PROJECT MANUAL
CONSTRUCTION DOCUMENT

PRESCHOOL EXPANSION
AND
DISTRICT OFFICE RENOVATION

MOUNT GILEAD EXEMPTED VILLAGE SCHOOLS
145 North Cherry Street
Mount Gilead, Ohio 43338

Prepared by:

Schorr Architects, Inc.
230 Bradenton Avenue
Dublin, Ohio 43017
614/798-2096

July 2, 2026
Comm. No. 2604

PRESCHOOL EXPANSION & DISTRICT OFFICE RENOVATION
MOUNT GILEAD EXEMPTED VILLAGE SCHOOLS

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Public Notice

Sealed bids will be received by the Board of Education of the Mount Gilead Exempted Village School District as provided in this notice for the Preschool Expansion & District Office Renovation Project – Phase II. Questions may be directed to Larry Rancour, Schorr Architects, Inc., at lrancour@schorrarchitects.com.

Bid documents will be made available for a non-refundable purchase from: DC Reprographics, 1254 Courtland Avenue, Columbus, Ohio 43201, at their website (www.DCplanroom.com).

Bids shall be enclosed in a sealed envelope addressed to the Board of Education of the Mount Gilead Exempted Village School District, ATTN: Tina Gabler, Treasurer, at 145 North Cherry Street, Mount Gilead, Ohio 43338 and plainly marked on the outside "Mount Gilead EVSD – Preschool Expansion & District Office Renovation Project – Phase II Bid." Bids will be received until **11:00 a.m.**, local time **July 24, 2026** and immediately after the deadline the bids will be opened and publicly read.

A pre-bid conference will be held at 145 North Cherry Street, Mount Gilead, Ohio 43338 on **July 14, 2026 at 11:00 a.m.**

All bids must include a Bid Guaranty, as described in the Instructions to Bidders. No bidder may withdraw its bid within 60 days after the opening; the Board reserves the right to waive irregularities, reject any or all bids, and conduct necessary investigations to determine bidder responsibility.

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A. BIDDER'S PLEDGE AND AGREEMENT

1. **Each Bidder acknowledges that this is a public project involving public funds and that the Owner expects and requires that each successful Bidder adhere to the highest ethical and performance standards. Each Bidder by submitting a bid pledges and agrees that (a) it will act at all times with absolute integrity and truthfulness in its dealings with the Owner and the Design Professional, (b) it will use its best efforts to cooperate with the Owner and the Design Professional and all other Contractors on the Project and at all times will act with professionalism and dignity in its dealings with the Owner, Design Professional, and other Contractors, (c) it will assign only competent supervisors and workers to the Project, each of whom is fully qualified to perform the tasks that are assigned to him/her, and (d) it has read, understands and will comply with the terms of the Contract Documents.**

B. EXAMINATION OF CONTRACT DOCUMENTS AND SITE CONDITIONS AND RELIANCE UPON TECHNICAL DATA

1. Each Bidder shall have a competent person carefully and diligently review each part of the Contract Documents, including the Divisions of the Specifications and parts of the Drawings that are not directly applicable to the Work on which the Bidder is submitting its bid. By submitting its bid, each Bidder represents and agrees, based upon its careful and diligent review of the Contract Documents, that it is not aware of any conflicts, inconsistencies, errors, or omissions in the Contract Documents for which it has not notified the Design Professional in writing at least ten (10) days prior to the bid opening. If there are any such conflicts, inconsistencies, errors, or omissions in the Contract Documents, the Bidder (i) will provide the labor, equipment, or materials of the better quality or greater quantity of Work and/or (ii) will comply with the more stringent requirements. The Bidder will not be entitled to any Change Order, additional compensation, or additional time on account of such conditions for any conflicts, inconsistencies, errors, or omissions that would have been discovered by such careful and diligent review, unless it has given prior written notice to the Design Professional.

2. Each Bidder shall have a competent person carefully and diligently inspect and examine the entire site and the surrounding area, including all parts of the site applicable to the Work for which it is submitting its bid, including location, condition, and layout of the site and the location of utilities, and carefully correlate the results of the inspection with the requirements of the Contract Documents. The Bidder's bid shall include all costs attributable to site and surrounding area conditions that would have been discovered by such careful and diligent inspection and examination of the site and the surrounding area, and the Bidder shall not be entitled to any Change Order, additional compensation, or additional time on account of such conditions.

3. The Bidder may rely upon the general accuracy of any technical data identified in the Owner-Contractor Agreement (e.g., any soils exploration reports, soil boring logs, site survey, or abatement reports) in preparing its bid, but such technical data are not part of the Contract Documents. Except for the limited reliance described in the preceding sentence, Bidder may not, if awarded a contract for the Work, rely upon or make any Claim against the Owner or Design Professional, or any of their agents or employees, with respect to any of the following:

    (a) the completeness of such reports and drawings for Bidder's purposes, including, but not limited to, any aspects of the means, methods, techniques, sequences, and procedures of construction to be employed by the successful Bidder and safety precautions and programs incident thereto; or

(b) any interpretation by the successful Bidder of or conclusion drawn from any technical data or any such other data, interpretations, opinions, or information. For example, all interpolations and extrapolations of data performed by the Bidder to estimate locations or quantities of subsurface strata are independent factual assumptions, which Owner does not warrant.

4. Each Bidder will be deemed to have actual knowledge of all information provided or discussed at the pre-bid meeting.

C. PROJECT

1. The Project is the **Preschool Expansion & District Office Renovation Project – Phase II** ("the Project"). The Project consists of the work indicated by the Contract Documents, in accordance with the Drawings and Specifications prepared by the Design Professional.

2. The Design Professional for the Project is:

Schorr Architects, Inc.
230 Bradenton Avenue
Dublin, Ohio 43017
Design Professional Representative: Larry Rancour, Vice President
Email: lrancour@schorrarchitects.com

3. Procurement Schedule:

Description	**Date**	**Time**
First Advertisement of Public Notice	July 2, 2026	N/A
Second Advertisement of Public Notice	July 9, 2026	N/A
Pre-Bid Meeting per Section F.5	July 14, 2026	11:00am
Deadline to Submit Questions per Section M.3	July 15, 2026	12:00pm
Deadline for Submission of Bids per Section G.5	July 24, 2026	11:00am

D. WORK

1. Only one contract will be issued by the Owner for constructing the Project, the General Contract, which will cover all scopes of work necessary to construct the Project.

2. The Contractor awarded the General Contract (General Contractor) will be responsible for the performance and coordination of any and all subcontractors and suppliers either directly or indirectly contracted with the General Contractor.

3. Owner may provide Bidders access to the Project site to conduct such examinations, investigations, explorations, tests, and studies as Bidder deems necessary for submission of a Bid. Bidder shall fill all holes and clean up and restore the Site to its former condition upon completion of such explorations, investigations, tests, and studies. Bidder shall comply with all applicable Laws and Regulations and Owner's policies relative to excavation and utility locates. Bidders must follow safety protocols required by law or requested by the Owner. Bidders may visit the site by contacting **Tina Gabler, Treasurer, at tgabler@mgschools.org, with a copy to Jeremy Froehlich, Superintendent, at jeremyfroehlich@mgschools.org** to set an appointment.

E. ESTIMATE OF COST

The total estimated construction cost for the base bid is $2,100,000.00

F. CONTRACT DOCUMENTS AND PRE-BID MEETING

1. The Contract Documents consist of the Contract Documents listed in Section 1 of the Owner-Contractor Agreement.

2. Copies of said drawings and specifications may be obtained by Prime Bidders from DC Reprographics, 1254 Courtland Avenue, Columbus, Ohio 43201; 614/297-1200, Fax: 614/297-1300, www.dcplanroom.com.

3. Bidders shall use complete sets of Contract Documents in preparing bids. Neither the Owner nor the Design Professional assumes any responsibility for errors or misinterpretations resulting from the use of incomplete sets of Contract Documents.

4. The Owner or the Design Professional, in making the Contract Documents available on the above terms, does so only for the purpose of obtaining bids on the Work and does not confer a license or grant for any other use.

5. A pre-bid conference will be held at the **Board Office located at 145 North Cherry Street, Mount Gilead, Ohio 43338** on the date and time referenced in the Procurement Schedule in Section C.3 above.

   Attendance is highly recommended. The Owner shall not be held liable if a bidder is unable to attend due to technical or other issues or obstructions.

G. PREPARATION OF BIDS

1. All bids must be submitted on the "Bid Form" furnished with the Contract Documents.

2. All blank spaces shall be filled in, in ink or typewritten, in words and figures, and in figures only where no space is provided for words, and signed by the Bidder. The wording on the Bid Form shall be used without change, alteration, or addition. Any change in the wording or omission of specified accompanying documents may cause the bid to be rejected. If there is an inconsistency or conflict in the bid amount, the lowest amount shall control, whether expressed in numbers or words.

3. Bidders shall note receipt of Addenda on the Bid Form. If the Bidder fails to acknowledge receipt of each Addendum, the Bid shall be deemed non-responsive, unless the Bid amount clearly and unambiguously reflects receipt of the Addendum or the Addendum involves only a matter of form and does not materially affect the price, quantity or quality of the Work to be performed.

4. Each Bidder shall submit **2 originals** of its bid to the Owner. The Bid Form shall be signed with the name typed or printed below the signature. A Bid shall not be submitted by facsimile transmission or any other electronic means. A Bidder that is a corporation shall sign its bid with the legal name of the corporation followed by the name of the state of incorporation and the legal signature of an officer authorized to bind the corporation to a contract.

5. Bids shall be enclosed in a sealed opaque envelope with the Bidder's name, plainly marked on the outside "**Mount Gilead EVSD – Preschool Expansion & District Office Renovation Project – Phase II**" and addressed as follows:

Mount Gilead Exempted Village School District Board of Education
ATTN: Tina Gabler, Treasurer
145 North Cherry Street
Mount Gilead, Ohio 43338

Bids must be received at the location and time designated above before the date and time referenced in the Procurement Schedule in Section C.3 above.

Hand deliveries to the Owner at this location are preferred. Hand deliveries may be made during the Owner's standard operating hours and must be made before the deadline. Respondents are responsible for confirming current operating hours.

A public bid opening will take place immediately after the time for submitting bids is expired.

The Owner shall not be held liable if a bidder is unable to attend due to technical or other issues or obstructions.

6. **The completed Bid Form shall be accompanied by the following completed documents:**

Bid Guaranty and if applicable, Contract Bond (See Paragraph G.8 below.)

Contractor's Qualification Statement (See Paragraph H.4 below.)

7. The Bidder shall take the following precautions in preparing its bid:

   a. Sign the bid and check to ensure all blank spaces have been filled in with requested information and that the specified accompanying documents (listed in Paragraph G.6 above) have been included in a sealed opaque envelope addressed as described in item Paragraph G.5 above.

   b. When the Bid Form provides for quoting either an addition or deduction for an Alternate item, indicate whether the sum named is an addition or deduction. If it is not indicated, it will be conclusively presumed that the amount is a deduction.

   c. When the Bid Form provides for quoting a unit price, the Bidder should quote the unit price as set forth in the Contract Documents and as described in Paragraph L.1 below.

   d. When applicable, make sure that the Bid Guaranty is properly executed and signed by:

      1) The Bidder
      2) The Surety or Sureties

   e. Make sure that the amount of the Bid Guaranty (if the Bid Guaranty is in the form of a certified check, letter of credit, or cashier's check) is for a specific sum in an amount as instructed in Paragraph G.8.a below. If the Bid Guaranty is in the form of the Bid Guaranty and Contract Bond, the amount may be left blank; if an amount is inserted, it must equal the total of the base bid plus the amount of all add alternates included in the bid. If inserted, then the failure to state an amount equal to the total of the base bid and all add alternates shall make the bid non-responsive if the Owner selects alternates not included in the amount.

f. Make sure that the appropriate bid package and scope of work is inserted in the correct space on the Bid Guaranty and Contract Bond Form. Failure to include work covered by the bid submitted may make the bid non-responsive.

8. Bonds and Guarantees

a. Bid Guaranty: Bidder shall furnish a Bid Guaranty, in the form prescribed in Sections 153.54, 153.57, and 153.571 of the Ohio Revised Code, in the form of either: (1) a bond for the full amount of the Base Bid plus the amount of all Add Alternates included in the Bidder's bid, in the form of the Bid Guaranty and Contract Bond included in the Contract Documents; or (2) a certified check, cashier's check, or irrevocable letter of credit in a form satisfactory to the Owner in an amount equal to 10% of the bid. Bid amount shall be the total of all sums bid, including all add alternatives, but excluding all deduct alternatives. NOTE: AIA or EJCDC Bid Bond forms are not acceptable.

b. Contract Bond: The successful Bidder, who, as a Bid Guaranty, submits a certified check, cashier's check, or irrevocable letter of credit in an amount equal to 10% of the bid, shall furnish a Contract Bond in the form Contract Bond included in the Contract Documents in an amount equal to 100% of the Contract Sum. NOTE: AIA or EJCDC Bond forms are not acceptable.

c. The bond must be issued by a surety company authorized by the Ohio Department of Insurance to transact business in the State of Ohio and acceptable to the Owner. The bond must be issued by a surety capable of demonstrating a record of competent underwriting, efficient management, adequate reserves, and sound investments. These criteria will be deemed to be met if the surety currently has an A.M. Best Company Policyholders Rating of "A-" or better and has or exceeds the Best Financial Size Category of Class VI. Other sureties may be acceptable to the Owner, in its sole discretion

d. All bonds shall be signed by an authorized agent of an acceptable surety and by the Bidder.

e. Surety bonds shall be supported by credentials showing the Power of Attorney of the agent, a certificate showing the legal right of the Surety Company to do business in the State of Ohio, and a financial statement of the Surety.

f. The Bid Guaranty, as applicable, shall be in the name of or payable to the order of the Owner.

g. The name and address of the Surety and the name and address of the Surety's Agent should be typed or printed on each bond.

H. METHOD OF AWARD

1. **All bids shall remain open for acceptance for sixty (60) days** following the day of the bid opening, but the Owner may, in its sole discretion, release any bid and return the Bid Guaranty prior to that date. The Bid Guaranty shall be subject to forfeiture, as provided in the Ohio Revised Code, if a bid is withdrawn during the period when bids are being held.

2. The Owner reserves the right to reject any, part of any, or all bids and to waive any informalities and irregularities. The Bidder expressly acknowledges this right of the Owner to reject any or all bids or to reject any incomplete or irregular bid. Bidders must furnish all information requested on or accompanying the Bid Form. Any false representations or failure to provide information may result in disqualification of the bid.

3. Determination of the Lowest Responsible Bid. Subject to the right of the Owner to reject any or all bids, the Owner will award the Contract for the Work to the bidder submitting the lowest responsible bid that is responsive to the bidding requirements, taking into consideration

accepted alternates. In evaluating bids, the Owner may consider the qualifications of the Bidders, whether or not the bids comply with the prescribed requirements, and alternates and unit prices, if requested, on the Bid Form. The Owner may also consider the qualifications and experience of subcontractors and suppliers. The Owner may conduct such investigations as are deemed necessary to establish the qualifications and financial ability of the Bidder and its subcontractors and suppliers. The factors the Owner may consider in determining which bid is the lowest responsible include the factors set forth below. The Owner, in its discretion, may consider and give such weight to these criteria as it deems appropriate.

a. The Bidder's work history. The Bidder should have a record of consistent customer satisfaction and of consistent completion of projects, including projects that are comparable to or larger and more complex than the Owner's Project, on time and in accordance with the applicable Contract Documents, and based upon the Bidder's claims history. If the Bidder's management operates or has operated another construction company, the Owner may consider the work history of that company in determining whether the Bidder submitted the lowest responsible bid.

   The Owner will consider the Bidder's prior experience on other projects of similar scope and/or complexity including prior projects with the Owner and/or Design Professional, including the Bidder's demonstrated ability to complete its work on these projects in accordance with the Contract Documents and on time, and will also consider its ability to work with the Owner and Design Professional as a willing, cooperative, and successful team member. Bringing overstated claims, an excessive number of claims, acting uncooperatively, and filing lawsuits against project owners and/or their design professionals on prior projects of similar scope and/or complexity will be deemed evidence of a Bidder's inability to work with the Owner and Design Professional as a willing, cooperative, and successful team member.

   The Bidder authorizes the Owner and its representatives to contact the owners and design professionals (and construction managers, if applicable) on projects on which the Bidder has worked and authorizes and requests such owners and design professionals (and construction managers) to provide the Owner with a candid evaluation of the Bidder's performance. By submitting its bid, the Bidder agrees that if it or any person, directly or indirectly, on its behalf or for its benefit brings an action against any of such owners or design professionals (or construction managers) or the employees of any of them as a result of or related to such candid evaluation, the Bidder will indemnify and hold harmless such owners, design professionals (and construction managers) and the employees of any of them from any claims, whether or not proven, that are part of or are related to such action and from all legal fees and expenses incurred by any of them arising out of or related to such legal action. This obligation is expressly intended for the benefit of such owners, design professionals (and construction managers), and the employees of each of them.

b. The Bidder's financial ability to complete the Contract successfully and on time without resort to its Surety.

c. The Bidder's prior experience with similar work on comparable or more complex projects.

d. The Bidder's prior history for the successful and timely completion of projects, including the Bidder's history of filing claims and having claims filed against it.

e. The Bidder's equipment and facilities.

f. The adequacy, in numbers and experience, of the Bidder's work force to complete the Contract successfully and on time.

g. The Bidder's compliance with federal, state, and local laws, rules, and regulations, including but not limited to the Occupational Safety and Health Act, the Ohio Prevailing Wage laws, and Ohio ethics laws.

h. The Bidder's participation in a drug-free workplace program acceptable to the Owner, and the Bidder's record for both resolved and unresolved findings of the Auditor of State for recovery as defined in Section 9.24 of the Ohio Revised Code.

i. The Owner's prior experience with the Bidder's surety.

j. The Bidder's interest in the Project as evidenced by its attendance at any pre-bid meetings or conferences for bidders.

k. Depending upon the type of the work, other essential factors, as the Owner may determine and as are included in the Specifications.

l. The number of years the Bidder has been actively engaged as a contractor in the construction industry.

m. Financial responsibility demonstrated by the Bidder and whether Bidder possesses adequate resources and availability of credit, the means and ability to procure insurance and acceptable performance bonds required for the Project and whether any claims have been made against performance bonds secured by the bidder on other construction projects.

n. The foregoing information with respect to each of the Subcontractors and Suppliers that the Bidder intends to use on the Project.

4. **Qualifications Statement. Each Bidder will submit with its bid a completed Contractor Qualifications Statement, which is included with the Contract Documents, and thereafter provide the Design Professional promptly with such additional information as the Design Professional may request regarding the Bidder's qualifications. A Bidder shall submit any requested additional information within 24 hours of the date on the request.**

5. The failure to submit requested information on a timely basis may result in the determination that the Bidder has not submitted the lowest responsible bid.

6. By submitting its bid, the Bidder agrees that the Owner's determination of which bidder is the lowest responsible bidder shall be final and conclusive, and that if the Bidder or any person on its behalf challenges such determination in any legal proceeding, whether or not proven, the Bidder will indemnify and hold the Owner and its employees and agents harmless from any claims included or related to such legal proceeding, whether or not proven, and from legal fees and expenses incurred by the Owner, its employees, or agents that arise out of or are related to such challenge.

7. **After bid opening, within 24 hours of a request made by the Owner or Design Professional, the apparent low Bidder and any other Bidder so requested must submit the following:**

   a. SUBCONTRACTORS: For all subcontracts with an estimated value of at least $20,000, a list of all Subcontractors that the Bidder will use to construct the Project, as well as an indication of whether or not the Bidder has ever worked with a proposed Subcontractor before, including the following information for the three most recent projects on which the Bidder and each Subcontractor have worked together:

   - Project Owner
   - Project Name
   - Subcontract Scope
   - Subcontract Value

- Owner's contact name and phone number.

If Bidder and a proposed Subcontractor have not worked together on at least three projects in the five years, Bidder must submit the information set forth above for the three most recent similar projects to the Project that a proposed Subcontractor has worked on.

The above Subcontractor information, as well as the information pertaining to each proposed Subcontractor, shall be used in the Owner's determination of the lowest responsible bid.

Once a Bidder identifies its proposed Subcontractors as set forth herein, and Owner makes no objections, the list shall not be changed unless written approval of the change is authorized by the Owner and Design Professional.

b. FINANCING: The following additional financial information is not a public record under Ohio Revised Code Section 149.43 and will be kept confidential, except under proper order of a court, per Ohio Revised Code Section 9.312(A).

i. Provide a financial statement, preferably audited, including your organization's latest balance sheet and income statement showing the following items:

- Current Assets (e.g., cash, joint venture accounts, accounts receivable, notes receivable, accrued income, deposits, materials inventory and prepaid expenses);
- Net Fixed Assets;
- Other Assets;
- Current Liabilities (e.g., accounts payable, notes payable, accrued expenses, provision for income taxes, advances, accrued salaries and accrued payroll taxes); and
- Other Liabilities (e.g., capital, capital stock, authorized and outstanding shares par values, earned surplus and retained earnings).

ii. Provide the name and address of firm preparing attached financial statement, and date thereof.

iii. If the attached financial statement is not for the identical organization named in the completed Contractor's Qualification Statement submitted with the bid, explain the relationship and financial responsibility of the organization whose financial statement is provided (e.g., parent-subsidiary).

8. Affidavit as to Personal Property Taxes. Each successful Bidder shall submit, prior to the time of the entry into the Contract, an affidavit in the form required by Section 5719.042, Ohio Revised Code, regarding the status of the Bidder's personal property taxes. A copy of the affidavit form is included with the Contract Documents.
9. No Bidder may withdraw its bid within **sixty (60)** days after the date bids are opened. The Owner reserves the right to waive any formalities or irregularities or to reject any or all bids.
10. The Owner reserves the right to disqualify bids, before or after opening, upon evidence of collusion with intent to defraud or other illegal practices on the part of the Bidder.

11. Award of Contract. The award of the Contract, when required, will only be made pursuant to a duly adopted resolution of the Owner.

I. EXECUTION OF CONTRACT

1. Within the time designated by the Owner or Design Professional after award of the Contract, the successful Bidder shall execute and deliver to the Owner or Design Professional the required number of copies of the Owner-Contractor Agreement, in the form included in the Contract Documents, and all accompanying documents requested, including, but not limited to, a Contract Bond (if applicable), insurance certificates, and a valid Workers' Compensation Certificate. The successful Bidder shall have no property interest or rights under the Owner-Contractor Agreement until the Agreement is executed by the Owner.

J. SUBSTITUTIONS/NON-SPECIFIED PRODUCTS

1. Certain brands of material or apparatus are specified. Each bid will be based on these brands, which may be referred to in the Contract Documents as Standards. The use of another brand (referred to as a substitution or proposed equal in the Contract Documents, when a bidder or the contractor seeks to have a different brand of material or apparatus than that specified approved by the Owner for use in the Project) may be requested as provided herein.

2. The products specified in the Contract Documents establish a standard of required function, dimension, appearance, and quality.

3. Bidders wishing to obtain approval to bid non-specified products shall submit written requests to the Design Professional a minimum of ten (10) calendar days before the bid date and hour. To facilitate the submission of requests, a Pre-Bid Substitution Form is included in the Contract Documents. The Bidder shall include the name of the material or equipment for which it is to be substituted and a complete description of the proposed substitution, including the name of the proposed manufacturer and/or product and a complete description of the proposed product including the manufacturer's name and model number or system proposed, drawings, product literature, performance and test data, color selections or limitations, and any other information necessary for evaluation. Include a statement including any changes in other materials, equipment, or other work that would be required if the proposed product is incorporated in the materials, equipment, or other work that would be required if the proposed product is incorporated in the work. The burden of proof of the merit of the proposed product is on the proposer. The Design Professional's decision on approval of a proposed product will be final.

   The following will be cause for rejection of a proposed substitution:

   a. Requests submitted by subcontractors, material suppliers, and individuals other than Bidders;

   b. Requests submitted without adequate documentation;

   c. Requests received after the specified cut-off date.

4. When the Design Professional approves a product submission before receipt of bids, the approval will be included in an Addendum, and Bidders may include the pricing of this product in their bid. Bidders shall not rely on approvals made in any other manner.

5. In proposing a non-specified product or a substitution, the Bidder represents and warrants that each proposed product will not result in any changes to the Project, including changes to the Work of other contractors, or any decrease in the performance of any equipment or systems to be installed in the Project and agrees to pay any additional costs incurred by the Owner and the Owner's consultants as a result of a non-specified or substitute product that is accepted.

6. Following the award of the Contract, there shall be no substitutions for specified products, except pursuant to a Change Order. The Owner in its sole discretion may decline to consider a substitution for a Change Order.

K. ALTERNATES

1. The Owner may request bids on alternates. If the Owner requests bids on alternates, the Bidder should include the cost of the alternates requested on its Bid Form.
2. At the time of awarding the Contract, the Owner will select or reject alternates as it determines is in its best interest. A Bidder's failure to include on its Bid Form the cost of an alternate selected by the Owner and applicable to the Bidder's work shall render the bid non-responsive and be grounds for the rejection of the bid. Otherwise, the failure to include the cost of an alternate will not be deemed material.
3. The Bidder acknowledges that although there is an estimate for the cost of the Project, the market conditions may and frequently do result in the estimate being different from the sum of the bids received, either higher or lower. The Bidder understands that the Owner may include alternates, which may include deduct alternates as well as add alternates, to give it flexibility to build the Project with the funds available. The Bidder further understands and acknowledges that use of add and deduct alternates is a long held customary practice in the construction industry in the State of Ohio. The Bidder also acknowledges that the Owner will not make a decision about the alternates on which to base the award of contracts until the bids are received, and the Owner can compare its available funds with the base bids and the cost or savings from selecting different alternates. The Bidder understands that the award to the Bidder submitting the lowest responsible bid will be based on the lowest base bid plus selected alternates, and may result in an award to a Bidder other than the Bidder that submitted the lowest base bid.
4. If, during the progress of the Work, the Owner desires to reinstate any alternate not included in the Contract, the Owner reserves the right to reinstate the alternate at the price bid by the Contractor provided that such action is taken in sufficient time so as not to delay the progress of the work or cause the Contractor additional expense.

L. UNIT PRICES

1. Where unit prices are requested in the Bid Form the Bidder should quote a unit price. Unless otherwise expressly provided in the Contract Documents, such unit prices shall include all labor, materials, and services necessary for the timely and proper installation of the item for which the unit prices are requested. The unit prices quoted in the bid shall be the basis for any Change Orders entered into under the Owner-Contractor Agreement, unless the Design Professional determines that the use of such unit prices will cause substantial inequity to either the Contractor or the Owner.

M. ADDENDA

1. The Owner reserves the right to issue Addenda changing, altering, or supplementing the Contract Documents prior to the time set for receiving bids. The Design Professional will issue the Addenda to clarify bidders' questions and/or to change, alter, or supplement the Contract Documents.
2. Any explanation, interpretation, correction, or modification of the Contract Documents will be issued in writing in the form of an Addendum, which shall be the only means considered binding; explanations, interpretations, etc., made by any other means shall NOT be legally binding. All Addenda shall become a part of the Contract Documents.
3. Bidders shall submit written questions to **Larry Rancour, at lrancour@schorrarchitects.com, the date and time referenced in the Procurement Schedule in Section C.3 above** to allow sufficient time for the Design Professional to respond.

All Addenda will be issued, except as hereafter provided, and e-mailed or otherwise furnished to persons who have obtained Contract Documents for the Project, at least seventy-two (72) hours prior to the published time for the opening of bids, excluding Saturdays, Sundays, and legal holidays. If any Addendum is issued within such seventy-two (72) hour period, then the time for opening of bids shall be extended one (1) week with no further advertising of bids required.

4. Copies of each Addendum will be sent only to the Bidders to whom Contract Documents have been issued and to Plan Rooms where copies of the Contract Documents are maintained. Receipt of Addenda shall be indicated by Bidders in the space provided on the Bid Form. Bidders are responsible for acquiring issued Addenda in time to incorporate them into their bid. Bidders should contact the Design Professional prior to the bid opening to verify the number of Addenda issued.

5. Each Bidder shall carefully read and review the Contract Documents and immediately bring to the attention of the Design Professional any error, omission, inconsistency, or ambiguity therein.

6. If a Bidder fails to indicate receipt of all Addenda through the last Addendum issued by the Design Professional on its Bid Form, the bid of such Bidder will be deemed to be responsive only if:

   a. The bid received clearly indicates that the Bidder received the Addendum, such as where the Addendum added another item to be bid upon and the Bidder submitted a bid on that item; or

   b. The Addendum involves only a matter of form or is one which has either no effect or has merely a trivial or negligible effect on price, quantity, quality, or delivery of the item bid upon.

N. INTERPRETATION

1. If a Bidder contemplating submitting a bid for the proposed Project is in doubt as to the true meaning of any part of the Contract Documents, it may submit a written request for an interpretation thereof to **Larry Rancour, at lrancour@schorrarchitects.com by the deadline for questions per paragraph M.3 above**. Any interpretation of the proposed documents will be made by Addendum only, duly signed by the Design Professional, and a copy of such Addendum will be mailed or delivered to each Bidder receiving a set of Contract Documents and each plan room where the Contract Documents are maintained. The Owner will not be responsible for any other explanation or interpretation of the proposed documents.

2. In interpreting the Contract Documents, words describing materials that have a well-known technical or trade meaning, unless otherwise specifically defined in the Contract Documents, shall be construed in accordance with the well-known meaning recognized by the trade.

3. Bidders are responsible for notifying the Owner and the Design Professional in a timely manner of any ambiguities, inconsistencies, errors, or omissions in the Contract Documents. The Bidder shall not, at any time after the execution of the Contract, be compensated for a claim alleging insufficient data, incomplete Contract Documents, or incorrectly assumed conditions regarding the nature or character of the Work, if no request was made by the Bidder prior to the bid opening.

O. STATE SALES AND USE TAXES

1. The Owner is a political subdivision of the State of Ohio and is exempt from taxation under the Ohio Sales Tax and Use Tax Laws. Building materials that the successful Bidder purchases for incorporation into the Project will be exempt from state sales and use taxes if the successful Bidder provides a properly completed Ohio Department of Taxation Construction Contract

Exemption Certificate to the vendors or suppliers when the materials are acquired. The Owner will execute properly completed certificates on request.

P. DATE FOR SUBSTANTIAL COMPLETION/ DATE FOR FINAL COMPLETION /LIQUIDATED DAMAGES

1. The Date for Substantial Completion (aka Contract Time), Date for Final Completion, and Liquidated Damages shall be as defined and set forth in the Owner-Contractor Agreement. **By submitting its Bid, each Bidder agrees that the period for performing its Work is reasonable**.

Q. OWNER'S RIGHT TO WAIVE DEFECTS AND IRREGULARITIES

1. The Owner reserves the right to waive any and all irregularities provided that the defects and irregularities do not affect the amount of the bid in any material respect or otherwise give the Bidder a competitive advantage.

R. MODIFICATION/WITHDRAWAL OF BIDS

1. Modification. A Bidder may modify its bid by written communication to the Owner addressed to the Owner's Representative at any time prior to the scheduled closing time for receipt of bids, provided such written communication is received by Owner's Representative prior to the bid deadline. The written communication shall not reveal the bid price, but should provide the addition or subtraction or other modification so that the final prices or terms will not be known until the sealed bid is opened. If the Bidder's written instructions with the change in bid reveal the bid amount in any way prior to the bid opening, the bid may be rejected as non-responsive.
2. Withdrawal Prior to Bid Deadline. A Bidder may withdraw its bid at any time for any reason prior to the bid deadline for the opening of bids. The request to withdraw shall be made in writing to and received by the Owner prior to the time of the bid opening.
3. Withdrawal after Bid Deadline.
    a. All bids shall remain valid and open for acceptance for a period of at least 60 days after the bid opening; provided, however, that a Bidder may withdraw its bid from consideration after the bid deadline when all of the following apply:
        (1) the price bid was substantially lower than the other bids;
        (2) the reason for the bid being substantially lower was a clerical mistake, rather than a mistake in judgment, and was due to an unintentional and substantial error in arithmetic or an unintentional omission of a substantial quantity of work, labor, or material;
        (3) the bid was submitted in good faith; and
        (4) the Bidder provides written notice to the Owner, to the attention of the Owner's Representative, within two (2) business days after the bid opening for which the right to withdraw is claimed.
    b. No bid may be withdrawn under this provision if the result would be the awarding of the contract on another bid for the bid package from which the Bidder is withdrawing its bid to the same Bidder.
    c. If a bid is withdrawn under this provision, the Owner may award the Contract to another Bidder determined by the Owner to be the lowest responsible bidder or the Owner may reject all bids and advertise for other bids. In the event the Owner advertises for other bids, the withdrawing Bidder shall pay the costs incurred in connection with the rebidding by the Owner, including the cost of printing new Contract Documents, required advertising, and printing and mailing notices to prospective bidders, if the Owner finds that such costs would not have been incurred but for such withdrawal.

S. COMPLIANCE WITH APPLICABLE LAWS

1. By submitting a bid for Work on the Project, the Bidder acknowledges that it is in compliance with applicable federal, state, and local laws and regulations, including, but not limited to, the following:

   a. Equal Employment Opportunity/Nondiscrimination. The Bidder agrees that if it is awarded a contract that in the hiring of employees for performance of work under the contract or any subcontract, neither it nor any subcontractor, or any person acting on its behalf or its subcontractor's behalf, by reason of race, creed, sex, disability as defined in Section 4112.01 of the Ohio Revised Code, or color, shall discriminate against any citizen of the state in the employment of labor or workers who are qualified and available to perform work to which the employment relates. The Bidder further agrees that neither it nor any subcontractor or any person on its behalf or on behalf of any subcontractor, in any manner, shall discriminate against or intimidate any employees hired for the performance of the work under the contract on account of race, creed, sex, disability as defined in Section 4112.01 of the Ohio Revised Code, or color.

   b. Ethics Laws. The Bidder represents that it is familiar with all applicable ethics law requirements, including without limitation Sections 102.04 and 3517.13 of the Ohio Revised Code, and certifies that it is in compliance with such requirements.

T. FINDINGS FOR RECOVERY

1. By submitting its bid, each Bidder certifies for reliance of the Owner that it has no unresolved finding for recovery against it issued by the Auditor of the State of Ohio on or after January 1, 2001, except as permitted by Section 9.24 (F) of the Ohio Revised Code.

U. PREVAILING WAGES

1. State of Ohio and Davis-Bacon Prevailing Wage Rates do not apply to this Project.

END OF INSTRUCTIONS TO BIDDERS

BID FORM

1.01 BID SUBMITTED BY:

_____
(Contractor)

Date bid submitted: _____

1.02 DELIVER TO:

Mount Gilead Exempted Village School District Board of Education
ATTN: Tina Gabler, Treasurer
145 North Cherry Street
Mount Gilead, Ohio 43338

1.03 Having carefully reviewed the Instructions to Bidders, Drawings, Specifications and other Contract Documents for the Project titled the **Preschool Expansion & District Office Renovation Project – Phase II** including having also received, read, and considered the following Addenda:

Addendum No.	Dated
_____	_____
_____	_____
_____	_____

and likewise having inspected the site and the conditions affecting and governing the Project, the undersigned hereby proposes to furnish all materials and to perform all labor, as specified and described in the said Specifications and/or as shown on the said Drawings for all Work necessary to complete the Project on a timely basis and in accordance with the Contract Documents regardless of whether expressly provided for in such Specifications and Drawings.

1.04 Before completing the Bid Form, the undersigned represents that it has carefully reviewed the Request for Bids, Instructions to Bidders, this Bid Form, Form of Bid Guaranty and Contract Bond, Contractor's Affidavit (O.R.C. 5719.042), Owner-Contractor Agreement as modified for the Project, Drawings, Project Specifications, and other Contract Documents. Failure to comply with provisions of the Contract Documents may be cause for disqualification of the bid.

1.05 BONDS AND CONTRACT: If the undersigned is notified of bid acceptance, it agrees to furnish required bonds as indicated in the Instructions to Bidders.

1.06 COMPLETION OF WORK: In submitting a bid, the undersigned agrees to execute the Owner-Contractor Agreement in the form included in the Contract Documents and to complete its Work as required by the Contract Documents.

NOTE A: The wording of the Bid Form shall be used throughout, without change, alteration, or addition. Any change may cause it to be rejected.

NOTE B: Bidder is cautioned to bid only on the Brands or Standards specified.

NOTE C: If there is an inconsistency or conflict in the Bid amount, the lowest amount shall control, whether expressed in numbers or words.

2.01 BID:

Include the cost of all labor and material for the contract listed below. Bidder is to fill in all blanks related to the Bid Package for which a bid is being submitted. If no bid is submitted for an item, leave the item blank or insert "NO BID" in the blank. For alternate items, indicate whether the amount stated

is in addition to or a deduction from the base bid amount (if there is no indication whether the amount for an alternate is an addition or a deduction, the amount shall be a deduction).

2.02 Bidder will complete the Work in accordance with the Contract Documents for the following price, not including alternates:

Lump Sum – All Work including allowances and not including Alternates outlined below:

_____ Dollars ($)
(Words) (Figures)

2.03 Allowances – included in the Lump Sum:

Allowance Description	Amount
Construction Testing	$10,000
Asbestos Abatement	$50,000
Electric Company Aid to Construction	$10,000

2.04 Alternates: N/A

2.05 Unit Prices: N/A

3.01 INSTRUCTIONS FOR SIGNING

A. The person signing for a sole proprietorship must be the sole proprietor or his authorized representative. The name of the sole proprietor must be shown below.

B. The person signing for a partnership must be a partner or his authorized representative.

C. The person signing for a corporation must be the president, vice president or other authorized representative; or he must show authority, by affidavit, to bind the corporation.

D. The person signing for some other legal entity must show his authority, by affidavit, to bind the legal entity.

4.01 BIDDER CERTIFICATIONS. The Bidder hereby acknowledges that the following representations in this bid are material and not mere recitals:

1. **The Bidder acknowledges that this is a public project involving public funds, and that the Owner expects and requires that each successful Bidder adhere to the highest ethical and performance standards. The Bidder by submitting its bid pledges and agrees that (a) it will act at all times with absolute integrity and truthfulness in its dealings with the Owner and the Design Professional, (b) it will use its best efforts to cooperate with the Owner and the Design Professional and all other Contractors on the Project and at all times will act with professionalism and dignity in its dealings with the Owner, Design Professional and other Contractors, (c) it will assign only competent supervisors and workers to the Project, each of whom is fully qualified to perform the tasks that are assigned to him/her, and (d) it has read, understands and will comply with the terms of the Contract Documents.**

2. The Bidder represents that it has had a competent person carefully and diligently review each part of the Contract Documents, including any Divisions of the Specifications and parts of the Drawings that are not directly applicable to the Work on which the Bidder is submitting its bid. By submitting

its bid, each Bidder represents and agrees, based upon its careful and diligent review of the Contract Documents, that it is not aware of any conflicts, inconsistencies, errors or omissions in the Contract Documents for which it has not notified the Design Professional in writing at least seven (7) days prior to the bid opening. If there are any such conflicts, inconsistencies, errors or omissions in the Contract Documents, the Bidder (i) will provide the labor, equipment or materials of the better quality or greater quantity of Work; and/or (ii) will comply with the more stringent requirements. The Bidder will not be entitled to any additional compensation for any conflicts, inconsistencies, errors or omissions that would have been discovered by such careful and diligent review, unless it has given such prior written notice to Design Professional.

3. The Bidder represents that it has had a competent person carefully and diligently inspect and examine the entire site for the Project and the surrounding area, including all parts of the site applicable to the Work for which it is submitting its bid, and carefully correlate the results of the inspection with the requirements of the Contract Documents. The Bidder agrees that its bid shall include all costs attributable to site and surrounding area conditions that would have been discovered by such careful and diligent inspection and examination of the site and the surrounding area, and the Bidder shall not be entitled to any Change Order, additional compensation, or additional time on account of conditions that could have been discovered by such an investigation.

4. The Bidder represents, understands and agrees that a) the Claim procedures in the General Conditions as modified for the Project are material terms of the Contract Documents, b) if it has a Claim, it will have its personnel provide complete and accurate information to complete and submit the Statement of Claim form on a timely basis, c) the proper completion and timely submission of a Statement of Claim form is a condition precedent to any change in the Contract Sum or the Contract Time(s), and d) the proper and timely submission of the Statement of Claim form provides the Owner and the Design Professional with necessary information so that the Owner may investigate the Claim and mitigate its damages.

5. The Bidder represents that the bid contains the name of every person interested therein and is based upon the Standards specified by the Contract Documents.

6. The Bidder and each person signing on behalf of the Bidder certifies, and in the case of a bid by joint venture, each member thereof certifies as to such member's entity, under penalty of perjury, that to the best of the undersigned's knowledge and belief: (a) the Base Bid, any Unit Prices and any Alternate bid in the bid have been arrived at independently without collusion, consultation, communication or agreement, or for the purpose of restricting competition as to any matter relating to such Base Bid, Unit Prices or Alternate bid with any other Bidder; (b) unless otherwise required by law, the Base Bid, any Unit Prices and any Alternate bid in the bid have not been knowingly disclosed by the Bidder and will not knowingly be disclosed by the Bidder prior to the bid opening, directly or indirectly, to any other Bidder who would have any interest in the Base Bid, Unit Prices or Alternate bid; (c) no attempt has been made or will be made by the Bidder to induce any other Person to submit or not to submit a bid for the purpose of restricting competition; and (d) the statements made in this Bid Form are true and correct.

7. The Bidder will execute the form of Owner/Contractor Agreement in the form included with the Contract Documents, if a Contract is awarded on the basis of this bid, and if the Bidder does not execute the Contract Form for any reason, other than as authorized by law, the Bidder and the Bidder's Surety are liable to the Owner.

8. The Bidder certifies that the upon the award of a Contract, the Contractor will ensure that all of the Contractor's employees, while working on the Project site, will not purchase, transfer, use or possess illegal drugs or alcohol or abuse prescription drugs in any way.

9. The Bidder agrees to furnish any information requested by the Design Professional or the Owner's authorized representative to evaluate that the Bidder has submitted the lowest responsible bid and that the bid is responsive to the specifications.

10. The Bidder certifies that it has no unresolved findings for recovery issued by the Auditor of State.

11. The Bidder certifies that it is aware of and in compliance with the requirements of Ohio Revised Code Section 3517.13 regarding campaign contributions.

12. The Bidder further states that it is a duly licensed contractor, for the type of work proposed, in accordance with the local requirements, and that all fees, permits, etc., pursuant to submitting this Bid have been paid in full.

LEGAL NAME OF BIDDER: _____

BIDDER IS (check one): __ sole proprietor __ partnership __ corporation __ other legal entity

NAME & TITLE OF PERSON LEGALLY AUTHORIZED TO BIND BIDDER TO A CONTRACT:

_____
Name Title

DATE SIGNED: _____ SIGNATURE: _____

ADDRESS: _____

_____

TELEPHONE: _____

FAX: _____

FEDERAL TAX I.D. # _____

When the Bidder is a partnership or a joint venture, state name and address of each partner in the partnership or participant in the joint venture below:

_____ _____

_____ _____
Name

_____
Address

_____ _____

_____ _____
Name

_____
Address

_____ _____

_____ _____
Name

_____
Address

_____ _____

_____ _____
Name

_____

Address

END OF SECTION

CONTRACTOR'S QUALIFICATION STATEMENT

SUBMITTED TO:

Mount Gilead Exempted Village School District Board of Education
ATTN: Tina Gabler, Treasurer
145 North Cherry Street
Mount Gilead, Ohio 43338

NAME OF PROJECT: **Preschool Expansion & District Office Renovation Project – Phase II**

SUBMITTED BY: _____

CONTRACTOR PROJECT CONTACT NAME: _____

ADDRESS: _____

EMAIL: _____

PHONE: _____

PRINCIPAL OFFICE: _____

☐ Corporation
☐ Partnership
☐ Individual
☐ Joint Venture
☐ Other

#	Question	Response
1 - Organization		
1.1	How many years has your organization been in business as a Contractor in the construction industry?	
1.2	How many years has your organization been in business under its present business name?	
1.2.1	Under what other or former names has your organization operated?	
1.3	Is your organization a corporation? If yes, answer #1.3.1 – 1.3.6	
1.3.1	Date of incorporation	

1.3.2	State of incorporation	
1.3.3	President's name	
1.3.4	Vice President's name(s)	
1.3.5	Secretary's name	
1.3.6	Treasurer's name	
1.4	Is your organization a partnership? If yes, answer #1.4.1 – 1.4.3	
1.4.1	Date of organization	
1.4.2	Type of partnership (if applicable)	
1.4.3	Name(s) of general partner(s)	
1.5	Is your organization individually owned? If yes, answer #1.5.1 – 1.5.2	
1.5.1	Date of organization	
1.5.2	Name of owner	

1.6	If the form of your organization is other than those listed above, describe it and name the principals.	
2 - Licensing		
2.1	List jurisdictions and trade categories in which your organization is legally qualified to do business, and indicate registration or license numbers, if applicable.	
2.2	List jurisdictions in which your organization's partnership or trade name is filed.	
2.3	List any suspension or revocations of any professional license of any director, officer, owner, or managerial employees of your organization, to the extent that any work to be performed on this Project is within the field of such licensed profession.	
3 - Financing: After bid opening, within 24 hours of a request made by the Owner or Design Professional, the apparent low Bidder and any other Bidder must submit additional financial information as requested.		
4 - References		

4.1	Trade References	
4.2	Bank References	
4.3	Surety – name of bonding company	
4.4	Surety – name and address of agent	
5 – Claims and Organization History		
5.1	Attach your organization's record for both resolved and unresolved findings of the Auditor of the State of Ohio for recovery as defined in Section 9.24 of the Ohio Revised Code. If none, state "none".	
5.2	Does your organization participate in a drug-free workplace program?	
5.3	Has your organization ever failed to complete any work or failed to complete any work by the substantial completion date, final completion date, or in a timely manner? If yes, attach details.	

5.4	Within the last five (5) years has your organization or any of its officers prosecuted any Claims, had any Claims prosecuted against it or them, or been involved in or is currently involved in any mediation or arbitration proceedings or lawsuits related to any construction project, or has any judgments or awards outstanding against it or them? If the answer is yes, please attach the details for each Claim, including the names and telephone numbers of the persons who are parties, the amount of the Claim, the type of Claim and basis for the Claim, and the outcome. Note: As used in this document "Claim" means a Claim initiated under the Contract Documents for a project or relating to the Work for a project, including Claims made against performance bonds secured by the Contractor on other construction projects.	
5.5	Has your organization ever failed to comply with federal, state, and local laws, rules and regulations including but not limited to the Occupational Safety and Health Act, the Ohio Prevailing Wage laws, and Ohio ethics laws? If yes, please attach details and reason(s) for each instance and the outcome including any fines or penalties imposed.	
5.6	Within the last five years, has any officer or principal of your organization ever been an officer or principal of another organization when it failed to complete a construction contract? If the answer is yes, please attach details for each instance, including the names and telephone numbers of the persons who are parties to the contract, and the reason(s) the contract was not completed.	
5.7	If any of the following members of your organization's management – president, chairman of the board, or any director – operates or has operated another construction company during the last five (5) years, identify the member of management and the name of the construction company.	
5.8	If your organization is operating under a trade name registration with the Secretary of State for the State of Ohio, identify the entity for which the trade name is registered. If none, state "none."	
5.9	If your organization is a division or wholly-owned subsidiary of another entity or has another relationship with another entity, identify the entity of which it is a division or wholly-owned subsidiary or with which it has another relationship and also identify the nature of the relationship. If none, state "not applicable."	

