceptance Testing:
   1. Contractor shall employ a certified American Concrete Institute/Michigan Concrete Association Concrete Field Testing Technician.
   2. Concrete:
      a. Sample: ASTM C172
      b. Frequency: Once for each 50 cubic yards, or less, of each class of concrete placed each day.
      c. One additional test cylinder will be taken during cold weather and be cured on site under the same conditions as the concrete it represents.
      d. One slump test will be taken for each set of test cylinders made.
      e. Perform following from sample:
         1) Mold three 6-inch cylinder compressive strength specimens: ASTM C31.

2) Slump test: ASTM C143.
3) Air test: ASTM C231.
4) Yield test: ASTM C138.
5) Strength test: ASTM C139.

3. If initial testing indicates nonconformance to specifications, additional testing shall be paid by Contractor. Replace nonconforming material at no additional cost.

3.10 PAVEMENT MARKING

A. Allow concrete pavement to cure for 28 days and be dry before starting pavement marking.

B. Sweep and clean surface to eliminate loose material and dust.

C. Apply paint with mechanical equipment to produce pavement markings of dimensions indicated with uniform, straight edges. Apply at manufacturer's recommended rates to provide a minimum wet film thickness of 15 mils.

3.11 REPAIRS AND PROTECTION

A. Remove and replace concrete pavement that is broken, damaged, or defective or that does not comply with requirements in this Section.

B. Protect concrete from damage. Exclude traffic from pavement for at least 14 days after placement.

C. Maintain concrete pavement free of stains, discoloration, dirt, and other foreign material. Sweep concrete pavement not more than two days before date scheduled for Substantial Completion inspections.

END OF SECTION 321313

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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 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

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.

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 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