5.10	List any projects within the previous five years where a public entity determined that your organization was not a responsible bidder, including the name of the public entity, the reasons given by the public entity, and an explanation thereof.	
6 - Experience		
6.1	List the categories of work that your organization normally performs with its own forces	
6.2	State average annual amount of construction work your organization has performed during the last five years	
6.3	State total amount of work in progress and under contract	
6.4	Describe the size and experience of your organization's work force and your equipment and facilities, in relation to your organization's ability to complete the Project successfully and on time.	
6.5	In the chart below, provide the following information for each contract your organization has had during the last 5 years, including current contracts, where the Contract Sum is/was 50% or more of the bid amount for this Project, including add alternates. Include details regarding timeliness of performance and quality of work. List the original contract price for each project, the amount of any change orders or cost overruns on each, and the reasons for the change orders or cost overruns, and your organization's record for complying with and meeting completion deadlines on construction projects. If there are more than 10 of these contracts only provide information on the most recent 10 contracts, including current contracts.	

Project/Scope of Work	Original Contract Sum	Amount of any change orders or cost overruns and reasons	Completion deadlines met?	Owner's Contact & Telephone Number	Engineer's or Architect's Representative Name & Telephone Number

Project/Scope of Work	Original Contract Sum	Amount of any change orders or cost overruns and reasons	Completion deadlines met?	Owner's Contact & Telephone Number	Engineer's or Architect's Representative Name & Telephone Number

6.6 In the chart below, provide the following information for each project your organization has had during the last 5 years, which your organization believes is of comparable or greater size and complexity than the Owner's project. If there are more than 5 of these projects, only provide information on the most recent 5 projects, including current projects.

Project and Scope of Work	Contract Sum	Owner's Contact & Telephone Number	Engineer's or Architect's Representative Name & Telephone Number

Project and Scope of Work	Contract Sum	Owner's Contact & Telephone Number	Engineer's or Architect's Representative Name & Telephone Number

6.7 In the chart below, list the construction education, training and construction experience for each person who will fill a management role on the Project, including without limitation the Project Executive, Project Engineer, Project Manager, and Project Superintendent. For each person listed, include with the other information, the last three projects on which the person worked and the name and telephone number of the design professional and the Owner. Attach a separate sheet if necessary, identifying the question number.

Name/Role	Education and Training	Project #1, Owner & A/E Contact, Telephone Number	Project #2, Owner & A/E Contact, Telephone Number	Project #3, Owner & A/E Contact, Telephone Number

Name/Role	Education and Training	Project #1, Owner & A/E Contact, Telephone Number	Project #2, Owner & A/E Contact, Telephone Number	Project #3, Owner & A/E Contact, Telephone Number

6.8 In the chart below, list construction projects your organization has in progress with an original Contract Sum of more than $100,000.00, giving the name of project, owner and its telephone number, design professional and its telephone number, contract amount, percent complete and scheduled completion date. Attach a separate sheet if necessary, identifying the question number.

Project/Scope of Work	Contract Sum	Scheduled Completion Date	% Complete	Owner's Contact & Telephone Number	Engineer's or Architect's Representative Name & Telephone Number

Project/Scope of Work	Contract Sum	Scheduled Completion Date	% Complete	Owner's Contact & Telephone Number	Engineer's or Architect's Representative Name & Telephone Number

Additional Criteria. The Owner, in its discretion, reserves the right to request additional information and documentation relating to the foregoing and related to any of the criteria listed in the Bidding and Contract Documents after the bid opening. The Owner may consider such information and documentation in determining which bidder is the lowest responsible. The Owner, in its discretion, may consider and give such weight to any and all criteria as it deems appropriate.

Certification. The undersigned certifies for the reliance of the Owner that after diligent investigation, to the best of the undersigned's belief, the information provided with this Contractor's Qualification Statement is true, accurate and not misleading.

SIGNATURE_____

Dated at this ____ day of _____, 20__.

Name of Organization: _____

By: _____[PRINT NAME]

Signature: _____

Title: _____

_____, being duly sworn, deposes and says that the information provided herein is true and sufficiently complete so as not to be misleading. The notarial act certified hereby is a jurat. An oath or affirmation was administered to the signer with regard to the notarial act certified to hereby.

Subscribed and sworn before me this _____ day of _____ 20__.

_____
Notary Public

My Commission Expires: _____

SEAL

OWNER-CONTRACTOR AGREEMENT

Owner: Mount Gilead Exempted Village School District Board of Education 145 North Cherry Street Mount Gilead, Ohio 43338	**Contractor:** _____ _____ _____
Owner's Representative(s): Tina Gabler, Treasurer	**Contractor's Representative:** _____
Project: Preschool Expansion & District Office Renovation Project	**Scope:** General Contractor

This document is an agreement between the Owner and the Contractor for the Work described in the Contract Documents related to the Scope identified above for the Project defined above and is effective as of _____ (the "Effective Date"; provided however that if no date is inserted, the Effective Date shall be the date the Agreement is signed by the Owner).

The Owner and the Contractor agree as set forth in the following sections:

1. <u>CONTRACT DOCUMENTS</u>. The Contract Documents consist of the following documents:

A. Legal Notice;
B. Instructions to Bidders;
C. Bid Form and Contractor's Qualification Statement;
D. Owner-Contractor Agreement;
E. General Conditions of the Contract for Construction (AIA Document A201-2017), as modified;
F. Drawings and Specifications included in the Project Manual prepared by Schorr Architects, Inc.;
G. Bid Guaranty and Contract Bond;
H. Addenda issued;
I. Contractor's Personal Property Tax Affidavit (O.R.C. 5719.042);
J. Statement of Claim Form; and
K. Modifications issued after the execution of the Agreement, including:
    i. A Change Order;
    ii. A Work Change Directive; or,
    iii. A written order for a minor change of the Work issued by the Design Professional in accordance with the General Conditions.

1.1. Notwithstanding anything in the Contract Documents to the contrary, in the event of any inconsistency, the provisions of this Agreement shall control over any other Contract Document, proposal, document, or other attachment. In the event inconsistencies, conflicts, or ambiguities between or among the Contract Documents are discovered after execution of the Agreement, Contractor shall provide the better quality or greater quantity of Work or comply with the more stringent requirements.

1.2. Contractor will use the State of Ohio Subcontract Form for all subcontracted Work, in accordance with ORC 153.503(C) and OAC 153:1-3-02.

Note: **Non-Contract Documents**. The following are the reports and tests of subsurface conditions at or contiguous to the Site, if any, that the Design Professional has used in preparing the Contract Documents. These are not Contract Documents. Geotechnical data is not a warranty of subsurface conditions and is not to be relied upon as a complete representation of all possible soil conditions. Neither Owner nor its consultants warrant the accuracy of the geotechnical data. It is possible that there may be other reports, and/or tests of subsurface conditions at or contiguous to the Site not prepared by or on behalf of Owner. The Owner makes no representation about such reports and/or tests, assuming they exist. Additional information, if needed by Contractor for geotechnical data or site survey, shall be obtained by the Contractor at no additional cost to Owner. The General Conditions, as modified, contain additional terms related to these reports and tests.

Contractor may rely upon the general accuracy of the "technical data" contained in such reports and drawings listed below, and except for such reliance on "technical data," Contractor shall not rely upon or make any claim against Owner or Architect with respect to: (1) the completeness of such reports and drawings for Contractor's purposes, including, but not limited to, any aspects of the means, methods, techniques, sequences, and procedures of construction to be employed by Contractor, and safety precautions and programs incident thereto; or (2) other data, interpretations, opinions, and information contained in such reports or shown or indicated in such drawings; or (3) any Contractor interpretation of or conclusion drawn from any "technical data" or any such other data, interpretations, opinions, or information. For example, all interpolations and extrapolations of data performed by Contractor to estimate locations or quantities of subsurface strata are independent factual assumptions which Owner does not warrant. (None if none are listed.)

_____

Note: **Non-Contract Documents**. The following are those reports and drawings related to any Hazardous Conditions at the Site, if any. These are not Contract Documents. The General Conditions, as modified, contain additional terms related to these reports and drawings. (None if none are listed.)

_____

2. DESIGN PROFESSIONAL RELATIONSHIP. The Contract Documents shall not be construed to create a contractual relationship of any kind between the Design Professional and the Contractor or any Subcontractor or Material Supplier to the Project. The Design Professional, however, shall be entitled to performance of the obligations of the Contractor intended for its benefit and to enforcement of such obligations, but nothing contained herein shall be deemed to give the Contractor or any third party any claim or right of action against the Design Professional that does not otherwise exist without regard to this Contract. The Contractor and its Subcontractors shall not be deemed to be beneficiaries of any of the acts or services of the Design Professional that are performed for the sole benefit of the Owner. Except as otherwise set forth herein, the Contractor shall communicate with the Owner through the Design Professional. Contractor shall copy Owner on all communications that may result in a request for an adjustment to the Contract Time or Contract Sum.

2.1. The Design Professional is:

Larry Rancour, Vice President
Schorr Architects, Inc.
230 Bradenton Avenue
Dublin, Ohio 43017

Any references to the "Architect" or the "Engineer" in the Contract Documents are deemed to refer to the Design Professional identified herein.

3. TIME FOR COMPLETION ("CONTRACT TIME") AND PROJECT COORDINATION.

3.1. DATE OF COMMENCEMENT. The date of commencement of the Work shall be the date identified as the "Date of Commencement" in the Notice to Proceed issued by the Owner, or by the Owner through the Design Professional, to the Contractor, or if there is no Notice to Proceed, the Effective Date of this Agreement.

3.2. DATE OF SUBSTANTIAL COMPLETION. The Project and Work for the Project consists of all labor, materials, equipment, and services necessary for construction of the Project, all in accordance with the Drawings and Specifications prepared by the Design Professional. The Contractor shall achieve Substantial Completion of its Work on the Project, as defined in the General Conditions, on or before **April 1, 2027** ("Date of Substantial Completion").

3.2.1. DATE OF FINAL COMPLETION. The Contractor shall achieve Final Completion of its Work on the Project, as defined in the General Conditions, on or before **May 15, 2027** ("Date of Final Completion").

3.2.2. SHUTDOWN DATES. Due to events scheduled by the Owner and/or other Owner considerations, Contractor will not be able to perform Work on the Project on the following dates: **N/A**. Contractor's Construction Schedule for performing the Work shall account for Contractor not being able to perform Work on these dates and the contractual dates for Substantial Completion and Final Completion will not be changed due to Contractor not being able to perform Work on these dates. The Contractor will coordinate any system interruptions with the Owner and the Design Professional and all system interruptions are subject to Owner's prior written approval.

3.2.3. UTILITIES AND OPERATIONS. Contractor shall not interrupt utilities to facilities or existing operations without prior written notice and approval by Owner.

3.3. CONSTRUCTION SCHEDULE. The Construction Schedule shall be developed by the Contractor as provided in the Contract Documents.

3.4. LIQUIDATED DAMAGES. If the Contractor does not have its Work on the Project Substantially Complete by the specified Date for Substantial Completion or if the Contractor does not have its Work on the Project Finally Complete by the specified Date for Final Completion, the Contractor shall pay the Owner (and the Owner may set off from sums coming due the Contractor) Liquidated Damages in the per diem amount(s) identified in the chart below:

Contract Sum	Liquidated Damages Per Day for Failure to Timely Achieve:	
	Substantial Completion	Final Completion
$1,000,000.00 or less	$500	$125
$1,000,000.01 to $2,000,000.00	$700	$250
$2,000,000.01 to $5,000,000.00	$1,000	$500
$5,000,000.01 to $10,000,000.00	$2,000	$1,000
$10,000,000.01 to $20,000,000.00	$4,000	$1,250
$20,000,000.01 to $50,000,000.00	$5,000	$1,500
$50,000,000.01 or more	$7,000	$2,000

The Contractor acknowledges that such amounts of Liquidated Damages represent a reasonable estimate of the actual damages for loss of or interference with the intended use of the Project that the Owner would incur if the Contractor's Work is not Substantially Complete by its Date for Substantial Completion or Finally Complete by the required Date for Final Completion, or both. Any waiver of consequential damages shall not preclude the Owner from recovering Liquidated Damages.

3.4.1. Nothing in this Section shall be construed to diminish Owner's indemnity rights pursuant to this Agreement nor shall it preclude the Owner from recovering its actual damages from the Contractor for third-party claims against the Owner or for damages not attributable to delay.

3.5. INITIAL DECISION MAKER. The Initial Decision Maker renders initial decisions on Claims in accordance with the claims process set forth in the General Conditions. The Initial Decision Maker shall be the Design Professional, unless a different Initial Decision Maker is identified below:

3.6. Time is of the Essence for the Contractor's performance of the Work.

4. CONTRACT SUM (also called Contract Price). The Contract Sum to be paid by the Owner to the Contractor, as provided herein, for the satisfactory performance and completion of the Work and all of the duties, obligations, and responsibilities of the Contractor under this Agreement and the other Contract Documents is _____ Dollars ($_____), subject to adjustment as set forth in the Contract Documents. The Contract Sum includes Allowances, Accepted Alternates, and all federal, state, county, municipal, and other taxes imposed by law, including but not limited to any sales, use, commercial activity, and personal property taxes payable by or levied against the Contractor on account of the Work or the materials incorporated into the Work. The Contractor will pay any such taxes. The Contract Sum includes the following:

4.1. Base Bid Amount: $_____ (Lump Sum Bid);

4.2. [Not Used.]

4.3. Allowances included in the Contract Sum:

Construction Testing $10,000
Hazardous Abatement $50,000
Aid to Construction $10,000

4.4. Unit Prices. N/A

4.5. If after Substantial Completion of its Work, the Contractor fails to submit its final payment application with all the documents required to be submitted with such application within ninety (90) days after written notice to do so from the Owner and without prejudice to any other rights and remedies the Owner may have available to it, the balance of the Contract Sum shall become the Owner's sole and exclusive property, and the Contractor shall have no further interest in or right to such balance.

5. RETAINAGE. Retainage applicable to the Contract will be withheld in accordance with Ohio Revised Code Sections 153.12, .13, and .14 and the Modified General Conditions.

5.1. RETAINAGE FOR LABOR. Payments for labor incorporated into the Work will be at the rate of 96% of the amount set forth in Contractor's payment application and approved by Owner, unless the parties agree otherwise.

5.2. RETAINAGE FOR MATERIALS AND EQUIPMENT. Payments for materials and equipment will be at the rate of 92% of the invoice cost of materials and equipment delivered to the Project site or other storage site approved by Owner. The balance of the invoice cost will be payable when the materials or equipment are incorporated into the Work. Incorporated into the Work means such materials and equipment are installed and conform to the requirements of the Contract Documents. When payment is made on account of materials or equipment not yet incorporated into the Project, such materials and equipment will become the property of Owner; provided that if such materials or equipment are stolen, destroyed, or damaged before being fully incorporated into the Project, Contractor shall be required to replace them at its expense.

5.3. No Subcontractor shall be paid at a rate lower than being paid to the Contractor by the Owner.

6. [NOT USED.]

7. GENERAL.

7.1. MODIFICATION. No modification or waiver of any of the terms of this Agreement or of any other Contract Documents shall be effective against a party unless set forth in writing and signed by or on behalf of a party. In the case of the Owner, the person executing the modification or waiver must be duly authorized by action of the Owner's governing body. Under no circumstances will forbearance, including the failure or repeated failure to insist upon compliance with the terms of the Contract Documents, constitute the waiver or modification of any such terms. The parties acknowledge and agree that it may not rely upon common law waiver or estoppel principles to establish an alleged waiver or modification of this Agreement or the Contract Documents and rather that this Agreement and the Contract Documents can only be waived or modified pursuant to this paragraph. The parties acknowledge that no person has authority to modify this Agreement or the other Contract Documents or to waive any of its or their terms, except as expressly provided in this Paragraph.

7.2. ASSIGNMENT. Contractor may not assign this Agreement without the written consent of Owner, which Owner may withhold in its sole discretion.

7.3. THIRD PARTIES. Nothing contained in the Contract Documents shall create a contractual relationship with or a cause of action in favor of a third party against either Owner of Contractor. However, it is understood that the Owner is an intended third-party beneficiary of Contractor's agreements with its Suppliers, and Subcontractors, and Suppliers' and Subcontractors' agreements with their Sub-Suppliers, and Sub-Subcontractors. Contractor shall incorporate the obligations of this Agreement into its respective agreements and subcontracts.

7.4. LAW AND JURISDICTION. All questions regarding the validity, intention, or meaning of this Agreement or any modifications of it relating to the rights and obligations of the parties shall be construed and resolved under the laws of the State of Ohio. Any suit, which may be brought to enforce any provision of this Agreement or any remedy with respect hereto, shall be brought in the Common Pleas Court for the county in which the Project is located and each party hereby expressly consents to the exclusive jurisdiction of such court. Each party waives its right to remove any such suit to federal court.

7.5. STATUTE OF LIMITATIONS. Regardless of any provision to the contrary, the statute of limitations with respect to defective or non-conforming Work shall not commence until Substantial Completion or until the discovery of the defective or non-conforming Work by the Owner, whichever is later.

7.6. CONSTRUCTION. The parties acknowledge that each party has reviewed this Agreement and the other Contract Documents and has voluntarily entered into this Agreement. Accordingly, the normal rule of construction to the effect that any ambiguities are to be resolved against the drafting party shall not be employed in the interpretation of this Agreement, the other Contract Documents, or any amendments or exhibits to it or them.

7.7. APPROVALS. Except as expressly provided herein, the approvals and determinations of Owner will be subject to the sole discretion of Owner and will be valid and binding on the Contractor, provided only that they be made in good faith, i.e., honestly. If Contractor challenges any such approval or determination, Contractor bears the burden of proving by clear and convincing evidence that it was not made in good faith.

7.8. PARTIAL INVALIDITY. If any term or provision of this Agreement is found to be illegal, unenforceable, or in violation of any laws, statutes, ordinances, or regulations of any public authority having jurisdiction, then, notwithstanding such term or provision, this Agreement will remain in full force and effect

and such term will be deemed stricken; provided this Agreement will be interpreted, when possible, so as to reflect the intentions of the parties as indicated by any such stricken term or provision.

7.9. COMPLIANCE WITH LAWS AND REGULATIONS. The Contractor, at its expense, will comply with all applicable federal, state, and local laws, rules, and regulations applicable to the Work, including but not limited to Chapter 4115 of the Ohio Revised Code and Sections 153.59 and 153.60 of the Ohio Revised Code, which prohibit discrimination in the hiring and treatment of employees, with respect to which the Contractor agrees to comply and to require its subcontractors to comply.

7.10. PROJECT SAFETY. Contractor must follow all applicable safety and health regulations during the progress of the Project and monitor all of its employees and its subcontractors for compliance with such safety and health regulations. In undertaking the responsibilities set forth in this section, Contractor does not assume any duty of responsibility to the employees of any Subcontractor or supplier, regardless of tier. Owner assumes no responsibility for the development, review, or implementation of any project safety plan or for Project safety and has no authority to direct the means and methods of Contractor.

7.11. EQUAL OPPORTUNITY. Contractor will not, and it will ensure that its Subcontractors, regardless of tier, do not, discriminate against any employee or applicant for employment because of race, religion, color, sex, or national origin. Such action includes but is not limited to the following: employment, upgrading, demotion, transfer, recruitment or recruiting advertising, layoff or termination, rates of pay or other forms of compensation, and selection for training, including apprenticeship. Contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices setting forth the policies of nondiscrimination. Contractor is responsible to ensure that each of its Subcontractors, regardless of tier, states in all solicitations or advertisements for employees placed by them or on their behalf that all qualified applicants will receive consideration for employment without regard to race, religion, color, sex, or national origin.

7.12. NO FINDINGS FOR RECOVERY. The Contractor represents that the Contractor is not subject to a finding for recovery under Section 9.24, Ohio Revised Code, or that the Contractor has taken the appropriate remedial steps required under Section 9.24, Ohio Revised Code, or otherwise qualifies under this section. If this representation and warranty is found to be false, the Contract is void, and Contractor will immediately repay Owner any funds paid to Contractor under this Contract.

7.13. NON-DISCRIMINATION. Contractor agrees:

.1 Per Section 153.59 of the Ohio Revised Code in the hiring of employees for the performance of Work under this Agreement or in any subcontract, neither the Contractor, subcontractor, or any person acting on behalf of either of them, shall by reason of race, creed, sex, disability, military status as defined in Section 4112.01 of the Revised Code, or color discriminate against any citizen of the state in the employment of labor or workers who are qualified and available to perform the Work to which the employment relates.

.2 That neither the Contractor, subcontractor, nor any person acting on behalf of either of them shall, in any manner, discriminate against or intimidate any employee hired for the performance of Work under this Agreement on account of race, creed, sex, disability, military status as defined in Section 4112.01 of the Revised Code, or color.

.3 That there shall be deducted from the amount payable to the Contractor by the Owner under this Agreement a forfeiture of twenty-five dollars ($25.00) as required by Ohio Revised Code Section 153.60 for each person who is discriminated against or intimidated in violation of this Agreement.

.4 That this Agreement may be canceled or terminated by the Owner and all money to become due hereunder may be forfeited for a second or subsequent violation of the terms of this section of this Agreement.

7.14. ETHICS. By signing and entering into this agreement with the Owner, the Contractor represents that it is familiar with all applicable ethics law requirements, including without limitation Sections 102.04 and 3517.13 of the Ohio Revised Code, and certifies that it is in compliance with such requirements. The Contractor understands that failure to comply with the ethics laws is, in itself, grounds for termination of this contract and may result in the loss of other contracts with the Owner.

7.15. JOB MEETINGS. The Contractor or one of its representatives with authority to bind the Contractor will attend all job meetings. The Owner anticipates that job meetings will be scheduled on a bi-weekly basis during construction or as needed. The Contractor will ensure that its Subcontractors also hold regular job meetings at which safety issues and job matters are discussed as these relate to the Work being performed. Job meetings include, but are not limited to, pre-construction meetings, weekly job meetings, weekly safety tool box meetings, and monthly safety meetings.

7.16. PROPERTY TAX AFFIDAVIT. The Contractor's affidavit given under Section 5719.024, Ohio Revised Code, is incorporated herein.

7.17. WARRANTIES. Notwithstanding anything to the contrary in the Contract Documents, including the Project Manual, Drawings, and Specifications, no warranties by Contractor shall be limited to any time shorter than the statute of limitations for written contracts in Ohio.

7.18. ENTIRE AGREEMENT. This Agreement and the other Contract Documents constitute the entire agreement among the parties with respect to their subject matter and will supersede all prior and contemporaneous, oral or written, agreements, negotiations, communications, representations, and understandings with respect to such subject matter, and no person is justified in relying on such agreements, negotiations, communications, representations, or understandings.

7.19. EXHIBITS. Exhibits to this Agreement include:

Exhibit A: Contract Bond

Exhibit B: Sales and Use Tax Construction Contract Exemption Certificate

Exhibit C: Statement of Claim Form

Exhibit D: Design Professional's Certificate of Substantial Completion

Exhibit E: Contractor's Affidavit of Payment of Amounts Withheld

Exhibit F: Contractor Waiver and Release Affidavit

Exhibit G: Subcontractors/Suppliers Waiver and Release Affidavit

Exhibit H: Contractor Final Lien Waiver and Release Affidavit

Exhibit I: Subcontractor/Suppliers Final Lien and Release Affidavit

However, in the event of any inconsistency, the provisions of this Agreement control over any proposal, document, or other attachment.

IN WITNESS WHEREOF, the parties have caused this Agreement to be executed by their properly authorized representatives and agree that this Agreement is effective as of the date first set forth above.

Owner: Mount Gilead Exempted Village School District Board of Education	Contractor: _____
By: _____	By: _____
Name: _____	Name: _____
Title: _____	Title: _____
Date: _____	Date: _____

CERTIFICATE OF FUNDS
(ORC 5705.41)

The undersigned Fiscal Officer of Owner hereby certifies that the moneys required to meet the obligations of the Owner during the current fiscal year, under the attached Agreement for the services indicated herein have been lawfully appropriated for those purposes and are in the appropriate account of the Owner or in the process of collection of the credit of the appropriate account or fund, free from any previous encumbrances.

Dated: _____ _____
Fiscal Officer

(ORC Section 5705.412)

The undersigned Treasurer, Board President, and the Superintendent of the Owner, hereby certify that the Owner has in effect for the term of the contract the authorization to levy taxes including the renewal of existing levies which, when combined with the estimated revenue from all other sources available to the Owner at the time of this certification, are sufficient to provide the operating revenues necessary to enable the Owner to maintain all personnel and programs for all the days set forth in its adopted school calendars for the current fiscal year and for a number of days in succeeding fiscal years equal to the number of days instruction was held or is scheduled for the current fiscal year.

Dated: _____

By: _____
Treasurer

By: _____
Superintendent

By: _____
Board President

AIA® Document A201® – 2017

General Conditions of the Contract for Construction

THIS DOCUMENT HAS BEEN MODIFIED FROM ITS ORIGINAL FORM.

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

Preschool Expansion & District Office Renovation Project – Phase II
145 North Cherry Street, Mount Gilead, Ohio 43338

THE OWNER:
(Name, legal status and address)

Mount Gilead Exempted Village School District Board of Education
145 North Cherry Street, Mount Gilead, Ohio 43338

THE ARCHITECT:
(Name, legal status and address)

Schorr Architects, Inc.
230 Bradenton Avenue
Dublin, Ohio 43017

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

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

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

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ARTICLE 1 GENERAL PROVISIONS

§ 1.1 Basic Definitions The definitions in this Section 1.1 shall apply throughout the Contract Documents.

§ 1.1.1 The Contract Documents

The Contract Documents are the Contract Documents identified in the Owner-Contractor Agreement ("Agreement"). 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.

§ 1.1.2 The Contract

The Contract Documents form the Contract for Construction. The Contract represents the entire and integrated agreement between the parties hereto and supersedes prior negotiations, representations, or agreements, either written or oral. The Contract may be amended or modified only by a Modification. The Contract Documents shall not be construed to create a contractual relationship of any kind (1) between the Contractor and the Architect or the Architect's consultants, (2) between the Owner and a Subcontractor or a Sub-subcontractor, (3) between the Owner and the Architect or the Architect's consultants, or (4) between any persons or entities other than the Owner and the Contractor. The Architect shall, however, be entitled to performance and enforcement of obligations under the Contract intended to facilitate performance of the Architect's duties.

§ 1.1.3 The Work

The term "Work" means the construction and services required by the Contract Documents, whether completed or partially completed, and includes all other labor, materials, equipment, paperwork, reports, documentation, other requirements, and services provided or to be provided by the Contractor to fulfill the Contractor's obligations. The Work may constitute the whole or a part of the Project.

§ 1.1.4 The Project

The Project is the total construction of which the Work performed under the Contract Documents may be the whole or a part and which may include construction by the Owner and by Separate Contractors.

§ 1.1.5 The Drawings

The Drawings are the graphic and pictorial portions of the Contract Documents showing the design, location and dimensions of the Work, generally including plans, elevations, sections, details, schedules, and diagrams.

§ 1.1.6 The Specifications

The Specifications are that portion of the Contract Documents consisting of the written requirements for materials, equipment, systems, standards and workmanship for the Work, and performance of related services.

§ 1.1.7 Instruments of Service

Instruments of Service are representations, in any medium of expression now known or later developed, of the tangible and intangible creative work performed by the Architect and the Architect's consultants under their respective professional services agreements. Instruments of Service may include, without limitation, studies, surveys, models, sketches, drawings, specifications, and other similar materials.

§ 1.1.8 Initial Decision Maker

The Initial Decision Maker is the Architect unless another person is identified in writing.

§ 1.1.9 Finally Resolved

Finally Resolved means that the Initial Decision Maker has made a decision on a Claim under Section 15.2.6.1 of the General Conditions and that any litigation regarding the Claim has been concluded.

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§ 1.1.10 Claim
Claim is defined in Section 15.1.1 of these General Conditions.

§ 1.1.11 Statement of Claim Form
Statement of Claim Form means the Statement of Claim Form included with the Project Manual.

§ 1.1.12 Separate Contractor
Separate Contractor is defined in Section 6.1.1 of these General Conditions.

§ 1.1.13 Standard of Care The Contractor shall perform its services consistent with the professional skill and care ordinarily provided by experienced contractors and working in the same or similar locality under the same or similar circumstances. Contractor shall perform its services as expeditiously as is consistent with such professional skill and care and the orderly progress of
the Project.

§ 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 whether or not expressly shown or described. The Contract Documents are complementary, and what is required by one shall be as binding as if required by all and performance by the Contractor shall be required 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.

§ 1.2.1.2 In the event of inconsistencies within or between the Contract Documents, the Contractor must provide the better quality or greater quantity of Work and must comply with the stricter requirements.

§ 1.2.2 Organization of the Specifications into divisions, sections and articles, and arrangement of Drawings shall not control the Contractor in dividing the Work among Subcontractors or in establishing the extent of Work to be performed by any trade.

§ 1.2.3 Unless otherwise stated in the Contract Documents, words that have well-known technical or construction industry meanings are used in the Contract Documents in accordance with such recognized meanings.

§ 1.3 Capitalization
Terms capitalized in these General Conditions include those that are (1) specifically defined, (2) the titles of numbered articles, or (3) the titles of other documents published by the American Institute of Architects.

§ 1.4 Interpretation
In the interest of brevity the Contract Documents frequently omit modifying words such as "all" and "any" and articles such as "the" and "an," but the fact that a modifier or an article is absent from one statement and appears in another is not intended to affect the interpretation of either statement.

§ 1.5 Ownership and Use of Drawings, Specifications, and Other Instruments of Service
§ 1.5.1 Ownership of the respective Instruments of Service, including the Drawings and Specifications, shall be as provided in the Owner-Architect Agreement. The Contractor, Subcontractors, Sub-subcontractors, and material or equipment 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 ownership of the Instruments of Service.

§ 1.5.2 The Contractor, Subcontractors, Sub-subcontractors, and material or equipment 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

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shall bear the copyright notice, if any, shown on the Instruments of Service. The Contractor, Subcontractors, Sub-subcontractors, and material or equipment 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 Notices, Requests, or demands by either party shall be in writing, unless otherwise expressly authorized, and shall be personally served; forwarded by expedited messenger service; sent by facsimile transmission; sent by electronic mail with delivery confirmation; or be given by registered or certified mail, return receipt requested, postage prepaid, and address by given written notice hereunder. All notices, requests, and demands shall be deemed received upon receipt in the case of personal delivery or delivery by expedited messenger service, including leaving the notice at the address provided herein during normal business hours; upon the expiration of forty-eight (48) hours from the time of deposit in the United States mail; or, in the case of a notice given by electronic mail or facsimile transmission, upon the expiration of 24 hours after the transmission is sent.

§ 1.7 Digital Data Use and Transmission

If the parties intend to transmit Instruments of Service or any other information or documentation in digital form, they shall endeavor to establish necessary protocols governing such transmissions, unless already provided in the Agreement or the Contract Documents.

§ 1.8 Building Information Models Use and Reliance

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

§ 1.9 Preconstruction Conference

Before any Work at the Site is started, a conference attended by the Owner, Contractor, Architect, and others as appropriate may be held to establish a working understanding among the parties as to the Work and to discuss the Submittal Schedule, Construction Schedule, and Schedule of Values, procedures for handling Shop Drawings and other submittals, processing Applications for Payment, and maintaining required records.

§ 1.10 Initial Acceptance of Schedules

At least 10 days before submission of the first Application for Payment a conference attended by a Contractor, Architect, and others as appropriate will be held to review for acceptability to the Architect the schedules submitted in accordance with the Contract Documents, including a Submittal Schedule, Construction Schedule, and Schedule of Values. The Contractor shall have an additional 10 days to make corrections and adjustments and to complete and resubmit the schedules. No progress payment shall be made to the Contractor until acceptable schedules are submitted to the Architect and Owner.

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 may designate in writing a representative. The Owner's representative shall have such authority only as is expressly authorized by the Owner's legislative body and as is permitted under the law of the State of Ohio. The Contractor is responsible for determining the limits of that authority.

§ 2.1.2 The Owner may prepare a Notice of Commencement for the Project, as required by the Ohio Revised Code and shall furnish to the Contractor a copy of the Notice of Commencement for the Project, within fifteen days after receipt of a written request.

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§ 2.2 Evidence of the Owner's Financial Arrangements

§ 2.2.1 The Owner shall complete the certificate(s) of available resources required by the Ohio Revised Code as evidence of available funds to fulfill the Owner's obligations under the Contract.

§ 2.2.2 [Not Used.]

§ 2.2.3 [Not Used.]

§ 2.2.4 Where the Owner has designated information furnished to the Contractor as "confidential," the Contractor shall keep the information confidential and shall not disclose it to any other person. However, the Contractor may disclose "confidential" information, after seven (7) days' notice to the Owner, where disclosure is required by law, including a subpoena or other form of compulsory legal process issued by a court or governmental entity, or by court or arbitrator(s) order. The Contractor may also disclose "confidential" information to its employees, consultants, sureties, Subcontractors and their employees, Sub-subcontractors, and others who need to know the content of such information solely and exclusively for the Project and who agree to maintain the confidentiality of such information. All security related information shall be automatically deemed confidential.

§ 2.3 Information and Services Required of the Owner

§ 2.3.1 Except for permits and fees that are the responsibility of the Contractor under the Contract Documents, including those required under Section 3.7.1, the Owner shall secure and pay for necessary initial plan approvals, easements, or assessments.

§ 2.3.2 The Owner may retain an architect lawfully licensed to practice architecture and/or engineering, or an entity lawfully practicing architecture and/or engineering, in the jurisdiction where the Project is located. That person or entity is identified as the Architect in the Agreement and is referred to throughout the Contract Documents as if singular in number.

§ 2.3.3 If the employment of the Architect terminates, the Owner may employ a successor to whom the Contractor has no reasonable objection and whose status under the Contract Documents shall be that of the Architect.

§ 2.3.4 To the extent necessary for the Work and as requested by the Contractor, the Owner may furnish surveys describing physical characteristics, legal limitations and utility locations for the site of the Project, and a legal description of the site. The Contractor shall be entitled to rely on the accuracy of information furnished by the Owner but shall exercise proper precautions relating to the safe performance of the Work. The Contractor may rely upon the general accuracy of the "technical data" contained in such reports and drawings, and except for such reliance on "technical data," the Contractor shall not rely upon or make any claim against the Owner or Architect with respect to: (1) the completeness of such reports and drawings for the Contractor's purposes, including, but not limited to, any aspects of the means, methods, techniques, sequences, and procedures of construction to be employed by the Contractor, and safety precautions and programs incident thereto; or (2) other data, interpretation, opinions, and information contained in such reports or shown or indicated in such drawings; or (3) any Contractor interpretation of or conclusion drawn from any "technical data" or any such other data, interpretations, opinions, or information. For example, all interpolations and extrapolations of data performed by the Contractor to estimate locations or quantities of subsurface strata are independent factual assumptions which the Owner does not warrant.

§ 2.3.5 The Owner shall furnish information or services required of the Owner by the Contract Documents with reasonable promptness. The Owner shall also furnish any other information or services under the Owner's control and relevant to the Contractor's performance of the Work with reasonable promptness after receiving the Contractor's written request for such information or services.

§ 2.3.6 Unless otherwise provided in the Contract Documents, the Owner shall furnish to the Contractor one copy of the Contract Documents for purposes of making reproductions pursuant to Section 1.5.2.

§ 2.4 Owner's Right to Stop the Work

If the Contractor fails to correct Work that is not in accordance with the requirements of the Contract Documents as required by Section 12.2 or 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

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Owner to exercise this right for the benefit of the Contractor or any other person or entity, except to the extent required by Section 6.1.3.

§ 2.5 Owner's Right to Carry Out the Work

If the Contractor defaults or neglects to carry out the Work in accordance with the Contract Documents and fails within two business days after receipt of notice from the Owner to commence or thereafter proceed without interruption to correct such default or neglect within fifteen days of such notice, the Owner, without prejudice to its other remedies, may correct such deficiencies. If such default or neglect results in a threat to the safety of any person or property, the Contractor shall immediately commence to correct such default or neglect upon receipt of written or oral notice thereof. In all such cases of default or neglect, an appropriate Change Order shall be issued deducting from payments then or thereafter due the Contractor the costs arising out of or related to the investigation and correction of such deficiencies, including Owner's attorneys' and consultants' fees and expenses and other expenses and compensation for the Architect's additional services made necessary by such default, neglect, or failure. If current and future payments due the Contractor are not sufficient to cover such amounts, the Contractor shall pay the difference to the Owner. If the Contractor disagrees with the actions of the Owner or the Architect, or the amounts claimed as costs to the Owner, the Contractor may file a Claim pursuant to Article 15.

ARTICLE 3 CONTRACTOR

§ 3.1 General

§ 3.1.1 The Contractor is the person or entity identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number. The Contractor shall be lawfully licensed, if required in the jurisdiction(s) where the Project is located. The Contractor shall designate in writing a representative who shall have express authority to bind the Contractor with respect to all matters under this Contract. The term "Contractor" means the Contractor or the Contractor's authorized representative.

§ 3.1.2 The Contractor shall perform the Work in accordance with the Contract Documents and shall comply with all rules, regulations, and policies of the Owner (available upon request) and all applicable federal, State, and local codes, statutes, ordinances, and regulations in the performance of the Work on the Project.

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

§ 3.2 Review of Contract Documents and Field Conditions by Contractor

§ 3.2.1 Execution of the Agreement by the Contractor is a representation that the Contractor has visited the site, diligently investigated the entire site and surrounding area, including existing buildings, if any, location, condition, and layout of the site and observable utility locations, become thoroughly familiar with local conditions under which the Work is to be performed, including the generally occurring climatic conditions and carefully correlated personal observations and other information 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 and in addition to the reviews required by the Instructions to Bidders and by these General Conditions, carefully study and compare the various Contract Documents relative to that portion of the Work, as well as the information furnished by the Owner pursuant to Section 2.3.4. In addition, prior to performing each portion of its Work, the Contractor 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, including the Work of the other contractors. The obligations of this Section 3.2.2 are for the purposes of facilitating construction by the Contractor, determining that the Work is constructible, determining if the Work of the Contractor is coordinated in the Contract Documents with the work of any other contractors, and for verifying that field conditions, including the work of other contractors, are consistent with the information in the Contract Documents and ready for the Work. Contractor shall promptly report to the Architect and Owner any errors, inconsistencies, or omissions discovered by or made known to the Contractor as a request for information in such form as the Architect may require. It is recognized that the Contractor's review is made in the Contractor's capacity as a contractor and not as a licensed design professional, unless otherwise specifically provided in the Contract Documents.

§ 3.2.3 Additionally, prior to performing each portion of the Work, the Contractor shall have a competent person review the Contract Documents for compliance with applicable laws, statutes, ordinances, codes, rules and

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regulations, or lawful orders of public authorities, and the Contractor shall immediately report to the Architect and Owner any nonconformity discovered by or made known to the Contractor as a request for information in such form as the Architect may require.

§ 3.2.4 If the Contractor believes that additional cost or time is involved because of clarifications or instructions the Architect issues in response to the Contractor's notices or requests for information pursuant to Sections 3.2.2 or 3.2.3, the Contractor shall make 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, if applicable, as would have been avoided if the Contractor had performed such obligations.

§ 3.3 Supervision and Construction Procedures

§ 3.3.1 The Contractor shall supervise and direct the Work, using the necessary skill and attention to complete the Work in accordance with the Contract Documents. 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 Documents. If the Contract Documents give specific instructions concerning construction means, methods, techniques, sequences, or procedures, the Contractor shall evaluate the jobsite safety thereof and except as stated below, shall be fully and 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 written notice to the Owner and Architect, and shall not proceed with that portion of the Work without further written instructions from the Architect. The Contractor shall propose alternative means, methods, techniques, sequences, or procedures. The Architect shall evaluate the proposed alternative solely for conformance with the design intent for the completed construction. Unless the Architect objects to the Contractor's proposed alternative, the Contractor shall perform the Work using its alternative means, methods, techniques, sequences, or procedures. The Contractor shall immediately upon entering the Project for the purpose of beginning work, locate all general reference points and take such action as necessary to prevent their destruction. The Contractor shall lay out its own work and be responsible for all lines, elevations, and measurements of the building, demolition work, utilities, and any other Work to be executed by Contractor under the Contract Documents. The Contractor shall verify grades, lines, levels, and dimensions indicated on the drawings to confirm that the Project will be constructed in accordance with the Contract Documents and shall notify the Architect and Owner of errors or inconsistencies before commencing Work. The Contractor shall establish and maintain a permanent benchmark, batter boards, level, and grades and shall lay out the exact location of all walls, partitions, openings, etc. The Contractor shall employ experienced and competent personnel and exercise proper precautions to verify the figures shown on the drawings for laying out Work, and will be held responsible for any error resulting from a failure to exercise such precautions.

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

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

§ 3.3.4 The Contractor shall maintain readily accessible to the Architect and Owner at the Project site, the following documents all of which shall be "public records" within the meaning of the Ohio Public Records Act:

.1 A set of Drawings and Specifications, as approved by the appropriate Authority Having Jurisdiction.

.2 A neat and legible set of As-Built Drawings and Project Manuals on which:

The Contractor shall keep an accurate record of all approved changes made to the Drawings to show actual installation where installation varies from Work as originally shown, including the exact location and depth of underground utility lines. Any such changes shall be noted by Change Order Number and drawn neatly in a contrasting color; and

The Contractor shall also keep record of all changes to the Specifications. When Shop Drawings are used, the Contractor shall cross-reference the corresponding sheet numbers on the As-Built Drawings and sections of the Specification.

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1. A daily log at the Project site in which it has recorded Project-related information, including, but not limited to, the weather, number of workers on site for each Contractor, identification of equipment, Work accomplished, problems encountered, and other similar relevant Project data;

1. As applicable to its Work, all Bulletins, Addenda, approved Shop Drawings, Product Data, Samples, manufacturers' installation, operating and/or maintenance instructions or requirements, certificates, warranties, Change Orders, Change Directives, other Modifications, and complete back-up data for all Change Orders, Change Directives, and other Modifications;

1. All the Contractor's communications, including but not limited to letters, memoranda, e-mail, invoices, and bills of lading, arising out of or related to the Project with the Architect, Owner, and/or its subcontractors, materialmen, and/or employees;

1. The payroll reports for its employees and the employees of its Subcontractors working on the Project;

1. Claims for the Contractor's failure to comply with the Ohio Public Records Act, if applicable, shall be claims under Section 3.18.1; and

1. Any other forms required under the terms of the Agreement.

§ 3.4 Labor and Materials

§ 3.4.1 Unless otherwise provided in the Contract Documents, the Contractor shall provide and pay for labor, materials, equipment, tools, construction equipment and machinery, water, heat, utilities, transportation, and other facilities and services necessary for proper execution and completion of the Work, whether temporary or permanent and whether or not incorporated or to be incorporated in the Work.

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

§ 3.4.3 The Contractor shall enforce strict discipline and good order among the Contractor's employees and other persons carrying out the Work. The Contractor shall only assign competent supervisors and workers to the Project, each of whom is fully qualified to perform the tasks assigned. If the Owner or Architect deems any employee of the Contractor or a Subcontractor unsatisfactory, the Contractor will transfer or require its Subcontractor to transfer such employee from the Project immediately and replace or require the prompt replacement of such employee with a competent employee. The Owner, however, shall be under no obligation to do so.

§ 3.5 Warranty

§ 3.5.1 The Contractor warrants to the Owner and Architect that materials and equipment furnished under the Contract will be of good quality and new unless the Contract Documents require or permit otherwise. The Contractor further warrants that the Work will conform to the requirements of the Contract Documents and will be free from defects. Work, materials, or equipment not conforming to these requirements may be considered defective. If required by the Architect, the Contractor shall furnish satisfactory evidence as to the kind and quality of materials and equipment.

§ 3.5.2 All material, equipment, or other special warranties required by the Contract Documents shall be issued in the name of the Owner, or shall be transferable to the Owner, and shall commence in accordance with Section 9.8.4. If the Contractor breaches any of its obligations under Section 3.5.1, the Contractor will pay the Owner for its damages and expenses, including but not limited to attorneys' and consultants' fees and expenses, arising out of or related to such breach.

§ 3.5.3 Except to the extent that the Contractor has notified the Architect in writing at least ten (10) days prior to the bid opening of specific problems with specified equipment or materials, the Contractor warrants that any equipment or materials used by the Contractor, including any equipment or materials selected from among the equipment or materials specified, will be fit for its intended purposes, compatible with the design intent, and, if the other

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contractors construct their work in accordance with the Contract Documents, constructible all without additional cost to the Owner. Such notice shall be conspicuously labeled at the top of the first page in not less than twelve point type as follows: **"NOTICE OF PROBLEMS WITH SPECIFIED EQUIPMENT OR MATERIALS."**

§ 3.6 Taxes

The Contractor shall pay sales, consumer, use, commercial activity, and similar taxes for the Work provided by the Contractor that are legally enacted when bids are received or negotiations concluded, whether or not yet effective or merely scheduled to go into effect. The Contractor acknowledges that the Owner is a political subdivision of the State of Ohio or tax exempt organization and is exempt from state sales, and use taxes. Upon written request, the Owner will provide the Contractor with any applicable certificates of exemption.

§ 3.7 Permits, Fees, Notices and Compliance with Laws

§ 3.7.1 Except for the permits identified in 3.7.1.1, and unless otherwise provided in the Contract Documents, the Contractor shall secure and pay for the building permit as well as for other permits, fees, inspections, tap fees, and capacity charges 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 the Agreement is executed. The Contractor or Subcontractor shall obtain, maintain, and pay for any license applicable to the Contractor's or Subcontractor's particular trade.

§ 3.7.1.1 The Owner or Owner's representative shall secure the required structural, plumbing, HVAC, electrical plan approvals, and the National Pollutant Discharge Elimination System ("NPDES") Storm Water general permit.

§ 3.7.1.2 The Contractor shall schedule and attend all intermediate and final inspections required for any permit applicable to the Work. The Contractor shall schedule the State Fire Marshal or local fire authority for the life safety inspection for occupancy permits. The Contractor shall pay for any reinspection required as a result of the Contractor's failure to receive approval of its work. The Contractor shall give the Architect and Owner reasonable notice of the dates and times for all inspections.

§ 3.7.2 The Contractor shall comply with and give notices required by applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders and all other requirements of public authorities applicable to performance of the Work.

§ 3.7.3 In addition to its other obligations under the Contract Documents, if the Contractor or any of its Subcontractors or Sub-subcontractors performs Work knowing it to be contrary to applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders and all other requirements 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

Subject to Section 2.3.4 of these General Conditions, and except as provided herein, if the Contractor encounters conditions at the site that are (1) subsurface or otherwise concealed physical conditions that differ materially from those indicated in the Contract Documents or (2) unknown physical conditions of an unusual nature that differ materially from those ordinarily found to exist and generally recognized as inherent in construction activities of the character provided for in the Contract Documents, the Contractor shall promptly provide notice to the Owner and the Architect before conditions are disturbed and in no event later than 14 days after first observance of the conditions. The Architect will promptly investigate such conditions and, if the Architect determines that they differ materially and cause an increase or decrease in the Contractor's cost of, or time required for, performance of any part of the Work, will recommend that an equitable adjustment be made in the Contract Sum or Contract Time, or both. If the Architect determines that the conditions at the site are not materially different from those indicated in the Contract Documents and that no change in the terms of the Contract is justified, the Architect shall promptly notify the Owner and Contractor in writing, stating the reasons. If either party disputes the Architect's determination or recommendation, that party may submit a Claim as provided in Article 15.

§ 3.7.5 If, in the course of the Work, the Contractor encounters human remains or recognizes the existence of burial markers, archaeological sites or wetlands not indicated in the Contract Documents, the Contractor shall immediately suspend any operations that would affect them and shall notify the Owner and Architect. Upon receipt of such notice, the Owner shall promptly take any action necessary to obtain governmental authorization required to resume

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the operations. The Contractor shall continue to suspend such operations until otherwise instructed by the Owner but shall continue with all other operations that do not affect those remains or features. Requests for adjustments in the Contract Sum and Contract Time arising from the existence of such remains or features may be made as provided in Article 15.

§ 3.8 Allowances

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

§ 3.8.2 Unless otherwise provided in the Contract Documents,

- **.1** allowances shall cover the cost to the Contractor of materials and equipment delivered at the site and all required taxes, less applicable trade discounts;
- **.2** Contractor's costs for unloading and handling at the site, labor, installation costs, overhead, profit, and other expenses contemplated for stated allowance amounts shall be included in the Contract Sum and shall not be chargeable against the allowance; 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 the difference between actual costs and the allowances under Section 3.8.2.1 which shall be retained by the Owner. The Contractor shall timely seek and obtain a Change Order before incurring any costs in excess of an allowance.

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

§ 3.9 Superintendent & Construction Supervision

§ 3.9.1 The Contractor shall employ a competent superintendent and necessary assistants who shall be in attendance at the Project site during performance of the Work. The superintendent shall represent the Contractor, and communications given to the superintendent shall be as binding as if given to the Contractor.

§ 3.9.2 The Contractor, as soon as practicable after award of the Contract, shall furnish in writing to the Owner and the Architect of the name and qualifications of a proposed superintendent in writing. Within 14 days of receipt of the information, the Architect may notify the Contractor, stating (1) whether the Owner or the Architect has reasonable objection to the proposed superintendent or (2) that the Architect requires additional time for review. Failure of the Architect to provide notice within the 14-day period shall constitute notice of no reasonable objection.

§ 3.9.3 The Contractor shall not employ a proposed superintendent to whom the Owner or Architect has made reasonable and timely objection. The Contractor shall not replace the assigned Superintendent without the Owner's consent, except with another Superintendent who is satisfactory to the Owner. If the Contractor proposes to change the Superintendent, the Contractor must submit to the Architect a written request for the change, including the justification for the change, the name and qualifications for the proposed replacement, and the time frame within which the change is proposed to take place. The Contractor shall provide promptly any related additional information the Architect or Owner requests.

§ 3.10 Contractor's Construction and Submittal Schedules

§ 3.10.1 The Contractor, within five (5) days of the date of any request from the Architect or the Owner to submit scheduling information, shall submit the scheduling information for its Work to the Architect and to the Owner in such form and in such detail as requested. The Contractor shall prepare the Construction Schedule within 10 days after the Effective Date. The Construction Schedule shall include and be consistent with any applicable Milestone Dates in the Contract Documents or otherwise provided by the Owner. The Contractor shall prepare all Construction Schedules in CPM format unless provided otherwise in the Contract Documents or otherwise agreed in writing by the Owner. Each major category of work shall be shown separately in the Construction Schedule with all the significant activities involved, showing durations of time, manpower requirements, and restraints. The Construction Schedule is for the purpose of coordinating the timing, phasing, and sequence of the Work of the Contractor and shall not change or modify the Date for Substantial Completion or the Date for Final Completion. The Date for Substantial Completion or the Date for Final Completion shall only be changed or modified by Change Order, other Modification, or a Claim that is Finally Resolved, regardless of the dates in the Construction Schedule.

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.1 The Contractor shall update the Construction Schedule each month;

.2 The Construction Schedule shall be manpower loaded and shall include a schedule of the submission of Shop Drawings, Product Data, and Samples;

.3 The Contractor shall, on a weekly basis, prepare and submit to the Architect and Owner a written report describing the activities begun or finished during the preceding week, Work in progress, expected completion of the Work, a look-ahead projection of all activities to be started or finished in the upcoming two (2) weeks, including without limitation the Contractor's workforce crew size and total resource hours associated with such Work and any other information requested;

.4 The float in the Construction Schedule and any updates to it shall belong to the Owner. Float shall mean the amount of time by which activities may be delayed without affecting the Contract Date for Substantial Completion; and

.5 The Contractor's obligation to submit requested scheduling information is a material term of its Contract. If the Contractor fails to submit requested scheduling information in writing within five (5) days of a request for such information from the Architect or Owner, the Contractor shall pay and the Owner may withhold from the Contractor Liquidated Damages at the rate of Fifty Dollars ($50.00) a day for each calendar day thereafter that the Contractor fails to submit the requested information.

§ 3.10.2 The Contractor, promptly after being awarded the Contract and thereafter as necessary to maintain a current submittal schedule, shall prepare and submit the submittal schedule(s) for the Architect's approval. The Architect's approval shall not be unreasonably delayed or withheld. The submittal schedule shall (1) be coordinated with the Contractor's construction schedule, and (2) allow the Architect reasonable time to review submittals. If the Contractor fails to submit a submittal schedule, or fails to provide submittals in accordance with the approved submittal schedule, the Contractor shall not be entitled to any increase in Contract Sum or extension of Contract Time based on the time required for review of submittals.

§ 3.10.3 The Contractor shall perform the Work in accordance with the most recent Construction Schedule submitted to the Owner and Architect, provided that the Contractor shall comply with any orders under Section 3.10.4. However, preparation of such schedule shall not constitute a waiver of the Owner's rights under the Contract to have the Work completed by the contractual dates of Substantial and Final Completion.

.1 **Notice of Delays.** The Contractor shall give the Owner and the Architect verbal notice of any delay affecting the Work within two (2) business days of the commencement of the delay. In addition, the Contractor shall give the Owner and Architect written notice of the delay within ten (10) business days of the commencement of the delay with specific recommendations about how to minimize the effect of the delay. The written notice of the delay shall conspicuously state at the top of the first page of the notice in twelve point type or larger that it is a **"NOTICE OF DELAY."** A notice of delay shall not constitute the submission of a Claim. The Contractor acknowledges and agrees that these notice provisions are material terms of the Contract Documents and give the Owner the opportunity to take action to minimize the cost and/or effect of delays.

§ 3.10.4 If the Architect or the Owner determines that the performance of the Work has not progressed so that it is likely that the Contractor will not Substantially Complete its Work by its Date of Substantial Completion, the Owner shall have the right to order the Contractor to take corrective measures necessary to expedite the Work, including, without limitation: (i) working additional shifts or overtime; (ii) supplying additional manpower, supervision, equipment, and facilities; and (iii) other similar measures (collectively referred to as "Corrective Measures"). If the Owner orders the Contractor to take such corrective measures, the Contractor shall take and continue such Corrective Measures until the Owner is satisfied that the Contractor is likely to Substantially Complete its Work by its Date for Substantial Completion.

.1 The Contractor shall not be entitled to adjustment in the Contract Sum in connection with the Corrective Measures required by the Owner pursuant to this Section 3.10.4, unless the Contractor is able to establish that it is entitled to additional compensation under the terms of the Contract Documents.

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§ 3.11 Documents and Samples at the Site

The Contractor shall maintain at the Project site for the Owner and the Architect the documents required by Section 3.3.4. These shall be in electronic form or paper copy, available to the Architect and Owner, and shall be delivered to the Architect in the form requested by the Owner for submittal to the Owner upon completion of the Work as a record of the Work or earlier when required by the Contract Documents.

§ 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. Shop Drawings shall also include but are not limited to, fabrication, erection and setting Drawings, scheduled Drawings, manufacturer's scale Drawings, wiring and control diagrams, cuts or entire catalogs, pamphlets, descriptive literature, performance, and technical data.

§ 3.12.2 Product Data are illustrations, standard schedules, performance charts, instructions, brochures, diagrams, and other information furnished by the Contractor to illustrate materials or equipment for some portion of the Work.

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

§ 3.12.4 Shop Drawings, Product Data, Samples, and similar submittals are not Contract Documents. Their purpose is to demonstrate how the Contractor proposes to conform to the information given and the design concept expressed in the Contract Documents for those portions of the Work for which the Contract Documents require submittals. Review by the Architect is subject to the limitations of Section 4.2.7. Informational submittals upon which the Architect is not expected to take responsive action may be so identified in the Contract Documents. Submittals that are not required by the Contract Documents may be returned by the Architect without action.

§ 3.12.5 The Contractor shall review for compliance with the Contract Documents, approve, and submit to the Architect, Shop Drawings, Product Data, Samples, and similar submittals required by the Contract Documents, in accordance with the submittal schedule approved by the Architect or, in the absence of an approved submittal schedule, with reasonable promptness and in such sequence as to cause no delay in the Work or in the activities of the Owner or of Separate Contractors.

.1 If the Shop Drawings or other submittals show variations from the requirements of the Contract Documents, the Contractor shall specify such variations in the Contractor's letter of submittal to the Architect accompanying the submittal. Variations must be approved by Change Order.

.2 If the Contractor's Shop Drawings or its submittals do not contain sufficient information, and the Architect must perform more than two reviews with respect to any submittal, the Contractor shall pay the additional costs and expenses incurred by the Owner as a result of such additional reviews by the Architect, and the Owner may withhold from sums due or coming due the Contractor amounts to cover such additional costs and expenses.

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

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

§ 3.12.8 The Work shall be in accordance with approved submittals except that the Contractor shall not be relieved of responsibility for deviations from the requirements of the Contract Documents by the Architect's approval of Shop Drawings, Product Data, Samples, or similar submittals, unless the Contractor has specifically notified the Architect in 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

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authorizing the deviation. The Contractor shall not be relieved of responsibility for errors or omissions in Shop Drawings, Product Data, Samples, or similar submittals, by the Architect's approval thereof.

§ 3.12.9 The Contractor shall direct specific attention, in writing or on resubmitted Shop Drawings, Product Data, Samples, or similar submittals, to revisions other than those requested by the Architect on previous submittals. In the absence of such written 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 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 cause such services or certifications to be provided by a properly licensed design professional who shall comply with reasonable requirements of the Owner regarding qualifications and insurance and whose signature and seal shall appear on all drawings, calculations, specifications, certifications, Shop Drawings, and other submittals prepared by such professional. Shop Drawings, and other submittals related to the Work, designed or certified by such professional, if prepared by others, shall bear such professional's written approval when submitted to the Architect. The Owner and the Architect shall be entitled to rely upon the adequacy, accuracy, and completeness of the services, certifications, and approvals performed or provided by such design professionals. 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 Contractor shall not be responsible for the adequacy of the performance and design criteria specified in the Contract Documents.

§ 3.12.10.2 If the Contract Documents require the Contractor's design professional to certify that the Work has been performed in accordance with the design criteria, the Contractor shall furnish such certifications to the Architect at the time and in the form specified by the Architect.

§ 3.12.11 Instructions. Unless otherwise expressly provided in the Contract Documents, the Contractor shall provide typed or printed instructions covering the operation and maintenance of each item of equipment furnished in a notebook submitted to the Architect for review and transmittal to the Owner. The instructions, as applicable, shall include, but may not be limited to, the following:

.1 Any schematic piping and wiring diagrams;
.2 Any valve charts and schedules;
.3 Any lubrication charts and schedules;
.4 Guides for troubleshooting;
.5 Pertinent diagrams and maintenance instructions for all equipment;
.6 Manufacturer's parts list;
.7 Operating and maintenance instructions for all equipment;
.8 Manufacturer's data on all equipment;
.9 Any testing procedures for operating tests; and
.10 Other instructions and materials as required by the Contract Documents.

The Contractor shall provide two bound copies of the above instruction books as well as electronic copies in PDF or other format acceptable to the Owner, on or before the Substantial Completion of its Work. The books shall describe the information to be covered clearly and in detail and shall be in form and content satisfactory to the Architect and the Owner.

§ 3.12.12 Testing Following Final Completion. The Contractor will participate in training sessions for the Owner's maintenance personnel. During the first twelve (12) months following Final Completion of each part of the Project, the Contractor (without additional compensation) will participate in tests scheduled by the Owner, which test the following building systems to the extent applicable to the Contractor's Work; air conditioning system (which shall

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be conducted during the first full summer following the completion of the Project or at such earlier time as scheduled by the Owner), heating system (which shall be conducted during the first full winter following the completion of the Project or at such earlier time as scheduled by the Owner), and such other systems, including the electrical system, plumbing system, fire protection system, and communications systems, as reasonably requested by the Owner. The Owner will be advised when the testing will be conducted and may observe the testing. It is intended that the testing be a comprehensive series of operation tests designed to determine whether the systems are fully operational in accordance with the requirements of the Contract Documents. If it appears that any of the systems, including equipment and software, do not conform to the requirements of the Contract Documents, the Contractor will remedy the defective and/or non-conforming work as provided in Section 12.2.2.1 of these General Conditions.

§ 3.12.13 Manufacturer's Instructions or Requirements. Without waiving, modifying, or relieving the Contractor from its other obligations under the Contract Documents, including its warranties and any performance specifications, the Contractor shall furnish and install its Work in accordance with any applicable manufacturer's instructions and requirements. Prior to installation, the Contractor shall review the manufacturer's instructions or requirements, and if there is a conflict between such instructions or requirements and the Drawings and/or Specifications, the Contractor shall request clarification from the Architect prior to commencing the Work.

§ 3.12.14 The Contractor shall furnish for each submission of Shop Drawings, a sufficient number of prints so the Architect can retain four (4) copies. Where the nature of the material being submitted is such that letter size sheets are a convenient method of presentation, such sheets shall be assembled in the form of booklets with covers showing the name of the job, the names of the Contractor and subcontractor or vendor, the location on the job and a list of the sheets contained. Do not submit complete catalogues with items checked for use as shop drawings.

§ 3.12.15 After review of the submittal, the Architect will return an original of each submission to the Contractor marked "approved" or "not approved" and shall furnish promptly one copy in either case to the Owner for information and reference purposes on the job. If marked "not approved," the Contractor shall resubmit showing corrections made. After the submission has been stamped "approved," the Contractor shall distribute all necessary prints to trades involved. No Shop Drawings shall be used if not stamped "approved" by the Architect. All work shall be done in accordance with approved Shop Drawings.

§ 3.12.16 Schedules, diagrams, cuts, catalogues, data, etc., as mentioned in this Section 3.12, shall be furnished in sufficient numbers so the Architect can retain four (4) copies and the Contractor will have the necessary number for its distribution. One copy of each of these shall be furnished to the Owner by the Architect for reference on the job and for its permanent records.

§ 3.12.17 All Contractors furnishing material or equipment where shop or setting drawings are required shall obtain measurements and observe conditions at the job and indicate on their drawings that such dimensions have been field measured. The Contractor shall affix its stamp of approval on the drawings as evidence they have been checked before submitting them to the Architect for approval. Where information from one Contractor is required by another before drawings can be made, that information shall be given in sufficient time to cause no delay on the part of either party.

§ 3.12.18 The Contractor shall maintain a separate complete clean set of all shop drawings, data, and correspondence pertinent to maintenance requirement. This complete file shall be submitted to the Owner upon Substantial Completion. Drawings shall contain all changes made during construction.

§ 3.12.19 The Contractor shall keep a complete record of all drawings including dates of issuance, receipt, and approval. A second set shall be maintained at the Project job site.

§ 3.12.20 When the Contractor requests a change in any item which will involve a change in related items or components, the Contractor requesting the change shall be responsible for, and pay all costs in connection with such changes. Changes shall be recorded on shop
drawings.

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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, rules and regulations, lawful orders and all other requirements of public authorities, and the Contract Documents and shall not unreasonably encumber the site with materials or equipment.

§ 3.13.1.1 Damage to road, features, or the grounds, resulting from hauling, storage of materials, or other activities connected with the Work, will be repaired by the Contractor at its expense to the satisfaction of the Architect.

§ 3.13.2 Signage. The Contractor and any entity for whom the Contractor is responsible shall not erect any sign on the Project site without the prior written consent of the Owner, which may be withheld in the sole discretion of the Owner.

§ 3.13.3 Restricted Activities. Unless expressly permitted by the Contract Documents or by the Owner in writing, the Contractor shall not interfere with the Owner's ongoing operations, shall not permit any of its employees or its Subcontractor's or materialmen's employees to use any existing facilities on the Project site, including, without limitation, lavatories, toilets, entrances, and parking areas, and shall not permit its employees or its Subcontractor's or materialmen's employees to bring any tobacco products, alcoholic beverages, controlled substances, or firearms onto the Project site or any other property owned or controlled by the Owner. Additionally, the Contractor shall not permit its employees or its Subcontractor's or materialmen's employees to use any headphones, radios, tape, or music players, or sound amplification equipment at or near the Project site.

§ 3.13.4 The Contractor shall conspicuously post notice of the prohibitions listed in the preceding subparagraphs at the Project site in the same locations as OSHA notices are required to be posted, and shall verbally inform all of the Contractor's employees and the employees of the Contractor's Subcontractors and materialmen, regardless of tier, of such
prohibitions.

§ 3.14 Cutting and Patching

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

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

§ 3.14.3 Patching resulting from operations of any Contractor shall be performed by workers skilled in the trade being patched, and paid for by the Contractor causing such patching.

§ 3.15 Cleaning Up

§ 3.15.1 The Contractor shall keep the premises and surrounding area free from accumulation of waste materials and rubbish caused by operations under the Contract. At completion of the Work, the Contractor shall remove waste materials, rubbish, the Contractor's tools, construction equipment, machinery, and surplus materials from and about the Project. At weekly intervals and as directed by the Owner, the Contractor shall clean up the job. The Contractor shall remove all discarded materials, rubbish, and debris from the premises, taking care to avoid scattering debris along the path of travel. The Contractor shall have a dumpster on the site so as to maintain clean and safe conditions throughout the duration of the Project.

§ 3.15.2 If the Contractor fails to clean up as provided in the Contract Documents, the Owner may do so and the Owner shall be entitled to reimbursement from the Contractor. The Architect's determination of the costs to be charged to the Contractor shall be final and binding.

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§ 3.16 Access to Work

The Contractor shall provide the Owner and Architect with access to the Work in preparation and progress wherever located. The Contractor is responsible to provide necessary and proper facilities for such access and observation and to provide access to the Work in preparation and progress for special inspections required by the building department or authority having jurisdiction.

§ 3.17 Royalties, Patents and Copyrights

The Contractor shall pay all royalties and license fees. The Contractor shall defend suits or claims for infringement of copyrights and patent rights and shall hold the Owner and Architect harmless from loss on account thereof, but shall not be responsible for such defense or loss when a particular design, process, or product of a particular manufacturer or manufacturers is required by the Contract Documents, or where the copyright violations are contained in Drawings, Specifications, or other documents prepared by the Owner or Architect. However, if the Contractor has reason to believe that the required design, process, or product is an infringement of a copyright or patent, the Contractor shall be responsible for the loss unless the information is promptly furnished to the Architect.

§ 3.18 Indemnification

§ 3.18.1 To the fullest extent permitted by law, the Contractor shall indemnify, defend, and hold harmless the Owner, Architect, Architect's consultants, and the officers, directors, partners, consultants, subcontractors, agents, and employees of any of them from and against claims (whether alleged or proven), demands, costs, losses, and/or damages, including but not limited to all fees and charges of architects, engineers, attorneys, and other professionals and all court, arbitration, or other dispute resolution costs, arising out of or relating to any claim or action, legal or equitable, caused or alleged to have been caused by the Contractor's performance of the Work, including but not limited to the Contractor's negligent performance of the Work, or any breach of the Contractor's obligations under the Contract Documents, including but not limited to the breach of any warranty provided in the Contract Documents.

§ 3.18.2 In claims against any person or entity indemnified under this Section 3.18 by an employee of the Contractor, a Subcontractor, anyone directly or indirectly employed by them, or anyone for whose acts they may be liable, the indemnification obligation under Section 3.18.1 shall not be limited by a limitation on amount or type of damages, compensation, or benefits payable by or for the Contractor or a Subcontractor under workers' compensation acts, disability benefit acts, or other employee benefit acts.

§ 3.19 Compliance with Demolition Laws

The Contractor will, at the Contractor's expense, fully comply with all statutes and regulations regarding notification and disposal of construction and demolition debris, including, without limitation, Ohio Revised Code Chapter 3714 and the regulations enacted thereunder.

§ 3.20 Underground Utility Facilities

§ 3.20.1 The Contractor, at least two (2) working days prior to commencing any construction in an area that may involve underground utility facilities, shall give notice to the Architect and the Owner and to the registered underground utility protection services and the owners of underground utility facilities shown on the Drawings and Specifications.

§ 3.20.2 The Contractor shall notify immediately the occupants of any premises near the Work and the Architect and the Owner as to any emergency that it may create or discover. The Contractor shall notify immediately the operator of any underground utilities and the Architect and Owner of any break or leak in the lines of such operator or any dent, gouge, groove, or other damage to such lines or to their rating or cathodic protection, made or discovered in the course of excavation.

§ 3.21 Records and Audits

The Contractor shall keep full and detailed accounts and exercise such controls as may be necessary for proper financial management under the Agreement; the accounting and control systems shall be satisfactory to the Owner. The Owner and the Owner's accountants shall be afforded access to review and audit the Contractor's records, books, correspondence, instructions, drawings, receipts, subcontracts, purchase orders, vouchers, memoranda, timesheets, payroll, and other data relating to this Project, records of time spent by each person performing work on the Project, and time spent on all other projects; such time and payroll records shall include the location of services,

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detailed description of time and work on this Project and any other projects (redacting the client name or description to the extent necessary) and the Contractor shall preserve these for a period of four (4) years after final payment, or for such longer period as may be required by law.

The Contractor shall make all such records, books, correspondence, instructions, drawings, receipts, subcontracts, purchase orders, vouchers, memoranda, timesheets, payroll, and other data relating to this Project, available to the Owner and the Owner's accountants in a location designated by the Owner at the time of the Owner's request. In the event that the Contractor's records are not available at the agreed upon time or place, or in the event that the Owner finds incomplete records or inaccurate accounting of paid expenses, the Contractor shall reimburse the Owner for its time, travel, and related expenses, and the Contractor shall reimburse the Owner the full amount of any discrepancies or overages.

ARTICLE 4 ARCHITECT

§ 4.1 General

§ 4.1.1 The Architect is the person or entity retained by the Owner pursuant to Section 2.3.2 and identified as such in the Agreement.

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

§ 4.2 Administration of the Contract

§ 4.2.1 The Architect will provide administration of the Contract as described in the Contract Documents and the Owner's agreement with the Architect and will be an Owner's representative during construction until the date the Architect issues the final Certificate for Payment and for such additional periods as the Owner and Architect may agree. The Architect will have authority to act on behalf of the Owner only to the extent provided in the Contract Documents and as authorized by the Owner.

§ 4.2.2 The Architect will visit the site at intervals appropriate to the stage of construction, or as otherwise agreed with the Owner, to become generally familiar with the progress and quality of the portion of the Work completed, and to determine in general if the Work observed is being performed in a manner indicating that the Work, when fully completed, will be in accordance with the Contract Documents. However, the Architect will not be required to make exhaustive or continuous on-site inspections to check the quality or quantity of the Work. The Architect will not have control over, charge of, or responsibility for the construction means, methods, techniques, sequences or procedures, or for the safety precautions and programs in connection with the Work, since these are solely the Contractor's rights and responsibilities under the Contract Documents.

§ 4.2.3 If required in the Owner's agreement with the Architect, on the basis of the site visits, the Architect will keep the Owner reasonably informed about the progress and quality of the portion of the Work completed, and promptly report to the Owner (1) known deviations from the Contract Documents, (2) known deviations from the most recent construction schedule submitted by the Contractor, and (3) defects and deficiencies observed in the Work. The Architect will not be responsible for the Contractor's failure to perform the Work in accordance with the requirements of the Contract Documents. The Architect will not have control over or charge of, and will not be responsible for acts or omissions of, the Contractor, Subcontractors, or their agents or employees, or any other persons or entities performing portions of the Work.

§ 4.2.4 Communications Facilitating Contract Administration

Except as otherwise provided in the Contract Documents or when direct communications have been specially authorized, the Owner and Contractor shall endeavor to communicate with each other through the Architect about matters arising out of or relating to the Contract. Communications by and with the Architect's consultants shall be through the Architect. Communications by and with Subcontractors and material suppliers shall be through the Contractor. Communications by and with Separate Contractors under contract directly with the Owner shall be through the Owner.

§ 4.2.5 Based on the Architect's evaluations of the Contractor's Applications for Payment, the Architect will review and certify the amounts that are due the Contractor and will issue Certificates for Payment in such amounts.

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§ 4.2.6 The Architect has authority to reject Work that does not conform to the Contract Documents. Whenever the Architect considers it necessary or advisable, the Architect will have authority to require inspection or testing of the Work in accordance with Sections 13.4.2 and 13.4.3, whether or not such Work is fabricated, installed or completed. However, neither this authority of the Architect nor a decision made in good faith either to exercise or not to exercise such authority shall give rise to a duty or responsibility of the Architect to the Contractor, Subcontractors, material and equipment suppliers, their agents or employees, or other persons or entities performing portions of the Work.

§ 4.2.7 If required in the Owner's agreement with the Architect, the Architect will review and approve, or take other appropriate action upon, the Contractor's submittals such as Shop Drawings, Product Data, and Samples, but only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents. The Architect's action will be taken in accordance with the submittal schedule approved by the Architect or, in the absence of an approved submittal schedule, with reasonable promptness while allowing sufficient time in the Architect's professional judgment to permit adequate review. Review of such submittals is not conducted for the purpose of determining the accuracy and completeness of other details such as dimensions and quantities, or for substantiating instructions for installation or performance of equipment or systems, all of which remain the responsibility of the Contractor as required by the Contract Documents. The Architect's review of the Contractor's submittals shall not relieve the Contractor of the obligations under Sections 3.3, 3.5, and 3.12. The Architect's review shall not constitute approval of safety precautions or, unless otherwise specifically stated by the Architect, of any construction means, methods, techniques, sequences, or procedures. The Architect's approval of a specific item shall not indicate approval of an assembly of which the item is a component.

§ 4.2.8 The Architect will prepare Bulletins, Change Orders, and Construction Change Directives, and may authorize minor changes in the Work as provided in Section 7.4. The Architect will investigate and make determinations and recommendations regarding concealed and unknown conditions as provided in Section 3.7.4.

§ 4.2.9 The Architect will conduct inspections to determine the date or dates of Substantial Completion and the Date of Final Completion; issue Certificates of Substantial Completion pursuant to Section 9.8; receive and forward to the Owner, for the Owner's review and records, written warranties and related documents required by the Contract and assembled by the Contractor pursuant to Section 9.10; and execute and distribute a final Certificate for Payment pursuant to Section 9.10.

§ 4.2.10 If the Owner and Architect agree, the Architect will provide one or more Project representatives to assist in carrying out the Architect's responsibilities at the site. The duties, responsibilities and limitations of authority of such Project representatives shall be consistent with these General Conditions.

§ 4.2.11 The Architect will interpret and decide matters concerning performance under, and requirements of, the Contract Documents on written request of either the Owner or Contractor. The Architect's response to such requests will be made in writing within any time limits agreed upon or otherwise with reasonable promptness. Copies of all Requests for Information shall be copied to the Owner by the Contractor at the time they are submitted to the Architect.

§ 4.2.12 Interpretations and decisions of the Architect will be consistent with the intent of, and reasonably inferable from, the Contract Documents and will be in writing or in the form of drawings. When making such interpretations and decisions, the Architect will endeavor to secure faithful performance by both Owner and Contractor, will not show partiality to either, and will not be liable for results of interpretations or decisions rendered in good faith.

§ 4.2.13 The Architect's decisions on matters relating to aesthetic effect will be final as to the Contractor if consistent with the intent expressed in the Contract Documents.

§ 4.2.14 The Architect will review and respond to requests for information about the Contract Documents. The Architect's response to such requests will be made in writing within any time limits agreed upon or otherwise with reasonable promptness. If appropriate, the Architect will prepare and issue supplemental Drawings and Specifications in response to the requests for information. If no agreement is made concerning the time within which interpretations required of the Architect shall be furnished in compliance with this Section 4.2, then delay shall not be recognized on account of failure by the Architect to furnish such interpretations until 15 days after written request is made for them and the Contractor establishes the Architect's delay in responding delayed the critical path of the

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Work. In its requests for information, the Contractor shall clearly identify the number of business days for the Architect to review and respond without any potential impact to the critical path or potential delay.

ARTICLE 5 SUBCONTRACTORS

§ 5.1 Definitions

§ 5.1.1 A Subcontractor is a person or entity who has a direct contract with the Contractor to perform a portion of the Work at the site. The term "Subcontractor" is referred to throughout the Contract Documents as if singular in number and means a Subcontractor or an authorized representative of the Subcontractor. The term "Subcontractor" does not include a Separate Contractor or the subcontractors of a Separate Contractor.

§ 5.1.2 A Sub-subcontractor is a person or entity who has a direct or indirect contract with a Subcontractor to perform a portion of the Work at the site. The term "Sub-subcontractor" is referred to throughout the Contract Documents as if singular in number and means a Sub-subcontractor or an authorized representative of the Sub-subcontractor.

§ 5.2 Award of Subcontracts and Other Contracts for Portions of the Work

§ 5.2.1 Unless otherwise stated in the Contract Documents or the bidding requirements, the Contractor, as soon as practicable after award of the Contract, shall notify the Owner and the Architect of the persons or entities proposed for each principal portion of the Work, including those who are to furnish materials or equipment fabricated to a special design. Within 14 days of receipt of the information, the Architect may notify the Contractor whether the Owner or the Architect (1) has reasonable objection to any such proposed person or entity or (2) requires additional time for review. Failure of the Architect to provide notice within the 14-day period shall constitute notice of no reasonable objection.

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

§ 5.2.3 If the Owner or Architect has an objection to a person or entity proposed by the Contractor, the Contractor shall propose within 10 days another to whom the Owner or Architect has no objection. If the proposed but rejected Subcontractor was reasonably capable of performing the Work, the Contract Sum and Contract Time shall be increased or decreased by the difference, if any, occasioned by such change, and an appropriate Change Order shall be issued before commencement of the substitute Subcontractor's Work. However, no increase in the Contract Sum or Contract Time shall be allowed for such change unless the Contractor has acted promptly and responsively in submitting names as required.

§ 5.2.4 The Contractor shall not substitute a Subcontractor, person, or entity for one previously selected if the Owner or Architect objects to such substitute. The Owner, through the Architect, may require the Contractor to change any Subcontractor previously approved and, except as provided hereafter, the Contract Sum shall be increased or decreased by the difference in cost resulting from such change. If the Contractor is in default because of the Subcontractor's performance, then the Contractor shall not be entitled to any adjustment in the Contract Sum and shall remain liable to the Owner for any damages or losses caused by such default.

§ 5.3 Subcontractual Relations

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

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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 in writing; and

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

(Paragraph Deleted)

§ 5.4.2 Upon such assignment, if the Work has been suspended for more than 30 days, the Subcontractor's compensation shall be equitably adjusted for increases in direct costs incurred by the Subcontractor resulting from the suspension.

§ 5.4.3 Upon assignment to the Owner under this Section 5.4, the Owner may further assign the subcontract to a successor contractor or other entity.

ARTICLE 6 CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS

§ 6.1 Owner's Right to Perform Construction and to Award Separate Contracts

§ 6.1.1 The term "Separate Contractor(s)" shall mean other contractors retained by the Owner under separate agreements. The Owner reserves the right to perform construction or operations related to the Project with the Owner's own forces, and with Separate Contractors retained by Owner. If the Contractor claims that delay or additional cost is involved because of such action by the Owner, the Contractor shall make such Claim as provided in Article 15.

§ 6.1.2 When separate contracts are awarded for different portions of the Project or other construction or operations on the site, the term "Contractor" in the Contract Documents in each case shall mean the Contractor who executes each separate Owner-Contractor Agreement.

§ 6.1.3 The Owner shall coordinate the activities of the Owner's own forces and of each Separate Contractor, if any, with the Work of the Contractor, who shall cooperate with them. The Contractor shall participate with any Separate Contractors and the Owner in reviewing their construction schedules. The Contractor shall make any revisions to its construction schedule deemed necessary after a joint review and approval by Owner. The construction schedules shall then constitute the schedules to be used by the Contractor. However, the Date of Substantial Completion or Date of Final Completion shall only be changed or modified by written, executed Modifications to the Contract Time, as provided in the Contract Documents, regardless of the dates in the Construction Schedule.

§ 6.1.4 Unless otherwise provided in the Contract Documents, when the Owner performs construction or operations related to the Project with the Owner's own forces or with Separate Contractors, the Owner or its Separate Contractors shall be deemed to be subject to the same obligations and to have the same rights that apply to the Contractor under the Conditions of the Contract, including, without excluding others, those stated in Article 3, this Article 6, and Articles 10, 11, and 12.

§ 6.2 Mutual Responsibility

§ 6.2.1 The Contractor shall afford the Owner and Separate Contractors reasonable opportunity for introduction and storage of their materials and equipment and performance of their activities, and shall connect and coordinate the Contractor's construction and operations with theirs as required by the Contract Documents.

§ 6.2.2 If part of the Contractor's Work depends for proper execution or results upon construction or operations by the Owner or a Separate Contractor, the Contractor shall, prior to proceeding with that portion of the Work, promptly report to the Architect apparent discrepancies or defects in the construction or operations by the Owner or Separate Contractor that would render it unsuitable for such proper execution and results of the Contractor's Work. Failure of the Contractor to so report shall constitute an acknowledgment that the Owner's or Separate Contractor's

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completed or partially completed construction is fit and proper to receive the Contractor's Work, except as to defects not then reasonably discoverable.

§ 6.2.3 [Not Used.]

§ 6.2.4 The Contractor shall promptly remedy damage that the Contractor wrongfully causes to completed or partially completed construction or to property of the Owner or Separate Contractor as provided in Section 10.2.5.

§ 6.2.5 The Owner and each Separate Contractor, if any, shall have the same responsibilities for cutting and patching as are described for the Contractor in Section 3.14.

§ 6.3 Owner's Right to Clean Up

If a dispute arises among the Contractor, Separate Contractors, and the Owner as to the responsibility under their respective contracts for maintaining the premises and surrounding area free from waste materials and rubbish, the Owner may clean up and the Architect will allocate the cost among those responsible. The Architect's decision allocating the cost shall be final and binding on the Contractor and the Owner.

ARTICLE 7 CHANGES IN THE WORK

§ 7.1 General

§ 7.1.1 Changes in the Work may be accomplished after execution of the Contract, and without invalidating the Contract, by Change Order, Construction Change Directive or order for a minor change in the Work, subject to the limitations stated in this Article 7 and elsewhere in the Contract Documents. To be valid, all changes involving an increase in the Contract Sum must have any required funding certificates attached to them.

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

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

§ 7.1.4 All such Changes in the Work shall be submitted with any required backup documentation to the Owner and Architect in writing in advance of performance of the Work and must be approved by the Owner in writing prior to commencement of the Work.

§ 7.2 Change Orders

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

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

§ 7.2.2 Methods used in determining adjustments to the Contract Sum may include those listed in Section 7.3.3. Notwithstanding the method used to determine the adjustment to the Contract Sum, the Contractor must provide documentation to support any cost included in the request. Documentation may include invoices and time records related to the costs, but must be in a form acceptable to the Architect and Owner. Costs included in any Change Order request must be limited to those in Section 7.3.7, unless provided elsewhere in the Contract Documents or agreed to by the Owner and Architect.

§ 7.2.3 The agreement on any Change Order shall constitute a final settlement of all matters relating to the change in the Work that is the subject of the Change Order, including but not limited to, all direct, indirect, and cumulative costs associated with such change and any and all adjustments to the Contract Sum and Contract Time. The Contractor shall not proceed with any change in the Work without a signed Change Order, Construction Change Directive, or Minor Change in the Work notice. The Contractor's failure to timely seek and obtain such authorization as specified herein, shall constitute an irrevocable waiver by the Contractor of an adjustment to the Contract Sum or Contract Time for the related work.

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§ 7.3 Construction Change Directives

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

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

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

.1 Mutual acceptance of a lump sum properly itemized and supported by sufficient substantiating data to permit evaluation;

.2 Unit prices stated in the Contract Documents or subsequently agreed upon;

.3 Subject to a not-to-exceed amount, a 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 7.3.7; or

.5 Except where unit prices are applicable, that the Contractor agrees and represents to the Owner for the Owner's reliance that all Change Order or Change Directive pricing submitted by the Contractor shall be based on the Contractor's actual costs or the Contractor's reasonable estimate of what would be its actual costs plus permitted overhead and profit.

§ 7.3.4 [Not Used.]

§ 7.3.5 Upon receipt of a Construction Change Directive, the Contractor shall promptly proceed with the change in the Work involved and advise the Architect of the Contractor's agreement or disagreement with the method, if any, provided in the Construction Change Directive for determining the proposed adjustment in the Contract Sum or Contract Time.

§ 7.3.6 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.

§ 7.3.7 If the Contractor does not respond promptly or disagrees with the method for adjustment in the Contract Sum, the Architect shall determine the method and 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 a true and accurate itemized accounting of all labor and material with appropriate supporting data. If the Architect prescribes a format for such accounting, the Contractor shall provide the accounting in such format. Unless otherwise provided in the Contract Documents, costs for the purposes of this Section 7.3.7 shall be limited to the following:

.1 Costs of labor, including social security, old age, and unemployment insurance, applicable payroll taxes, fringe benefits required by agreement or custom, and workers' compensation insurance, and other employee costs approved by the Architect. Contractor pricing information shall include the number of hours and rate of pay for each classification of worker;

.2 Costs of materials (including any and all discounts, rebates, or related credits, supplies, and equipment, including cost of transportation, whether incorporated or consumed;

.3 Rental costs of machinery and equipment, exclusive of hand tools, minor equipment, simple scaffolds, etc. whether rented from the Contractor or others. Charges for certain non-owned heavy or specialized equipment may be invoiced at up to 100% of the documented rental cost. The Contractor shall submit copies of actual paid invoices to substantiate rental costs; Charges for certain Contractor-owned, heavy or specialized equipment may be invoiced at up to 100% of the cost listed by the current edition of the Associated Equipment Dealers Green Book rental rates and specifications for construction equipment. No recovery will be allowed for hand tools, minor equipment, simple scaffolds, etc. The longest period of time that the equipment is to be required for the Work shall be

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the basis for the pricing. Downtime due to repairs, maintenance and weather delays should not be allowed;

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

.5 Additional reasonable costs of supervision and field office personnel directly attributable to the change; and

.6 Total cumulative overhead and profit for all Subcontractors and Contractor on any add or deduct Change Order shall not exceed 15% of the total cost of labor and material.

§ 7.3.8 The amount of credit to be allowed by the Contractor to the Owner for a deletion or change order that results in a net decrease in the Contract Sum shall be actual net cost as confirmed by the Architect plus the credit for overhead and profit. 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, or decrease if any, with respect to that change.

§ 7.3.9 Pending final determination of the total cost of a Construction Change Directive to the Owner, the Contractor may request payment for Work completed under the Construction Change Directive in Applications for Payment. The Architect will make an interim determination for purposes of monthly certification for payment for those costs and certify for payment the amount that the Architect determines, in the Architect's professional judgment, to be reasonably justified. The Architect's interim determination of cost shall adjust the Contract Sum on the same basis as a Change Order, subject to the right of either party to disagree and assert a Claim in accordance with Article 15.

§ 7.3.10 When the Owner and Contractor agree with a determination made by the Architect concerning the adjustments in the Contract Sum and Contract Time, or otherwise reach agreement upon the adjustments, such agreement shall be effective immediately and the Architect will prepare a Change Order. Change Orders may be issued for all or any part of a Construction Change Directive.

§ 7.3.11 The Contractor shall not assign any portion of the Work to another contractor whereby the Contractor would benefit directly or indirectly from the double application of charges for overhead and profit.

§ 7.3.12 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.

§ 7.3.13 The Contractor shall not be reimbursed for the following costs:

.1 Employee Profit Sharing Plans regardless of how defined or described, the Contractor will pay these charges from Contractor profit and will not be reimbursed

,2 Voluntary Employee Deductions (e.g., United Way Contributions, U.S. Savings Bonds, etc.)

§ 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 conspicuously marked at the top of the order as a **"MINOR CHANGE IN THE WORK"** and signed by the Architect and shall be binding on the Owner and Contractor. The Contractor shall carry out such written orders promptly. If the Contractor believes that the proposed minor change in the Work will affect the Contract Sum or Contract Time, the Contractor shall notify the Architect and shall not proceed to implement the change in the Work. If the Contractor performs the Work set forth in the Architect's order for a minor change without prior notice to the Architect that such change will affect the Contract Sum or Contract Time, the Contractor waives any adjustment to the Contract Sum or extension of the Contract Time.

ARTICLE 8 TIME

§ 8.1 Definitions

§ 8.1.1 Unless otherwise provided, Contract Time is the period of time, including authorized adjustments, allotted in the Contract Documents for Substantial Completion of the Work.

§ 8.1.2 The Date of Commencement of the Work is the date established in the Agreement.

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§ 8.1.3 The Date of Substantial Completion is the date certified by the Architect in accordance with Section 9.8.

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

§ 8.2 Progress and Completion

§ 8.2.1 Time limits stated in the Contract Documents are of the essence of the Contract. By executing the Agreement, the Contractor confirms that the Contract Time is a reasonable period for performing the Work.

§ 8.2.2 The Contractor shall not knowingly, except by agreement or instruction of the Owner in writing, prematurely commence operations on the site or elsewhere prior to the effective date of insurance required by Article 11 to be furnished by the Contractor and Owner. The Date of Commencement of the Work shall not be changed by the effective date of such insurance.

§ 8.2.3 The Contractor shall proceed expeditiously with adequate forces and shall achieve Substantial Completion within the Contract Time.

§ 8.3 Delays and Extensions of Time

§ 8.3.1 If the Contractor is delayed at any time in the commencement or progress of the Work by an Excusable Delay as set forth in Section 15.1.6.3, then subject to the agreement of the Owner, then the Contract Time shall be extended by Change Order for such reasonable time as the Architect may determine.

§ 8.3.2 Claims relating to time shall be made in accordance with applicable provisions of Article 15.

§ 8.3.3 This Section 8.3 does not preclude recovery of damages for delay by either party under other provisions of the Contract Documents.

ARTICLE 9 PAYMENTS AND COMPLETION

§ 9.1 Contract Sum

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

§ 9.1.2 [Not Used.]

§ 9.2 Schedule of Values

Within 10 days of the Effective Date, the Contractor shall submit a schedule of values to the Architect for the Architect's review and approval, allocating the entire Contract Sum to the various portions of the Work. The Schedule of Values shall be prepared in the form, and supported by the data to substantiate its accuracy, required by the Architect. By submitting such Schedule of Values, the Contractor represents for the reliance of the Architect and the Owner that the allocation of the values to the portions of the Work is a fair and reasonable estimate of such allocation. Once approved, the Contractor will not change the allocations in the Schedule of Values without the Architect's further approval. The Architect may from time to time require the Contractor to adjust such schedule if the Architect determines it to be in any way unreasonable or inaccurate. The Contractor then shall adjust the Schedule of Values as required by the Architect within ten (10) days. This schedule, with any adjustments approved by the Architect shall be used as a basis for reviewing the Contractor's Applications for Payment. Any changes to the Schedule of Values shall be submitted to the Architect and supported by such data to substantiate its accuracy as the Architect may require, and unless objected to by the Architect, shall be used as a basis for reviewing the Contractor's subsequent Applications for Payment. The Contractor shall include a separate line item in its Schedule of Values for its Project Superintendent.

§ 9.2.1 The Contractor will identify in its Schedule of Values a line item entitled "As-Built Drawings and Record Documents." The Scheduled Value for this item will be one and one-half percent (1.5%) of the Contract Sum for contracts with a Contract Sum of $1,000,000 or less, and one percent (1%) of the Contract Sum for contracts with a Contract Sum greater than $1,000,000. When As-Built Drawings and Record Documents are received and reviewed by the Architect, and a letter is forwarded to the Owner affirming the completeness of these documents, these costs may be released. At the Owner's discretion, the costs dedicated to this Scheduled Value may be adjusted to reflect

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adjustments to the Contract Sum due to approved change orders. Unless specifically approved in writing by the Owner, retained funds will not be released until As-Built Drawings and Record Drawings are received, reviewed, and deemed complete by the Architect.

§ 9.3 Applications for Payment

§ 9.3.1 At least three days before the date established in Section 9.3.1.3 for each progress payment, the Contractor shall submit to the Owner and Architect a draft Application for Payment prepared in accordance with the Schedule of Values, if required under Section 9.2, for completed portions of the Work. The draft Application for Payment shall be reviewed and adjusted, if necessary, by the Architect and returned to the Contractor. The Application for Payment, as reviewed and adjusted by the Architect, shall be notarized, if required, and be re-submitted with all the documentation required to be submitted with such Application for Payment, and any other supporting documentation required by the Contract Documents, Contractor's Payment Application Checklist,and by the Architect. The percentage completion of each portion of the Work shall be consistent with the then current Construction Schedule for the Project. The Application for Payment will be in the form and submitted with the number of copies and all related documents as required by the Contract Documents. The Contractor also shall submit with its Application for Payment and such other documents and/or data substantiating the Contractor's right to payment that as Owner or Architect may require, such as copies of requisitions, and releases and waivers of liens from Subcontractors and material suppliers, and shall reflect retainage if provided for in the Contract Documents. The Contractor shall also provide its monthly report detailing the Project's progress to date, projected progress for the next thirty (30) days and current project financial summary, including but not limited to:

.1 The balance of any construction allowances and summary list of how the allowances have been expended to date.

.2 A change order log showing any proposed, pending, and approved change order expenses to date.

.3 Complete breakout showing the total completed and/or stored materials, labor, and equipment on the Project as of the date of the payment application, and anticipated schedule of payment applications detailing projections for the value of completed and/or stored materials, labor, and equipment, month by month, through the end of the Project.

§ 9.3.1.1 As provided in Section 7.3.9, such applications may include requests for payment on account of changes in the Work that have been properly authorized by Construction Change Directives, or by interim determinations of the Architect, but not yet included in Change Orders.

§ 9.3.1.2 Applications for Payment shall not include requests for payment for portions of the Work for which the Contractor does not intend to pay a Subcontractor or supplier, unless such Work has been performed by others whom the Contractor intends to pay.

§ 9.3.1.3 The Contractor shall submit its Application for Payment to the Architect on AIA Documents G-702 and G-703 and Certification or such other format as the Owner specifies, on or before the twenty-fifth (25th) day of each month for Work completed to that date. The Owner will issue payment to the Contractor within thirty (30) days from the date of its receipt of the certified Application for Payment from the Architect and in compliance with all of the Owner's policies, procedures, and documentation requirements.

§ 9.3.1.4 Beginning with the second Application for Payment, the Contractor will submit (a) a release and/or waiver of claims, including a waiver of all lien rights, in the form included in the Contract Documents or required by the Owner for itself and each of its Subcontractors and Suppliers, regardless of tier, for the work performed to date on the Project and for the value of the work performed during the current billing period (b) a complete list of its Subcontractors and Suppliers in the form included in the Contract Documents or as required by the Owner, and (c) a completed Application for Payment Checklist in the form required by the Owner. The Owner shall not have an obligation to pay the Contractor pursuant to an Application for Payment without the corresponding releases and/or waivers of claims and the complete list of the Contractor's Subcontractors and Suppliers. A final waiver of lien in the form included in the bid package, for the total value of each subcontract shall be included with the final Application for Payment for each subcontract and with the Contractor's final pay application for the Project. The total of the lien waivers shall match the total amount paid to the Contractor, inclusive of all approved change orders.

§ 9.3.1.5 Partial payments to the Contractor for labor performed shall be made at the rate of 92 percent of the amount invoiced through the Application for Payment that shows the total Contract completion at 50 percent or greater,

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pursuant to Ohio Revised Code Section 153.12. For materials and equipment delivered and suitably stored at the site for subsequent incorporation in the Work partial payments to the Contractor shall be made at the rate of 92 percent of the amount invoiced, in accordance with the Ohio Revised Code. After the Contract is 50 percent complete as evidenced by payments in the amount of at least 50 percent of the Contract Price to the Contractor, no additional funds shall be retained from payments for labor. The Owner will withhold retainage from the amount set forth in the Application for Payment approved by the Architect, as provided in the Contract Documents.

§ 9.3.1.6 Documentation. Upon request, the Contractor immediately will supply the Owner and the Architect with such information as may be requested as to verify the amounts due to the Contractor, including but not limited to original invoices for materials and equipment and documents showing that the Contractor has paid for such materials and equipment, and so as to verify that amounts due laborers, Subcontractors, and Material Suppliers have been paid to them. The failure to provide such information shall be justification for withholding payment to the Contractor.

§ 9.3.1.7 Retainage or Other Escrow Account. Owner and Contractor acknowledge that R.C. 153.63 provides that retained and detained funds will be deposited into an escrow account governed by an escrow agreement with a third party escrow agent. If Contractor wishes to have funds so deposited, (1) Contractor must provide written notice to the Owner of the request for an escrow account prior to submission of the first pay application, (2) Contractor will be responsible for all expenses associated with the escrow agent and escrow account beyond the interest income from the account, which will be paid for out of the principal amount deposited into the escrow account, and (3) Contractor must enter into a mutually agreeable written escrow agreement with the Owner and the escrow agent. If the Contractor does not request an escrow account prior to the submission of the first pay application or, in the event Contractor does timely request an escrow account before submission of the first pay application, if Contractor cannot (or does not) agree to a mutually agreeable escrow agreement, the Contractor consents to the following: (a) Owner may deposit funds into a savings or checking account established by the Owner (which may also contain other funds); (b) Owner will not be serving in a fiduciary capacity while holding the funds; (c) Owner is not required to deposit the funds into a separate escrow account governed by an escrow agent; and (d) the foregoing satisfies the Owner's obligations under R.C. 153.63 as it pertains to both R.C. 153.12 (retained funds) and 1311.28 (detained funds).

§ 9.3.1.8 Except with the Owner's prior approval, the Contractor shall not make advance payments to suppliers for materials or equipment which have not been delivered and stored at the site.

§ 9.3.2 Unless otherwise provided in the Contract Documents, payments shall be made on account of materials and equipment delivered and suitably stored at the site for subsequent incorporation in the Work. If approved in advance by the Owner, payment may similarly be made for materials and equipment suitably stored off the site at a location agreed upon in writing. Payment for materials and equipment stored on or off the site shall be conditioned upon compliance by the Contractor with procedures satisfactory to the Owner to establish the Owner's title to such materials and equipment or otherwise protect the Owner's interest, and shall include the costs of applicable insurance, storage, and transportation to the site, for such materials and equipment stored off the site.

§ 9.3.3 The Contractor warrants that title to all Work covered by an Application for Payment will pass to the Owner no later than the time of payment. The Contractor further warrants that upon submittal of an Application for Payment all Work for which Certificates for Payment have been previously issued and payments received from the Owner shall, to the best of the Contractor's knowledge, information, and belief, be free and clear of liens, claims, security interests, or encumbrances, in favor of the Contractor, Subcontractors, material suppliers, or other persons or entities making a claim by reason of having provided labor, materials, and equipment relating to the Work. The Contractor agrees to bond off any lien filed on the real property on which the Project is located, the Owner's interest in such real property, and/or the remaining balance of the Contract Sum by providing a bond meeting the requirements of the Ohio Revised Code. The Contractor shall do so within sixty (60) days of the filing of the lien.

§ 9.4 Certificates for Payment

§ 9.4.1 The Architect will, within seven days after receipt of the Contractor's properly completed Application for Payment and Contractor's Payment Application Checklist (if required) and Certification, the documentation described in the Contractor's Payment Application Checklist and Certification, and such other documents and/or data substantiating the Contractor's right to payment as the Owner or Architect may require, either issue to the Owner a Certificate for Payment, with a copy to the Contractor, for such amount as the Architect determines is

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properly due, or notify the Contractor and Owner in writing of the Architect's reasons for withholding certification in whole or in part as provided in Section 9.5.1.

§ 9.4.2 The issuance of a Certificate for Payment will constitute a representation by the Architect to the Owner, based on the Architect's evaluation of the Work and the data comprising the Application for Payment, that, to the best of the Architect's knowledge, information, and belief, the Work has progressed to the point indicated, and that the quality of the Work is in accordance with the Contract Documents, and that the Contractor is entitled to payment in the amount certified. The foregoing representations are subject to an evaluation of the Work for conformance with the Contract Documents upon Substantial Completion, to results of subsequent tests and inspections, to correction of minor deviations from the Contract Documents prior to completion, and to specific qualifications expressed by the Architect. The issuance of a Certificate for Payment will further constitute a representation that the Contractor is entitled to payment in the amount certified. However, the issuance of a Certificate for Payment will not be a representation that the Architect has (1) made exhaustive or continuous on-site inspections to check the quality or quantity of the Work; (2) reviewed construction means, methods, techniques, sequences, or procedures; (3) reviewed copies of requisitions received from Subcontractors and material suppliers and other data requested by the Owner to substantiate the Contractor's right to payment; or (4) made examination to ascertain how or for what purpose the Contractor has used money previously paid on account of the Contract Sum.

§ 9.5 Decisions to Withhold Certification

§ 9.5.1 The Architect may withhold a Certificate for Payment in whole or in part, to the extent reasonably necessary to protect the Owner, if in the Architect's opinion the representations to the Owner required by Section 9.4.2 cannot be made. If the Architect is unable to certify payment in the amount of the Application, the Architect will notify the Contractor and Owner as provided in Section 9.4.1. If the Contractor and Architect cannot agree on a revised amount, the Architect will promptly issue a Certificate for Payment for the amount for which the Architect is able to make such representations to the Owner. The Architect may also withhold a Certificate for Payment or, because of subsequently discovered evidence, may nullify the whole or a part of a Certificate for Payment previously issued, to such extent as may be necessary in the Architect's opinion to protect the Owner from loss for which the Contractor is responsible, including loss resulting from acts and omissions described in Section 3.3.2, because of

- **.1** defective Work not remedied or the Contractor is in default of the performance of any of its obligations under the Contract Documents including but not limited to: failure to provide sufficient skilled workers, failure to provide scheduling information as provided in Section 3.10.1, failure to prepare the Construction Schedule as provided in Section 3.10.1, failure to conform to the Construction Schedule, and/or failure to coordinate its Work with the work of other contractors, if any;
- **.2** third party claims filed or reasonable evidence indicating probable filing of such claims, unless security acceptable to the Owner is provided by the Contractor;
- **.3** failure of the Contractor to make payments properly to Subcontractors or suppliers for labor, materials or equipment;
- **.4** reasonable evidence that the Work cannot be completed for the unpaid balance of the Contract Sum;
- **.5** damage to the Owner or a Separate Contractor;
- **.6** reasonable evidence that the Work will not be completed within the Contract Time, and that the unpaid balance would not be adequate to cover actual or liquidated damages for the anticipated delay;
- **.7** failure to carry out the Work in accordance with the Contract Documents; or
- **.8** **the Contractor is in default of the performance of any of its obligations under another contract it has with the Owner.**

§ 9.5.2
[Not Used.]

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

§ 9.5.4 If the Architect withholds certification for payment under Section 9.5.1.3, the Owner may, at its sole option, issue joint checks to the Contractor and to any Subcontractor or material or equipment suppliers 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 Architect shall reflect such payment on the next Certificate for Payment.

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§ 9.6 Progress Payments

§ 9.6.1 After the Architect has issued a Certificate for Payment, the Owner shall issue payment to the Contractor as set forth herein and shall so notify the Architect.

§ 9.6.2 The Contractor shall promptly, within the time period required by Ohio law, pay each Subcontractor upon 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. Neither the Contractor nor its Subcontractors shall withhold retainage from its Subcontractors or their sub-subcontractors beyond the retainage withheld by the Owner from the Contractor.

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

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

§ 9.6.5 The Contractor's payments to material and equipment suppliers shall be treated in a manner similar to that provided in Sections 9.6.2, 9.6.3 and 9.6.4.

§ 9.6.6 A Certificate for Payment, a progress payment, or partial or entire use or occupancy of the Project by the Owner shall not constitute acceptance of Work not in accordance with the Contract Documents.

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

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

§ 9.7 Failure of Payment

If the Owner does not pay the Contractor the amount certified by the Architect within thirty (30) days after receipt of the certified Application for Payment for the Architect and the Owner has no other basis to withhold payment pursuant to the Contract Documents, then the Contractor may, upon seven additional days' notice to the Owner and Architect, stop the Work until payment of the amount owing has been received. The Contract Time shall be extended appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable costs of shutdown, delay and start-up, plus interest as provided for in the Contract Documents.

§ 9.8 Substantial Completion

§ 9.8.1 Substantial Completion is the stage in the progress of the Work when the Work is sufficiently complete in accordance with the Contract Documents so that the Owner can occupy and utilize the Work for its intended use. Notwithstanding anything in the Contract Documents to the contrary, this shall include, but is not limited to, start up and successful testing of all systems and equipment..

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§ 9.8.1.1 Date for Substantial Completion
The Date for Substantial Completion is the Date for Substantial Completion as set forth in the Owner-Contractor Agreement. The Date for Substantial Completion shall only be changed or modified by Change Order, other Modification, or a Claim that is Finally Resolved, regardless of any dates in the Construction Schedule.

§ 9.8.2 When the Contractor considers that the Work, or a portion thereof which the Owner agrees to accept separately, is substantially complete, the Contractor shall prepare and submit to the Architect a comprehensive list of items to be completed or corrected prior to final payment together with all required documents neatly bound and indexed. 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. When a specific manufacturer's warranty is required by the Specifications, the Contractor shall state in writing to the Architect that all the manufacturer's requirements for the issuance of the warranty has been completed and that the Work is ready for the Architect's and Owner's inspection. All manufacturer's warranties required for the Work shall commence as of the Date of Substantial Completion stated on the certificate issued by the Architect.

§ 9.8.3 Upon receipt of the Contractor's list and the documents required by Section 3.12.11 neatly bound and indexed, the Architect will make an inspection to determine whether the Work or designated portion thereof is substantially complete. If the Architect's inspection discloses any item, whether or not included on the Contractor's list, which is not sufficiently complete in accordance with the Contract Documents so that the Owner can occupy or utilize the Work, and the Work is Substantially Complete, the Contractor shall, before issuance of the Certificate of Substantial Completion, complete or correct such item upon notification by the Architect. In such case, the Contractor shall then submit a request for another inspection by the Architect to determine Substantial Completion.

§ 9.8.3.1 Time for Completion of Items on List and Remedies. The Contractor shall complete all items on the list accompanying the Architect's Certificate of Substantial Completion by the Date of Final Completion set forth in the Owner-Contractor Agreement for the Project. If the Contractor fails to do so, the Owner in its discretion may perform the Work by itself or others and the cost thereof shall be charged against the Contractor. If the balance of the Contract Sum is insufficient, the Contractor will pay the Owner the balance on demand. The Contractor's warranties and obligations under the Contract Documents shall remain in full force and effect and cover any remedial work even if performed by others. If more than one inspection by the Architect for purposes of evaluating corrected Work is required, the Contractor shall pay the additional costs and expenses incurred by the Owner as a result of more than one inspection by the Architect, and the Owner may withhold from sums due or coming due the Contractor amounts to cover such additional costs and
expenses.

§ 9.8.4 When the Work or designated portion thereof is substantially complete, the Architect will prepare a Certificate of Substantial Completion that shall establish the date of Substantial Completion; shall establish responsibilities of the Owner and Contractor for security, maintenance, heat, utilities, damage to the Work and insurance; and consistent with Section 9.8.3.1 shall 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 Upon receipt of the Certificate of Substantial Completion from the Architect and consent of the Contractor's surety if any, the Owner shall make payment of retainage applying to such Work or designated portion thereof. Such payment shall be adjusted for Work that is incomplete or not in accordance with the requirements of the Contract Documents.

§ 9.9 Partial Occupancy or Use
§ 9.9.1 The Owner may occupy or use any completed or partially completed portion of the Work at any stage when such portion is designated by separate agreement with the Contractor and/or with the Architect's approval, provided such occupancy or use is consented to by the insurer as required under Section 11.3.1.5 and authorized by public authorities having jurisdiction over the Project. Such partial occupancy or use may commence whether or not the portion is substantially complete, provided the Owner and Contractor have accepted in writing the responsibilities assigned to each of them for payments, retainage, if any, security, maintenance, heat, utilities, damage to the Work and insurance, and have agreed in writing concerning the period for correction of the Work and commencement of warranties required by the Contract Documents. In the event of a disagreement about such responsibilities,

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correction period, or commencement of warranties, the Architect will resolve the disagreement, and the Architect's decision will be final and binding. When the Contractor considers a portion substantially complete, the Contractor shall prepare and submit a list to the Architect as provided under Section 9.8.2. Consent of the Contractor to partial occupancy or use shall not be unreasonably withheld. The stage of the progress of the Work shall be determined by written agreement between the Owner and Contractor or, if no agreement is reached, by decision of the Architect, which shall be final and binding.

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

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

§ 9.10 Final Completion and Final Payment

§ 9.10.1 Upon receipt of the Contractor's written notice that the Work is ready for final inspection and acceptance and upon receipt of a final Application for Payment and a properly completed Contractor's Payment Application Checklist (if required), all the documentation required to be submitted with such Checklist, and any other supporting documentation required by the Contract Documents or by the Architect, the Architect will promptly make such inspection. When the Architect finds the Work acceptable under the Contract Documents and the Contract fully performed, including all required documents submitted, the Architect will promptly issue a final Certificate for Payment stating that to the best of the Architect's knowledge, information and belief, and on the basis of the Architect's on-site visits and inspections, the Work has been completed in accordance with the Contract Documents and that the entire balance found to be due the Contractor and noted in the final Certificate is due and payable. The Architect's final Certificate for Payment will constitute a further representation that conditions listed in Section 9.10.2 as precedent to the Contractor's being entitled to final payment have been fulfilled.

§ 9.10.1.1 Final Completion Defined

Final Completion shall mean that the Work is complete in all respects in accordance with the Contract Documents and the Contractor has submitted to the Architect all documents required to be submitted to the Architect for final payment.

§ 9.10.1.2 Date for Final Completion

The Date for Final Completion is the Date for Final Completion as set forth in the Owner-Contractor Agreement. The Date for Final Completion shall only be changed or modified by Change Order, or other Modification, or a Claim that is Finally Resolved, regardless of any dates in the Construction Schedule.

§ 9.10.2 Neither final payment nor any remaining retained percentage shall become due until the Contractor submits to the Architect (1) an affidavit that payrolls, bills for materials and equipment, and other indebtedness connected with the Work for which the Owner or the Owner's property might be responsible or encumbered (less amounts withheld by Owner) have been paid or otherwise satisfied, (2) a certificate evidencing that insurance required by the Contract Documents to remain in force after final payment is currently in effect and will not be canceled or allowed to expire until at least 30 days' prior written notice has been given to the Owner, (3) a written statement that the Contractor knows of no substantial reason that the insurance will not be renewable to cover the period required by the Contract Documents, (4) consent of surety, if any, to final payment, (5) documentation of any special warranties, such as manufacturers' warranties or specific Subcontractor warranties, and (6) if required by the Owner, other data establishing payment or satisfaction of obligations, such as receipts and releases and waivers of liens, claims, security interests, or encumbrances arising out of the Contract, to the extent and in such form as may be designated by the Owner. If a Subcontractor refuses to furnish a release or waiver required by the Owner, the Contractor may furnish a bond satisfactory to the Owner to indemnify the Owner against such lien, claim, security interest, or encumbrance. If a lien, claim, security interest, or encumbrance remains unsatisfied after payments are made, the Contractor shall refund to the Owner all money that the Owner may be compelled to pay in discharging the lien, claim, security interest, or encumbrance, including all costs and reasonable attorneys' fees.

Unless otherwise provided in the Contract Documents, the final Application for Payment shall be itemized, and the Contractor shall ensure that the final Application for Payment transmitted to the Architect also is accompanied by the following additional documents, if not previously delivered to the Architect:

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.1 Evidence that all Completion/Punchlist items have been completed;
.2 Where applicable, keys and keying schedule;
.3 The documents, including as-built set of Drawings and Specifications, referred to in Section 3.3.4 in both hard copy and electronic file (in the format requested by the Owner) not otherwise required by the Contract Documents to be delivered earlier; and
.4 Other documents required by the Contract Documents.

§ 9.10.3 If, after Substantial Completion of the Work, Final Completion thereof is materially delayed through no fault of the Contractor or by issuance of Change Orders affecting Final Completion, and the Architect so confirms, the Owner shall, upon application by the Contractor and certification by the Architect, and without terminating the Contract, make payment of the balance due for that portion of the Work fully completed, corrected, and accepted. If the remaining balance for Work not fully completed or corrected is less than retainage stipulated in the Contract Documents, and if bonds have been furnished, the written consent of the surety to payment of the balance due for that portion of the Work fully completed and accepted shall be submitted by the Contractor to the Architect prior to certification of such payment. Such payment shall be made under terms and conditions governing final payment, except that it shall not constitute a waiver of Claims.

§ 9.10.4 The making of final payment shall constitute a waiver of Claims by the Owner except those arising from or related to:

.1 liens, Claims, security interests, or encumbrances arising out of the Contract and unsettled;
.2 failure of the Work to comply with the requirements of the Contract Documents;
.3 terms of special warranties required by the Contract Documents;
.4 audits performed by the Owner, if permitted by the Contract Documents, after final payment; or
.5 **any claims, damages, losses, or expenses for indemnification under Section 3.18.1.**

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

ARTICLE 10 PROTECTION OF PERSONS AND PROPERTY

§ 10.1 Safety Precautions and Programs

The Contractor shall be responsible for initiating, maintaining, and supervising all safety precautions and programs in connection with the performance of the Contract, including compliance with OSHA and other state and federal regulations applicable to the Work. The Contractor's safety program shall be written and a copy maintained at the Project site for inspection, upon request. Neither the Owner nor the Architect accept any responsibility or liability for the safety of the Contractor's employees or for enforcing the Contractor's safety program. Additionally, the Contractor shall comply with the Owner's rules, regulations, and policies.

§ 10.2 Safety and Health of Persons and Property

§ 10.2.1 The Contractor shall take all reasonable precautions for safety and health 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, including the Owner's employees, employees of other contractors, their subcontractors, material suppliers, and persons on the site or adjoining property;
.2 the Work and materials and equipment to be incorporated therein, whether in storage on or off the site, under care, custody, or control of the Contractor, a Subcontractor, or a Sub-subcontractor and/or the Work of any other contractor and the materials and equipment to be incorporated in such Work; and
.3 other property at the site or adjacent thereto, such as trees, shrubs, lawns, walks, pavements, roadways, structures, and utilities not designated for removal, relocation, or replacement in the course of construction.

§ 10.2.2 The Contractor shall comply with, and give notices required by applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities, bearing on safety of persons or property or their protection from damage, injury, or loss.

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§ 10.2.3 The Contractor shall implement, erect, and maintain, as required by existing conditions and performance of the Contract, reasonable safeguards for safety and protection, including posting danger signs and other warnings against hazards; promulgating safety regulations; and notifying the owners and users of adjacent sites and utilities of the safeguards. The Contractor shall be responsible, at the Contractor's sole cost and expense, for all measures necessary to protect any property adjacent to the Project and improvements therein.

§ 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 not bring any hazardous materials onto the Project site unless expressly required by the Contract Documents.

§ 10.2.5 The Contractor shall promptly remedy damage and loss (other than damage or loss insured under property insurance required by the Contract Documents) to property referred to in Sections 10.2.1.2 and 10.2.1.3 caused in whole or in part by the Contractor, a Subcontractor, a Sub-subcontractor, or anyone directly or indirectly employed by any of them, or by anyone for whose acts they may be liable and for which the Contractor is responsible under Sections 10.2.1.2 and 10.2.1.3, except damage or loss attributable to acts or omissions of the Owner or Architect or anyone directly or indirectly employed by either of them, or by anyone for whose acts either of them may be liable, and not attributable to the fault or negligence of the Contractor. The foregoing obligations of the Contractor are in addition to the Contractor's obligations under Section 3.18. In the event of a dispute about who is responsible for damage and loss to such property, the issue shall be submitted to the Architect and the Architect's decision shall be final and binding on the respective parties.

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

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

§ 10.2.8 Injury or Damage to Person or Property

If the Contractor suffers injury or damage to person or property because of an act or omission of the Owner, or of others for whose acts the Owner is legally responsible, the Contractor shall submit a Statement of Claim Form for such injury or damage as required by Section 15.1.

§ 10.3 Hazardous Materials and Substances

§ 10.3.1 The Contractor is responsible for compliance with any requirements included in the Contract Documents regarding hazardous materials or substances. If the Contractor encounters a hazardous material or substance not addressed in the Contract Documents and if reasonable precautions will be inadequate to prevent foreseeable bodily injury or death to persons resulting from a material or substance, including but not limited to asbestos or polychlorinated biphenyl (PCB), encountered on the site by the Contractor, the Contractor shall, upon recognizing the condition, immediately stop Work in the affected area and report the condition to the Owner and Architect in writing.

§ 10.3.2 Upon receipt of the Contractor's written notice, the Owner shall obtain the services of a licensed laboratory to verify the presence or absence of the material or substance reported by the Contractor and, in the event such material or substance is found to be present, to cause it to be rendered harmless. Unless otherwise required by the Contract Documents upon written request, the Owner shall furnish in writing to the Contractor and Architect the names and qualifications of persons or entities who are to perform tests verifying the presence or absence of such material or substance or who are to perform the task of removal or safe containment of the material or substance. Work in the affected area shall be resumed immediately following the occurrence of any one of the following events: (i) the Owner causes remedial work to be performed that results in the hazardous substance being rendered harmless; (ii) the Owner and the Contractor, by written agreement, decide to resume performance of the Work; or (iii) the Work may safely and lawfully proceed using appropriate protective measures, as determined by a competent person employed by the Owner. By Change Order, the Contract Time shall be extended appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable additional costs of shutdown, delay, and start-up. The term "rendered harmless" shall be interpreted to mean that exposure levels of asbestos and polychlorinated biphenyl (PCB) are less than any applicable exposure standards set forth in OSHA regulations.

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§ 10.3.3 [Not Used.]

§ 10.3.4 The Owner shall not be responsible for hazardous materials or substances the Contractor brings to the site unless such materials or substances are expressly required by the Contract Documents. Hazardous materials shall be identified by a Material Safety Data Sheet (MSDS). These MSDS's shall be submitted by the Contractor to the Owner prior to that material being used on the Project. The Owner shall be responsible for hazardous materials or substances required by the Contract Documents, except to the extent of the Contractor's fault or negligence in the use and handling of such materials or substances.

§ 10.3.5 In addition to the Contractor's obligations in Section 3.18 and elsewhere in the Contract Documents, the Contractor shall indemnify and reimburse the Owner for the cost and expense the Owner incurs (1) for remediation of hazardous materials or substances the Contractor brings to the site and negligently handles, or (2) where the Contractor fails to perform its obligations under Section 10.3.1, except to the extent that the cost and expense are due to the Owner's fault or negligence.

§ 10.3.6 [Not Used.]

§ 10.4 Emergencies

In an emergency affecting safety of persons or property, the Contractor shall act, at the Contractor's discretion, without special instructions or authorization, 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 responsibility for emergencies covered hereby, which with normal diligence, planning, and the close supervision of the Work as required under the Contract, could have been foreseen or prevented. Contractor will provide Owner a list of names and telephone numbers of the designated employees for each Subcontractor to be contacted in case of emergency during non-working hours. A copy of the list will also be displayed on the jobsite.

ARTICLE 11 INSURANCE AND BONDS

§ 11.1 Contractor's Liability Insurance and Bonds

§ 11.1.1 The Contractor shall purchase from and maintain in an insurance company or insurance companies approved by the Owner and licensed to do business in the State of Ohio such insurance as will protect the Contractor from claims set forth below which may arise out of or result from the Contractor's operations and completed operations under the Contract and for which the Contractor may be legally liable, whether such operations be by the Contractor or by a Subcontractor or by anyone directly or indirectly employed by any of them, or by anyone for whose acts any of them may be liable.

- **.1** Claims under workers' compensation, disability benefit, and other similar employee benefit acts that are applicable to the Work to be performed;
- **.2** Claims for damages because of bodily injury, occupational sickness or disease, or death of the Contractor's employees;
- **.3** Claims for damages because of bodily injury, sickness or disease, or death of any person other than the Contractor's employees;
- **.4** Claims for damages insured by usual personal injury liability coverage;
- **.5** Claims for damages, other than to the Work itself, because of injury to or destruction of tangible property, including loss of use resulting therefrom;
- **.6** Claims for damages because of bodily injury, death of a person or property damage arising out of ownership, maintenance or use of a motor vehicle;
- **.7** Claims for bodily injury or property damage arising out of completed operations, which coverage shall be maintained for no less than five (5) years following final payment; and
- **.8** Claims involving contractual liability insurance applicable to the Contractor's obligations under Section 3.18.

§ 11.1.2 The insurance required by Section 11.1.1 shall include at least the specific coverages and be written for not less than limits of liability specified in the Contract Documents or required by law, whichever coverage is greater. Coverages, shall be maintained without interruption from the Date of Commencement of the Work until the date of final payment and termination of any coverage required to be maintained after final payment, and, with respect to

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the Contractor's completed operations coverage, until the expiration of the period for correction of Work or for such other period for maintenance of completed operations coverage as specified in the Contract Documents.

§ 11.1.2.1 The minimum limits of liability for the required policies shall be not less than the following, unless a greater amount is required by law:

.1 Commercial General Liability ("CGL"): Bodily injury (including death and emotional distress) and property damage with limits of $ 1,000,000 each occurrence and $ 2,000,000 aggregate. CGL shall include: (i) Premises-Operations, (ii) Explosion and Collapse Hazard, (iii) Underground Hazard, (iv) Independent Contractors' Protective, (v) Broad Form Property Damage, including Completed Operations, (vi) Contractual Liability, (vii) Products and Completed Operations, (viii) Personal Injury, (ix) Stopgap liability; (x) per project aggregate endorsement ; and (xi) an endorsement redefining "occurrence" to include property damage arising from the faulty workmanship performed by the Contractor or on the Contractors' behalf by Subcontractors.

.2 Automobile Liability, covering all owned, non-owned, and hired vehicles used in connection with the Work: Bodily injury (including death and emotional distress) and property damage with a combined single limit of $1,000,000 each accident.

.3 Workers' compensation with policy limits as established by Ohio law.

§ 11.1.2.2 Such policies shall be supplemented by an umbrella policy in the amount of $5,000,000 each occurrence and $5,000,000 aggregate.

§ 11.1.2.3 The Contractor shall maintain Pollution Liability insurance with a limit for any one incident of not less than $1,000,000 and an aggregate limit of not less than $2,000,000.

§ 11.1.2.4 By requiring such insurance and insurance limits herein, the Owner does not represent that coverage and limits will necessarily be adequate to protect the Contractor, and such coverage and limits shall not be deemed as a limitation on the Contractor's liability under the indemnities granted to the Owner.

§ 11.1.2.5 [Not Used.]

§ 11.1.2.6 Products and completed operations coverage shall commence with the certification of the final Certificate for Payment to the Contractor and extend for not less than the applicable Statute of Repose.

§ 11.1.2.7 The Contractor shall require all Subcontractors to provide Workers' Compensation, CGL, and Automobile Liability insurance with the same minimum limits specified herein, unless the Owner agrees to a lesser amount.

§ 11.1.2.8 All liability policies required in Section 11.1 shall include an additional insured endorsement naming the Owner and Architect, and any other individuals or entities identified in these General Conditions, all of whom shall be listed as additional insured, and include coverage for the respective officers, directors, partners, employees, agents, consultants, and subcontractors of each and any of all such additional insured. The additional insured endorsement shall be ISO 20 10 11 85 or its equivalent so that Completed Operations liability extends to the additional insureds.

§ 11.1.2.9 All liability policies required in Section 11.1 shall be primary and non-contributory.

§ 11.1.3 Certificates of insurance acceptable to the Owner, copies of endorsements, and other evidence of insurance requested by the Owner or any other additional insured, prior to commencement of the Work, shall be delivered to the Owner with copies to each additional insured identified in these General Conditions, when the Contractor delivers the executed counterparts of the Agreement to the Owner and thereafter upon renewal or replacement of each required policy of insurance. These certificates and the insurance policies required by this Section 11.1 shall contain a provision that coverages afforded under the policies will not be canceled, materially changed with respect to coverage for the Project, or allowed to expire until at least 30 days' prior written notice has been given to the Owner and Contractor and to each other additional insured identified in the General Conditions to whom a certificate of insurance has been issued. An additional certificate evidencing continuation of liability coverage, including coverage for completed operations, shall be submitted with the final Application for Payment as required by Section 9.10.2 and thereafter upon renewal or replacement of such coverage until the expiration of the time

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required by Section 11.1.2. Information concerning reduction of coverage on account of revised limits or claims paid under the General Aggregate, or both, shall be furnished by the Contractor with reasonable promptness. Prior to commencing the Work, the Contractor shall provide the Owner with the specific additional insured endorsement that names the Owner as well as copies of the waiver of subrogation and primary and contributory endorsements.

§ 11.1.3.1 Prior to commencing the Work, the Contractor shall furnish to the Owner, through the Architect, one copy of each of the Certificates of Insurance required herein. The Certificates of Insurance shall specifically set forth evidence of all coverage required by Section 11.1. The form of certificate shall be the form prescribed by the Owner, which shall be the ACORD Form 25 (2009/09 or more recent). The Contractor shall furnish to the Owner copies of any endorsement that is subsequently issued by amending coverage or limits.

§ 11.1.4 In no event will any failure of the Owner to receive certified copies or certificates of policies required under Section 11.1 or to demand receipt of such certified copies or certificates prior to the Contractor's commencing the Work be construed as a waiver by the Owner or the Architect of the Contractor's obligations to obtain insurance pursuant to this Article 11. The obligation to procure and maintain any insurance required by this Article 11 is a separate responsibility of the Contractor and independent of the duty to furnish a certified copy or certificate of such insurance policies.

§ 11.1.5 If the Contractor fails to purchase and maintain, or require to be purchased and maintained, any insurance required under Section 11.1, the Owner may but shall not be obligated to, upon five (5) days written notice to the Contractor, purchase such insurance on behalf of the Contractor and shall be entitled to be reimbursed by the Contractor upon demand.

§ 11.1.6 When any required insurance, due to the attainment of a normal expiration date or renewal date expires, the Contractor shall supply the Owner with Certificates of Insurance and amendatory riders or endorsements that clearly evidence the continuation of all coverage in the same manner, limits of protection, and scope of coverage as was provided by the previous policy. In the event any renewal or replacement policy, for whatever reason obtained or required, is written by a carrier other than that with whom the coverage was previously placed, or the subsequent policy differs in any way from the previous policy, the Contractor shall also furnish the Owner with a certified copy of the renewal or replacement policy unless the Owner provides the Contractor with prior written consent to submit only a Certificate of Insurance for such policy. All renewal and replacement policies shall be in form and substance satisfactory to the Owner and written by carriers acceptable to the Owner.

§ 11.1.7 Any aggregate limit under the Contractor's liability insurance shall, by endorsement, apply to the Project separately.

§ 11.1.8 The Contractor shall require each of its Subcontractors to (i) procure insurance reasonably satisfactory to the Owner and (ii) name the Owner and Architect, and any of their employees and agents, as additional insured under the Subcontractor's CGL policy. The additional insured endorsement included on the Subcontractor's CGL policy shall state that coverage is afforded the additional insureds with respect to claims arising out of operations performed by or on behalf of the Contractor. If the additional insured have other insurance that is applicable to the loss, such other insurance shall be on an excess or contingent basis. The amount of the insurer's liability under this insurance policy shall not be reduced by the existence of such other insurance.

§ 11.1.9 Notice of Cancellation or Expiration of Contractor's Required Insurance. Within three (3) business days of the date the Contractor becomes aware of an impending or actual cancellation or expiration of any insurance required by the Contract Documents, the Contractor shall provide notice to the Owner of such impending or actual cancellation or expiration. Upon receipt of notice from the Contractor, the Owner shall, unless the lapse in coverage arises from an act or omission of the Owner, have the right to stop the Work until the lapse in coverage has been cured by the procurement of replacement coverage by the Contractor. The furnishing of notice by the Contractor shall not relieve the Contractor of any contractual obligation to provide any required coverage.

§ 11.2 Owner's Liability Insurance

§ 11.2.1 The Owner, at the Owner's option, may purchase and maintain at Owner's expense Owner's own liability insurance.

§ 11.2.2 [Not Used.]

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§ 11.2.3 [Not Used.]

§ 11.3 Property Insurance

§ 11.3.1 Builder's Risk Insurance. The Contractor shall purchase and maintain, in a company or companies lawfully authorized to do business in the jurisdiction in which the Project is located
, property insurance written on a builder's risk "all-risk" or equivalent policy for the Project in the amount of the initial Contract Sum, plus value of subsequent contract modifications and cost of materials supplied or installed by others, comprising total value for the entire Project at the site on a replacement cost basis without optional deductibles. Such builder's risk insurance shall be maintained, unless otherwise provided in the Contract Documents or otherwise agreed in writing by all persons and entities who are beneficiaries of such insurance, until final payment has been made as provided in Section 9.10 or until no person or entity other than the Owner has an insurable interest in the property required by this Section 11.3 to be covered, whichever is later. This insurance shall include interests of the Owner, the Contractor, Subcontractors, and Sub-subcontractors in the Project.

§ 11.3.1.1 The builder's risk insurance obtained shall be on an "all-risk" or equivalent policy form and shall include, without limitation, insurance against the perils of fire (with extended coverage) and physical loss or damage including, without duplication of coverage, theft, vandalism, malicious mischief, collapse, earthquake, flood, windstorm, falsework, testing and startup, temporary buildings and debris removal including demolition occasioned by enforcement of any applicable legal requirements, and shall cover reasonable compensation for the Architect's and Contractor's services and expenses required as a result of such insured loss.

§ 11.3.1.1.1 If applicable, property insurance provided by the Owner shall not cover any tools, apparatus, machinery, scaffolding, hoists, forms, staging, shoring, and other similar items commonly referred to as construction equipment that may be on the site and the capital value of which is not included in the Work, nor shall such insurance cover any materials or equipment before these materials and equipment are physically incorporated into the Work. The Contractor shall make its own arrangements for any insurance it may require on such construction equipment and materials and equipment. Any policy obtained by the Contractor under this Section 11.3 and related sections shall include a waiver of subrogation in accordance with the requirements of Section 11.3.8. If the Work is located in a Special Flood Hazard Area, as defined by the Federal Emergency Management Agency, the Contractor shall provide an endorsement to the property insurance policy that provides coverage for physical loss or damage caused by flood.

§ 11.3.1.2 When it is available, the party providing the builder's risk insurance shall provide to the other party with written proof of the builder's risk insurance upon written request.

§ 11.3.1.3 If the property insurance requires deductibles, the Owner shall pay such deductibles, however, that if the cause of any loss payment under such insurance or self-insurance is the fault of Contractor, the Contractor shall pay such deductible.

§ 11.3.1.4 The builder's risk insurance shall cover portions of the Work stored off the site, and also portions of the Work in transit.

§ 11.3.1.5 This property insurance must allow for partial utilization of the Work by the Owner and shall contain no partial occupancy restriction for the Project by the Owner. Partial occupancy or use in accordance with Section 9.9 shall not commence until the insurers providing the property insurance pursuant to Section 11.4 have acknowledged notice thereof and in writing effected any changes in coverage necessitated thereby. The insurance company or companies providing property insurance shall consent to such partial occupancy or use by endorsement on the policy or policies, but the property insurance shall not be canceled or permitted to lapse on account of any partial use or occupancy.

§ 11.3.1.6 Damages to Other Property. The maintaining of such insurance as outlined in Section 11.1 shall in no way constitute a waiver of the Contractor's legal liability for damage to any adjoining buildings or existing buildings or their contents or the Work and property of others on the site beyond the limits of insurance thus maintained. The Contractor shall hold the Owner free and harmless from any injury and damage resulting from the negligent or faulty performance of the Contract by the Contractor or its Subcontractors or others under its control or direction.

§ 11.3.1.7 This property insurance must include testing and startup.

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§ 11.3.2 Boiler and Machinery Insurance. The Owner, at the Owner's option, may purchase and maintain boiler and machinery insurance required by the Contract Documents or by law, which shall specifically cover such insured objects during installation and until final acceptance by the Owner; this insurance shall include interests of the Owner, Contractor, Subcontractors, and Sub-subcontractors in the Work, and the Owner and Contractor and any other individuals or entities identified in the Contract Documents and the officers, directors, partners, employees, agents, and consultants of each and any of them, each of whom is deemed to have an insurable interest and shall be listed as an insured or additional insured.

§ 11.3.3 Loss of Use Insurance The Owner, at the Owner's option, may purchase and maintain such insurance as will insure the Owner against loss of use of the Owner's property due to fire or other hazards, however caused. The Owner waives all rights of action against the Contractor for loss of use of the Owner's property, including consequential losses due to fire or other hazards however caused.

§ 11.3.4 If the Contractor requests in writing that insurance for risks other than those described herein or other special causes of loss be included in the property insurance policy, the Owner shall, if possible, include such insurance, and the cost thereof shall be charged to the Contractor by appropriate Change Order.

§ 11.3.5 If during the Project construction period the Owner insures properties, real or personal, or both, at or adjacent to the site by property insurance under policies separate from those insuring the Project, or if after final payment property insurance is to be provided on the completed Project through a policy or policies other than those insuring the Project during the construction period, the Owner shall waive all rights in accordance with the terms of Section 11.3.8 for damages caused by fire or other causes of loss covered by this separate property insurance. All separate policies shall provide this waiver of subrogation by endorsement or otherwise.

§ 11.3.6 The Owner shall maintain copies of the policies of insurance it is required to purchase and maintain hereunder at its offices and shall permit the Architect or the Contractor to inspect the policies during normal business hours and upon reasonable advance written notice.

§ 11.3.7 All policies of insurance (and the certificates or other evidence thereof) required to be purchased and maintained in accordance with Section 11.3 will contain a provision or endorsement that the coverage afforded will not be canceled or materially changed or renewal refused until at least 30 days prior written notice has been given to the Owner and Contractor and to each other additional insured to whom a certificate of insurance has been issued and will contain waiver provisions in accordance with these General Conditions.

§ 11.3.8 Waivers of Subrogation

The Owner and Contractor waive all rights against (1) each other and any of their subcontractors, sub-subcontractors, agents, and employees, each of the other; (2) the Architect and Architect's consultants; and (3) Separate Contractors, if any, and any of their subcontractors, sub-subcontractors, agents, and employees, for damages caused by fire, or other causes of loss, to the extent of actual recovery of any insurance proceeds under any property insurance obtained pursuant to this Section 11.3 or other property insurance and builder's risk insurance applicable to the Work, except such rights as they have to proceeds of such insurance held by the Owner in good faith. The Owner or Contractor, as appropriate, shall require, by appropriate agreements, similar written waivers each in favor of the individuals and entities identified above from the Architect, Architect's consultants, Separate Contractors, if any, and the subcontractors, sub-subcontractors, agents, and employees of any of them. The policies shall provide such waivers of subrogation by endorsement or otherwise. A waiver of subrogation shall be effective as to a person or entity even though that person or entity would otherwise have a duty of indemnification, contractual or otherwise, did not pay the insurance premium directly or indirectly, and whether or not the person or entity had an insurable interest in the damaged property.

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(Paragraphs Deleted)

11.3.9 A loss insured under the Owner's property insurance shall be adjusted by the Owner in good faith and made payable to the Owner in good faith for the insureds, as their interests may appear, subject to requirements of any applicable mortgagee clause and of Section 11.3.10. The Contractor shall pay Subcontractors their just shares of

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insurance proceeds received by the Contractor, and by appropriate agreements, written where legally required for validity, shall require Subcontractors to make payments to their Sub-Subcontractors in similar manner.

§ 11.3.10 The Owner in good faith shall have power to adjust and settle a loss with insurers unless one of the parties in interest shall object in writing within fifteen days after occurrence of loss to the Owner's exercise of this power; if such objection is made, the dispute shall be resolved as provided in Sections 15.3 and 15.4. If the Owner and Contractor have selected arbitration as the method of binding dispute resolution, the Owner in good faith shall make settlement with insurers, or, in the case of a dispute over distribution of insurance proceeds, in accordance with the directions of the arbitrators.

§ 11.3.11 If required in writing by a party in interest, the Owner in good faith shall, upon occurrence of an insured loss, give bond for proper performance of the Owner's duties. The cost of required bonds shall be charged against proceeds received in good faith. The Owner shall deposit in a separate account proceeds so received, which the Owner shall distribute in accordance with such agreement as the parties in interest may reach. If after such loss no other special agreement is made and unless the Owner terminates the Contract for convenience, replacement of damaged property shall be performed by the Contractor after notification of a Change in the Work in accordance with Article 7.

§ 11.4. Performance Bond and Payment Bond

§ 11.4.1 The Contractor shall provide a contract bond to guaranty payment and performance of the Work, as required by Ohio law. When the Contractor delivers the executed counterparts of the Agreement to the Owner, the Contractor shall deliver such bond to the Owner, along with other documents as may be required.

§ 11.4.1.1. If the surety on any bond furnished by the Contractor is declared bankrupt or becomes insolvent or its right to do business is terminated in any state where any part of the Project is located or it ceases to meet with the requirements of the Agreement or Ohio law, the Contractor shall promptly notify the Owner and the Architect and shall, within 20 days after the event giving rise to such notification, provide another bond and surety, both of which shall comply with the requirements of the Contract Documents and Ohio law.

§ 11.4.2 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.

§ 11.4.3 Material Default or Termination. If the Owner notifies the Contractor's surety that the Contractor is in material default or terminates the Contract, the surety will promptly and within 21 days investigate the claimed material default or termination. If the Owner gives a notice of material default and then terminates the Contract, the surety shall complete its investigation within 21 days of the notice of material default. As part of such investigation, the surety shall visit the offices of the Contractor, Architect, and Owner to review the available project records. If the surety proposes to take over the Work, the surety shall do so no later than the expiration of such 21 day period or 10 days after the date the Owner terminates the Contract, whichever is later. If the Owner terminates the Work, and the surety proposes to provide a replacement contractor, the replacement contractor shall be fully capable of performing the Work in accordance with the Contract Documents, including meeting all the requirements of the Contract Documents. If the Contractor is terminated, the replacement contractor shall not be the Contractor. The surety will provide the Owner with the results of its investigation, including any written report or documents. This Section 11.4.3 is in addition to the Owner's rights under Section 14.2.2 and is not intended to create any rights of the surety, including but not limited to the right to takeover the Contractor's obligations.

ARTICLE 12 UNCOVERING AND CORRECTION OF WORK

§ 12.1 Uncovering of Work

§ 12.1.1 If a portion of the Work is covered contrary to the Architect's request or to requirements specifically expressed in the Contract Documents, it must, if requested in writing by the Architect, be uncovered for the Architect's examination and be replaced at the Contractor's expense without change in the Contract Time.

§ 12.1.2 If a portion of the Work has been covered that the Architect has not specifically requested to examine prior to its being covered, the Architect may request to see such Work and it shall be uncovered by the Contractor. If such Work is in accordance with the Contract Documents, the costs of uncovering and replacement shall, by appropriate Change Order, be at the Owner's expense. If such Work is not in accordance with the Contract Documents, such

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costs and the cost of correction shall be at the Contractor's expense unless the condition was caused by the Owner or a Separate Contractor in which event the Owner shall be responsible for payment of such costs.

§ 12.2 Correction of Work

§ 12.2.1 Before or After Substantial Completion

In addition to the rights and remedies under Section 2.5, the Contractor shall promptly correct Work rejected by the Architect or Owner for failing to conform to the requirements of the Contract Documents, whether discovered before or after Substantial Completion and whether or not fabricated, installed or completed. Costs of correcting such rejected Work, including additional testing and inspections, the cost of uncovering and replacement, and compensation for the Architect's services and expenses made necessary thereby, shall be at the Contractor's expense.

§ 12.2.2 After Substantial Completion

§ 12.2.2.1 In addition to the Contractor's obligations under Section 3.5, if, within one year after the date of Substantial Completion of the Work or designated portion thereof or after the date for commencement of warranties established under Section 9.9.1, or by terms of any applicable special warranty required by the Contract Documents, any of the Work is found to be not in accordance with the requirements of the Contract Documents, the Contractor shall begin to correct it within 2 business days after receipt of written notice from the Owner to do so and complete such correction within 30 days after receipt of such notice, unless the Owner has previously given the Contractor a written acceptance of such condition. The Owner shall give such notice promptly after discovery of the condition. If the Contractor fails to correct nonconforming Work within 30 days after receipt of notice from the Owner or Architect, the Owner may correct it in accordance with Section 2.5.

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

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

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

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

§ 12.2.5 Nothing contained in this Section 12.2 shall be construed to establish a period of limitation with respect to other obligations the Contractor has under the Contract Documents. Establishment of the one-year period for correction of Work as described in Section 12.2.2 relates only to the specific obligation of the Contractor to correct the Work, and does not limit any warranty period under these Contract Documents, and has no relationship to the time within which the obligation to comply with the Contract Documents may be sought to be enforced, nor to the time within which proceedings may be commenced to establish the Contractor's liability with respect to the Contractor's obligations other than specifically to correct the Work.

§ 12.3 Acceptance of Nonconforming Work

If the Owner prefers to accept Work that is not in accordance with the requirements of the Contract Documents, the Owner may do so instead of requiring its removal and correction, in which case the Contract Sum will be reduced as appropriate and equitable. Such adjustment shall be effected whether or not final payment has been made. Any such acceptance shall be in writing and executed by a representative of the Owner who has been expressly authorized to do so.

ARTICLE 13 MISCELLANEOUS PROVISIONS

§ 13.1 Governing Law

The Contract shall be governed by the law of the place where the Project is located.

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§ 13.2 Successors and Assigns

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

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

§ 13.3 Rights and Remedies

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

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

§ 13.4 Tests and Inspections

§ 13.4.1 Tests, inspections, and approvals of portions of the Work shall be made as required by the Contract Documents and by applicable laws, statutes, ordinances, codes, rules, and regulations or lawful orders of public authorities. Unless otherwise provided, the Contractor shall make arrangements for such tests, inspections, and approvals with an independent testing laboratory or entity acceptable to the Owner, or with the appropriate public authority, and shall bear all related costs of tests, inspections, and approvals. The Contractor shall provide proper facilities at all times for inspections and tests of work by the Owner and other authorities having jurisdiction over the Project. The Contractor shall remove any water used in conducting such tests and inspections in a manner so as not to discharge the water on any portions of the Work or damage any portion of the Work. The Contractor shall give the Architect timely notice of when and where tests and inspections are to be made so that the Architect may be present for such procedures. The Owner shall bear costs of (1) tests, inspections, or approvals that do not become requirements until after the Agreement is executed, and (2) tests, inspections, or approvals where building codes or applicable laws or regulations prohibit the Owner from delegating their cost to the Contractor.

§ 13.4.1.1 If Laws and Regulations of any public body having jurisdiction require any Work (or part thereof) specifically to be inspected, tested, or approved by an employee or other representative of such public body, the Contractor shall assume full responsibility for arranging and obtaining such inspections, tests, or approvals, pay all costs in connection therewith, and furnish the Architect the required certificates of inspection or approval. The Contractor shall give the Architect timely notice of when and where tests and inspections are to be made so that the Architect may be present for such procedures.

§ 13.4.1.2 The Contractor shall be responsible for arranging and obtaining and shall pay all costs in connection with any inspections, tests, or approvals required for the Owner's and Architect's acceptance of materials or equipment to be incorporated in the Work; or acceptance of materials, mix designs, or equipment submitted for approval prior to the Contractor's purchase thereof for incorporation in the Work. Such inspections, tests, or approvals shall be performed by organizations acceptable to the Owner and Architect. Tests required by the Contract Documents to be performed by the Contractor that require test certificates to be submitted to the Owner or Architect for acceptance shall be made by an independent testing laboratory or agency licensed or certified in accordance with Laws and Regulations and applicable state and local statutes. In the event state license or certification is not required, testing laboratories or agencies shall meet the following applicable requirements:

.1 "Recommended Requirements for Independent Laboratory Qualification," published by the American Council of Independent Laboratories.

.2 Basic requirements of ASTM E329, "Standard Specification for Agencies Engaged in the Testing and/or Inspection of Materials used in Construction" as applicable.

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.3 Calibrate testing equipment at reasonable intervals by devices of accuracy traceable to either the National Institute of Standards and Technology or accepted values of natural physical constants.

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

§ 13.4.3 If procedures for testing, inspection, or approval under Sections 13.4.1 and 13.4.2 reveal failure of the portions of the Work to comply with requirements established by the Contract Documents, all costs made necessary by such failure, including those of repeated procedures and compensation for the Architect's services and expenses, shall be at the Contractor's expense. Neither the observations by the Owner or its designated representative, nor inspections, tests, or approvals by persons other than the Contractor, shall relieve the Contractor from its obligations to perform the Work in accordance with the Contract Documents.

§ 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 in duplicate to the Owner and the Architect.

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

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

§ 13.5 Interest

Payments due and unpaid under the Contract Documents shall bear interest from the date payment is due at the rate the parties agree upon in writing or, in the absence thereof, at zero percent (0%).

§ **13.6 Time Limits on Claims.** As between the Owner and Contractor, the statute of limitations shall commence as provided in current Ohio law.

§ **13.7 Attorney-Client Confidential and Privileged Communications.** The Contractor acknowledges and agrees that the Owner's legal counsel may from time to time provide legal services to the Project and that in doing so may communicate with the Architect. The Contractor agrees that such communications will be privileged communications and, if there is a Claim contemplated or pending, any written communications will be confidential work product.

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 90 consecutive days through no act or fault of the Contractor, a Subcontractor, a Sub-subcontractor, their agents or employees, or any other persons or entities performing portions of the Work under direct or indirect contract with the Contractor, for any of the following reasons:

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

.2 An act of government, such as a declaration of national emergency, that requires all Work to be stopped;

.3 Because the Architect has not issued a Certificate for Payment and has not notified the Contractor of the reason for withholding certification as provided in Section 9.4.1, or because the Owner has not made payment on a Certificate for Payment within the time stated in the Contract Documents; or

.4 The Owner has failed to furnish to the Contractor reasonable evidence as required by Section 2.2.

§ 14.1.2 The Contractor may terminate the Contract if, through no act or fault of the Contractor, a Subcontractor, a Sub-subcontractor, their agents or employees, or any other persons or entities performing portions of the Work under direct or indirect contract with the Contractor, repeated suspensions, delays, or interruptions of the entire

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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' written notice to the Owner and Architect, terminate the Contract and recover from the Owner payment for Work executed, including reasonable overhead and profit on Work executed, and costs incurred by reason of such termination.

§ 14.1.4 If the Work is stopped for a period of 60 consecutive days through no act or fault of the Contractor, a Subcontractor, a Sub-subcontractor, or their agents or employees or any other persons or entities performing portions of the Work under contract with the Contractor 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' written notice to the Owner and the Architect, terminate the Contract and recover from the Owner as provided in Section 14.1.3.

§ 14.2 Termination by the Owner for Cause

§ 14.2.1 The Owner may terminate the Contract if the Contractor

- **.1** refuses or fails to supply enough properly skilled workers or proper materials;
- **.2** fails to make payment to Subcontractors for materials or labor 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; or
- **.4** otherwise is guilty of substantial breach of a provision of the Contract Documents, including but not limited to failure to maintain the Construction Schedule or failure to correct defective and/or non-conforming Work.

§ 14.2.2 When any of the reasons described in Section 14.2.1 exist, the Owner may, without prejudice to any other rights or remedies of the Owner and after giving the Contractor and the Contractor's surety, if any, seven days' written notice, terminate employment of the Contractor and may, subject to any prior rights of the surety as expressly stated in the applicable surety bond:

- **.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.

As set forth in this section, the Owner's termination of the Contractor is without prejudice to any other rights and remedies of the Owner, including but not limited to the Owner's rights and remedies under the Contract Document and at law, all of which shall survive termination.

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

§ 14.2.4 If the unpaid balance of the Contract Sum exceeds costs of finishing the Work, including compensation for the Architect's services and expenses made necessary thereby, and other costs or damages incurred by the Owner and not expressly waived, including but not limited to the Owner's attorneys' and consultants' fees and expenses, arising out of or related to the termination, such excess shall be paid to the Contractor. If such costs, other costs, and damages exceed the unpaid balance, the Contractor shall pay the difference to the Owner. The amount to be paid to the Contractor or Owner, as the case may be, shall be certified by the Initial Decision Maker, upon application, and this obligation for payment shall survive termination of the Contract.

§ 14.3 Suspension by the Owner for Convenience

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

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

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

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

§ 14.4 Termination by the Owner for Convenience

§ 14.4.1 Upon three business days written notice to the Contractor and Architect, 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 Contractor shall be entitled to receive payment for Work properly executed.

ARTICLE 15 CLAIMS AND DISPUTES

§ 15.1 Claims

§ 15.1.1 Definition

A Claim is a demand or assertion by one of the parties seeking, as a matter of right, payment of money, a change in the Contract Time, or other relief with respect to the terms of the Contract. The term "Claim" also includes other disputes and matters in question between the Owner and Contractor arising out of or relating to the Contract. The Contractor's Claims must be initiated by submitting the Statement of Claim Form ("Claim Form") included with the Contract Documents to the Architect and the Owner, properly completed in accordance with the instructions accompanying the Form and submitted within the time period under Section 15.1.3.1. The responsibility to substantiate Claims shall rest with the party making the Claim. The Contractor shall not knowingly present or cause to be presented to the Owner a false or fraudulent Claim. "Knowingly" shall have the same meaning as in Section 3729(b) USC of the Federal False Claims Act. If the Contractor knowingly presents or causes to be presented a false or fraudulent Claim, then the Contractor shall be liable to the Owner for the same civil penalty and damages as the United States Government would be entitled to recover under such Section 3729(a) USC and shall also indemnify and hold the Owner harmless from all costs and expenses, including the Owner's attorneys' and consultants' fees and expenses incurred in investigating and defending against such Claim and in pursuing the collection of such penalty, damages, and fees and expenses. 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.

(Paragraph Deleted)

The Contractor acknowledges and agrees that the Owner and/or parties in privity of contract with the Owner may delay, interfere with, and/or disrupt the Work of the Contractor, and such actions do not constitute a breach of contract by the Owner, since the Contractor is entitled to additional compensation by properly submitting and pursuing a Claim as permitted by these General Conditions. Pending final resolution of the Claim, the Contractor shall continue performance of the Work as provided in Section 15.1.4.

§ 15.1.2 [Not Used.]

§ 15.1.3 Notice of Claims

§ 15.1.3.1 As a condition precedent to a change in the Contract Sum or the Contract Times, for each Claim the Contractor shall deliver a fully completed Statement of Claim Form, a copy of which form is a Contract Document, to the Initial Decision Maker with a copy sent to the Owner and the Architect, if the Architect is not serving as the Initial Decision Maker, within 10 days of the start of the event giving rise to the Claim. The Contractor shall be

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responsible for substantiating its Claim. The Contractor's failure to deliver a fully completed Statement of Claim form shall be an irrevocable waiver of the Contractor's right to any form of additional compensation, be it in time or money, arising out of the Claim or the circumstances underlying the Claim. Further, the Contractor's obligation to deliver a fully completed Statement of Claim form within such 10 day period is a material term of the Contract Documents and provides the Owner with the opportunity to mitigate its damages.

§ 15.1.3.2 Claims by the Owner, where the condition giving rise to the Claim is first discovered after expiration of the period for correction of the Work set forth in Section 12.2.2, shall be initiated by notice to the other party. In such event, no decision by the Initial Decision Maker is required.

§ 15.1.4 Continuing Contract Performance

§ 15.1.4.1 Pending final resolution of a Claim, except as otherwise agreed in writing or as provided in Section 9.7 and Article 14, the Contractor shall proceed diligently with performance of the Contract and the Owner shall continue to make payments in accordance with the Contract Documents.
The Architect will prepare Change Orders and issue Certificates for Payment in accordance with the decisions of the Initial Decision Maker.

§ 15.1.4.2 [Not Used.]

§ 15.1.5 Claims for Additional Cost

If the Contractor wishes to make a Claim for an increase in the Contract Sum, the Contractor shall submit a Statement of Claim Form as required by Section 15.1.3.1. Prior notice is not required for Claims relating to an emergency endangering life or property arising under Section 10.4.

§ 15.1.6 Claims for Additional Time

§ 15.1.6.1 If the Contractor wishes to make a Claim for an increase in the Contract Time following proper Notice of Delay as required under Section 3.10.3.1 of these General Conditions, the Contractor shall submit a Statement of Claim Form as required by Section 15.1.3.1.

§ 15.1.6.2 If the Contractor is prevented from completing any part of the Work within the Contract Time due to weather conditions and the Contractor wants additional time to complete the Work, the Contractor shall initiate a Claim by submission of the Statement of Claim Form in accordance with Section 15.1.3.1. The Contractor's entitlement to additional time shall be evaluated and substantiated as provided in Section 15.1.6.2.1.

§ 15.1.6.2.1 Weather Delays. When the Contractor is prevented from completing any part of the Work on the critical path within the Contract Time due to weather conditions, provided the Contractor properly initiates a Claim, the Contract Time will be extended by one (1) day for each work day lost due to weather that delays Work on the critical path in excess of those in the following table:

Month	Number of Workdays Lost Due to Weather
January	8
February	8
March	7
April	6
May	5
June	4
July	4
August	4
September	5
October	6
November	6
December	6

§ 15.1.6.3 Excusable and Compensable Delays. The delays for which the Contractor is entitled to additional time are "Excusable Delays." The only Excusable Delays are delays which the Contractor establishes were: (a) caused by the Owner or those in privity of contract with the Owner, (b) physical damage to the Project over which the Contractor

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has no control, (c) labor disputes beyond the control of the Contractor, (d) work days lost due to weather conditions as provided under Section 15.1.6.2, (e) concealed or unknown conditions under Section 3.7.4, and (f) other unforeseeable delays beyond the control of the Contractor and its subcontractors and suppliers of any tier.

The delays for which the Contractor is entitled to additional time and money are "Compensable Delays." The only Compensable Delays are Excusable Delays which the Contractor establishes were proximately caused by an improper action or failure to act by the Owner.

§ 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

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 Agreement in accordance with Article 14. Nothing contained in this Section 15.1.7 shall be deemed to preclude an award of liquidated damages, when applicable, in accordance with the requirements of the Contract Documents.

§ 15.1.8 Settlement Offers. If the Contractor initiates a Claim, the Owner may make settlement offers to settle the Claim at any time up to the date of the trial. Such settlement offers shall be subject to Rule 408 (Compromise and Offers of Compromise) of the Ohio Rules of Evidence. If at any stage of the litigation, including any appeals, the Contractor's Claim is dismissed or found to be without merit, or if the damages awarded to the Contractor on its Claim do not exceed the Owner's last settlement offer, the Contractor shall be liable to the Owner and shall reimburse the Owner for all of the Owner's attorneys' fees and expenses, and arising out of or related to such Claim since the date of such last settlement offer.

§ 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, 11.3.9, and 11.3.10, shall be referred to the Initial Decision Maker for initial decision. The Architect will serve as the Initial Decision Maker, unless otherwise indicated in the Agreement. Except for those Claims excluded by this Section 15.2.1, an initial decision shall be required as a condition precedent to any further proceeding permitted under these General Conditions of any Claim arising prior to the date final payment is due, unless 30 days have passed after the Claim has been referred to the Initial Decision Maker without a decision having been rendered. Unless the Initial Decision Maker and all affected parties agree, the Initial Decision Maker will not decide disputes between the Contractor and persons or entities other than the Owner.

§ 15.2.2 The Initial Decision Maker will review Claims and within thirty (30) days of the receipt of a Claim take one or more of the following actions: (1) request additional supporting data from the claimant or a response with supporting data from the other party, (2) reject the Claim in whole or in part, (3) approve the Claim, (4) suggest a compromise, or (5) advise the parties that the Initial Decision Maker is unable to resolve the Claim if the Initial Decision Maker lacks sufficient information to evaluate the merits of the Claim or if the Initial Decision Maker concludes that, in the Initial Decision Maker's sole discretion, it would be inappropriate for the Initial Decision Maker to resolve the Claim.

§ 15.2.2.1 Owner's Request for Documents. The Owner may request such documents and information from the Contractor as the Owner determines necessary to evaluate and comment upon the Claim. Upon receipt of such request from the Owner, the Contractor shall provide all requested documents and information within ten (10) days. Such documents and information may include but not be limited to the Contractor's Project accounting records, estimate for the Project, daily job logs, and other information from which the Contractor's Project costs may be derived. The Contractor shall provide the requested documents in the formats requested, which include both paper and electronic copies. If requested by the Owner, the electronic copies shall be provided in native computer language. To the extent permitted by law, the Owner shall keep the Project accounting records and estimate for the Project confidential. The Contractor's provision of the requested documents to the Owner in the format requested by the Owner shall be a condition precedent to any further proceeding under the Contract Documents.

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Failure to provide the requested documents shall be a material breach of the Contract, and the Contractor shall indemnify the Owner for all of the Owner's costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to the Contractor's failure to comply with this provision. If the Contractor fails to provide the requested documents, the Contractor shall be precluded from presenting such documents in any subsequent dispute resolution proceedings, if the data was reasonably available at the time of the request.

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

§ 15.2.4 If the Initial Decision Maker requests a party to provide a response to a Claim or to furnish additional supporting data, such party shall respond, within ten days after receipt of the request, and shall either (1) provide a response on the requested supporting data, (2) advise the Initial Decision Maker when the response or supporting data will be furnished, or (3) advise the Initial Decision Maker that no supporting data will be furnished. Upon receipt of the response or supporting data, if any, the Initial Decision Maker will either reject or approve the Claim in whole or in part. If the Initial Decision Maker requests supporting data from a party and the party fails to provide it, the party thereafter shall be precluded from presenting such data in any subsequent dispute resolution proceedings, if the data was reasonably available to it at the time of the request.

§ 15.2.5 The Initial Decision Maker will render an initial decision approving or rejecting the Claim, or indicating that the Initial Decision Maker is unable to resolve the Claim. This initial decision shall (1) be in writing; (2) state the reasons therefor; and (3) notify the parties and the Architect, if the Architect is not serving as the Initial Decision Maker, of any change in the Contract Sum or Contract Time or both. The initial decision shall be final and binding on the parties but subject to mediation if both parties agreed in writing to mediate and, if mediation is not successful in resolving the matter or the parties do not agree to mediate, litigation in accordance with Section 15.4.1.

§ 15.2.6 Either party may file for mediation of an initial decision at any time, subject to the terms of Section 15.2.6.1.

§ 15.2.6.1 If the Contractor does not request mediation of a written decision of the Initial Decision Maker , within 30 days from the date of receipt of an initial decision, then the Initial Decision Maker's decision becomes final and binding upon the Contractor. If the Initial Decision Maker renders a decision after litigation has been initiated, such decision may be entered as evidence, but shall not supersede the litigation proceedings unless the decision is acceptable to all parties concerned. Litigation shall be considered "initiated" upon either the service of the original complaint on the Owner or, if litigation relating to the Project has already been filed, when a motion for leave to amend the complaint to add the claim has been filed.

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

§ 15.2.8 If a Claim relates to or is the subject of a mechanic's lien, the party asserting such Claim may proceed in accordance with applicable law to comply with the lien notice or filing deadlines.

§ 15.3 Mediation

§ 15.3.1 If both Parties agree to mediate, in writing, then 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, may, after initial decision by the Initial Decision Maker or 30 days after submission of the Claim to the Initial Decision Maker, be subject to mediation, pursuant to mediation procedures mutually agreed-upon by the Parties.

§ 15.3.2 [Not Used.]

§ 15.3.3 [Not Used.]

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§ 15.3.4 The parties shall share the mediator's fee and any filing fees equally. The mediation shall be held in the county where the Project is located, unless another location is mutually agreed upon. Agreements reached in mediation shall be enforceable as settlement agreements in any court having jurisdiction thereof.

§ 15.4 Litigation

§ 15.4.1 Any Claim subject to, but not resolved by mediation or any Claim that is not subject to mediation, shall be subject to litigation unless both parties mutually agree in writing to arbitrate the Claims. Venue for such litigation shall be exclusive in the state court of competent jurisdiction in the Court of Common Pleas, in the county in which the Project is located. The parties expressly waive the right to remove any litigation to federal court. Any Claim subject to, but not resolved by, mediation may be
decided by arbitration if the parties mutually agree in writing. There shall be no mandatory arbitration of Claims.

§ 15.4.1.1 [Not Used.]

§ 15.4.2 [Not Used.]

§ 15.4.3 [Not Used.]

§ 15.4.4 Consolidation or Joinder [This Section is deleted in its entirety.]

§ 15.4.4.1 [Not Used.]

§ 15.4.4.2 [Not Used.]

§ 15.4.4.3 [Not Used.]

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CONTRACTOR'S PERSONAL PROPERTY TAX AFFIDAVIT
(O.R.C. § 5719.042)

State of Ohio
County of _____, ss:

_____, being first duly sworn, deposes and says that he is the
(Name)

_____ of _____ with offices located at
(Title) (Contractor)

_____, and as its duly
(Address of Contractor)

authorized representative, states that effective this _____ day of _____, 20___,

_____
(Name of Contractor)

( ) is charged with delinquent personal property taxes on the general list of personal property as set forth below:

County	Amount (include total amount penalties and interest thereon)
_____ County	$_____
_____ County	$_____
_____ County	$_____

( ) is not charged with delinquent personal property taxes on the general list of personal property in any Ohio county.

_____
(Affiant)

Sworn to and subscribed before me by the above-named affiant this _____ day of _____, 20__.
The notarial act certified hereby is a jurat. An oath or affirmation was administered to the signer with regard to the notarial act certified to hereby.

_____
(Notary Public)

My commission expires

_____, 20__

BID GUARANTY AND CONTRACT BOND

(O.R.C. § 153.571)

KNOW ALL PERSONS BY THESE PRESENTS, that we, the undersigned _____ _____ ("Contractor") as principal and _____ _____ as surety are hereby held and firmly bound unto the **Mount Gilead Exempted Village School District Board of Education,** as obligee in the penal sum of the dollar amount of the bid submitted by the principal to the obligee on _____, 20__, to undertake the construction of the **Preschool Expansion & District Office Renovation Project – Phase II** ("Project"). The penal sum referred to herein shall be the dollar amount of the principal's bid to the obligee, incorporating any additive or deductive Alternates made by the principal on the date referred to above to the obligee, which are accepted by the obligee. In no case shall the penal sum exceed the amount of _____ _____ Dollars ($_____). (If the foregoing blank is not filled in, the penal sum will be the full amount of the principal's bid, including add Alternates. Alternatively, if the blank is filled in the amount stated must not be less than the full amount of the bid including add Alternates, in dollars and cents. A percentage is not acceptable.) For the payment of the penal sum well and truly to be made, we hereby jointly and severally bind ourselves, our heirs, executors, administrators, successors, and assigns.

Signed this _____ day of _____, 20__.

THE CONDITION OF THE ABOVE OBLIGATION IS SUCH that whereas the above named principal has submitted a bid for work on the Project.

Now, therefore, if the obligee accepts the bid of the principal and the principal fails to enter into a proper contract in accordance with the bid, plans, details, specifications, and bills of material; and in the event the principal pays to the obligee the difference not to exceed ten percent (10%) of the penalty hereof between the amount specified in the bid and such larger amount for which the obligee may in good faith contract with the next lowest bidder to perform the work covered by the bid; or in the event the obligee does not award the contract to the next lowest bidder and resubmits the project for bidding, the principal pays to the obligee the difference not-to-exceed ten percent (10%) of the penalty hereof between the amount specified in the bid, or the costs, in connection with the resubmission, of printing new contract documents, required advertising, and printing and mailing notices to prospective bidders, whichever is less, then this obligation shall be null and void, otherwise to remain in full force and effect; if the obligee accepts the bid of the principal and the principal within ten (10) days after the awarding of the contract enters into a proper contract in accordance with the bid, plans, details, specifications, and bills of material, which said contract is made a part of this bond the same as though set forth herein.

Now also, if the said principal shall well and faithfully do and perform the things agreed by said principal to be done and performed according to the terms of said contract; and shall pay all lawful claims of subcontractors, materialmen, and laborers, for labor performed and materials furnished in the carrying forward, performing, or completing of said contract; we agreeing and assenting that this undertaking shall be for the benefit of any materialman or laborer having a just claim, as well as for the obligee herein; then this obligation shall be void; otherwise the same shall remain in full force and effect; and surety shall indemnify the obligee against all damage suffered by failure of the principal to perform the contract according to its provisions and in accordance with the plans, details, specifications, and bills of material therefor and to pay all lawful claims of subcontractors, materialmen, and laborers for labor performed or material furnished in carrying forward, performing, or completing the contract and surety further agrees and assents that this undertaking is for the benefit of any subcontractor, materialman, or laborer having a just claim, as well as for the obligee; it being expressly understood and agreed that the liability of the surety for any and all claims hereunder shall in no event exceed the penal amount of this obligation as herein stated.

The said surety hereby stipulates and agrees that no modifications, omissions, or additions in or to the terms of the said contract or in or to the plans or specifications therefore shall in any wise affect the obligations of said surety on its bond, and does hereby waive notice of any such modifications, omissions or additions to the terms of the contract or to the work or to the specifications.

Signed and sealed this _____ day of _____, 20__.

_____
PRINCIPAL

By: _____

Printed Name & Title: _____

_____
SURETY

By: _____

Printed Name & Title: _____

_____

Surety's Address: _____

_____

Surety's Telephone Number: _____

Surety's Fax Number: _____

_____
SURETY'S AGENT

Surety's Agent's Address: _____

_____

Surety's Agent's Telephone Number: _____

Surety's Agent's Fax Number: _____

NOTE: The Contract Bond form that follows is to be used ONLY by a bidder that is awarded a contract and submits a form of bid guaranty other than the combined Bid Guaranty and Contract Bond with its bid. If a bidder submits a combined Bid Guaranty and Contract Bond, then the bid guaranty becomes the contract bond when the contract is awarded.

AIA Bid Bond or Payment and Performance Bond forms are not acceptable for this Project.

CONTRACT BOND
(O.R.C. § 153.57)

KNOW ALL PERSONS BY THESE PRESENTS, that we, the undersigned ("Contractor"), as principal, and _____, as surety, are hereby held and firmly bound unto **Mount Gilead Exempted Village School District Board of Education** ("Owner") as obligee, in the penal sum of _____ Dollars ($ _____), for the payment of which well and truly to be made, we hereby jointly and severally bind ourselves, our heirs, executors, administrators, successors, and assigns.

THE CONDITION OF THE ABOVE OBLIGATION IS SUCH that whereas, the above-named principal did on the _____day of _, 20__, enter into a contract with the Owner for construction of the **Preschool Expansion & District Office Renovation Project – Phase II** ("Project"), which said contract is made a part of this bond the same as though set forth herein:

Now, if the said Contractor shall well and faithfully do and perform the things agreed by the Contractor to be done and performed according to the terms of said contract; and shall pay all lawful claims of subcontractors, materialmen, and laborers, for labor performed and materials furnished in the carrying forward, performing, or completing of said contract; we agreeing and assenting that this undertaking shall be for the benefit of any materialman or laborer having a just claim, as well as for the obligee herein; then this obligation shall be void; otherwise the same shall remain in full force and effect; it being expressly understood and agreed that the liability of the surety for any and all claims hereunder shall in no event exceed the penal amount of this obligation as herein stated.

The said surety hereby stipulates and agrees that no modifications, omissions, or additions in or to the terms of the said contract or in or to the plans or specifications therefore shall in any wise affect the obligations of said surety on its bond, and does hereby waive notice of any such modifications, omissions or additions to the terms of the contract or to the work or to the specifications.

Signed and sealed this _____ day of _____, 20__.

_____
(PRINCIPAL)

By: _____

Printed Name & Title: _____

_____

_____
(SURETY)

By: _____

Printed Name & Title: _____

_____

Surety's Address: _____

_____

_____

Surety's Telephone Number: _____

Surety's Fax Number: _____

_____
NAME OF SURETY'S AGENT

Surety's Agent's Address: _____

_____

_____

Surety's Agent's Telephone Number: _____

Surety's Agent's Fax Number: _____

Department of Taxation
tax.ohio.gov

Sales and Use Tax
Construction Contract Exemption Certificate

STEC CC
Rev. 04/24

Identification of Contract:

Contractee's (owner's) name: Mount Gilead Exempted Village School District Board of Education

Exact location of job/project: 145 North Cherry Street, Mount Gilead, Ohio 43338

Name of job/project as it appears on contract documentation: Preschool Expansion & District Office Renovation Project

The undersigned hereby certifies that the tangible personal property purchased under this exemption certificate is purchased exempt of the tax for incorporation into:

☐	A building used exclusively for charitable purposes by a nonprofit organization operated exclusively for charitable purposes as defined in Ohio Revised Code (R.C.) section 5739.02(B)(12);	☐	Real property that is owned, or will be accepted for ownership at the time of completion, by the United States government, its agencies, the state of Ohio or an Ohio political subdivision;
☐	A horticulture structure or livestock structure for a person engaged in the business of horticulture or producing livestock;	☑	Real property under a construction contract with the United States government, its agencies, the state of Ohio, or an Ohio political subdivision;
☐	The original construction of a sports facility under R.C. section 307.696;	☐	A building under a construction contract with an organization exempt from taxation under section 501(c)(3) of the Internal Revenue Code of 1986 when the building is to be used exclusively for the organization's exempt purposes;
☐	A hospital facility entitled to exemption under R.C. section 140.08;		
☐	A computer data center entitled to exemption under R.C. 122.175; ____% exempt per OH Dept. of Development	☐	A house of public worship or religious education;
☐	A megaproject entitled to exemption as described in R.C. 5739.02(B)(13).	☐	Building and construction materials and services sold for incorporation into real property comprising a convention center that qualifies for property tax exemption under R.C. 5709.084 (until one calendar year after the construction is completed).
☐	Real property outside this state if such materials and services, when sold to a construction contractor in the state in which the real property is located for incorporation into real property in that state, would be exempt from a tax on sales levied by that state;		

The original of this certificate must be signed by the owner/contractee and/or government official and must be retained by the prime contractor. Copies must be maintained by the owner/contractee and all subcontractors. When copies are issued to suppliers when purchasing materials, each copy must be signed by the contractor or subcontractor making the purchase.

Prime Contractor
Name _____
Signed by _____
Title _____
Street address _____
City, state, ZIP code _____
Date _____

Owner/Contractee
Name Mount Gilead EVSD Board of Education
Signed by _____
Title _____
Street address 145 North Cherry Street
City, state, ZIP code Mount Gilead, Ohio 43338
Date _____

Subcontractor
Name _____
Signed by _____
Title _____
Street address _____
City, state, ZIP code _____
Date _____

Political Subdivision
Name Same as Owner/Contractee
Signed by _____
Title _____
Street address _____
City, state, ZIP code _____
Date _____

STATEMENT OF CLAIM FORM

Claim No. ___ for Contractor

1. Name of Contractor: _____

2. Date written claim given: _____.

3. Contractor's representative to contact regarding the claim:

   Name: _____ Title: _____
   Telephone No. _____ (office) FAX No. _____

   E-mail: _____

4. General description of claim:

_____
_____
_____

5. Contract Documents. If the claim is based upon any part or provision in the Contract Documents, including but not limited to pages in the Drawings and/or paragraphs in the Specifications, Owner-Contractor Agreement, General Conditions or Supplementary General Conditions, state upon which parts or provisions the claim is based:

_____
_____
_____

6. Delay claims:
   6.1 Date delay commenced: _____
   6.2 Duration or expected duration of the delay, if known: _____
   6.3 Apparent cause of the delay and part of critical path affected:

_____
_____
_____

   6.4 Expected impact of the delay and recommendations for minimizing such impact:

_____
_____
_____

7. Additional compensation. Set forth in detail all additional compensation to which the Contractor believes it is entitled with respect to this claim:

_____
_____
_____

8. Instructions for Completing the Statement of Claim Form ("Instructions"). The Instructions are incorporated in this Form.

9. Truth of Claim. By submitting this claim, the Contractor and its representative certify that after conscientious and thorough review and to the best of his or her knowledge and belief a) the Contractor has complied fully with the Instructions, b) the information in this State of Claim is accurate, c) the Contractor is entitled to recover the compensation in paragraph 7, and d) the Contractor has not knowingly presented a false or fraudulent claim. The Contractor by its authorized representative must acknowledge this Statement of Claim before a notary public.

CONTRACTOR: _____

By: _____

Name and Title: _____

Date: _____

CONTRACTOR'S ACKNOWLEDGMENT

State of _____,

County of _____, ss:

_____ first being sworn, states that after conscientious and thorough review, the statements made in attached Statement of Claim Form are complete and true to the best of his or her knowledge and belief.

_____

Sworn to before me a notary public by _____ on _____ __, 20__. The notarial act certified hereby is a jurat. An oath or affirmation was administered to the signer with regard to the notarial act certified to hereby.

_____
Notary Public

WHEN COMPLETED, FORWARD A COPY OF THIS NOTICE AND STATEMENT OF CLAIM FORM TO THE OWNER AND DESIGN PROFESSIONAL.

INSTRUCTIONS FOR COMPLETING THE STATEMENT OF CLAIM FORM

1. Completing the Statement of Claim Form ("Claim Form") is a material term of the Contract. The Claim Form tells the Owner and Design Professional that the Contractor is making a Claim and that they need to act promptly to mitigate the effects of the occurrence giving rise to the Claim. The Claim Form also provides them with information so that they can mitigate such effects. The Contractor acknowledges that constructive knowledge of the conditions giving rise to the Claim through job meetings, correspondence, site observations, etc. is inadequate notice, because knowledge of these conditions does not tell the Owner and Design Professional that the Contractor will be making a Claim and most often is incomplete.

2. If the space provided in the Claim Form is insufficient, the Contractor, as necessary to provide complete and detailed information, must attach pages to the Claim Form with the required information.

3. Paragraph 4. The Contractor must state what it wants, *i.e.*, time and/or compensation, and the reason why it is entitled to time and/or compensation.

4. Paragraph 5. The Contractor must identify the exact provisions of the Contract Documents it is relying on in making its Claim. For example, if the Claim is for a change in the scope of the Contractor's Work, the Contractor must identify the specific provisions of the Specifications, and the Plan sheets and details that provide the basis for the scope change.

5. Paragraph 6. This paragraph applies to delay claims, including delays that the Contractor believes result in constructive acceleration. The Contractor must identify the cause of the delay, party or parties responsible, and what the party did or did not do that caused the delay, *i.e.*, specific work activities. The Contractor acknowledges that general statements are not sufficient, and do not provide the Owner with sufficient information to exercise the remedies available to the Owner or to mitigate the effects of the delay.

   For example, if the Contractor claims a slow response time on submittals caused a delay, the Contractor must identify the specific submittals, all relevant dates, and then show on the applicable schedule, by circling or highlighting, the activities immediately affected by the delays. Also for example, if the Contractor claims it was delayed by another Contractor, the Contractor must identify the delaying Contractor, specifically what the delaying Contractor did or did not do that caused the delay, and then show the applicable schedule, by circling or highlighting, the activities immediately affected by the delays. Further by example, if the Contractor seeks an extension of time for unusually severe weather, the Contractor must submit comparative weather data along with a record of the actual weather at the job site and job site conditions.

6. Paragraph 6.4. Time is of the essence under the Contract Documents. If there is a delay, it is important to know what can be done to minimize the impact of the delay. It therefore is important that the Contractor provide specific recommendations on how to do so.

7. Paragraph 7. The Contractor must provide a specific and detailed breakdown of the additional compensation it seeks to recover. For future compensation, the Contractor shall provide its best estimate of such compensation.

8. Paragraph 8 and Acknowledgment. By submitting this Claim, the Contractor and its representative certify that after conscientious and thorough review and to the best of his or her knowledge and belief a) the Contractor has complied fully with the Instructions, b) the information in this Claim Form is accurate, c) the Contractor is entitled to recover the compensation in paragraph 7, and d) the Contractor has not knowingly presented a false or fraudulent claim. The Contractor by its authorized representative must acknowledge this Statement of Claim before a notary public.

End of Instructions

CERTIFICATE OF SUBSTANTIAL COMPLETION

Project: **Preschool Expansion & District Office Renovation Project – Phase II**	Contract For: General Contract
Owner: **Mount Gilead Exempted Village School District Board of Education**	CONTRACTOR: [insert name and address] _____

The Design Professional hereby certifies that the Date for Substantial Completion of the Contractor's Work as set forth in the Owner-Contractor Agreement is:

_____
(Insert Date for Substantial Completion of the Work)

The Design Professional hereby certifies that the Date for Substantial Completion in the Contractor's Agreement with the Owner (the "Agreement"), as extended by Change Orders and Claims submitted by the Contractor that have been Finally Resolved, as defined below, is:

1. Date for Substantial Completion in the Agreement (above): _____
2. Additional days added to Date for Substantial Completion by Change Order: _____
3. Additional days added by Claims that have been Finally Resolved: _____
4. Date for Substantial Completion in the Contract Adjusted by days under No. 2 and No. 3 _____

"Finally Resolved" means that the Design Professional has made a decision (or declined to make a decision) on the Claim under the General Conditions and that any litigation regarding the Claim has been concluded.

The Design Professional certifies that the Contractor's Work to the best of the Design Professional's knowledge, information, and belief was Substantially Complete, as Substantial Completion is defined in the Contract Documents, on _____.

The Design Professional hereby certifies that the difference between (a) the Date for Substantial Completion adjusted by the days under No. 2 and No. 3 above and (b) the date the Contractor's Work was Substantially Complete is _____ days.

NOTICES OF DELAY. The Design Professional hereby certifies that all "NOTICES OF DELAY" submitted by the Contractor and described in the General Conditions are attached to this Certificate. This certification is solely for the purpose of identifying all "NOTICES OF DELAY" submitted by the Contractor and is not intended to imply that any of these NOTICES OF DELAY were properly submitted in accordance with Contract Documents or are valid.

STATEMENT OF CLAIM FORMS. The Design Professional hereby certifies that all Statement of Claim Forms described in the General Conditions and submitted by the Contractor are attached to this Certificate. This certification is solely for the purpose of identifying all Statement of Claim Forms submitted by the Contractor and is not intended to imply that any of these Statement of Claim Forms were properly submitted in accordance with Contract Documents or are valid.

PUNCHLIST ITEMS. A list of items to be completed by the Contractor is attached to this Certificate. The failure to include items on this list does not change the responsibility of the Contractor to complete its Work in accordance with the Contract Documents. The Contractor shall complete all items on the Punchlist in accordance with the Contract Documents.

Security, maintenance, utilities, damage to the Work and insurance are the responsibility of the Owner and the Contractor based on their operations pursuant to final completion of the Work.

Copies of this Certificate were provided to the Contractor and the Owner on _____

Signature: _____

Date: _____

CONTRACTOR'S AFFIDAVIT AND CERTIFICATION WITH LIST OF SUBCONTRACTORS AND SUPPLIERS WITH ANY AMOUNTS WITHHELD

PROJECT:
Preschool Expansion & District Office Renovation Project – Phase II

CONTRACTOR: _____

In Support of PAYMENT APPLICATION No.: _____

For the Period Through: _____

STATE OF _____:
: SS,
COUNTY OF _____:

The undersigned after first being sworn swears that a) all previous progress payments received on account of the Work have been applied on account to discharge Contractor's legitimate obligations associated with prior Applications for Payment; b) set forth below is a complete list of its Subcontractors and Suppliers; and c) set forth below is a complete description of all amounts withheld from any Subcontractor or Supplier and the reason why. Attach additional sheets if necessary.

Typed or Printed Name of Subcontractor or Supplier	Address of Subcontractor or Supplier	Telephone Number of Subcontractor or Supplier

Typed or Printed Name of Subcontractor or Supplier	Address of Subcontractor or Supplier	Telephone Number of Subcontractor or Supplier

WITHHOLDINGS FROM SUBCONTRACTORS AND/OR SUPPLIERS:

Typed or Printed Name of Subcontractor or Supplier	Amount Withheld	Reason for Withholding

Moreover, Contractor certifies that, except for as set forth immediately above, Contractor has paid all of its subcontractors and suppliers who were due to be paid with the proceeds of the prior Application for Payment and Contractor acknowledges that Owner is relying upon such certification when paying Contractor the amount asked for in the payment application that this Affidavit and Certification supports.

CONTRACTOR: [insert name]

_____

BY: _____
(Signature of authorized representative

NOTARY PUBLIC

Subscribed and sworn to before me on this date by _____ on behalf of _____. The notarial act certified hereby is a jurat. An oath or affirmation was administered to the signer with regard to the notarial act certified to hereby.

_____
Signature of Notary Public

Notary Public: _____

My Commission Expires: _____

CONTRACTOR'S WAIVER & RELEASE AFFIDAVIT
("AFFIDAVIT")

Project: **Preschool Expansion & District Office Renovation Project – Phase II**

The undersigned hereby acknowledges receipt of payment for all Work on the Project through the date of the prior Application for Payment by the **Mount Gilead Exempted Village School District Board of Education** (the "Owner") with which it has a contract for the Project.

In return for said payment, and/or pursuant to certain contractual obligations of the undersigned, the undersigned hereby waives and releases any rights it has or may have through the date of the last Application for Payment to any and all types of claims relating to the Project, including without limitation claims of payment, Mechanic's Lien, stop notice, equitable lien, labor and material bond, breach of contract or unjust enrichment, or any other claim against the Owner, for any labor, materials, or equipment the undersigned may have delivered or provided to the Project, except for any Claims the undersigned has made by properly and timely submitting a Statement of Claim form. The undersigned further certifies that this Affidavit covers claims by all contractors, subcontractors, and suppliers who may have provided any labor, material, or equipment to the Project through the undersigned or at the undersigned's request. The undersigned acknowledges that all such contractors, subcontractors, sub-subcontractors and suppliers have signed an affidavit in the form of this Affidavit releasing any and all claims against the Owner, except for any Claims the undersigned has made by properly and timely submitting a Statement of Claim form. The undersigned hereby represents and warrants that it has paid any and all welfare, pension, vacation or other contributions required to be paid on account of the employment by the undersigned of any laborers on the Project.

This Affidavit is for the benefit of, and may be relied upon by the Owner. The undersigned hereby agrees to indemnify, defend and hold harmless each of the foregoing, the Project, work of improvement, and real property from any and all claims, or liens that are or should have been released in accordance with this Affidavit.

_____
Company Name

_____
Authorized Signature (Company Officer)

_____
Title

_____
Date

State of: _____ County of _____

Subscribed and sworn to before me this_____ day of _____. The notarial act certified hereby is a jurat. An oath or affirmation was administered to the signer with regard to the notarial act certified to hereby.

Notary Public: _____

My Commission Expires: _____

SUBCONTRACTORS, SUPPLIERS
WAIVER & RELEASE AFFIDAVIT
("AFFIDAVIT")

Project: **Preschool Expansion & District Office Renovation Project – Phase II**

The undersigned hereby acknowledges receipt of payment for all Work on the Project through the date of the prior Application for Payment by the Contractor ("Contractor") with which it has a contract.

In return for said payment, and/or pursuant to certain contractual obligations of the undersigned, the undersigned hereby waives and releases any rights it has or may have through the date of the Contractor's last Application for Payment and to any and all types of claims relating to the Project, including without limitation claims of payment, Mechanic's Lien, stop notice, equitable lien, labor and material bond, breach of contract or unjust enrichment, or any other claim against the Contractor, the Contractor's surety, and/or the **Mount Gilead Exempted Village School District Board of Education** (the "Owner"), for any labor, materials, or equipment the undersigned may have delivered or provided to the Project, except for any Claims the undersigned has made by properly and timely submitting a Statement of Claim form, a copy of which has been delivered to the Owner. The undersigned further certifies that this Affidavit covers claims by all contractors, subcontractors and suppliers through the date of the Contractor's last Application for Payment who may have provided any labor, material, or equipment to the Project through the undersigned or at the undersigned's request. The undersigned acknowledges that all such contractors, subcontractors, sub-subcontractors and suppliers have signed an affidavit in the form of this Affidavit releasing any and all claims against the Contractor, the Contractor's surety, and/or the Owner, except for any Claims made by properly and timely submitting a Statement of Claim form a copy of which has been delivered to the Owner. The undersigned hereby represents and warrants that it has paid any and all welfare, pension, vacation or other contributions required to be paid on account of the employment by the undersigned of any laborers on the Project.

The undersigned agrees that upon receipt of the payment from the Contractor with respect to the Contractor's current Application for Payment, it shall, if applicable, immediately execute and cause to be filed or recorded a legally effective Satisfaction of Lien, Release of Lien, or any other legal instrument necessary to cause prejudicial dismissal and release of any lien, encumbrance, lawsuit, or other claim against the Contractor, the Contractor's surety and the Owner, the property where the Project is located, and/or any surety bond posted by the Contractor or the Owner to the extent of the foresaid payment. Upon request of the Contractor, the undersigned shall provide proof of having complied with this obligation.

This Affidavit is for the benefit of, and may be relied upon by, the Contractor, the Contractor's surety and the Owner. The undersigned hereby agrees to indemnify, defend and hold harmless each of the foregoing, the Project, its Work, and real property from any and all claims, or liens that are or should have been released in accordance with this Affidavit and from any liability, cost, or expense incurred as a result of any breach of this Affidavit by the undersigned.

_____
Company Name

_____
Authorized Signature (Company Officer)

_____
Title

_____
Date

State of: _____ County of _____

Subscribed and sworn to before me this_____ day of _____. The notarial act certified hereby is a jurat. An oath or affirmation was administered to the signer with regard to the notarial act certified to hereby.

Notary Public: _____

My Commission Expires: _____

CONTRACTOR'S FINAL WAIVER & RELEASE AFFIDAVIT
("AFFIDAVIT")

Project: **Preschool Expansion & District Office Renovation Project – Phase II**

In consideration for payment received from the **Mount Gilead Exempted Village School District Board of Education** (the "Owner") in the amount requested in Contractor's Final Application for Payment to the Owner, the receipt of which is hereby acknowledged, the undersigned Contractor hereby waives and releases any rights it has or may have to any and all types of claims relating to the Project, including without limitation claims of payment, Mechanic's Lien, stop notice, equitable lien, labor and material bond, breach of contract or unjust enrichment, or any other claim against the Owner, for any labor, materials, or equipment the undersigned may have delivered or provided to the Project, except for any Claims the undersigned has made by properly and timely submitting a Statement of Claim form. The undersigned further certifies that this Affidavit covers claims by all contractors, subcontractors, and suppliers who may have provided any labor, material, or equipment to the Project through the undersigned or at the undersigned's request. The undersigned acknowledges that all such contractors, subcontractors, sub-subcontractors and suppliers have signed an affidavit in the form of this Affidavit releasing any and all claims against the Owner, except for any Claims the undersigned has made by properly and timely submitting a Statement of Claim form. The undersigned hereby represents and warrants that it has paid any and all welfare, pension, vacation or other contributions required to be paid on account of the employment by the undersigned of any laborers on the Project.

This Affidavit is for the benefit of, and may be relied upon by the Owner. The undersigned hereby agrees to indemnify, defend and hold harmless each of the foregoing, the Project, work of improvement, and real property from any and all claims, or liens that are or should have been released in accordance with this Affidavit.

_____
Company Name

_____
Authorized Signature (Company Officer)

_____
Title

_____
Date

State of: _____ County of _____

Subscribed and sworn to before me this_____ day of _____. The notarial act certified hereby is a jurat. An oath or affirmation was administered to the signer with regard to the notarial act certified to hereby.

Notary Public: _____

My Commission Expires: _____

SUBCONTRACTORS, SUPPLIERS
FINAL WAIVER & RELEASE AFFIDAVIT
("AFFIDAVIT")

Project: **Preschool Expansion & District Office Renovation Project – Phase II**

Upon receipt of payment in the amount of $_____ received from _____ ("Prime Contractor") the undersigned Subcontractor or Supplier waives and relinquishes all rights of lien or claim that it may have either in law or equity (including but not limited to rights under Ohio Mechanics' Lien Laws, O.R.C. 1311.01 *et seq*.) with respect to the construction project known as the **Preschool Expansion & District Office Renovation Project – Phase II** ("the Project"), for all labor, all equipment, and/or materials provided to or on behalf of the Project throughout its entirety, except for claims previously made pursuant to the agreement in place between Subcontractor or Supplier and Prime Contractor, and any lien previously perfected and remaining unreleased.

The undersigned Subcontractor or Supplier acknowledges and agrees that such payment represents final payment in full for all such labor, equipment and/or materials including retainage, if any, and that the Subcontractor or Supplier has completed its work on the Project. The undersigned Subcontractor or Supplier certifies that all amounts have been paid by the Subcontractor or Supplier for all work or materials furnished by others to the Subcontractor or Supplier for which the Subcontractor or Supplier has received previous payments from Prime Contractor, and Subcontractor or Supplier acknowledges that Prime Contractor is now making payment to the Subcontractor or Supplier in reliance upon such certification. The undersigned Subcontractor or Supplier further certifies that it will pay all amounts lawfully owing for all work or materials furnished by others to the Subcontractor or Supplier with the payment received from Contractor referenced herein.

This Affidavit is for the benefit of, and may be relied upon by, the Contractor, the Contractor's surety and the Owner. The undersigned hereby agrees to indemnify, defend and hold harmless each of the foregoing, the Project, its Work, and real property from any and all claims, or liens that are or should have been released in accordance with this Affidavit and from any liability, cost, or expense incurred as a result of any breach of this Affidavit by the undersigned.

IN WITNESS WHEREOF, the undersigned has caused this Affidavit to be executed by its authorized representative as of the date indicated below.

THE INDIVIDUAL SIGNING THIS AFFIDAVIT REPRESENTS THAT HE/SHE IS AUTHORIZED TO DO SO.

SUBCONTRACTOR OR SUPPLIER:

_____
Company Name

_____
Authorized Signature (Company Officer)

_____
Title

_____
Date

State of: _____ County of _____

Subscribed and sworn to before me this_____ day of _____. The notarial act certified hereby is a jurat. An oath or affirmation was administered to the signer with regard to the notarial act certified to hereby.

Notary Public: _____

My Commission Expires: _____

PRE-BID SUBSTITUTION FORM

<u>Note.</u> Certain brands of material or apparatus are specified. Each bid will be based on these brands, which may be referred to in the Contract Documents as Standards. The use of another brand (referred to as a substitution or proposed equal in the Contract Documents, when a bidder or the contractor seeks to have a different brand of material or apparatus than that specified approved by the Owner for use in the Project) may be requested as provided in the Instructions to Bidders.

The detailed procedures for submitting substitutions are set forth in Paragraph J of the Instructions to Bidders.

Specification Section	Brand or Name Specified	Proposed Substitution

SECTION 26 05 44 – SLEEVES AND SLEEVE SEALS FOR ELECTRICAL RACEWAYS AND CABLING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Division 01, “General Requirements.”

B. Division 07, “Thermal and Moisture Protection.”

1.2 DESCRIPTION

A. Provide sleeves and sleeve seals, including all accessories required for a complete installation, at penetrations of floor and wall assemblies. Sleeve where electrical work, including raceways, conduit, and wiring:
   1. Passes through equipment room walls.
   2. Passes exposed through non-fire-rated construction walls.
   3. Passes exposed through non-fire-rated construction above-grade floors.
   4. Passes through smoke-rated or fire-rated separations. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to maintain or restore original fire-resistance rating of assembly according to Division 07.

1.3 TERMINOLOGY

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.

1.4 QUALITY ASSURANCE

A. Standards:
   1. American Society for Testing & Materials (ASTM):
      a. ASTM E 84, Standard Test Method for Surface Burning Characteristics of Building Materials.”
      b. ASTM E 814, “Standard Method of Fire Tests of Through Penetration Fire Stops.”
   2. Factory Mutual Global (FMG).
   3. National Fire Protection Association (NFPA):
      a. 2023 NFPA 70, “National Electrical Code® (NEC).”
      b. 2021 NFPA 101, “Life Safety Code.”
   4. Underwriters Laboratories, Inc. (UL) 1479, “Fire Tests of Through-Penetration Firestops.”

1.5 SUBMITTALS

A. Submit Manufacturer’s product data, installation instructions, and details for each required product.

PART 2 - PRODUCTS

2.1 STANDARD SLEEVE MATERIALS

A. Sleeve Material, up to 8 in. diameter: Machine-cut Schedule 40 black steel pipe.

B. Sleeves shall be large enough for sleeve seals to be installed. Size to allow 1/2 in. minimum clearance all around.

2.2 SLEEVE SEALS — FIRE-RATED ELECTRICAL PENETRATIONS

A. Acceptable Manufacturers: Either provide sleeves and sleeve seals from the Manufacturers listed in Division 07 or provide sleeves and sleeve seals from the following Manufacturers: 3M Fire Barrier caulking or putty, BP Fyre Putty, Carborundum Fibersil, Chase Foam, CSD Sealing Systems "FSP," Dow Corning 3-6548, Hilti Fire Stop, International Protective Coatings Corporation "Flame-Safe," Johns-Manville Cerafiber, KBS Mortar Seal, or Nelson Fire Stop.

B. ASTM E119 and E814 Silicone RTV foam, UL-approved.

C. Sleeves shall be large enough for fire-rated sleeve seals to be installed. Size to allow 1/2 in. minimum clearance all around.

2.3 SLEEVE SEALS — WATERTIGHT ELECTRICAL PENETRATIONS

A. Provide sleeves with waterstop anchor flange at midpoint where penetrating structure at or below grade.
   1. Acceptable Manufacturers: Calpico, 3M, or Hilti.

B. **Option:** Compression Seals: GPT Industries Link-Seal. Stainless steel bolts and nuts. Provide correct size seal, and coordinate with sleeve size.
   1. Acceptable Manufacturers: GPT Industries or approved equal by Metraflex, Wayne, Michigan, or Calpico.

C. Sleeves shall be large enough for watertight sleeve seals to be installed. Size to allow 1/2 in. minimum clearance all around.

PART 3 - EXECUTION

3.1 COORDINATION

A. Coordinate location of sleeves, core-drilled holes, and other holes required with the Lead Contractor, Structural Engineer, equipment, and other Trades.

3.2 INSTALLATION — GENERAL

A. Indicated sizes and locations are based on early Project information and should be verified by the Contractor.

B. Chases and constructed openings that are not indicated on the Drawings shall be provided at the expense of the Contractor requiring the chase or constructed opening.

C. If it becomes necessary to cut into the work because of the failure of the Contractor to notify the Lead Contractor, then the Lead Contractor shall do any cutting and patching required later, at the Contractor's expense.

D. Provide dimensions and locations of openings required in walls for sleeves and similar items, and deliver sleeves, to the Lead Contractor, so as not to delay construction.

E. **BEFORE CONSTRUCTION OF MASONRY OR CONCRETE WALLS IS STARTED**, give the Lead Contractor locations and sizes of all openings required for the installation of equipment or sleeves.

F. If sleeves are not installed due to the fault of the Contractor, the Lead Contractor shall core-drill holes through masonry or concrete construction at the expense of the Contractor.

G. In New Drywall Wall Construction, as applicable to this Project:
   1. Provide sleeves for electrical items.
   2. **Option** for above ceiling only: Omit concrete block(s) where required for penetrations, and shall provide square-finished opening. Do not omit concrete blocks in sound barrier walls, under bearing points, or in fire-rated or smoke-rated walls.
   3. Coordinate with the Lead Contractor, Structural Engineer, and A/E.

H. In Existing Walls: Contractor shall provide sleeves for its own Work, unless specifically shown otherwise. Perform one of the following for conduit penetrations and other openings through existing masonry or concrete walls:
   1. Knock out concrete block(s). Do not knock out concrete blocks under bearing points. Install sleeve. Repair wall. Coordinate with the A/E.
   2. Knock out concrete block(s). Do not knock out concrete blocks under bearing points. No sleeve needed if no fire rating required. Coordinate with the A/E.
   3. Core-drill through walls where required. No sleeve needed if smooth opening and no fire rating required.
   4. Provide own sleeves and all required cutting, drilling, and patching for openings required through below-grade walls, or under interior bearing walls. Install sleeve such that the wall does not bear on the electrical work.

I. Sleeves are not required in floor slabs on grade or in core-drilled openings not requiring firestopping or watertightness.
   1. **Exception:** Sleeves are required at core-drilling through hollow-core pre-cast concrete slabs and through concrete block walls to facilitate containment of required firestopping material.

J. Furnish all conduit sleeves and caulking for openings in existing and or new walls and turn them over to the Lead Contractor for installation and caulking.

K. Conduit shall not bear on sleeves. Install sleeves plumb and true to line, grade, and position.

L. Cutting:
   1. Cut off sleeves through walls flush with each surface.
   2. Cut off sleeves 1/8 in. above finished floors and 3 in. above floors or curbs in utility rooms, equipment rooms, and shafts. Cut off bottom of sleeve flush with surface.
   3. Refer to Division 01 for specific requirements regarding approved cutting methods.

M. Unused sleeves shall be plugged and fire-packed. Provide finish that matches finish of adjacent surface.

3.3 INSTALLATION — FIRE-RATED ELECTRICAL PENETRATIONS

A. Verify which existing and new walls, ceilings, or floors are fire-rated, if any, and provide approved fire-blocking or fire-protective devices.

B. Use approved, UL-listed, fire-retardant sealants, backing, and packing to maintain fire rating of the structure penetrated.

C. Spray UL-listed foam sealant around exposed conduits entering and leaving fire-rated wall or floor structures.

D. To ensure fire blocking, close space around conduits and other electrical items passing through walls and floors. Seal space up to a 1/2 in. gap with sealant or caulking. Close off space greater than a 1/2 in. gap with sheet metal and seal airtight.

E. Pack all fire-rated or sound-rated separation sleeves with glass fiber, high-temperature mineral wool, aluminum-silica fiber, fire-retardant rope, calcium silicate, or other

noncombustible material to maintain fire rating of structure, and finish with fire-rated sleeve seals.

F. Fill space around all sleeves extending into exposed areas with material compatible with adjacent construction and finish.

G. All openings shall have been UL-tested utilizing the proper rated penetrations to be equal to, or greater than, the barrier assembly in which the penetration occurs.

H. Install all penetrations and openings in accordance with the Manufacturers' instructions.

I. The fire-blocking assembly shall maintain the required fire-resistance rating of the existing and/or new wall or floor in which it is placed. Apply a further sealant, if necessary, to attain a smoke-tight condition. Close openings without sleeves in the same manner.

J. Refer to Division 07 for additional requirements.

3.4 INSTALLATION — WATERTIGHT ELECTRICAL PENETRATIONS

A. Sleeving with absolutely watertight seal is required for electrical work passing through exterior walls above grade, and underground foundation walls and other below-grade penetrations into building.

B. Conduit sleeves penetrating outside wall or slabs on grade shall have welded intermediate flange imbedded in masonry. Space around conduit shall be clamped, packed, and caulked to make an absolutely watertight seal within sleeve. Caulk around outside of sleeve.
   1. **Option:** Install compression seals.

END OF SECTION 26 05 44

SECTION 26 05 53 – IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 DESCRIPTION

A. Identify each piece of electrical equipment, including those listed below, on the front cover or trim with its designated name or number/letter shown on the Drawings, and with the voltage available within the panel and the source from where it is fed.
   1. Cover plates.
   2. Power panelboards.
   3. Lighting panelboards.
   4. Disconnect switches. Indicate what load is being fed.
   5. Auxiliary systems.

PART 2 - PRODUCTS

2.1 NAMEPLATES

A. Acceptable Manufacturers: Seton or approved equal by Brady, MSI, PipeMarker, or Seton.

B. Laminated plastic nameplates, sized for minimum 1/4 in. high white letters or numbers engraved into a black background, Gothic style.

C. Do **NOT** use "Dymo" or similar tape type labels.

PART 3 - EXECUTION

3.1 COORDINATION

A. Coordinate to ensure that the identification used by all Trades is uniform in type, style, and appearance.

B. Coordinate with the Owner regarding equipment identification type, style, and appearance.

C. Coordinate the exact nomenclature to be used on equipment nameplates with the Owner and A/E.

3.2 INSTALLATION

A. Install nameplates for equipment. Identification shall be as shown on the following examples:

MAIN SWITCH
208Y/120-volt, 3-phase, 4-wire

PANEL 2H
208Y/120-volt, 3-phase, 4-wire
From DP2

B. Attach nameplates with stainless steel screws.
   1. **Exception:** Use compatible adhesive where screws might damage equipment.

C. Cover Plates for Receptacles and Wall Switches:
   1. Label cover plate back with branch circuit identification in permanent marker.

D. Identify panelboards in finished areas on the inside cover.

E. Switch function identification shall be as specified on the Drawings.

END OF SECTION 26 05 53

SECTION 26 05 73.19 – ARC-FLASH HAZARD ANALYSIS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Section 26 24 16, “Panelboards.”

B. Section 26 28 00, “Low-Voltage Circuit Protective Devices.”

1.2 ARC FLASH CALCULATIONS (FOR ELECTRICAL SERVICES 1,000 AMPERES AND ABOVE) AND EQUIPMENT LABELING

A. Arc Flash Warning: Affix label on panelboards, disconnects, and similar equipment.

B. Contractor shall provide the data and labeling listed below in compliance with the requirements of 2023 NEC Articles 110.16 and 110.24, 2024 NFPA 70E, OSHA, and IEEE Standard 1584.

C. Equipment Manufacturer shall calculate, and provide labels indicating, the following data:
1. The available fault current.
2. Incident energy in calories per square centimeter (cal/cm2) at an 18 in. working distance from the bus structure.
3. The arc flash protection boundary (AFPB) in feet.
4. The Hazard Risk Category and personal protection equipment (PPE) level clothing required for personnel working within the AFPB.
5. Selective coordination of the continuity of operation of the emergency illumination system.

D. Provide Selective Coordination Study of new and existing equipment.

1.3 QUALITY ASSURANCE

A. Standards:
1. Institute of Electrical and Electronics Engineers, Inc. (IEEE), Standard 1584.
2. National Fire Protection Association (NFPA):
   a. 2023 NFPA 70, “National Electrical Code®” (NEC), Articles 110.16 and 110.24.
   b. 2024 NFPA 70E, “Standard for Electrical Safety in the Workplace.”
3. Occupational Safety and Health Administration (OSHA).

1.4 LABELING

A. If electrical service equipment does not meet Arc Flash Hazard Analysis on the line side of the service disconnecting, the Contractor shall provide a label to read as follows: “POWER COMPANY SHALL SHUT DOWN PRIMARY ELECTRICAL SERVICE PRIOR TO SERVICING ELECTRICAL SERVICE DISCONNECTING MEANS.”

END OF SECTION 26 05 73.19

SECTION 26 09 23 – LIGHTING CONTROL DEVICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Section 26 05 00.78, “Closeout Submittals for Electrical.”

B. Section 26 27 00, “Low-Voltage Distribution Equipment.”

A. Section 26 51 19, “LED Interior Lighting.”

B. Section 26 52 13, “Emergency and Exit Lighting.”

C. Section 26 56 19, “LED Exterior Lighting.”

1.2 DESCRIPTION

A. Provide the following lighting controls:
   1. Time clock.
   2. Outdoor photoelectric sensors.
   3. Daylight-harvesting controls.
   4. Indoor occupancy sensors.
      a. Passive infrared.
      b. Ultrasonic.
      c. Dual-technology.
   5. Indoor vacancy sensors, dual-technology.
   6. Outdoor motion sensors.
   7. Lighting contactors.
   8. Dimmers, manual.
   9. Low-voltage switching system.

B. Color Selections: The A/E shall approve all color selections for electrical equipment, including lighting controls, and cover plates.

1.3 QUALITY ASSURANCE

A. Standards:
   1. National Electrical Manufacturers Association (NEMA) WD 7-2011 (R2016) Occupancy Motion Sensor Standard.
   2. National Fire Protection Association (NFPA): 2023 NFPA 70, “National Electrical Code® (NEC).”
   3. Underwriters Laboratories, Inc. (UL).

1.4 WARRANTIES

A. Indoor Occupancy Sensors: Full 5-year warranty.

B. Indoor Vacancy Sensors: Full 5-year warranty.

1.5 SPARE PARTS

A. Provide (3) spare occupancy sensors and power pack relays of each type specified.

B. Provide (3) spare vacancy sensors and power pack relays of each type specified.

C. Provide (3) spare low-voltage switching system override switches.

PART 2 - PRODUCTS

2.1 INDOOR OCCUPANCY SENSORS

A. Wall-mounted or ceiling-mounted solid-state units with a separate relay unit, complying with NEMA WD 7.
   1. Operation: Unless otherwise indicated, turn lights on when covered area is occupied and off when unoccupied, with a time delay for turning lights off, adjustable over a range of 1 minute to 15 minutes (minimum).
   2. Sensor output: Contacts rated to operate the connected relay, complying with UL 773A. Sensor shall be powered from the relay unit.
   3. Relay unit:
      a. Dry contacts rated for
         1) 20-A load at 120 volts AC and 277 volts AC.
         2) 13-A tungsten at 120 volts AC.
         3) 1 HP at 120 volts AC.
      b. Power supply to the sensor shall be 24-volt-DC, 150-milliampere, Class 2 power source as defined by NFPA 70.
      c. Provide dry contact for integration with the building management system in addition to the contact required for lighting control.
   4. Mounting:
      a. Sensor: Suitable for mounting in any position on a standard outlet box.
      b. Relay: Externally mounted through a 1/2 in. knockout in a standard electrical enclosure.
      c. Time-delay and sensitivity adjustments: Recessed and concealed behind hinged door.
      d. Indicator: LED, to show when motion is being detected during testing and normal operation of the sensor.
      e. Bypass switch: Override ON function in case of sensor failure.
      f. Automatic light-level sensor: Adjustable from 2 footcandles to 200 footcandles. Keep lighting off when selected lighting level is present.

B. Provide occupancy sensors, power packs, and all associated accessories, back boxes, conduit, wiring, etc., for complete installation of occupancy sensor-controlled lighting for rooms indicated as requiring occupancy sensor control on the Drawings.

C. Required Occupancy Sensor Submittals: The selected Lighting Control Sensor Manufacturer shall provide a shop drawing submittal indicating compliance with performance requirements and design criteria, including analysis data prepared by persons trained and certified by the Manufacturer in lighting control sensor system design. Submit the following for approval, using the Contract Drawings as a basis:
   1. Layout drawings: The Manufacturer shall design and submit layout drawings indicating the location, quantity, and type of sensor, power pack, relay, and switch in each room. Drawings shall indicate coverage patterns, dropped ceiling soffits, cabinets, furniture layouts, HVAC ceiling diffusers, and other features that could affect the coverage.
   2. Layout shall be based on the sensor mounting style and approximate layout indicated on the Contract Drawings. Apply the type of sensor required for the room or space type (i.e., if the Contract Drawings indicated a ceiling type sensor in a classroom, apply a ceiling type sensor that would be suitable for use in a classroom). Sensor mounting styles are not to be changed from those indicated.
   3. Wiring diagrams for the power and low-voltage circuits required for room lighting controls, etc.

4. Product data sheets for each component.
5. Bill of materials showing quantities of each component.

D. Dual-Technology Indoor Occupancy Sensors: Detect occupancy by using a combination of passive infrared (PIR) and ultrasonic detection methods in area of coverage. Particular technology or combination of technologies that controls ON-OFF functions shall be selectable in the field by operating controls on unit.
1. Acceptable Manufacturers: Current, Cooper Controls, Sensor Switch, Sensorworks, Greengate, Crestron, PLC Multipoint, Steinel, or Leviton.
2. Ceiling-mounted:
   a. Sensitivity adjustment: Separate for each sensing technology.
   b. Detector sensitivity: Detect occurrences of 6 in. minimum movement of any portion of a human body that presents a target of not less than 36 sq. in., and detect a person of average size and weight moving not less than 12 in. in either a horizontal or a vertical manner at an approximate speed of 12 in. per second.
   c. Detection coverage:
      1) Standard room: Detect occupancy anywhere within a circular area of 1,000 sq. ft. when mounted on a 96 in. high ceiling.
      2) Large room: Detect occupancy anywhere within a circular area of 2,000 sq. ft. when mounted on a 96 in. high ceiling.
3. Wall switch sensors: Adaptive technology type, 120/277 volts, adjustable time delay up to 20 minutes, manual override switch, 180-degree field of view, with a minimum coverage area of 900 sq. ft., complying with NEMA WD 7.

2.2 INDOOR VACANCY SENSORS, DUAL-TECHNOLOGY

A. Required Vacancy Sensor Submittals: The selected Lighting Control Sensor Manufacturer shall provide a shop drawing submittal indicating compliance with performance requirements and design criteria, including analysis data prepared by persons trained and certified by the Manufacturer in lighting control sensor system design. Submit the following for approval, using the Contract Drawings as a basis:
1. Layout drawings: The Manufacturer shall design and submit layout drawings indicating the location, quantity, and type of sensor, power pack, relay, and switch in each room. Drawings shall indicate coverage patterns, dropped ceiling soffits, cabinets, furniture layouts, HVAC ceiling diffusers, and other features that could affect the coverage.
2. Layout shall be based on the sensor mounting style and approximate layout indicated on the Contract Drawings. Apply the type of sensor required for the room or space type (i.e., if the Contract Drawings indicated a ceiling type sensor in a classroom, apply a ceiling type sensor that would be suitable for use in a classroom). Sensor mounting styles are not to be changed from those indicated.
3. Wiring diagrams for the power and low-voltage circuits required for room lighting controls, etc.
4. Product data sheets for each component.

B. Acceptable Manufacturers: Leviton or approved equal by Current, Schneider Electric, Cooper Controls, Sensor Switch, Sensorworks, Lutron, Philips Controls, Crestron, PLC Multipoint, Steinel, or Watt Stopper.

C. Ceiling-Mounted: Leviton Model OSC20-MOW/OPP20-OD2. UL-listed, self-contained, with (2) ultrasonic transmitters, (2) ultrasonic receiving transducers, sensitivity adjustment, adjustable 8-second to 32-minute time-delayed OFF, power pack relay, voltage determined by power pack, 24 volt sensor input, and white finish.

D. Wall-Mounted: Leviton Model OSSMT-TMI (single switch). UL-listed, self-contained, with (1) ultrasonic transmitter, (1) ultrasonic receiving transducer, sensitivity adjustment, single pushbutton to provide manual ON switching, self-adjusting time-delay, power pack, 120 volts, and ivory finish and cover plate.

E. Wall-Mounted Dimming: Sensor Switch Model WSX-PDT-D-SA-GY. UL-listed self-contained, with (1) ultrasonic transmitter, (1) ultrasonic receiving transducer, sensitivity adjustment, single pushbutton to provide manual ON switching, two pushbuttons (1) to raise and (1) to lower lighting level, self-adjusting time delay, power pack, (120 volts and XXXX finish and cover plate.

2.3 LOW-VOLTAGE SWITCHING SYSTEM

A. Acceptable Manufacturers: Acuity Controls or approved equal by Lutron, Lighting Control & Design, Intelligent Lighting Controls, Schneider Electric, Current, Philips Controls, Nexlight, PLC Multipoint, Crestron, Nexlight or Watt Stopper.

B. Completely solid-state, UL-listed, low-voltage switching system, consisting of wall-mounted relay cabinets, relays, transformer, and low-voltage switches.

C. Relay Cabinets: Acuity Controls #GR 2400. Surface-mounted NEMA 1 enclosure. Shall accept the quantity of 20-ampere 1-pole relays indicated on the Drawings. Integral programmable time clock with astro-dial, warn-before-off feature, day-of-week and holiday schedule, on-board program entry keypad, relay control card, modem for remote programming and control, master AUTO/ON/OFF relay override switch, rechargeable 10-year capacitor backup, 120/277-volt AC power supply inputs, and network capability.

D. Low-Voltage Switches: Acuity Controls Sensor Switch sPODM Series. Flush-mounted single-gang with cover plate and ON/OFF switches. Refer to Section 26 27 00 for switch colors.

E. Network Interface: Acuity Controls Unity 2 software.

F. Supervisory Package Software: For programming relay cabinets through HVAC temperature control computer.

G. Provide on-site start-up by factory technician and demonstration.

PART 3 - EXECUTION

3.1 INSTALLATION — INDOOR OCCUPANCY SENSORS

A. Install and aim sensors in locations shown on the Manufacturer’s layout to achieve not less than 90% coverage of areas indicated. Do not exceed coverage limits specified in the Manufacturer’s written instructions.

B. Switching shall consist of automatic ON and automatic OFF via sensors or relay control.

C. Adjust sensor sensitivity and time delay to prevent nuisance switching of the lights. Each installed sensor shall be tested in the test mode to see that lights turn on and off based on occupancy.

D. Wire sensors according to the Manufacturer’s recommendations to allow for both sensor and manual control of lighting as shown on the Drawings.

E. Power packs shall be provided in the quantity required to serve sensor(s) with the switching and branch circuiting schemes indicated on the Drawings. Power packs shall be plenum-rated. Install power pack on local branch circuit junction box serving local area lighting.

F. Ceiling-Mounted Sensors:
   1. Coordinate layout and installation of ceiling-mounted devices with other construction that penetrates ceilings or is supported by them, including luminaires, HVAC equipment, smoke detectors, fire-suppression systems, and partition assemblies.
   2. Install sensors away from air supply outlets according to the Manufacturer's requirements.

G. Replace all damaged, deformed, defective, or inoperative occupancy sensors that fail during the 1-year guarantee period.

3.2 INSTALLATION — INDOOR VACANCY SENSORS

A. Install and aim sensors in locations shown on the Manufacturer's layout to achieve not less than 90% coverage of areas indicated. Do not exceed coverage limits specified in the Manufacturer's written instructions.

B. Switching shall consist of manual ON and automatic OFF via sensors or relay control.

C. Adjust sensor sensitivity and time delay to prevent nuisance switching of the lights. Each installed sensor shall be tested in the test mode to see that lights turn off based on vacancy.

D. Wire sensors according to the Manufacturer's recommendations to allow for both sensor and manual control of lighting as shown on the Drawings.

E. Power packs shall be provided in the quantity required to serve sensor(s) with the switching and branch circuiting schemes indicated on the Drawings. Power packs shall be plenum-rated. Install power pack on local branch circuit junction box serving local area lighting.

F. Ceiling-Mounted Sensors:
   1. Coordinate layout and installation of ceiling-mounted devices with other construction that penetrates ceilings or is supported by them, including luminaires, HVAC equipment, smoke detectors, fire-suppression systems, and partition assemblies.
   2. Install sensors away from air supply outlets according to the Manufacturer's requirements.

G. Replace all damaged, deformed, defective, or inoperative vacancy sensors that fail during the 1-year guarantee period.

3.3 INSTALLATION — LOW-VOLTAGE SWITCHING SYSTEM

A. Install surface-mounted low-voltage switching system relay cabinets and run all power wiring to loads and all low-voltage and network wiring to ON/OFF switches and other relay cabinets.

B. Install low-voltage ON/OFF switches and run low-voltage wiring to relay cabinets.

C. Provide connectors and RS-232 cable between the network interface unit and the existing HVAC temperature control computer. Hire a Contractor licensed to perform HVAC Work to provide final connection of network interface and installation of lighting control software onto existing HVAC temperature control computer.

D. Program all relay cabinets to turn all lights ON and OFF on a predetermined schedule, or to be overridden and switched from low-voltage switches as shown on the Drawings.

END OF SECTION 26 09 23

SECTION 26 24 16 – PANELBOARDS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Section 26 05 29, “Hangers and Supports for Electrical Systems.”

B. Section 26 05 73.19, “Arc-Flash Hazard Analysis.”

1.2 DESCRIPTION

A. Lighting and Appliance Branch-Circuit Panelboards: Provide factory-assembled panelboards having main lugs or main breaker, and branch breakers, as shown on the Drawings. Include the following:
   1. Integral surge protective device in all 208/120-volt panelboards.
   2. Branch circuit breakers, as shown on the Panel Schedule(s) or in accordance with the load being served:
      a. Heating/air-conditioning/refrigeration (HACR)-rated.
      b. Ground-fault circuit interrupter (GFCI).
      c. Shunt trip.
      d. Undervoltage trip.
      e. Fire alarm (RED) with lockstrap.
      f. Other special circuit breakers.
   3. Furnish distribution system coordination study provided by the Panelboard Manufacturer.

B. Distribution Panelboards: Provide with main circuit breaker and branch circuit breakers as shown on the Drawings.
   1. Provide integral surge protective device in 208/120-volt panelboard.
   2. Panelboard shall be suitable for service-entrance duty.
   3. Furnish distribution system coordination study provided by the Distribution Panelboard Manufacturer.

1.3 RATINGS, CHARACTERISTICS, AND CAPACITY

A. Refer to the Drawings for voltage, ampacity, and breaker requirements.

1.4 ARC FLASH CALCULATIONS AND EQUIPMENT LABELING

A. Refer to Section 26 05 73.19.

1.5 QUALITY ASSURANCE

A. Standards:
   1. American National Standards Institute (ANSI) C 33.38.
   2. Federal W-P-115b and W-C375B.
   3. National Electrical Manufacturers Association (NEMA), PB-1 Panelboards, 2023.
   4. National Fire Protection Association (NFPA): 2023 NFPA 70, “National Electrical Code® (NEC),” Articles 110 and 408.
   5. Underwriters Laboratories, Inc. (UL):
      a. UL 50, “Enclosures for Electrical Equipment, Environmental Considerations.”
      b. UL 67, “Standard for Panelboards.”
      c. UL 489, “Standard for Molded-Case Circuit Breakers, Molded-Case Switches, and Circuit-Breaker Enclosures.”
      d. UL 1449, “Standard for Surge Protective Devices.”

1.6 WARRANTIES

A. Provide (1) full year warranty on all equipment furnished.

PART 2 - PRODUCTS

2.1 DO NOT ORDER PANELBOARDS UNTIL THE ARC-FLASH, SELECTIVE-COORDINATION, AND FAULT-CURRENT STUDIES ARE COMPLETED.

2.2 LIGHTING AND APPLIANCE BRANCH-CIRCUIT PANELBOARDS

A. Acceptable Manufacturers: Siemens Type “P1/P2” or approved equal by Square D, ABB, or Eaton.

B. Dead front steel cabinet, baked enamel finish, concealed hinges, flush lock, typed circuit directory, tin-plated copper bussing, separate copper ground and neutral bars, lugs and adapters suitable for feeder sizes (CU/AL), bolt-on thermal magnetic circuit breakers, tripped circuit indicator, 20-ampere switching breaker rating, lock-on straps. Comply with UL 67.

C. Circuit breakers shall match ampere-interrupting-capacity (AIC) rating of lighting and appliance panelboards.

D. Do **NOT** provide series-rated branch circuit breakers.

E. Minimum interrupting capacity shall be 22,000 amperes root-main-square (RMS).

F. Furnish integral surge protective device with status indicator lights and a rated-for-minimum-peak surge current of 80,000 amperes per mode. Integral surge protection device shall **NOT** reduce the number of circuit breaker spaces shown on the panelboard schedules.

G. Panelboards provided with an integral surge protective device shall have the device installed, delivered, and warranted by the Electrical Distribution Equipment Manufacturer. Surge protective devices shall meet UL 1449 Standard, Third Edition, and shall be suitable in Category B or C3 environments.

H. Provide lockstraps on circuit breakers as shown on the Drawings.

I. Sized Panelboards (up to 400 amperes):
   1. Single-tub panelboards: 20 in. wide x 5-3/4 in. deep.
   2. Double-tub panelboards: 40 in. wide x 5-3/4 in. deep. Furnish feed-through lugs and consecutive branch circuit numbering from top to bottom.

J. Future Space: Provide 20% spare space capacity in all panelboards with a minimum of (6) spare branch circuit breakers.

2.3 DISTRIBUTION PANELBOARDS

A. Acceptable Manufacturers: Siemens Type ”P3/P5” or approved equal by Square D, ABB, or Eaton.

B. Code-gauge steel with welded steel base, factory-tested, factory-assembled, fully bussed panel.

C. Branch Circuit Breakers:
   1. Thermal, magnetic, quick-make, quick-break type, with tripped circuit indication.
   2. Circuit breakers shall match ampere-interrupting-capacity (AIC) rating of distribution panelboards.
   3. Do **NOT** provide series-rated branch circuit breakers.

D. Bussing: Tin-plated copper bussing and copper grounding bus, 65,000-ampere minimum RMS fault current rating.

E. Furnish integral surge protective device with status indicator lights and a rated-for-minimum-peak surge current of 240,000 amperes per mode. Integral surge protection device shall **NOT** reduce the number of circuit breaker spaces shown on the panelboard schedules

F. Refer to the Drawings for bus ampacity and circuit breaker ratings.

G. Future Space: Provide 20% space for future circuit breakers as shown on the Drawings.

H. For double-tub panels, furnish feed-through lugs (for future distribution section).

PART 3 - EXECUTION

3.1 INSTALLATION

A. Coordinate all panelboard locations with other Contractors.

B. Install panelboards in accordance with the Manufacturer's installation instructions, including proper torque and anti-corrosion grease.

C. Maintain all Code clearances around panelboards in accordance with 2023 NEC Articles 110 and 408.

D. Shim 1/2 in. from wall any surface-mounted panelboard mounted on outside wall. Mount on 3/4 in. thick painted plywood mounting board to permit back ventilation.

E. Install top of panelboard cabinet at 6 ft. above floor.

F. All flush panelboards shall have (5) 1 in. spare conduits rising and turning out of the wall above the ceiling line for future use. Provide fire-resistant backing to maintain wall fire-resistance rating. Provide wall recess.

G. Distribution Panelboard:
   1. Mount on 4 in. high concrete base. Refer to Section 26 05 29 for concrete requirements.
   2. Provide for future expansion as shown on the Drawings.
   3. Identify all branch circuit breakers with laminated plastic nameplates.
   4. Provide approximately 6 in. x 4 in. engraved laminated plastic warning sign on Distribution Panelboards, reading "WARNING — SHUTTING OFF MAIN SWITCH DOES NOT SHUT OFF POWER IN ENTIRE BUILDING. ADDITIONAL SWITCH IS LOCATED ON EXTERIOR WALL."

H. Test the full load phase balance of all panelboards. Rearrange loads to balance panelboards within 10%.

I. Inside the door of each panel, furnish directory frames that shall contain a correctly typed directory card properly filled out to correspond to the circuit numbers on the Drawings. If room numbers assigned by the Owner do not match the room numbers on the Drawings, both sets of room numbers shall be cross-referenced and identified in the panel directory.

J. Provide copies of all panel directories in Operating and Maintenance Manuals.

K. Re-check all connections before the end of the 1-year guarantee period.

END OF SECTION 26 24 16

SECTION 26 27 00 – LOW-VOLTAGE DISTRIBUTION EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Section 26 05 33, “Raceway and Boxes for Electrical Systems.”

B. Section 26 05 53, “Identification for Electrical Systems.”

C. Section 26 09 23, “Lighting Control Devices.”

1.2 DESCRIPTION

A. Provide low-voltage distribution equipment, including cover plates. Low-voltage distribution equipment includes:
   1. Receptacles.
   2. Switches.
   3. Flush wall boxes.
   4. Plates.
   5. Lighting controls. Refer to Section 26 09 23.

B. Color Selections: The A/E shall approve all color selections for switches, receptacles, and cover plates. Plate covers shall match color of devices.

1.3 QUALITY ASSURANCE

A. Standards:
   1. National Electrical Manufacturers Association (NEMA).
   2. National Fire Protection Association (NFPA):
      a. 2023 NFPA 70, “National Electrical Code® (NEC)”:
         1) Article 406.
   3. Underwriters Laboratories, Inc. (UL) Label.

PART 2 - PRODUCTS

2.1 RECEPTACLES

A. Acceptable Manufacturers: Hubbell, Pass & Seymour, Eaton Wiring Devices, Bryant, or Leviton.

B. 125-volt, Extra-Heavy-Duty Industrial Grade (HBL) 2-pole, 3-wire grounding, back-wired and side-wired, or Hubbell SNAPConnect™-wired.

20-ampere Duplex, Tamper-Resistant	CR20-WTR (NEMA 5-20R)
20-ampere Duplex/USB, Tamper-Resistant	USB20A5W (NEMA 5-20R)
20-ampere Duplex GFCI Outlet, Tamper-Resistant	GFRTR20W (NEMA 5-20R)
20-ampere Duplex GFCI Outlet, Tamper-Resistant, Weather-Resistant	GFSG5362W / GFTWRST20SNAPW (NEMA 5-20R)

2.2 SWITCHES

A. Acceptable Manufacturers: Hubbell, Pass & Seymour, Eaton Wiring Devices, Bryant, or Leviton.

B. 20-ampere, 120/277-volt, back-wired and side-wired, or Hubbell SNAPConnect™-wired.

DEVICE	HUBBELL CAT. NO.
1-Pole	(CSB120-W) HBL1221-W / SNAP1221-W
2-Pole	(CSB220-W) HBL1222-W / SNAP1222-W

2.3 FLUSH WALL BOXES

A. Acceptable Manufacturers: Wiremold or approved equal by Hubbell, Pass & Seymour, FSR Inc., or Arlington Industries.

B. Wiremold Model EFSB4, 4-gang, with (1) 20-ampere, 125-volt duplex receptacle bracket and (2) audio/visual brackets.

2.4 PLATES

A. Acceptable Manufacturers: Hubbell, Pass & Seymour, Eaton Wiring Devices, Bryant, Intermatic, or Leviton.

B. Plates for Flush Devices in Interior Partitions: Specification Grade stainless-steel Type 302/304.

C. Plates for Flush Devices in Interior Partitions: Pass & Seymour “TP” TradeMaster Series. Unbreakable Specification Grade with smooth finish.

D. Plates for Flush Devices in Concrete Block Walls: Specification Grade stainless-steel Type 302/304 “Jumbo” plates.

E. Plates for Devices in Surface Fittings: Cadmium-plated steel surface covers. Covers shall fit without overlap and have round corners.

F. Plates for Specialty Switches and Outlets Required for Auxiliary Systems: Stainless steel.

G. Plates for Heavy-Duty Outlets: Stainless steel.

H. Plates for Raceways: Refer to Section 26 05 33 for raceway information.
1. Plates for surface-mounted raceway system devices: Specification Grade stainless-steel Type 302/304 with a smooth finish.
2. Plates for non-metallic raceway system outlets: Flush, nonmetallic PVC. Color shall match non-metallic raceway color.

I. Weather-Resistant Plates:
1. GFCI duplex receptacles: Hubbell EXTRA DUTY NEMA 3R Cat. No. WP26E Single-gang, cast-aluminum, gasketed with single latched lockable lift cover suitable for GFCI duplex receptacle in wet locations while in use.
2. Switches: Hubbell Cat. No. HBL1795. Clear silicone rubber bubble plate suitable for toggle switches.

PART 3 - EXECUTION

3.1 COORDINATION

A. To ensure proper final connection, verify the NEMA receptacle configuration required with the Owner or Equipment Supplier.

3.2 EQUIPMENT TERMINATION

A. Prior to rough-in, verify termination requirements, including, but not limited to, voltage, ampacity, plug-receptacle configuration, and equipment location.

3.3 INSTALLATION

A. Wiring devices shall be NEMA type approved for the environmental conditions prevailing.

B. Provide ground-fault circuit interrupter (GFCI) receptacles where required to comply with Code. Each GFCI receptacle indicated on the drawings shall **NOT** be wired to protect "downstream" receptacles located on the same circuit.

C. Provide surge-protection type receptacles where shown on the Drawings. Each receptacle shall **NOT** be wired to protect "downstream" receptacles located on the same circuit.

D. Devices and cover plates shall be absolutely plumb and horizontal with no visible gaps around edge of plates.

E. Provide brown devices and matching cover plates for devices located in paneled or dark-painted walls or surfaces.

F. In masonry walls, install the top or bottom of an electrical box at the nearest block joint.

G. Do **NOT** install flush-mounted devices in walls back-to-back.

H. Connect green insulated ground wire to each device grounding terminal. Wire to panel ground bar.

I. Receptacles:
   1. Check the polarity of all receptacles.
   2. All weather-resistant outlets shall include tamper-resistant and weather-resistant GFCI-type receptacle, unless indicated otherwise on the Drawings.
   3. All receptacles wired to GFCI circuit breakers shall be labeled "GFCI-PROTECTED OUTLET."
   4. Tamper-resistant receptacles: In accordance with 2023 NEC Article 406.12, all 15 and 20-ampere, 125-volt and 250-volt, straight-blade receptacles shall be tamper-resistant in the following locations:
      a. Pre-school and education facilities.
      b. Business offices accessible to the general public.

J. Switches: Install switches adjacent to strike side of door openings. Prior to roughing in, verify with the Lead Contractor which side of the door opening is the strike side.

K. Plates:
   1. Install cover plates on all devices.
   2. Install galvanized, blank, screw, or hinge covers on all junction boxes.
   3. Install gang plates on gang devices.
   4. All metal plates shall be grounded.
   5. Cover plate identification: Refer to Section 26 05 53.

END OF SECTION 26 27 00

SECTION 26 28 00 – LOW-VOLTAGE CIRCUIT PROTECTIVE DEVICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Section 26 05 00.78, “Closeout Submittals for Electrical.”

B. Section 26 05 73.19, “Arc-Flash Hazard Analysis.”

1.2 DESCRIPTION

A. Provide fuses and enclosed switches and circuit breakers in accordance with code requirements and as shown on the Drawings.
   1. Cartridge fuses (switch fuses) rated 600 volts AC and less:
      a. For use in:
         1) Control circuits.
         2) Enclosed switches.
         3) Distribution panelboards.
         4) Enclosed controllers.
      b. Provide where noted.
      c. Provide for other circuits.
   2. Cabinet for spare fuses.
   3. Enclosed switches and circuit breakers:
      a. Fusible switch units: Provide fuses for secondary main and branch fusible switch units.
      b. Fusible switches.
      c. Non-fusible switches.
      d. Fused shunt-trip disconnect switches for elevator(s).
      e. Molded-case circuit breakers (molded-case switches).

1.3 RATINGS AND CAPACITIES

A. Refer to the Drawings for ampacity, number of poles, NEMA type, and fuse type/size.

1.4 ARC FLASH CALCULATIONS AND EQUIPMENT LABELING

A. Refer to Section 26 05 73.19.

1.5 QUALITY ASSURANCE

A. Standards:
   1. American National Standards Institute (ANSI).
   2. National Electrical Manufacturers Association (NEMA).
   3. National Fire Protection Association (NFPA): 2023 NFPA 70, “National Electrical Code® (NEC),” Article 240.
   4. Underwriters Laboratories, Inc., (UL), including UL 1008, “Transfer Switch Equipment.”

1.6 SPARE PARTS

A. Spare Fuses: Furnish (3) of each size and type specified. Refer to Section 26 05 00.78.

PART 2 - PRODUCTS

2.1 CARTRIDGE FUSES (SWITCH FUSES)

A. Acceptable Manufacturers: Bussmann or approved equal by Mersen, Edison, or Littelfuse.

B. Switch fuses shall comply with NEMA KS1-1975, UL 98, ANSI C33.64, and 2023 NEC.

C. Bussmann Type (FRN-R, NEMA Class RK-5) (KTN-R, NEMA Class RK-1) (LPN-R, NEMA Class RK-1). 250 volts, 600 amperes and below. Dual element, time delay, current-limiting, 300,000-ampere root-main-square (RMS) symmetrical interrupting capacity, sizes as shown on the Drawings.

D. Bussmann Type (FRS-R, NEMA Class RK-5) (KTS-R, NEMA Class RK-1) (LPS-R, NEMA Class RK-1). 600 volts, 600 amperes and below. Dual element, time delay, current-limiting, 300,000-ampere root-main-square (RMS) symmetrical interrupting capacity, sizes as shown on the Drawings.

E. Bussmann Type KRP-C, NEMA Class L "Hi-Cap." 601 amperes and above. Dual element, time delay, current-limiting, 300,000-ampere root-main-square (RMS) symmetrical interrupting capacity, sizes as shown on the Drawings.

F. Bussmann Type LPJ-SP, NEMA Class J. 600 volts, 1 ampere to 600 amperes. Dual element, time delay, current-limiting, 300,000 amperes. root-main-square (RMS) symmetrical interrupting capacity, sizes as shown on the Drawings.

2.2 CABINET FOR SPARE-FUSES

A. Acceptable Manufacturers: Bussmann or approved equal by Mersen, Littelfuse, AMP, or Unity.

B. Provide cabinet for spare fuses, with fuse pullers and a framed, typewritten list of fuse sizes. Furnish (3) spare fuses for each size rating.

2.3 ENCLOSED SWITCHES AND CIRCUIT BREAKERS

A. Fusible Switch Units: Provide fusible switch units compatible with existing switchboards and distribution panelboards.

B. Fusible Switches:
1. Acceptable Manufacturers: Square D or approved equal by Siemens, ABB, or Eaton.
2. Switches shall comply with NEMA KS1-1975, UL 98, ANSI C33.64, and 2023 NEC.
3. Square D Type HD. NEMA heavy-duty, steel enclosure, dual-cover interlocks, HP-rated plated contacts, indicating handle and provisions for padlocking. Switches shall be NEMA Type approved for the environmental conditions prevailing. Provide Class R rejection fuse clips for fusible switches.
4. Switches for service entrance applications shall be service-entrance-rated.

C. Non-Fusible Switches:
1. Acceptable Manufacturers: Square D or approved equal by Siemens, ABB, or Eaton.
2. Switches shall comply with NEMA KS1-1975, UL 98, ANSI C33.64, and 2023 NEC.
3. Square D Class 2510. Horsepower-rated manual switches or toggle-operated 1-phase motor switches for unfused loads less than 16 amperes.

D. Fused Shunt-Trip Disconnect Switches for Elevator(s):
1. Acceptable Manufacturers: Bussmann or approved equal by Littelfuse, Square D, Siemens, Mersen, ABB, or Eaton.

2. Bussmann “Power Module” PS Series. Fused shunt-trip disconnect switch, with Class J fuses, 120-volt AC shunt-trip mechanism, key test switch, pilot light, and auxiliary controls, in NEMA 1 enclosure.

EXECUTION

2.4 INSTALLATION — GENERAL

A. Provide overcurrent protection for equipment and wiring as required by 2023 NEC Article 240.

2.5 INSTALLATION — CARTRIDGE FUSES (SWITCH FUSES)

A. Coordinate fuse selection with the ampere draw and type of load being served.

2.6 INSTALLATION — CABINET FOR SPARE-FUSES

A. Install cabinet adjacent to switchboard. Confirm location with the Owner.

B. Provide copy of list of fuse sizes in the Operating and Maintenance Manuals.

2.7 INSTALLATION — ENCLOSED SWITCHES AND CIRCUIT BREAKERS

A. Fusible Switch Units:
1. Fusible switch units are indicated on the Drawings with a Buss fuse type/size, subscript-indicated.
2. Install fusible switch units in existing distribution panel/switchboard space(s) and provide laminated plastic nameplate(s).
3. Install fuse reducers in fusible switch units.
4. 100 amperes and above:
a. Install in accordance with the Manufacturer’s instructions, including proper torque and anti-corrosion grease.
b. Re-check all connections before the end of the 1-year guarantee period.

B. Fusible Switches:
1. Locate fusible switches to provide access and minimum 3 ft. clearance in front. Locate minimum 2 ft. above grade or roof.
2. Coordinate location with other Contractors.
3. Install fuse reducers in fusible switches.
4. 100 amperes and above:
a. Install in accordance with the Manufacturer’s instructions, including proper torque and anti-corrosion grease.
b. Re-check all connections before the end of the 1-year guarantee period.

C. Non-Fusible Switches:
1. Locate non-fusible switches to provide access and minimum 3 ft. clearance in front. Locate minimum 2 ft. above grade or roof.
2. Coordinate location with other Contractors.
3. 100 amperes and above:
a. Install in accordance with the Manufacturer’s instructions, including proper torque and anti-corrosion grease.
b. Re-check all connections before the end of the 1-year guarantee period.

D. Fused Shunt-Trip Disconnect Switches for Elevator(s): Mount and wire to associated elevator controller.

E. Molded-Case Circuit Breakers (Molded-Case Switches):
   1. Provide branch circuit breakers for existing switchboards and panelboards for equipment and wiring.
   2. Install new circuit breaker(s) in existing switchboards and panelboard space(s). Update circuit directory.
   3. 100 amperes and above:
      a. Install in accordance with the Manufacturer's instructions, including proper torque and anti-corrosion grease.
      b. Re-check all connections before the end of the 1-year guarantee period.

END OF SECTION 26 28 00

SECTION 26 43 00 – SURGE PROTECTIVE DEVICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Section 16 46 13, “Lightning Protection for Structure.”

B. Section 26 24 16, “Panelboards”

1.2 DESCRIPTION

A. Provide a surge protective device on the main switchboard. Refer to Section 26 24 13.

B. Provide integral surge protective devices in 208/120 – volt panelboard as shown on the Drawings. Refer to Section 26 24 16.

C. Surge Protective Devices:
1. Shall be suitable for Type 1 or Type 2 SPD applications in Category C environments as described in ANSI/IEEE C62.41.
2. Shall be of parallel design.
3. Shall provide protection for line-to-ground, neutral-to-ground, and line-to-neutral for wye distribution systems.

1.3 QUALITY ASSURANCE

A. Standards:
1. American National Standards Institute (ANSI) / Institute of Electrical and Electronic Engineers (IEEE) C62.1, 62.11, C62.41, and C62.45.
2. National Electrical Manufacturers Association (NEMA).
3. National Fire Protection Association (NFPA): 2023 NFPA 70, “National Electrical Code® (NEC),” Article 242.
4. Underwriters Laboratories, Inc., (UL):
   a. UL 96A, “Requirements for a Master Label System.”
   b. UL 1449, “Standard for Surge Protective Devices.”

1.4 WARRANTIES

A. Provide 15-year warranty.

PART 2 - PRODUCTS

2.1 BASIC CONSTRUCTION

A. Maximum continuous operating rating shall be capable of sustaining 115% of nominal root-main-square (RMS) voltage continuously without degradation. Surge protective device shall use only solid-state clamping components to limit the surge voltage. Response time shall be no greater than (5) nanoseconds. NEMA 4 enclosure.

B. Surge protective device shall use LED indicators to indicate suppression component failure in all protection modes including N-G, as well as optically isolated N.C. dry contacts for remote monitoring.

C. All surge protective device protection modes shall be internally fused at the component level with the fuses I^2T capable of allowing the suppressor’s maximum rated transient current to pass through the suppressor without fuse operation. If the rated I^2T characteristic of the fusing is exceeded, the fusing shall be capable of opening in less than (1) millisecond and

clear both high and low impedance fault conditions. The fusing shall be capable of interrupting up to 300 kA symmetrical fault current. This overcurrent protection circuit shall be monitored and provide indication of suppression operation/failure.

2.2 SURGE PROTECTIVE DEVICES

A. Acceptable Manufacturers: Current Technology or approved equal by efi Electronics, ASCO, L.E.A. International, MCG Surge Protection, Josyln, or the Equipment Manufacturer.

B. Main Switchboard: Current Technology TransGuard Model TG3- (050) (080) (100) (125) (150) (200) (250) (300)-(208) (240)- (480)-3Y-PN-M2-F. Provide (208/120) (480/277) -volt, 3-phase surge protective device on Switchboard "MDP" with display event counter, battery-operated audible alarm with silence and test switches, LED status indicator lights, peak surge current of (50,000) (80,000) (100,000) (125,000) (150,000) (200,000) (250,000) (300,000) amperes per mode, Type 1, Category C, UL 1449 Standard, Third Edition. Wire to 100-ampere, 3-pole circuit breaker at 70 amperes with #2 AWG wiring.

C. Branch Panelboards: Current Technology TransGuard Model TG3-(050) (080) (100) (125) (150) (200) (250) (300)-(208) (240) (480) – (208) (240) (480)-3Y-PN-M2-N. Provide 3-phase surge protective device with display event counter, battery-operated audible alarm with silence and test switches. LED status indicator lights, peak surge current of (50,000) (80,000) (100,000) (125,000) (150,000) (200,000) (250,000) (300,000) amperes per mode, Type 1, Category C, UL 1449 Standard, Third Edition. Wire to 100-ampere, 3-pole circuit breaker with #2 / #6 AWG wiring

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install surge protective device in strict accordance with the Manufacturer's directions.

B. Install the main service surge protective device adjacent to switchboard and wire to 100A.3P. circuit breaker with #2 / #6 AWG wiring minimum with a maximum length of wire not to exceed 10 ft. Install as short and straight as practically possible. Twist input conductors together to reduce the wire impedance. Wire surge protective device leads through a circuit breaker that shall be capable of electrically isolating surge protective device from the electric service for repair, without interrupting service to the building.

C. If the branch panelboard does not have an integral surge protective device install the branch service surge protective device adjacent to the branch panelboard and wire to 100A.3P. circuit breaker mounted in the panelboard with #2 / #6 AWG wiring minimum with a maximum length of wire not to exceed 10 ft. Install as short and straight as practically possible.

D. Factory-trained technician shall inspect and test surge protective devices to ensure proper wiring, operation, and ground-to-neutral bond.

E. Include copies of test report(s) in Operating and Maintenance Manuals.

END OF SECTION 26 43 00

SECTION 26 51 19 – LED INTERIOR LIGHTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Section 26 05 00.78, “Closeout Submittals for Electrical.”

B. Section 26 05 29, “Hangers and Supports for Electrical Systems.”

C. Section 26 09 23, “Lighting Control Devices.”

1.2 DESCRIPTION

A. Provide light-emitting diode (LED) luminaires as shown on the Drawings, complete with drivers, frames, canopies, hangers, straps, and trim, as needed for a complete installation.

B. Coordinate luminaire mounting type with ceiling type listed on the Architectural Room Finish Schedule.

1.3 QUALITY ASSURANCE

A. Standards:
1. American National Standards Institute (ANSI).
2. Americans with Disabilities Act (ADA).”
3. Certification by Electrical Testing Laboratories (ETL).
4. DesignLights Consortium® (DLC).
5. Institute of Electrical and Electronics Engineers, Inc. (IEEE).
6. National Fire Protection Association (NFPA): 2023 NFPA 70, “National Electrical Code® (NEC),” Article 410.
7. Underwriters Laboratories, Inc., (UL) Label.

1.4 WARRANTIES

A. Warranty Period for Luminaires: 5-year limited warranty.

1.5 SPARE PARTS

A. Furnish spare luminaires, and drivers. Refer to Lighting Fixture Schedule.

PART 2 - PRODUCTS

2.1 LUMINAIRES

A. Refer to the Drawings for Lighting Fixture Schedule.

B. Only those Manufacturers listed on the Lighting Fixture Schedule will be acceptable.

C. Luminaire brackets, mounting hardware, bolts, nuts, washers, connectors, etc., shall be aluminum, galvanized steel, or other non-rusting finish.

2.2 LED LUMINAIRES

A. Each interior luminaire shall consist of an assembly, including a housing, an LED array as the light source, and an electronic driver (power supply).

B. Each luminaire shall be designed to operate within a temperature range of 55 degrees F. to 105 degrees F.

C. Lumen output: Output shall not decrease by more than 20% over the minimum operational life of 50,000 hours.

D. Individual LEDs shall be connected such that a catastrophic loss or the failure of (1) LED will not result in the loss of the entire luminaire.

E. LED boards shall be suitable for field maintenance or service from below the ceiling with plug-in connectors. LED boards shall be upgradable.

F. LED Power Supply and Driver:
   1. Driver:
      a. 120 volts, UL-listed, sound rated A+. Shall be greater than 80% efficient at full load across all input voltages. Input wires shall be minimum #18 AWG solid copper.
      b. Luminaires that are identified on the Drawings as capable of dimming shall be capable of continuous dimming without perceivable flicker over a range of 100% to (1%) (5%) of rated lumen output with a smooth shut-off function.
      c. Provide driver disconnect.
   2. The surge protection residing within the driver shall protect the luminaire from damage and failure for transient voltages and currents as defined in ANSI/IEEE C64.41 2002 for Location Category A, where failure does not mean a momentary loss of light during the transient event.
   3. Power factor: Shall be 90% or greater at all standard operating voltages and full luminaire output.

G. LED Thermal Management:
   1. Thermal management of LED-generated heat shall be of sufficient capacity to ensure proper operation of the luminaire over the expected useful life.
   2. The LED Manufacturer's maximum junction temperature for the expected life shall not be exceeded at the average operating ambient.
   3. The LED Manufacturer's maximum junction temperature for catastrophic failure shall not be exceeded at the maximum operating ambient.
   4. The Driver Manufacturer's maximum case temperature shall not be exceeded at the maximum operating ambient. Thermal management shall be passive by design. The use of fans or other mechanical devices is not allowed.

2.3 HURRICANE/EARTHQUAKE CLIPS

A. Acceptable Manufacturers: ERICO CADDY®, Cooper, B-Line, or the Luminaire Manufacturer.

PART 3 - EXECUTION

3.1 INSTALLATION — LUMINAIRES

A. Ceiling Location: Coordinate the location of all luminaires with the Architectural reflected ceiling plan, and with any diffusers, grilles, registers, smoke and heat detectors, speakers, or sprinklers.

B. Coordinate the installation of luminaires with the painting work. Do **NOT** install luminaires until painting work is completed.

C. Securely mount all luminaires to elements of the building structure or suspended therefrom, such that luminaires will be square, plumb, and rigid; will not fall or sag; and will not cause the suspended ceiling system to sag or wall board to pull away.

D. Provide steel angles, channels, strut channels, etc., to securely mount luminaires suspended from joists, metal decks, or similar construction.

E. Provide hanger supports and clamps to support luminaires from **STRUCTURE**, not from ceiling or wallboard.

F. Use hurricane/earthquake clips to secure lay-in and downlighting luminaires to ceiling grid.

G. Verify the actual suspension system to be used and make all adjustments in luminaire installation provisions occasioned thereby.

H. Furnish flush luminaires with installation provisions compatible with the suspended acoustic ceiling tile system provided.

I. Provide (2) independent galvanized-steel safety hanger wires or safety chains/cables to hang recessed luminaires from structure. Support all new and relocated luminaires. Wires or chains/cables shall pass 3 ft., 50-pound drop test.

J. Attach all luminaires to UL-listed boxes, which shall be rigidly supported to the structure independent of the ceiling suspension system. Provide additional support to the ceiling suspension system by means of hanger bars between tees.

K. Recessed downlighting luminaires mounted in suspended acoustic tile ceiling shall have adjustable bar straps for support on the ceiling suspension system from ceiling support channel or tees.

L. Fire-Rated Ceilings: Install 1/2 in. gypsum wallboard enclosures over recessed luminaires with a minimum of 1 in. clearance to the luminaire. Installation shall comply with the UL listing for the ceiling in which the luminaires are installed.
   1. **Option:** May **ONLY** be used for recessed luminaires rated for insulation contact (IC). Contractor may provide a fire-rated luminaire enclosure over each luminaire.

M. Flush luminaires with light spilling between frame and ceiling shall have felt gasket installed between trim and ceiling.

N. All luminaires installed on walls in halls, corridors, passageways, or aisles and mounted between 27 in. and 80 in. above the finished floor shall protrude no more than 4 in. into the space to comply with ADA.

O. LED Arrays:
   1. Install arrays in all luminaires installed under this Contract in accordance with the Lighting Fixture Schedule.
   2. Install new arrays not more than (10) days prior to date of completion.
   3. All arrays shall be in working order at Contract Completion.
   4. Replace all defective arrays with new arrays when the work is finally accepted.

P. Clean luminaires of dirt and smudges both inside and outside.

Q. Replace all damaged, deformed, defective, inoperative, or noisy drivers, luminaires, screw-in LED lamps, and LED arrays that fail during the 1-year guarantee period.

END OF SECTION 26 51 19

SECTION 26 52 13 – EMERGENCY AND EXIT LIGHTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Section 26 05 00.78, “Closeout Submittals for Electrical.”

B. Section 26 05 29, “Hangers and Supports for Electrical Systems.”

1.2 DESCRIPTION

A. Provide battery-operated emergency and exit lighting as shown on the Drawings, complete with accessories, as needed for a complete installation.
   1. Emergency luminaires, including LED lamps, battery, and charger.
   2. Emergency/generator transfer devices (ETD/GTD).
   3. Exit signs, including LED lamps, battery, and charger.
   4. Emergency battery inverters, including battery, charger, and remote test station.

1.3 QUALITY ASSURANCE

A. Standards:
   1. American National Standards Institute (ANSI).
   2. Americans with Disabilities Act (ADA).”
   3. Certification by Electrical Testing Laboratories (ETL).
   4. Institute of Electrical and Electronics Engineers, Inc. (IEEE).
   5. National Fire Protection Association (NFPA):
      a. 2023 NFPA 70, “National Electrical Code® (NEC),” Articles 410 and 700.
      b. 2021 NFPA 101, “Life Safety Code®.”
   6. Underwriters Laboratories, Inc., (UL):
      a. UL 924.
      b. UL 1008.

1.4 WARRANTIES

A. Special Warranty for Emergency Lighting Batteries: Manufacturer’s standard form in which the Manufacturer of the battery-powered emergency lighting unit agrees to repair or replace components of rechargeable batteries that fail in materials or workmanship within specified warranty period.

B. Battery Warranty Period for Battery-Operated Emergency Lighting Units: 5years from date of Substantial Completion. A full warranty shall apply for the first year, and a prorated warranty for the remaining (9) years.

C. Battery Warranty Period for Battery-Operated Exit Signs: 5 years from date of Substantial Completion. Full warranty shall apply for the first year, and a planned warranty for the remaining (4) years.

D. Battery Warranty Period for Emergency Battery Inverters: (5) years from date of Substantial Completion.

1.5 SPARE PARTS

A. Furnish spare luminaires, emergency battery packs, and emergency lighting transfer devices. Refer to Section 26 05 00.78.

B. Additional Spare Parts for Emergency and Exit Lighting: Contractor shall include in its Bid the items listed below, installed complete at the direction of the A/E or AHJ. If, at the

completion of the project, these items are not installed, the Contractor shall turn them over to the Owner as spare parts. Refer to Section 26 52 13 for additional information.

1. Battery-operated exit lights: Quantity 5%, [3] minimum.
2. Battery-operated emergency lights: Quantity 5%, [3] minimum.
3. Battery-operated combination exit/emergency lights: Quantity 5%, [1] minimum.

PART 2 - PRODUCTS

2.1 BATTERY-OPERATED EMERGENCY LUMINAIRES

A. Self-contained units complying with UL 924. Sealed, maintenance-free, nickel–cadmium or nickel-metal hydride type battery. Fully automatic, solid-state type charger with sealed transfer relay. Heavy-chrome-plated wire guard protects lamp heads or fixtures where indicated on the Lighting Fixture Schedule.

1. Operation: Relay automatically turns lamp on when power-supply circuit voltage drops to 80% of nominal voltage or below. Lamp automatically disconnects from battery when voltage approaches deep-discharge level. When normal voltage is restored, the relay disconnects lamps from battery, and battery is automatically recharged and floated on charger.
2. Test push button: Push-to-test type, in unit housing. Simulates loss of normal power. Demonstrates unit operability.
3. LED indicator light: Indicates normal power on. Normal glow indicates trickle charge; bright glow indicates charging at end of discharge cycle.
4. Integral time-delay relay: Holds unit on for fixed interval of (15) minutes when power is restored after an outage.
5. Integral self-test: Factory-installed electronic device automatically initiates code-required test of unit emergency operation at required intervals. Test failure is annunciated by an integral audible alarm and a flashing red LED.

2.2 BATTERY-OPERATED EXIT SIGNS

A. Exit signs shall comply with AHJ requirements and with UL 924 for sign colors, visibility, luminance, and lettering size.

B. Internally Lighted Signs:

1. Lamps for AC operation: LEDs, 50,000 hours minimum rated lamp life.
2. Battery-operated exit signs: Integral automatic charger in a self-contained power pack. Sealed, maintenance-free, nickel–cadmium or nickel-metal hydride type battery. Fully automatic, solid-state type charger with sealed transfer relay.
    a. Operation: Relay automatically energizes lamp from battery when circuit voltage drops to 80% of nominal voltage or below. When normal voltage is restored, the relay disconnects lamps from battery, and battery is automatically recharged and floated on charger.
    b. Test push button: Push-to-test type, in unit housing, simulates loss of normal power and demonstrates unit operability.
    c. LED indicator light: Indicates normal power on. Normal glow indicates trickle charge; bright glow indicates charging at end of discharge cycle.
    d. Integral self-test: Factory-installed electronic device automatically initiates code-required test of unit emergency operation at required intervals. Test failure is annunciated by an integral audible alarm and a flashing red LED.

PART 3 - EXECUTION

3.1 INSTALLATION — EMERGENCY LIGHTING UNITS

A. Test by interrupting power supply to demonstrate proper operation. Verify transfer from normal power to battery emergency power and retransfer to normal.

3.2 INSTALLATION — EXIT SIGNS

A. Test by interrupting power supply to demonstrate proper operation. Verify transfer from normal power to battery and retransfer to normal.

B. Verify that exit signs are installed according to their listing and the requirements in NFPA 101.

C. Provide number of faces and direction arrows for all exit lights as shown on the Drawings.

3.3 INSTALLATION — EMERGENCY LED DRIVERS

A. Test by interrupting power supply to demonstrate proper operation. Verify transfer from normal power to battery and retransfer to normal.

3.4 TESTING

A. Prepare a written report of tests, inspections, observations, and verifications indicating and interpreting results. If adjustments are made to lighting system, retest to demonstrate compliance with standards.

END OF SECTION 26 52 13

SECTION 27 05 01 - BASIC COMMUNICATIONS REQUIREMENTS

PART 1 - GENERAL

1.1 Refer to Section 26 05 01 Basic Electrical Requirements which are hereby made part of Division 27 - Communications.

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SECTION 27 05 02 - AGREEMENT AND WAIVER FOR USE OF ELECTRONIC FILES

PART 1 - GENERAL

1.1 The Engineer, at their sole discretion and without obligation, makes graphic portions of the contract documents available for use by the contractor in electronic format. These electronic files are proprietary, and remain the Engineer's Instruments of Service and shall be for use solely with respect to this project, as provided in the Standard Form of Agreement between Owner/Architect and Engineer.

1.2 Electronic files shall be released only after bids have been received for the project and contracts have been signed with the contractors.

1.3 The contractor shall acknowledge receipt of electronic files in the requested format for this project. The electronic files are provided as a convenience to the User, for use in preparing shop drawings and/or coordination drawings related to the construction of only the project identified in the Agreement. The electronic files and the information contained within are the property of the Engineer and/or the Architect and/or the Owner, and may not be reproduced or used in any format except in conjunction with the project identified in the Agreement.

1.4 The User acknowledges that the information provided in the electronic files is not a substitution or replacement for the Contract Documents and does not become a Contract Document. The User acknowledges that neither the Engineer, the Architect, the Consultants, the Client or the Owner make any warrant or representation that the information contained in the electronic files reflect the Contract Documents in their entirety. The User assumes full responsibility in the use of the electronic files, including the responsibility to see that all manual modifications, addenda, bulletins, clarifications and Change Orders to the drawings executed as a part of the Contract Documents have been incorporated.

1.5 The User acknowledges that the receipt of electronic files in no way relieves the User from the responsibility for the preparation of shop drawings or other schedules as set forth in the Contract between the Contractor and the Owner.

1.6 Electronic files are available in the AutoCAD .DWG or Revit model format for a cost as indicated in the Agreement and Waiver Form. Providing the documents in the .DXF format will be an additional charge per sheet as indicated in the Agreement and Waiver Form. Charges are for the Engineer's time to prepare the documents in the format stated. They are available through the Engineer's office on a C.O.D. basis only. A sample of the format will be provided by the Engineer upon request by the contractor, for the purpose of testing the compatibility of the format to contractor's systems.

1.7 Projects developed using AutoCAD MEP will have all drawings converted to the AutoCAD format, when requested to be DWG or DXF format.

1.8 Project models will be furnished without views.

1.9 The electronic files shall be stripped of the Project's name and address, the Architect's / and / Engineer's / and / any consultant's name and address, and any professional licenses indicated on the contract documents, (and all dimensions, verbiage, and statistical information). Use of these electronic files is solely at the contractor's risk, and shall in no way alter the contractor's Contract for Construction.

1.10 The User agrees to indemnify, hold harmless and defend the Engineer, the Architect, the Consultants, the Owner, the Client and any of their agents from any litigation resulting from the use of (by any means of reproduction or electronic media) these files. The Engineer makes no representation regarding fitness for any particular purpose, or suitability for use with any software or hardware, and shall not be responsible or liable for errors, defects, inexactitudes, or anomalies in the data, information, or documents (including drawings and specifications) caused by the Engineer's or its consultant's computer software or hardware defects or

errors; the Engineer's or its consultant's electronic or disk transmittal of data, information or documents; or the Engineer's or its consultant's reformatting or automated conversion of data, information or documents electronically or disk transmitted from the Engineer's consultants to the Engineer.

1.11 The contractor waives all claims against the Engineer, its employees, officers and consultants for any and all damages, losses, or expenses the contractor incurs from such defects or errors in the electronic files. Furthermore, the contractor shall indemnify, defend, and hold harmless the Engineer, and its consultants together with their respective employees and officers, harmless from and against any claims, suits, demands, causes of action, losses, damages or expenses (including all attorney's fees and litigation expenses) attributed to errors or defects in data, information or documents, including drawings and specifications, resulting from the contractor's distribution of electronic files to other contractors, persons, or entities.

PART 2 - PRODUCTS – NOT USED

PART 3 - EXECUTION

3.1 Attached "Agreement" shall be submitted with accompanying payment to the Engineer prior to delivery of electronic files.

END OF SECTION

Project: Mt. Gilead Public Schools
145 N. Cherry St.
Mount Gilead, OH 43338

Owner: Mt Gilead Public Schools

Heapy Engineering Project Number: 2026-91002.00

Heapy Engineering Project Manager: Michael Jankowski

The Provider, named below, will furnish the Recipient, named below, certain documents prepared by the Provider or its sub consultants in an electronic format. These documents are hereinafter **collectively** referred to as "Electronic Files". The Electronic Files are instruments of the Provider services performed solely for the Owner's benefit and to be used solely for this Project. The Provider does not represent that the information contained in the Electronic Files are suitable for use on any other project or for any other purpose. If the Electronic Files are used for any other project or purpose without the Provider's specific written permission, the risk of such use shall be assumed solely by the Recipient or other user.

Prior to the use of the Electronic Files the Provider and the Recipient agree to the following terms and conditions:

1. The Provider and Recipient fully understand that the data contained in these electronic files are part of the Provider's Instruments of Service. The Provider shall be deemed the author of the drawings and data, and shall retain all common law, statutory law and other rights, including copyrights.

2. The Recipient confirms their request to the Provider for Electronic Files for the Project listed above, which the Recipient understands are to be provided only in accordance with, and conditioned upon, the terms and conditions of this Agreement and Waiver for Use of Electronic Files.

3. The Provider agrees that the Recipient may use the Electronic Files for the sole purpose of preparing shop drawings and/or coordination drawings for the above Project only. Any Electronic Files provided are strictly for the use of the Recipient in regard to the Project named above, and shall not be utilized for any other purpose or provided by the Recipient to any entity other than its subcontractors for the Project named above.

4. The Recipient acknowledges that the furnishing of Electronic Files in no way relieves the Recipient from the responsibility of shop drawings or other schedules as set forth in the Contract between the Contractor and the Owner.

5. The Recipient acknowledges:

    a. That the Electronic Files do not contain all of the information of the Bid Documents or Contract Documents for the construction of the Project above.

    b. That information in the Bid Documents or Contract Documents may be revised or modified in the future.

    c. The Provider does not have, and will not have, any duty or obligation to advise or give notice to the Recipient of any such revisions or modifications.

    d. That the Recipient agrees that its use of the Electronic Files is at the Recipient's sole risk of liability, and that the Recipient shall make no claim or demand of any kind against the Provider arising out of Recipient's receipt or use of the Electronic Files.

6. The Provider makes no representation or warranty of any kind, express or implied, with respect to the Electronic Files and specifically makes no warranty that the Electronic Files shall be merchantable or fit for any particular purpose, or

accurate or complete. Furthermore, any description of said Electronic Files shall not be deemed to create an implied or express warranty that such Electronic Files shall conform to said description.

7. Due to the unsecured nature of the Electronic Files and the inability of the Provider or the Recipient to establish controls over their use, the Provider assumes no responsibility for any consequences arising out of the use of the data. It is the sole responsibility of the Recipient to check the validity of all information contained within the Electronic Files. The Recipient shall at all times refer to the Construction Documents of the project during all phases of the project. The Recipient shall assume all risks and liabilities resulting from the use of this data, and the Recipient agree(s) to waive any and all claims and liability against the Provider and its sub consultants resulting in any way from the use of the Electronic Files.

8. Electronic Files are provided strictly as a courtesy by the Provider solely for the convenience of the Recipient, and are not part of the Bid Documents or Contract Documents for the Project. The Electronic Files do not replace or supplement the paper copies of any drawings, specifications, or other documents included in the Contract Documents for use on the project.

    a. The Recipient assumes full responsibility in the use of Electronic Files, including the responsibility to see that all manual modifications, addenda, bulletins, clarifications and Change Orders to the drawings executed as a part of the Contract Documents have been incorporated.

9. As stated herein, the possibility exists that the Electronic Files provided may differ from the Bid Documents or Contract Documents for construction of the Project. The Provider shall not be responsible, nor be held responsible, for differences between Electronic Files, the Bid Documents, and Contract Documents. The Bid Documents or Contract Documents for the Project may be modified by the Provider at any time, either before or after construction begins. The Provider has no responsibility, either before or after any such modification, to determine or to advise the Recipient whether any such modification causes Electronic Files provided to the Recipient to be out of date, inconsistent with the Bid Documents or Contract Documents, or otherwise unsuitable or unfit for use in any way.

10. The Recipient assumes all risk and liability for any losses, damages, claims, or expenses (including defense and attorney fees) resulting from its receipt, use, or possession of Electronic Files furnished by the Provider. The Provider makes no representation, warranty or guarantee that the Electronic Files:

    a. Are suitable for any other usage or purpose.

    b. Have any particular durability.

    c. Will not damage or impair the Recipient's computer or software.

    d. Contain no errors or mechanical flaws or other discrepancies that may render them unsuitable for the purpose intended by the Recipient.

11. Recipient agrees to indemnify, defend and hold harmless the Provider, agents, employees, and the Owner from, and against, any and all claims, suits, losses, damages or costs, of any kind or nature, including attorney’s fees, arising from or by reason of the Recipient’s use of Electronic Files provided by the Provider, and such defense and indemnification obligation duties shall survive any use under this Agreement and Waiver for Use of Electronic Files.

12. The Recipient agrees that the Provider shall have no responsibility whatsoever for problems of any nature arising from transmitting and storing electronic files at a Recipient requested FTP or project management site or the conversion of the Electronic Files by the Recipient or others for use in non-native applications. The Provider will not provide Electronic Files in compressed formats. Recipient agrees to accept the files in the format provided by the Provider, and that Recipient’s conversion or electronic file storage at the Recipient’s requested site, shall be at Recipient’s sole risk.

13. Recipient acknowledges:

    a. That the Electronic Files provided by the Provider are a graphical representation of the building in order to generate two-dimensional industry standard drawings.

b. That the data contained in the Electronic Files may not be 100% accurate and should not be used for dimensional control, building layout, shop drawings, or any other similar purpose

c. That any schedule of materials produced directly from the Electronic Files has not been checked for accuracy.

d. That the information in the Electronic Files should be used only for comparative purposes and shall not be relied upon for accurate quantity estimates or used in establishing pricing.

14. Electronic Files provided by the Provider will only contain elements and content that the Provider deems necessary and appropriate to share. No specific Level of Detail (LoD) is implied or expected. The Recipient agrees that no proprietary content, MvParts or Revit Families or any other AutoCAD MEP or Revit MEP content shall be removed from the model and/or used for any other purpose but to support this specific project.

15. The Provider, at its sole discretion, may modify the Electronic files before they are provided to the Recipient. Such modifications may include, but are not necessarily limited to, removal of certain information. The Provider, at its sole discretion, may refuse to provide some or all Electronic Files requested by Recipient.

16. The availability of Electronic Files that were not prepared by the Provider is subject to the consent of the Owner or consultant that prepared those Electronic Files. The Provider will not negotiate with the Owner or consultant or repeatedly solicit the Owner or consultant to obtain such consent. Neither this Agreement and Waiver for Use of Electronic Files nor any such separate Consultant's consent may be assigned or transferred by Recipient to any other person or entity.

Provider (Name of Company): _____

Recipient (Name of Company): _____

Recipient Address: _____

Name of authorized Recipient Representative: _____

Title of authorized Recipient Representative: _____

E-mail address of authorized Recipient Representative: _____

Signature of authorized Recipient Representative: _____

Date: _____

NOTE: Select requested Electronic File format and complete applicable cost summary.

1. ☐ DWG / DXF Format - List of Drawings Requested: ___

_____

2. ☐ Revit Project Model Requested (Model only, no Views included)

The following costs are applicable to Delivery of Electronic Files (select one):

☐ CD-ROM ☐ Heapy FTP ☐ User's FTP site ☐ Flash Drive

Requested Electronic DWG / DXF file format (select one):

☐ 2010 DWG	☐ 2007 DWG	☐ 2004 DWG	☐ 2000 DWG	☐ R12 DWG
☐ 2010 DXF	☐ 2007 DXF	☐ 2004 DXF	☐ 2000 DXF	☐ R12 DXF

Cost of Preparation of Division 27 Electronic DWG / DXF Files:

First Drawing: $50.00 $50.00

Additional Drawings $15.00 each _____ x $15.00 = $ _____

Conversion to DXF Format: $5.00 additional/sheet _____ x $ 5.00= $ _____

Total Cost: (Please make check payable to Heapy Engineering and include a copy of this form.) $ _____

All files will be bound together.

Requested electronic Revit file format (Select One):

☐ 2025 RVT

Cost of Preparation of Division 27 Electronic Revit Model Files:

Revit Project Model without Views	$500.00

Total Cost: (Please make check payable to Heapy Engineering and include a copy of this form.) $ _____

SECTION 27 05 04 - BASIC COMMUNICATIONS MATERIALS AND METHODS

PART 1 - GENERAL

1.1 Refer to Section 26 05 04 Basic Electrical Materials and Methods which are hereby made part of Division 27 - Communications.

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SECTION 27 05 05 - FIRESTOPPING

PART 1 - GENERAL

1.1 Firestopping assemblies shall be provided at penetrations of conduits, bus ducts, cables, cable trays and other electrical items thru fire rated floors, fire rated floor-ceiling and roof ceiling assemblies, fire rated walls and partitions and fire rated shaft walls and partitions. In addition, firestopping assemblies shall be provided at penetrations thru 0-hour rated floors. Refer to the drawings for fire rated building elements.

1.2 All existing penetrations which have firestopping which are disturbed as part of this project, shall have the existing firestop restored to its UL listed approved condition.

1.3 Firestopping assemblies shall be tested and rated in accordance with ASTM E814, E119 and listed in accordance with UL 1479, as published in the UL Fire Resistance Directory. Firestopping shall provide a fire rating equal to that of the construction being penetrated.

1.4 Firestopping materials, assemblies and installation shall conform to requirements of the OBC Chapter 1, Section 106 and Chapter 7, Section 712 and the Authority Having Jurisdiction.

1.5 For those firestopping applications that exist for which no UL tested system is available through any manufacturer, a manufacturer's engineering judgment derived from similar UL system designs or other tests will be submitted to local authorities having jurisdiction for their review and approval prior to installation. Engineer judgment drawings must follow requirements set forth by the International Firestop Council.

1.6 Shop drawings shall be prepared and submitted for review and approval. Submittals shall include manufacturer's specifications and technical data of each material, documentation of U.L. firestopping assemblies and installation instructions. Submittals shall include all information required in OBC Chapter 1, Section 106 and Chapter 7, Section 712

PART 2 - PRODUCTS

2.1 Firestopping materials shall be manufactured and/or supplied by Hilti, 3M, Rectorseal-Metacaulk, Tremco, Nelson, Specified Technologies or other approved manufacturer.

2.2 Materials shall be in the form of caulk, putty, sealant, intumescent material, wrap strip, fire blocking, ceramic wool and other materials required for the UL listed assemblies. These shall be installed in conjunction with sleeves and materials for fill and damming.

2.3 Combination pre-set floor sleeve and firestopping assemblies shall be STI EZ-Path or equal 3M Fire Barrier, Hilti CFS-MSL

PART 3 - EXECUTION

3.1 Installation of all materials and assemblies shall be in accordance with UL assembly drawings and the manufacturer's instructions.

3.2 Installation shall be done by an experienced installer who is certified, licensed or otherwise qualified by the firestopping manufacturer as having the necessary training and experience.

3.3 Refer to 27 05 33 Raceway and Boxes for Communication Systems for sleeve requirements and treatment of penetrations not requiring firestopping.

END OF SECTION

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SECTION 27 05 26 - GROUNDING AND BONDING FOR COMMUNICATIONS SYSTEMS

PART 1 - GENERAL

1.1 Scope of Work

A. Work includes the provision of the technical grounding system including connections within technology rooms/closets.

B. Work includes bonding of technology pathways and equipment to the technical grounding system.

1.2 System Description

A. Provide a Telecommunications Ground Bar (TGB) in each TC and at the telephone and CATV service entrance points. Provided under Division 26 Bid Package.

B. Provide a Telecommunications Bonding Conductor (TBC) from each TGB to a local electrical panelboard ground. This bonding conductor shall consist of a minimum #6, bare copper grounding conductor. Provide a warning label attached to each Telecommunications Bonding Conductor at each end stating “WARNING: Building telecommunications grounding system. Do not remove or disconnect without prior approval from District’s Telecommunications Department.” Provided under Division 26 Bid Package. This sign shall be an engraved placard.

C. Provide a Telecommunications Bonding Conductor (TBC) from each TGB to the existing TMGB. This bonding conductor shall consist of bare copper grounding conductor, sized per TIA 607 based upon distance. Provide a warning label attached to each Telecommunications Bonding Conductor at each end stating “WARNING: Building telecommunications grounding system. Do not remove or disconnect without prior approval from District’s Telecommunications Department.” Provided under Division 26 Bid Package. This sign shall be an engraved placard.

D. Provide bonding between all joints of cable tray and ladder rack. Provide bonding to all conduit sleeves. Provide bonding to all technology equipment racks and cabinets within each wiring closet.

E. Provide bonding from the Technology grounding system to the telephone and CATV demarc equipment and protector panels. Coordinate this grounding prior to installation of telephone and CATV services.

F. This contract shall be responsible for providing all equipment, cable tray, ladder rack, conduit and sleeve grounding in each TC to the grounding system installed under Division 26.

G. All work shall be in compliance with NEC, Article 250 and EIA/TIE J-STD-607.

H. Should a conflict arise between the drawings, this specification and referenced industry design standards and codes, the most stringent requirement shall be utilized.

1.3 Quality Assurance

A. All work shall be installed in compliance with the latest edition of the Commercial Building Telecommunications Wiring Standard EIA/TIA, BICSI Standards, applicable National Electric Code Sections, Ohio Building Codes.

B. All equipment shall be UL listed.

C. All equipment and Installation Practices shall comply with the latest ANSI/NFPA-70 National Electric Code.

D. All equipment Installation Practices shall comply with the Local Electric Code.

E. All equipment Installation Practices shall comply with the latest ANSI/TIA/EIA-758 Customer Owned Outside Plant Standard.

F. All equipment shall comply with the latest ANSI-J-STD-607 Commercial Building Grounding (Earthing) and Bonding Requirements for Telecommunications Standard.

G. All equipment and Installation Practices shall comply with the latest BICSI Telecommunications Distribution Methods Manual (TDMM)

1.4 Shop Drawings

A. A complete list of materials with model and part numbers and references to the Part 2 specification paragraph numbers.

B. Manufacturers Data Sheets of all products and cabling, specific to the project. Data sheets shall show the exact parts, with model numbers and options as required and clearly identified.

C. Job specific wiring diagrams.

1. Riser diagram showing conduit requirements with pull boxes, outlet boxes, part numbers of cable used, and a number of circuits in each conduit.

D. 30x42 floor plans at a scale of not less than 1/8 inch =1 foot -0 inches showing the location of all items of equipment. Drawings shall also indicate each location where electrical power is required, and the specific configuration of that power connection (voltage, plug type, mounting height, etc.)

1.5 Relevant Standards

A. The Telecommunications Grounding Installation shall comply with the following at a minimum:

1. All local, state and national codes
2. The National Electric Code (NEC)
3. The National Electrical Safety Code (NESC)
4. Electronic Industries Alliance (EIA) / Telecommunications Industry Association (TIA) 606, J-STD-607 and all applicable and current Technical Service Bulletins (TSB).

PART 2 - PRODUCTS

2.1 Telecommunications Main Ground Bar (TMGB)

A. Ground bar shall be solid copper, 4 inches high, .25 inch thick, minimum 24 inches long with pre-drilled holes for standard-sized Lugs and must be UL listed. Provide final length as required to accommodate grounding lug attachments.

B. Ground bars shall be provided with insulated stand-off brackets for wall mounting providing a minimum of 2-inch wall clearance. Insulators shall have a minimum voltage rating of 600V and a minimum Short Time Electrical Strength of 55kVv.

C. All connections shall be made with double-bolted, compression style grounding lugs.

D. Manufactured by StormCopper or equal by CPI, B-Line, Andrew, Tessco Technologies, Hubbell.

2.2 Telecommunications Ground Bar (TGB)

A. Ground bar shall be solid copper, 4 inches high, .25 inch thick, minimum 12 inches long with pre-drilled holes for standard-sized Lugs and must be UL listed. Provide final length as required to accommodate grounding lug attachments.

B. Ground bars shall be provided with insulated stand-off brackets for wall mounting providing a minimum of 2 inch wall clearance. Insulators shall have a minimum voltage rating of 600V and a minimum Short Time Electrical Strength of 55kVv.

C. All connections shall be made with double-bolted, compression style grounding lugs.

D. Bus bar and standoff assembly manufactured by StormCopper or equal by B-Line, Andrew, Tessco Technologies, Hubbell.

2.3 Telecommunications Bonding Conductor (TBC)

A. Utilized for connections of TMGB to main service building ground, and for TMGB to TGB connections. Sized as required in TIA 607 standards.

B. Insulated Conductors - Soft, annealed bare copper per ASTM B-3. Concentric, compressed stranded (class B or C Alternate ASTmB-787) per ASTM B-8, UL-83 and UL-854. Insulation Jacket: Nylon per UL-83. Insulation: High dielectric polyvinyl chloride per UL-83 and UL-854.

C. Uninsulated Conductor: Soft, annealed bare copper per ASTM B-3. Stranded as specified herein. Overall Finish: Gray polyvinyl chloride (PVC) per UL-824.

D. All connections shall be made with double-bolted, compression style grounding lugs.

E. RATINGS - Cables conform to the following standards:

1. UL-83 for THHN-THWN Cdrs.
2. Federal Specification J-C-30B

2.4 Bonding Conductors

A. Conductor shall be minimum #6AWG and may be either stranded or solid, insulated or bare.

B. Cable as manufactured by Superior/Essex, Rome, AIWC.

C. All connections shall be made with double-bolted, compression style grounding lugs.

PART 3 - EXECUTION

3.1 General

A. The telecommunications grounding system shall provide an electrically continuous, low impedance path for all connected telecommunications equipment and pathways.

B. When using grounding conductors installed in rigid, ferrous metallic conduit, both ends of the bonding conductor must be bonded to the conduit ends.

C. The bonding conductors shall have no splices or connections.

D. The bonding conductor shall be connected to the building main electrical grounding system through the use of exothermic weld, listed lugs, listed pressure connectors, listed clamps, or other listed means.

E. All metallic telecommunications pathways and equipment within telecommunications spaces shall be bonded to the local TGB/TMGB utilizing Bonding Conductors (BC).

3.2 Wiring

A. In large buildings with multiple floors and multiple riser closets per floor, the TGB in the closets at the top floor and every third floor shall be joined with the Grounding Equalizer (GE).

B. Refer to drawings for specific location and arrangement of telecommunications Bonding Backbone and Telecommunications Ground bars.

C. The drawings do not indicate specific routes for telecommunications grounding cables. The Telecommunications Contractor is responsible for developing all cabling routes utilizing existing cable management pathways and systems or providing supplemental cable management pathways and systems so that all structured cabling adhere to specific codes and standards specifically developed for the installation of such cables. Where the use of existing cable management systems and pathways would cause the grounding system to violate specific codes and standards regarding cable lengths, environments, proximity to EMI and RF noise sources, etc, the Telecommunications Contractor shall be responsible for developing alternative pathways and shall include all labor and material for doing so within the scope of this work.

D. TC-01 shall be provided with the Main Telecommunications Ground Bar (MTGB). The MTGB shall be bonded to the building electrical system ground and shall be bonded to one additional building electrical system ground (such as building steel).

E. Each Telecommunications Closet (TC) shall be provided with a Telecommunications Ground Bar (TGB).

F. Provide a Telecommunications Bonding Conductor (TBC) from each TGB.

3.3 Grounding/Bonding Connections

A. Ground all backbone cable sheaths, shield drain wires from all voice/data horizontal cable, equipment racks and equipment to the local TGB / MTGB.

B. All grounding and bonding shall be in conformance with the National Electric Code, article 250 and as recommended by EIA/TIA-607.

C. All joints of all cable tray and ladder rack shall be bonded together. When bonding to painted equipment, methods shall be utilized to ensure continuity of grounding connection.

D. Telephone and CATV Service entrance equipment and primary protection panels, shall be bonded to the technical grounding system. Coordinate with serving utilities regarding configuration of grounding connections.

E. All connection to ground bars (TGB, TMGB) shall be made using listed lugs appropriate for mounting provisions in the supplied ground bar.

3.4 Testing General

A. The Contractor shall be responsible for testing the complete technology grounding system.

B. No testing shall be executed until the entire system has had the Owner approved labeling scheme applied and accepted.

C. Test reports shall be provided to indicate.

1. Impedance values across each TBB from the TMGB to the TGB.
2. Impedance values across the TBC from the TMGB to the main electrical service ground.
3. Impedance values across each GE between TGB on a common floor.

D. Tests shall be witnessed by Architect / Engineer / Owner and shall be monitored by a recorder.

E. System testing shall be performed with final test results turned over to the Owner prior to acceptance of the system. Missing or incomplete test results will not be reviewed and the system will not be commissioned by the Owner / Architect / Engineer.

F. Instruments and labor required for tests shall be furnished by the Contractor. All system test equipment shall be approved by the Owner/ Architect / Engineer prior to application.

G. Instruments required for tests shall be furnished by the Contractor.

3.5 Labeling

A. The Contractor shall be responsible for labeling all telecommunications grounding equipment, cable, etc. in accordance with the guidelines as described herein.

B. Each telecommunications ground bar shall be provided with a warning label on an engraved placard to read:

1. "WARNING: Building telecommunications grounding system. Do not remove or disconnect without prior approval from building Telecommunications Department."

C. Each Telecommunications Bonding Conductor (TBC, TBB, GE, etc.) to be provided with a label indicating source and destination ground bars.

3.6 As-Built Documentation

A. Refer to Section 27 05 01 for submittal requirements.

B. Copies of all approved shop drawings with the Engineer's stamp.

C. Copy of all test reports.

D. Technology drawings updated with final as-built information. This shall be in the form of a complete set of Technology drawings with as-built information indicated in colored pen based upon actual field conditions.

1. System schematic and block diagrams for technology grounding system updated with final as-built information. These drawings shall define the exact arrangement of each system including wiring configuration, device locations and cable types.

3.7 Warranty

A. The entire grounding and bonding system as specified herein shall be guaranteed against defects in workmanship and materials for a period of one (1) year as described herein. Period shall commence after system has been commissioned by the Owner, Engineer and Architect. The Installing Contractor shall provide the initial warranty service. Provide a written statement of this warranty as part of the shop drawing submittal and included in the O&M Manuals.

END OF SECTION

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SECTION 27 05 28 - COMMUNICATIONS SYSTEMS PATHWAYS AND SUPPORT EQUIPMENT

PART 1 - GENERAL

1.1 Scope of Work

A. Work consists of pathways to carry communication wiring of all descriptions, including empty conduits, conduit sleeves, ladder rack, basket tray, cable management systems, innerduct, etc.

B. Work includes support equipment for telecommunications cabling including backboards, rough-in boxes and cabinets.

C. Work includes new cable management systems to support all installed communications cabling per standards and manufacturer’s recommendations.

1.2 Quality Assurance

A. Communications pathways and support equipment shall be closely coordinated with other trades to provide adequate access, appropriate clearances and required separation between systems.

1.3 Shop Drawings

A. A complete list of materials with model and part numbers and references to the Part 2 specification paragraph numbers.

B. Manufacturers Data Sheets of all products and cabling, specific to the project. Data sheets shall show the exact parts, with model numbers and options as required and clearly identified.

1.4 Drawings

A. The drawings, which constitute a part of these bid documents, indicate the general route of the pathways to carry communication wiring systems. Data presented on these drawings are as accurate as preliminary surveys and planning can determine until final equipment selection is made. Accuracy is not guaranteed and field verification, of all dimensions, routing, etc., is directed.

B. Specifications and drawings are for assistance and guidance, but exact routing, locations, distances and levels will be governed by actual field conditions. Contractor is directed to make field surveys as part of his work prior to submitting system layout drawings.

1.5 Related Work by Others

A. Communications cabling shall be included as stated in the specification section for each individual system.

PART 2 - PRODUCTS

2.1 Conduit Systems

A. Refer to specification section 27 05 33 Raceway and Boxes for Communications Systems.

2.2 Wireways shall be metal trough with a removable hinged cover and generous knockout arrangement. Provide necessary ells, tees and fittings for a complete installation. All components shall be hot dip galvanized after fabrication or provided with a rust inhibiting phosphatizing coating and finished in baked

enamel. All hardware shall be plated to prevent corrosion. Wireways shall be manufactured by Square D, Weigman, Hoffman or Austin.

2.3 Cable Management System

A. Provide pre-manufactured cable supports as manufactured by Panduit, Cooper B-Line, Caddy, Mineralac, Mono-Systems or Rayco. Cable supports shall be secured to building structure through threaded rod, beam clamps or other UL approved supports as required by site conditions. Components shall provide a minimum cable support point spacing of 48 inches.

B. Cable management devices must be sized to accommodate 100 percent spare capacity of the final installed cable base.

C. Cable management system support components shall be designed with wide support surfaces that do not cause cables to be bend, crushed or otherwise deformed when installed within component loading parameters. Cable management system shall meet UL standards and be UL labeled. Utilizing elements of the building's structure such as beams, joists, etc. to hang cable from will not be acceptable.

D. Bridle rings shall not be acceptable.

2.4 Innerduct

E. Interior Innerduct – UL listed, plenum rated, flexible innerduct, corrugated with pull line. Refer to drawings for specific size.

2.5 Backboards

A. Refer to Section 27 05 04 – Basic Communications Materials and Methods.

2.6 Rough-In Boxes

A. Refer to Section 27 05 33 – Raceway and Boxes for Communications Systems.

B. Refer to drawings for types, quantities and configurations of outlet boxes used to serve communications cabling.

PART 3 - EXECUTION

3.1 General Installation

A. Refer to drawings for pathway types, locations and routing.

B. Cable pathways shall provide the following minimum clearances:

1. Motors and transformers – 4 ft.
2. Conduit and cable used for electrical power distribution – 1 ft.
3. Fluorescent lighting – 5 inches.
4. Power lines up to 5 kV – 5 inches.
5. Power lines over 5 kV. – 24 inches.

C. Backboards and cabinets shall be installed in telecommunications rooms/spaces to support telecommunications equipment and wiring. Coordinate locations of backboards and cabinets with Owner prior to installation.

D. Restore fire rating and smoke stoppage integrity where all wireways, raceways and cable trays pierce walls, floors and ceilings by sealing with approved means; refer to 27 05 33 Raceway and Boxes for Communications Systems paragraph.

E. Provide necessary pathways in areas that have exposed structure or plastered ceilings to provide a wiring path for cables from area above suspended ceilings to respective backboards.

F. No non-metallic or combustible materials shall be installed in ceiling or other plenums used for circulating room air used for heating, ventilation or cooling.

G. Cabling pathways shall be installed with a minimum of 12" clearance above and 6" clearance below. It shall not be acceptable for any other building systems including piping, ductwork, equipment, etc. to infringe upon this clear space.

H. In no circumstances are components of other building system allowed to run through or penetrate the plane of the cable tray channel. This includes piping/conduit passing through cable tray.

3.2 Conduit Systems – Coordinate with Division 26 Contractor to ensure that conduit system installed for telecommunications cabling shall conform to the following:

A. No section of conduit shall be longer than 100 feet between pulling points.

B. No more than two 90 deg. bends in a section of conduit between pulling points.

C. Each section of conduit shall be labeled for length, destination closet and origination closet.

D. Refer to EIA/TIA 569-A for specific conduit and pull box requirements.

E. Conduit and wiring above accessible ceilings shall be run as high as possible, above piping and ductwork, so as to not interfere with mechanical trades, access to mechanical and electrical devices and to allow freedom to remove ceiling panels.

F. Provide a No. 12 gauge pull wire or nylon pull cord in each empty conduit run.

3.3 Wireways

A. Wireways shall be supported with factory made hangers designed expressly for this purpose and 0.375 inch diameter solid hanger rods approximately 5 ft. on center or approved strap hangers for surface mounting.

3.4 Cable Management System

A. The drawings do not indicate specific routes for telecommunications cables. The Division 27 Contractor is responsible for developing all cabling routes utilizing existing cable management pathways and systems or providing supplemental management pathways and systems so that all structured cabling adhere to specific codes and standards specifically developed for the installation of such cables. Where the use of existing cable management systems and pathways would cause the structured cable system to violate specific codes and standards regarding cable lengths, environments, proximity to EMI and RF noise sources, etc., the Division 27 Contractor shall be responsible for developing alternative pathways and shall include all labor and material for doing so within the scope of this work.

B. In areas where there is not an installed raceway system (conduits or cable tray) and a cable support system is required, this contract shall be responsible for providing a cable management system. Where

cables are installed open wired through the use of cable management systems, they shall be installed such that there is a minimum sag of 4 inches for every 4 foot of horizontal run. Cable pathways shall provide the following minimum clearances:

1. Motors and transformers – 4 feet.
2. Conduit and cable use for electrical power distribution – 1 feet.
3. Fluorescent lighting – 5 inch.
4. Power lines up to 2kVA – 5 inch.
5. Power lines over 5kVA – 24 inch cable management system shall be secured to building structure utilizing manufactured approved methods and hardware.

C. Cable management system support components shall be designed with wide support surfaces that do not cause cables to be bent, crushed or otherwise deformed when installed within component loading parameters. Cable management system shall meet UL standards and be UL labeled. Utilizing elements of the building's structure such as beams, joists, etc. to hang cable from will not be acceptable.

3.5 Innerduct

A. Innerduct shall be installed with pull string in each innerduct to facilitate placement of future cables.

3.6 Identification / Labeling

A. All continuous communications pathways such as conduit, cable tray, etc. shall be labeled to indicate origination and destination. Label shall be applied every 50 feet wherever accessible or subject to administration. Coordinate label information with Owner.

B. Label shall consist of mechanically printed, permanent adhesive label, applied to cleaned / prepped area of raceway.

3.7 As-Built Documentation

A. Provide a complete set of architectural floor plan drawings indicating final communications pathway systems with accurate "as-built" locations to show the actual route for the communications systems pathways.

B. Drawings shall indicate each pathway type and provide sizing information such as conduit/innerduct diameter, cable tray width, cable management ring size, etc.

C. Component Service Manuals: Include information for testing, repair, troubleshooting, assembly, disassembly, and required / recommended maintenance intervals for all types of pathways.

3.8 Restore fire rating and smoke stoppage integrity where all wireways, raceways and cable trays pierce walls, floors and ceilings by sealing with approved means; refer to Raceway and Boxes for Communications Systems Section 27 05 33.

END OF SECTION

SECTION 27 05 28 – PATHWAYS FOR COMMUNICATIONS SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Section 26 05 19, “Low-Voltage Electrical Power Conductors and Cables.”

B. Section 26 05 26, “Grounding and Bonding for Electrical Systems.”

C. Section 26 05 43, “Underground Ducts and Raceways for Electrical Systems.”

D. Section 26 05 44, “Sleeves and Sleeve Seals for Electrical.”

E. Division 28, “Electronic Safety and Security.”

1.2 DESCRIPTION

A. Provide conductor wires and cables, connectors, splices, and terminations rated 600 volts or less, as well as pathways, including backboards, grounding, receptacles, conduits, conduit sleeves, and boxes, for the systems listed below. These systems are furnished by others. Refer to the Drawings for conduit locations.
1. Telephone.
2. Telephone/data.
3. Computer data.
4. CATV.
5. Combination television/data.
6. Paging.
7. Intercommunications.
8. Public address.
9. Radio.
10. Radio antenna.
11. Monopole antenna.
12. Intrusion detection.
13. Video surveillance: Closed-circuit television (CCTV) for security systems.

B. Conduit Sleeves: Refer to Section 26 05 44.

C. Underground Telephone Service: Refer to Section 27 05 43.

D. The Owner will provide additional equipment, such as the following:
1. Telephone equipment.
2. Telephone/data equipment.
3. Equipment racks; computers, jacks, plates, cabling, connectors, modems, data switches, servers, terminal strips, and ground bar.
4. Audio-video communications: Broadcast television receivers, amplifiers, splitters, taps, connectors, and coaxial cable.
5. Paging call-in stations, amplifier, and control unit.
6. Intercommunications stations.
7. Public address speakers, amplifiers, and stations.
8. Radios and microphones.
9. Radio antenna and mast.
10. Video surveillance: CCTV cameras, video monitors, switcher, and power supply.
11. Video surveillance: Cable, cover plates, connectors, jacks, wiring, and final connection and testing.

1.3 QUALITY ASSURANCE

A. Standard: Underwriters Laboratories, Inc. (UL).

PART 2 - PRODUCTS

2.1 TELEPHONE AND TELEPHONE/DATA BACKBOARDS

A. 3/4 in. thick x 48 in. wide x 96 in. high, exterior grade, AC plywood backboard painted with (2) coats gray fire-retardant paint on all sides and edges.
   1. **Option:** Provide fire-rated plywood and omit fire-rated paint.

2.2 TELEPHONE GROUNDING

A. Ground Wire: #6 AWG solid copper, insulated.

B. Ground Bar: Harger GBI14420BIC. 1/4 in. thick x 4 in. wide x 20 in. long with (27) sets of 5/16 in. diameter holes at 5/8 in. on center, (3) sets of 7/16 in. diameter holes at 1 in. on center, 1-1/2 in. insulators, and 1 in. offset stainless steel mounting brackets.
   1. Acceptable Manufacturers: Harger or approved equal by Emerson, Erico, Homaco, or ILSCO.

2.3 WIRING

A. Stranded copper, 300-volt insulation, 2023 NFPA 262-listed, size and type as specified in Division 27 and Division 28.

B. All low-voltage wiring shall be plenum-rated, regardless of location. Refer to respective applicable Special System Sections in Division 27 and Division 28 for description of required wire or cable.

2.4 CONDUIT

A. Provide minimum 1/2 in. conduit with bushed ends and pull wire for the following:
   1. Public address system.
   2. Interior intercommunications system.

B. Provide minimum 3/4 in. conduit with bushed ends and pull wire for the following:
   1. Telephone system.
   2. Telephone/data system (1 in. minimum underfloor).
   3. Broadcast television system.

C. Provide minimum 1 in. conduit with bushed ends and pull wire for the following:
   1. Telephone/data system.
   2. Computer data system.
   3. Combination television/data system.
   4. Exterior intercommunications system.
   5. Radio antenna system roof penetrations.
   6. Monopole antenna conduit system roof penetrations.
   7. Video surveillance system.
   8. Video surveillance system roof penetrations.
   9. Intrusion detection system.

D. Provide 2 in. conduit with pull wire for the following:
   1. Radio antenna system.
   2. Radio system, with bushed ends and pull wire.

2.5 BOXES

A. Provide wall outlet boxes for the following:
   1. Telephone conduit system.
   2. CATV system.
   3. Public address conduit system. 4 in. X 4 in. No cover plates.
   4. Radio conduit system.
   5. Intrusion detection system.

B. Provide wall and floor boxes for the following:
   1. Telephone/data conduit system.
   2. Computer data conduit system.

C. Provide combination wall or floor boxes for the following:
   1. Telephone/data conduit system.

D. Provide wall outlet boxes for the following:
   1. Telephone conduit system: 4-11/16 in. square x 2-7/8 in. deep with plaster ring and single 2 in. X 4 in. opening in wall. No cover plates.
   2. Telephone/data conduit system: 4-11/16 in. square x 2-7/8 in. deep with plaster ring and single 2 in. X 4 in. opening in wall. No cover plates.

E. Provide 2-gang outlet boxes for the following:
   1. Combination television/data system.

2.6 PLATES

A. Acceptable Manufacturers: Hubbell, Pass & Seymour, Cooper, Bryant, or Leviton.

B. Plates for flush technology outlets shall smooth-finish plastic.

C. Plates for flush technology outlets shall be Specification Grade stainless-steel Type 302/304.

PART 3 - EXECUTION

3.1 WIRING

A. Install wiring in accordance with the Manufacturer's recommendations. installation shall be acceptable to the AHJ.

B. Enclose all conductors in a continuous, grounded raceway system, unless otherwise noted.

C. Install wiring in **CONDUIT** at the following locations:
   1. Where wiring rises up inside walls.
   2. Where wiring is run below floor.
   3. Where wiring is run through or above inaccessible ceilings or in chases.
   4. Where wiring is run below ceilings or in equipment rooms.

D. Contractor may run wiring and cable exposed **ONLY** above accessible lay-in ceilings. Run wiring neatly, perpendicular to walls, and away from piping, ductwork, or other construction likely to damage the insulation. Securely clip or fasten wiring directly to the building structure or support it with bridle rings.
   1. **Exception:** All low-voltage fire alarm wiring shall be installed in conduit regardless of location. Refer to Section 27 15 01.19.
   2. **Exception:** All low-voltage area of refuge wiring shall be installed in conduit regardless of location. Refer to Section 27 51 29.

3.2 INSTALLATION

A. Grounding: Mount grounding bar on standoff insulators, minimum 1/2 in. from backboard.
   1. Telephone ground: Provide a ground wire from the main building electrical service entrance ground to ground bar on the telephone backboard.
   2. Telephone equipment ground: Install 3/4 in. conduit with #6 ground wire from terminal board to the main building electrical service entrance ground.

B. Install an isolated ground quadruplex convenience outlets where shown on the Drawings, supplied by a dedicated 20-amp, 120-volt circuit.

C. On exterior walls where boxes and conduits cannot be concealed, neatly install and paint surface-mounted raceway and fittings. Color shall match structure, ceiling, or wall background.

D. Telephone Conduit System:
   1. Extend conduit to (above accessible lay-in ceiling) (telephone backboard).
   2. Size conduit for cable conductor count.
   3. Run wiring for telephone in cable tray, unless otherwise noted.
   4. Installation shall conform in all respects to the requirements of the Telephone Utility Company that shall govern these Specifications.

E. Telephone/Data Conduit System:
   1. Provide backboards.
   2. Stub out conduits above accessible ceilings.
   3. Provide conduit to cable tray where shown on the Drawings.
   4. Provide conduit sleeves.
   5. Provide 120-volt isolated ground receptacles.
   6. Run wiring for data transmission in cable tray, unless otherwise noted.
   7. Installation shall conform in all respects to the requirements of the Telephone Utility Company that shall govern these Specifications

F. Computer Data Conduit System:
   1. Extend conduit to above accessible lay-in ceiling.
   2. Run wiring for data transmission in cable tray, unless otherwise noted.

G. Broadcast Television Conduit System:
   1. Extend conduit to above accessible lay-in ceiling.
   2. Run wiring for broadcast television in cable tray, unless otherwise noted.

H. Paging Conduit System: Provide conduit to telephone backboard and outlet boxes with blank cover plates.

I. Public Address Conduit System: Provide conduit to cable tray where shown on the Drawings.

J. Radio Conduit System: Provide conduit to cable tray where shown on the Drawings.

K. Radio Antenna Conduit System: Provide 1 in. conduit roof penetrations with weatherheads 24 in. above roof line, with wireways and grounding.

L. Monopole Antenna Conduit System: Provide minimum 1 in. conduit roof penetrations with weatherheads 24 in. above roof line, with wireways and grounding.

M. Video surveillance conduit system:
   1. Provide conduit to cable tray where shown on the Drawings.

2. Provide minimum 1 in. conduit roof penetrations with weatherheads 24 in. above roof line, with wireways and grounding.

END OF SECTION 27 05 28

SECTION 27 05 33 - RACEWAY AND BOXES FOR COMMUNICATIONS SYSTEMS

PART 1 - GENERAL

1.1 This specification section covers common conduit systems, boxes, firestopping and sleeves. Where other methods are specified under separate sections for specific applications, the specific application requirements shall govern.

1.2 Refer to Section 27 05 05 Firestopping and Division 07 for firestopping requirements.

1.3 Refer to Section 27 05 28 Communications Systems Pathways and Support Equipment.

PART 2 - PRODUCTS

2.1 Conduit Type - Application (Use only conduit types listed)

A. Conduit - Rigid or Intermediate Grade Galvanized Threaded.

Application - restrictions - (Not to be used in):

1. Direct buried in corrosive soils.
2. Corrosive atmospheres.

B. Conduit - Thinwall EMT.

Application - restrictions - (Not to be used in):

1. Poured concrete.
2. Exposed to weather.
3. Underground.
4. Exposed in mechanical equipment or other equipment/process rooms below 48 inches.
5. Hazardous or corrosive atmospheres.
6. Not to be used for medium voltage (2001 volts or higher) cable.
7. Not to be used in utility tunnels.

C. Conduit - PVC Type 40 (Schedule 40) rigid, conforming to ANSI, NEMA specifications and each length UL labeled.

Application - use limited to:

1. In or under concrete slabs on grade where permitted by electric legend on the drawings.
2. Exterior use when encased in 3 inch concrete.
3. Direct buried, underground when indicated on drawings.

2.2 Conduit sizes

D. Conduits shall be 1 inch minimum size.

2.3 Conduit Fittings

E. Fittings and workmanship shall ensure electrical continuity. All conduit systems in poured concrete shall be concrete tight.

F. Application of bushings, locknuts and insulated fittings shall comply with NEC requirements.

G. Use conduit fittings as manufactured by Efcor, Steel City, Raco, Midwest, Appleton, ETP / O-Z / Gedney or T&B, equal to the following catalog numbers:

1. Rigid conduit
   - all fittings, couplings and connectors shall be threaded type.
   - grounding bushings, malleable iron; insulated; Steel City BG-801; Midwest Series GLL.
2. EMT
- fittings shall be all steel, set screw or compression type, concrete tight.
- set-screw type couplings; Midwest Series 460; Steel City TK 121; Appleton TW 50S.
- compression type couplings; Midwest series 660S; Steel City TK111; Appleton TWC50CS.
- set-screw type connectors; Midwest Series 450; Steel City TC 121; Appleton TWC 50S.
- compression type connectors; Midwest Series 650; Steel City TC111; Appleton TW50CS.
3. Flexible conduit
   - malleable iron, "squeeze" type, non-insulated; Midwest series 1708; Steel City XC 901; Appleton 7481V. (For lighting fixture whips only - all steel or die cast screw in connector; Midwest 771; Steel City XC 241; Appleton SGC 50DC).
4. Liquid tight conduit
   - steel or malleable iron; Midwest Series LT; Steel City LT 100; Appleton ST.
5. PVC Type 40
   - Couplings and fittings socket type solvent weld, coupling and solvent by same manufacturer as conduit.

2.4 Boxes

A. Junction boxes and pull boxes shall be code gauge galvanized steel with multiple screw fasteners and covers.

B. Outlet boxes all steel construction with galvanized or plated finish or otherwise all metal, by Steel City, Appleton, Crouse Hinds, R&S or Raco.

1. Flush mounted device outlet boxes shall be minimum 4 inches square. Provide extension rings as required. Use Caddy No. H2-3 mounting support plate where metal studs are used.
2. Device rings in finished masonry or tile walls shall be square corner masonry type with no extended ears, to allow flush mounting of plates.
3. Floor boxes shall be UL listed for its application as manufactured by Hubbell, Steel City, Walker, Raco or Wiremold.
4. Surface mounted device boxes shall be cast "FS" type or special surface mounted boxes for use with surface raceway systems.

C. Provide water tight boxes, slip expansions and bonding jumpers where dictated by construction conditions.

D. Terminations at boxes shall be secured by locknuts or approved bushings.

2.5 Surface Metal Raceways

A. Snap on cover types by Mono-Systems, Panduit or Wiremold / Walkermold with prime gray finish (enamel finish coat to match room finishes in remodel areas). Application - permitted only when specifically shown on the drawings.

B. Fittings, boxes and extension rings: Furnish manufacturer’s standard accessories; match finish of raceway.

2.6 Sleeves and Openings

A. Sleeves and formed openings shall be placed in walls, partitions, floor slabs and poured concrete roof decks for the passage of conduit, cable, wireway, cable tray and bus duct. Sleeves and formed openings are not required:

1. In floor slabs on grade.
2. Where conduit is installed before the wall, partition or slab is constructed.
3. Openings are cut for conduit passage and patched with equal or comparable material to close the space around the conduit.
4. In stud and gypsum board or plaster walls and partitions which are not fire rated.
5. For conduit passing thru masonry walls and partitions and stud and gypsum board or plaster walls and partitions. Sleeves are required however, for which expansion, contraction and other movement can be expected.
6. In core drilled openings in solid concrete not requiring water protection. Sleeves are required, however, at core drilling thru hollow pre-cast slabs and concrete block walls, to facilitate containment of required firestopping material.
7. In large floor openings for multiple pipe and duct risers which are within a fire rated shaft, unless the opening is to be closed off with concrete or other material after conduits are set.

B. Sleeves for passage of conduit and cables shall be schedule 40 black steel pipe or galvanized rigid conduit. Rectangular sleeves for cables, wireway, cable tray and bus duct shall be 18 gauge galvanized steel in poured concrete floors, walls and roof decks; 26 gauge galvanized sheet steel in other than poured concrete.

C. Sleeves shall be sized to afford 0.25 inches to 0.75 inches clearance space.

D. Sleeves shall be provided where penetrations through non-rated partitions are required and shall be minimum 2 inches. Penetrations through rated partitions shall be as outlined specification 27 05 05.

2.7 Escutcheon plates shall be split-ring chromium plated pressed steel. Plates shall be sized to cover the surface penetration and sleeve. Plates shall be installed on exposed piping in finished rooms and areas where conduits penetrate walls, floors, ceilings or overhead structure.

2.8 Anchors and Fasteners

A. Anchors and fasteners shall be of a type designed and intended for use in the base material to which the material support is to be attached and shall be capable of supporting the intended load and withstanding any associated stresses and vibrations.

B. In general, screws shall be used in wood, masonry anchors on concrete or brick, toggle bolts in hollow walls, and machine screws, bolts or welded studs on steel.

C. Nails shall not be used except for temporary support or for light loads in wood frame construction.

D. In outdoor locations or other corrosive atmospheres, the anchors and fasteners shall be non-corrosive or have suitable corrosion resisting coatings.

PART 3 - EXECUTION

3.1 Conduit shall be run concealed in all finished areas of new construction and elsewhere unless specifically indicated or upon specific permission by the Architect. All conduit shall parallel building lines.

3.2 Conduit shall be run overhead and shall not be run below concrete slabs unless specifically indicated on the drawings and in the legend on the drawings.

3.3 Where feeders are permitted to be run below floor slab on grade, they shall be installed in non-metallic conduit encased in 3 inches concrete using galvanized rigid steel elbows or fiberglass, (equal to Champion Fiberglass), elbows with all necessary fittings and couplers. (NOTE: Where not required to be run overhead, branch circuits may be installed in 1 inch or smaller Schedule 40 PVC conduit below the vapor barrier, shall have a minimum of 6-inch fill over the conduit below the vapor barrier without concrete encasing the PVC.

This PVC conduit shall not stub up more than 18 inches above the finished floor and shall be concealed in walls./ The 90 degree elbow and stub up shall be galvanized rigid steel).

3.4 All conduits installed below concrete slab on grade shall have a minimum of 6-inches fill over the conduits in order to prevent accidental damage to conduits should the floor be saw-cut in the future.

3.5 Conduits shall not be installed above the vapor barrier in concrete floors poured on grade.

3.6 Conduit crossing building expansion joints shall have expansion provisions with grounding continuity; use special expansion fittings or other NEC approved method. Refer to the Architectural and Structural floor plans and details for locations of expansion joints.

3.7 Do not install wall-mounted boxes back-to-back in opposite sides of wall. In stud walls, boxes shall be on opposite sides of studs. In acoustic rated walls, boxes shall be separated a minimum of 24 inches.

3.8 Boxes not otherwise accessible in ceilings and walls shall be made accessible by installation of hinged door access panels. Refer to Section 27 05 04 – Basic Communications Materials and Methods.

3.9 Use cast floor boxes for installation in slab on grade; formed steel boxes are acceptable for other installation.

3.10 Work shall be so planned as to:

A. Minimize the number of offsets and junction boxes. For feeder conduits, use all long radius conduit bends or accessibly located large junction boxes with screw covers.

B. Generally run conduit and conductors as high as practicable against underside of floor slab in concrete construction or immediately below the top chord of bar joist construction unless otherwise shown. This high level zone shall be used for running electrical raceways. Running conduits promiscuously at various levels and directions will not be acceptable. Runs at bottom chord level or ceiling grid level will not be acceptable.

C. Where spray on fireproofing is used, coordinate with the General Contractor about installing supports, panel feeders and larger conduits before fireproofing is applied. Branch circuit conduits and smaller size conduits may be run as high as possible on stud walls that go all the way up to the structure; this will minimize damage to spray on fireproofing. Patch and repair damaged spray on fireproofing caused by electrical installation; conduits shall not be fully covered with fireproofing.

D. Coordinate activity in advance to avoid interference with other trades.

E. Provide access to all junction and pull boxes.

F. Maintain 6 inches from conduit to paralleled hot water piping and 4 inches from cross piping and 12 inches from generator exhaust piping.

3.11 Secure feeder conduit to basic structural elements with galvanized strap hangers and clamps; use of trapeze type hangers is encouraged for multiple conduits where space will permit. Galvanized metal clamps and screws may be used for attaching and supporting branch circuit conduit. Non-metallic fasteners shall not be used except plastic inserts may be used in concrete for small conduits. Vertical conduits shall be supported at each floor by clamps.

3.12 Surface mounted horizontal and vertical conduit supports on walls up to a height of 7 feet-0 inches above the floor shall be one or two hole sheet metal pipe straps. Pinch type hangers similar to Minerallac type may only be used at heights greater than 8 feet-0 inches. The use of pinch type hangers similar to Minerallac type

are expressly prohibited on ductwork, air handling units and other mechanical equipment below 8 feet-0 inches.

3.13 During construction temporarily cap open ends of conduit. Caution trades to take special care of runs in concrete slabs during pouring.

3.14 Empty conduit installed for communications use or for future systems shall have an insulated pull wire or heavy nylon cord inserted for use in pulling wires.

3.15 Pull mandrel or large swab thru conduit to ensure freedom from debris before pulling wires. Use pulling lubricants sparingly.

3.16 Sleeves for passage of conduit, cables, wireway, cable tray and bus duct shall be placed in the initial stages of construction before concrete, masonry and other general construction activity. Means shall be taken to ensure that the sleeve will not move during or after construction. Beams, columns and other structural members shall not be sleeved except upon approval of the Architect.

3.17 Length of wall sleeves shall be such that the sleeve ends are substantially flush with both sides of the wall or partition. Floor sleeves shall be flush with the bottom and top of the floor slab except, in mechanical rooms and other areas which might have water on the floor, sleeves shall project a minimum of 1 inch above finished floor. Refer to the following paragraph for qualifications and exceptions relating to firestopping.

3.18 Refer to 27 05 05 Firestopping. Sleeves which are a part of firestopping assemblies shall conform to the requirements of the assembly with particular emphasis regarding size, annular space, length, passage or non-passage of insulation and the installation of the sleeves.

3.19 Where firestopping is not required, the annular space between the sleeve, core drilling or opening and the conduit, cable, cable tray, bus duct and raceway shall be closed with caulking to retard the passage of smoke.

3.20 Where permitted by OBC Section 712 Penetrations, metallic conduits requiring no pipe sleeves in passing thru concrete floors or concrete or masonry walls and partitions, the annular space shall be closed full depth of the penetration with materials and methods compatible with the floor, wall or partition material (concrete, grout or mortar).

3.21 Openings for multiple conduits extending through floors where water protection is required (mechanical rooms, kitchens, other potentially wet areas) may be protected with a 4 inch high by 4 inch wide concrete curb with chamfered corners in lieu of individual sleeves. These concrete curbs may be used in lieu of the Josam 26420 riser sleeve and clamping ring provided the floor membrane and curbing are arranged to maintain the integrity of the membrane.

3.22 Conduits, wire and cables entering from outside the building shall be sealed water and moisture tight. Seal between conduit and sleeves, conduits and core drilled holes and around conductors inside conduits.

3.23 Powder actuated fasteners of any type are prohibited in occupied buildings. This includes anchors which are driven into place by any device which produces an impact force by use of a powder charge, compressed air, gas or any other propellant.

3.24 All conduit terminations to be equipped with locknuts and bushings. Conduits 1-1/2 inches and larger shall have insulating bushings, grounding lug and shall have locknuts inside and outside the enclosure.

3.25 Outlet Box Installation

A. Set box square and true with finished building surfaces and trim.

B. Secure boxes firmly to building structure.

C. Verify location of outlets in finished rooms with Architectural Drawings of interior details and finish. In centering outlets and locating boxes, allow for overhead pipes, ducts and mechanical equipment, variations in fireproofing and plastering, window and like, and correct any inaccuracy from failure to do so without expense to the Owner.

D. Maintain symmetry of all outlets as closely as possible within Architectural Elevation contained. For example, the Contractor shall center light fixture over doorway or receptacle in section of masonry wall, if shown in that approximate position. If receptacle is shown in same location as counter or bench, determine countertop height and set receptacle to clear top and trim of counter and render outlet easily accessible.

E. In the event of conflict between locations of electrical outlets as shown on the Electrical Drawings and on the Architectural Drawings, outlets shall be installed in accordance with the latter.

F. The Owner reserves the right to relocate any device as much as 10 feet-0 inches (measured horizontally) from its indicated location at no additional cost, provided the contractor is notified prior to roughing that device in.

3.26 Contractor shall record carefully on a set of "as built" prints the exact location of all feeder conduits.

END OF SECTION

SECTION 27 05 53 - IDENTIFICATION FOR COMMUNICATIONS SYSTEMS

PART 1 - GENERAL

1.1 Refer to Section 26 05 53 Identification for Electrical Systems which are hereby made part of Division 27 - Communications.

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SECTION 27 15 13 - COMMUNICATIONS COPPER HORIZONTAL CABLING

PART 1 - GENERAL

1.1 Scope of Work

A. The intent of this specification section is to cover the materials and installation of a structured cabling system and termination equipment as outlined herein and as detailed on the drawings. Work shall consist of

1. Work area outlets including faceplates, jacks (voice, data, CATV, A/V), and labels. Boxes and conduit are being provided by Division 26 contractor.
2. Voice and data copper station cabling from work area outlets to telecommunications rooms including termination testing and labeling.
3. Voice and data work area equipment cords.
4. Voice and data horizontal cross-connect jumpers and patch cables including labeling.

1.2 System Description

A. Voice and Data station cabling (copper) system shall consist of:

1. Workstation outlet jacks.
2. Voice and data station cabling as specified herein from each workstation outlet to the termination equipment located in the Local Telecom Closet (TR-0X) or the Main Telecom Room (ER).
3. Station Cable Termination Equipment in each TR.
4. Final connections of the station cabling at the workstation outlet jack and the termination equipment in each TR.
5. Cross connects / patch cable to connect work area outlets to backbone / network electronics.
6. Testing and labeling.

1.3 Quality Assurance

A. All work shall be installed in compliance with the latest edition of the Commercial Building Telecommunications Wiring Standard EIA/TIA, ANSI, ICEA, BICSI Standards, applicable National Electric Code Sections, Ohio Building Codes.

1.4 Contractor Qualifications

A. Work shall be performed by a BICSI certified Telecommunications Contractor that is properly certified in the cabling system being installed. Contractor’s requesting pre-approval from the Engineer to perform the work as specified in this section shall meet the following requirements:

B. The Contractor must have an on-staff, full time RCDD. The personnel assigned to project manager for this project must be a current RCDD in good standing.

C. The personnel assigned to project foreman at the project site must be a minimum BICSI Level II certified installer.

D. The Contractor must have at least one BICSI Level I certified installer in the daily work crew.

E. The Contractor must hold a current certification from the manufacturer of the proposed cabling system solution. This certification must be valid for both installation and testing and shall enable the Contractor to offer the full manufacturer’s product and applications warranties as specified herein.

F. Requests for consideration shall be sent to the Construction Manager/Architect/Engineer (by mail or fax) and shall include the following:

1. Copy of the BICSI RCDD certificate for the Contractor's on-staff, full time project manager.
2. Copy of the BICSI Level I, II and III certificate(s) for the Contractor's on-staff, full time installation personnel. Prior to commencement of work, the Contractor shall submit the resume of personnel assigned to the project. Any approval given during bidding shall be based upon the information submitted. Change in approved personnel prior to completion of the project shall be brought to the attention of the Engineer for review.
3. Copy of the Voice/Data System Manufacturers Approval Certificate indicating that the Contractor is a certified installer of the proposed voice and data Cabling System Solution.
4. It will not be the responsibility of the Engineer to recognize or respond to incomplete or incorrect requests.

G. It shall not be acceptable for any portion of the work specified herein to be performed by a sub-contractor unless such sub-contractor has been pre-approved by the Engineer in writing. Refer to following requirements:

1. The Engineer will respond in writing to applicants who meet the requirements of this specification or to the project's construction manager. This response will serve as formal notice that the Contractor is approved for the listed project.
2. Contractors who have not received approval from the Engineer prior to issue of formal contracts will not be approved to perform the work outlined in this specification section regardless of their qualifications.

1.5 Shop Drawings

A. A complete list of materials with model and part numbers and references to the Part 2 specification paragraph numbers.

B. Manufacturers Data Sheets of all products and cabling, specific to the project. Data sheets shall show the exact parts, with model numbers and options as required and clearly identified.

C. Qualifications

1. Copy of current BICSI and manufacturers certifications. Certifications that are past the expire date will not be accepted.
2. A statement of contractor's qualifications to verify compliance with other provisions within the specifications, unless the contractor has been pre-approved.

1.6 Relevant Standards

A. The Structured Cabling Installation shall comply with the following at a minimum:

1. All local, state and national codes
2. The National Electric Code (NEC)
3. The National Electrical Safety Code (NESC)
4. Electronic Industries Alliance (EIA)/ Telecommunications Industry Association (TIA) 526, 568, 569, 598, 606, J-STD-607, 758 and all applicable and current Technical Service Bulletins (TSB).

1.7 Related Sections

A. The following specification sections shall be deemed to be included in part or in whole and require close coordination to ensure total system interoperability and compatibility:

B. 27 11 00 – Communications Equipment Room Fittings

C. 27 13 13 – Communications Copper Backbone Cabling

D. 27 13 23 – Communications Optical Fiber Backbone Cabling

PART 2 - PRODUCTS

2.1 Structured Cabling System

A. The entire voice/data horizontal station cabling solution shall be a listed EIA/TIA cabling system solution from a single Manufacturer/Source as required by the Manufacturer/Source. Provide a listed Cabling System Solution utilizing cable/components from the following list of acceptable manufacturers:

1. Cable –Systimax, Belden (CDT), Berk-Tek, Commscope, General BICC, Mohawk,.
2. Components –Systimax, Belden (CDT), Hubbell, Leviton, Ortronics, Panduit, Siemon, Wiremold.

B. Horizontal cabling systems shall be permanent link configuration for data for data.

C. Horizontal (station) cable shall be plenum rated.

D. Voice/Data station cabling shall be terminated utilizing EIA/TIA 568A/B standards, as indicated by Owner.

E. Voice station cabling shall be terminated utilizing USOC-61 standards.

F. Cables installed in underground conduits shall be indoor/outdoor rated.

1. Where wet label cables are required to feed floor boxes, the contractor shall transition cable back to plenum rated cable by providing “consolidation point” above ceiling consisting of Category rated 110 block and plenum enclosure and make transition from wet label cable to indoor plenum rated cable.
2. Where indoor/outdoor rated CM cables are run through plenum spaces, the contractor shall provide rigid metallic conduit and sealed junction boxes to completely enclose the cable route through the plenum space.
3. Refer to drawings for locations with floor box outlets. Transition shall not affect system warranty.

2.2 Data/Voice Station Cable

G. Category 6, 4 twisted pair, non-shielded (UTP) station cable (capable of transmissions speeds in excess of 1.2 Gb/s and supporting IEEE 802.3ab Gigabit Ethernet) shall be used for serving data outlets. Cable shall be sequentially marked at 2 foot intervals. Color as selected by Owner.

H. Category 6a, 4 twisted pair, non-shielded (FUTP)/shielded (STP) cable, rated for minimum 500 Mhz, support for 10Gig Ethernet at 100 m. Cable shall be sequentially marked at 2 foot intervals. Color as selected by Owner.

I. Each cable shall be a dedicated home run from the workstation outlet jack to the data termination equipment in the local TR. Terminate cable at the workstation and at the TR termination equipment as specified herein and as indicated on the drawings.

J. Cable shall be labeled at both ends to indicate patch panel and port served. Coordinate labeling scheme with Owner and submit to Engineer for review.

2.3 Workstation Outlets

A. Data/Voice Jacks

1. Served from Category 5e/6 cable shall be Cat. 5e/6 rated, 8 position, 8 wire flush mounted modular jack (RJ-45). Equipment to be of manufacturer and series as required by Specified Link/Channel Solution Warranty. Color as selected by Owner. Modular mounting straps under duplex outlet faceplates shall not be acceptable.

2. Modular Plug Terminated Link (MPTL) – TIA 568.D-2 may be utilized to serve the following PoE powered end devices in lieu of surface outlets at the device location:

   a. IP Cameras

   b. Wireless Access Points (WAPs)

B. Outlet Components

1. Faceplates shall be modular 6 port and shall accept the approved voice/ data and video jacks including voice/data (RJ-11, RJ-45), Video (type F, type RCA, type BNC and S-Video), Audio (type RCA) and fiber (type ST, SC, LC and MT-RJ). Faceplates and jacks shall be by a single manufacturer. Equipment to be of manufacturer and series as required by Specified Link/Channel Solution Warranty. Color as selected by Owner. Modular mounting straps under standard outlet faceplates shall not be acceptable.
   a. It shall not be acceptable to utilize standard outlet style-line faceplates with modular mounting straps for the jacks. All jacks must mount directly to modular ports within the faceplate.
   b. Where standard faceplates are not available from the manufacturer for the full line of jacks designed at a particular location, the contractor shall be responsible for providing a custom punched and engraved faceplate to meet the application.
2. Outlets designated to serve wall phones shall be of a type that is designed to support a wall mounted telephone. Equipment to be of manufacturer and series as required by Specified Link/Channel Solution Warranty. Color as selected by Owner.
3. Outlets to be installed in floor boxes/pole-thru to be installed in faceplates, compatible with floor box/poke-thru make/model and secured within floor box/poke-thru. The use of loose or un-mounted jacks shall not be acceptable. Where floor box/poke-thru is provided by others, coordinate during construction with floor box/poke-thru to determine specific requirements for jacks and coverplate.
4. Each and every voice/data jack shall be labeled to corresponding patch panel and port. Each and every audio/video and CATV jack shall be labeled to indicate function (audio “L” and “R”, video, CATV, etc.). Coordinate labeling scheme with Owner. Labels shall be computer generated on an adhesive media and attached to the workstation outlet. Labels applied with pens or markers will not be acceptable.
5. Provide blank inserts for all unused ports.
6. Refer to drawings for arrangement of various workstation outlets including jack types and quantities within each outlet type. All voice/data/video/audio and fiber jacks indicated in the faceplate shall be deemed included in this specification unless specifically noted otherwise.
7. Outlet faceplates shall be stainless steel. Where manufacturer does not provide a full compliment of voice/data and AV modules as required by design configurations, the contractor shall be responsible for utilizing a custom punch plate including all associated costs.

8. Outlet faceplates shall be same material/finish as faceplates of adjacent electrical outlets unless specifically indicated or otherwise required for custom applications.

2.4 TR/MER Data/Voice Termination Equipment

A. Twisted pair modular patch panels, rack rail mounted, Cat. 5e/6 rated, 110 termination, RJ-45, multi-port (24 or 48). Equipment to be of manufacturer and series as required by Specified Link/Channel Solution Warranty. Provide quantity of patch panels as required by quantity of data station cable. Mount panels in data racks in each TR. Each panel shall be fully loaded. Provide labeling for each connected port as coordinated with Owner.

B. Twisted pair modular patch panels, rack rail mounted, Cat. 6a rated, 110 termination, RJ-45, multi-port (24 or 48) with rear cable management lacing bars for additional cable management and support.. Equipment to be of manufacturer and series as required by Specified Link/Channel Solution Warranty. Provide quantity of patch panels as required by quantity of data station cable. Mount panels in equipment racks/cabinets and ZO/CP boxes below floor as indicated on drawings. Each panel shall be fully loaded. Provide labeling for each connected port as coordinated with Owner.

C. Provide quantity of copper patch panels to accommodate complete termination of all installed copper station cables plus an additional 20 percent spare capacity.

2.5 Station Cable Termination Assignments

A. Refer to the drawings for assignment of room station cabling to the respective TR termination equipment.

2.6 Patch Cables

A. This contract shall be responsible for providing all required patch cables to make a complete and fully functioning network. The following patch cables requirements are considered part of these specifications:

1. Data Station (copper) at Workstation – Provide a nominal 12 feet patch cable with every workstation jack to match the EIA/TIA channel configuration of the cabling system. Coordinate the patch cable length and color with the Owner by establishing specific color types and various cable lengths throughout the installation. The Owner may requests various lengths at various outlets depending upon the field conditions and the locations of the equipment which utilizes any given jack.
2. Data Station (copper) at TR – Provide a nominal 7 foot patch cable with every patch panel port to match the EIA/TIA channel configuration of the cabling system. Coordinate the patch cable length and color with the Owner by establishing specific color types and various cable lengths throughout the installation. The Owner may requests various lengths at various patch panel ports depending upon the field conditions and the locations of the equipment which utilizes any given port.
3. Voice Station at Workstation – None required. Telephone handsets cables are specified under section 27 31 13.
4. Voice Station at TR – Provide a nominal 7 foot patch cable with every patch panel port to match the EIA/TIA channel configuration of the cabling system. Coordinate the patch cable length and color with the Owner by establishing specific color types and various cable lengths throughout the installation. The Owner may requests various lengths at various patch panel ports depending upon the field conditions and the locations of the equipment which utilizes any given port.

PART 3 - EXECUTION

3.1 General Installation

A. Backboard mounted wiring connecting blocks shall be mounted such that the top of block is no more than 72 inches from the floor and the bottom of lowest block is no lower than 30 inches from the floor.

B. Cross connects / patch cables from voice backbone cable to voice station cables shall be furnished / provided by this Contractor, installed by 27 21 00 Contractor. Patch cables from data backbone and data station cable patch panels to network electronic equipment shall be furnished / provided by this Contractor, installed by Division 27 21 00 Contractor.

C. Refer to drawings for quantity and arrangement of voice/data/technology outlets including jacks and cabling.

D. Make all telephone and data terminations at TR termination equipment and at each workstation outlet jack utilizing a tool appropriate for the equipment as recommended by the equipment manufacturer.

E. Coordinate color requirements for all jacks, station cables, patch panels, patch cables, etc. with Owner / Engineer. Color coding shall be consistent for all like equipment.

F. Delivery of all loose equipment which is to be turned over to Owner shall be carefully coordinated and scheduled with Owner prior to shipment.

3.2 Wiring Installation

A. Voice and data station cable shall not exceed the EIA/TIA maximum lengths for the specified Category rating. The contractor shall be responsible for verifying adequate cable pathways to limit cable lengths prior to installation. Where existing or designed pathways do not allow for compliance to distance limitations for voice and data cabling, the contractor shall provide alternate pathway routes to the Engineer for review.

B. Interior - All voice/data/CATV station cables shall be run in conduit surface raceway from outlet to above accessible ceiling/ in conduit from outlet to nearest section of corridor cable tray/ extended from suspended cable management system out to nearest section of corridor cable tray/in conduit from outlet to local TR or ER extended via corridor cable tray and/or cable management system to local TR or ER as indicated on drawings and specifications. All cabling shall be run parallel or perpendicular to building lines. The contractor will be responsible for all cable management required to support cables per standards between installed fixed raceways (conduit, cable tray, wireways, etc.).

C. The drawings do not indicate specific routes for telecommunications cables. The Contractor is responsible for developing all cabling routes utilizing existing cable management pathways and systems or providing supplemental cable management pathways and systems so that all structured cabling adhere to specific codes and standards specifically developed for the installation of such cables. Where the use of existing cable management systems and pathways would cause the structured cable system to violate specific codes and standards regarding cable lengths, environments, proximity to EMI and RF noise sources, etc, the Contractor shall be responsible for developing alternative pathways and shall include all labor and material for doing so within the scope of this work.

D. In areas where there is not an installed raceway system (conduits or cable tray) and a cable support system is required, this contract shall be responsible for providing a Cable Management System. Cable management system shall provide support no more than 5 feet on center. Where cables are installed open wired through the use of cable management systems, they shall be installed such that there is a minimum sag of 4 inches for every 4 foot of horizontal run. Cable pathways shall provide the following minimum clearances (parallel or perpendicular):

1. Motors and transformers – 48 inches
2. Conduit and cable used for electrical power distribution – 12 inches
3. Fluorescent lighting – 5 inches
4. Power lines up to 2kVA – 5 inches
5. Power lines over 5kVA – 24 inches

6. Hot water/steam lines - Bare –18 inches, Insulated – 6 inches

E. Cable management system shall be secured to building structure utilizing manufactured approved methods and hardware.

F. Cable management system support components shall be designed with wide support surfaces that do not cause cables to be bent, crushed or otherwise deformed when installed within component loading parameters. Cable management system shall meet UL standards and be UL labeled. Utilizing elements of the building's structure such as beams, joists, etc. to hang cable from will not be acceptable.

G. Each voice and data jack shall be wired with a dedicated home run. Each voice and data jack shall be identified. The jacks shall be labeled on the faceplate. Station cables shall be labeled at TR termination point with corresponding workstation outlet jack number.

H. Voice and data cables shall be handled and installed with extreme care. Twisted pairs shall be untwisted less than .5 inch at terminations for Cat, 5e, Cat. 6. Tie wraps shall loosely hold cables; do not overtighten. Cables shall have sweeping bends and shall have a maximum bending radius at any point in the installation of not less than 4 times the outer diameter of the cable. The cable manufacturer's recommended bending radius and maximum pulling tensions shall be strictly adhered and shall not be exceeded. Failure to comply will result in the removal and replacement of affected cable at no additional cost to the Owner.

I. Voice and data horizontal station cable shall not exceed the EIA/TIA guidelines for LINK distances. The permanent LINK shall be as defined in the EIA/TIA standards as the distance from the workstation outlet jack to the TR termination equipment patch panel/cross-connect port.

J. Provide adequate cable slack at each workstation outlet and the IDF/MDF termination equipment as follows:

1. Workstation outlet
   a. 12 inches of copper cable slack.

K. Where cables are installed in conduit, the conduit system shall conform to the following:

1. No section of conduit shall be longer than 100 feet between pulling points.
2. No more than two 90 deg. Bends in a section of conduit between pulling points.
3. Each section of conduit shall be labeled for length, destination closet and origination closet.
4. Refer to EIA/TIA 569-A for specific conduit and pull box requirements.

L. At voice termination equipment at TR racks/backboards, voice backbone and station cables shall be terminated following the standard telephone color code unless otherwise indicated.

M. All cabling installed in underground conduit installations shall be outdoor rated cables, acceptable for use by the manufacturer in underground applications.

N. Lubricant – Utilize only lubricant specifically rated for the cable being installed.

3.3 Telecommunications Rooms

A. The lay-out of the telecommunications rooms as depicted on the drawings shall be utilized as a general guide for bidding purposes. The final room layout shall be carefully coordinated with input from the Owner and from other trades with equipment and/or cabinets to be placed in the room. Final configuration of telecom rooms shall be submitted to Engineer as a coordination drawing with

information from all other trades occupying the same room for review prior to permanent mounting of equipment or termination of cabling.

B. Coordinate lay-out of telecom rooms to avoid placing telecommunications equipment and cabinets under water piping (other than sprinkler heads) or HVAC units.

C. Coordinate lay-out of telecom rooms with electrical plans and locations of electrical outlets.

D. Lay-out of telecommunications equipment cabinets and racks shall provide a minimum of 36 inch isle in front and behind equipment racks and cabinets which is clear of obstructions or equipment protrusions.

E. Within the various telecom rooms, coordinate rack locations and orientation to maintain required clearances including any equipment depths that may have to be accounted for. Some equipment, such as servers and UPS units may have special mounting requirements that need additional coordination.

3.4 Grounding – Not Applicable

3.5 Programming – Not Applicable

3.6 Identification/Labeling

A. The Contractor shall be responsible for labeling all supplied communications equipment, cable, etc. in accordance with the guidelines as described herein. The end of each cable, each jack, patch panel, cross-connect and rack/backboard shall be identified and permanently recorded on 8.50 X 11 sheets attached to each rack/backboard.

B. No labeling for any system which relies on room names/numbers as part of the equipment/cable labels shall be applied until the final building signage package with approved room names/numbers has been reviewed and incorporated. Labeling done based upon bid document room names/numbers prior to approved building signage package will not be accepted and may require the contractor to revise labeling at their expense.

C. Each cable, jack cross-connect and patch panel shall be labeled at every location where they are administered per TIA/EIA-606.

D. Both ends of data and telephone system cabling shall be tagged and identified utilizing a permanent cable marking system or other system as approved by the Owner / Engineer. DYMO style labels, cloth or plastic “numbers” or hand written labels WILL NOT BE ACCEPTED.

E. Utilize a three (3) syllable labeling scheme as follows:

1. Sample label for station cable / jack “S3-D3-05” (read as: Station cable, fed from IDF 3 - terminated in the data rack on the third patch panel - jack number five).
2. First syllable shall consist of a letter and a numeral. The letter shall be “S” indicating “station cable”. The numeral shall indicate the wiring closet “IDF”, the jack and cable feed from (IDF 2 would be “2”, IDF 7 would be “7”, etc.).
3. The second syllable shall consist of a letter and a numeral. The letter shall indicate the type of rack/frame the cable is fed from (“D” - Data, “T” - Telephone). The numeral shall indicate which patch panel in the rack (for data) or BIX cross-connect (for telephone) the cable is connected to.
4. The third syllable shall consist of a numeral (starting at 01) to indicate which jack in the patch panel (for data) or which wiring pair group in the cross-connect (for telephone) the cable is connected to.

F. Patch panels to have panel # / port # / room number for each terminated cable.

G. This contractor shall be responsible for creating/maintaining the numbering scheme as directed by the Owner.

H. Create a detailed records sheet for the station cabling including floor plans showing outlet locations and which jacks are in which outlet. Records shall indicate connection rack/backboard, patch panel / cross-connect and jack / port, at both ends, for each cable. Provide with O&M Manual

I. All labeling and recording shall be approved by the Owner and the Engineer prior to application.

3.7 Testing General

A. The Contractor shall be responsible for testing all installed structured cables including:

1. Voice and data station

B. No testing shall be executed until the entire system has had the Owner approved labeling scheme applied and accepted. All final test reports shall utilize the field installed labels at each outlet for the test of the corresponding outlet. Test reports which contain temporary generic or incorrect labels will not be accepted.

C. The Contractor shall be responsible for testing 10 percent of all installed data station cables, 10 percent of all installed voice station cables, where required to test a percentage of each cable type, the contractor shall choose the cables to test in such a manner as to provide a good cross sectional representation of the entire installed cabling plant. In such a manner, the Contractor shall avoid choosing all of the test cables from a single location or termination room.

D. No testing shall be executed until the entire system has had the Owner approved labeling scheme applied and accepted.

E. Tests shall be witnessed by Architect / Engineer / Owner and shall be monitored by a recorder.

F. System testing shall be performed with final test results turned over to the Owner prior to acceptance of the system. Missing or incomplete test results will not be reviewed and the system will not be commissioned by the Owner / Architect / Engineer.

G. Instruments and labor required for tests shall be furnished by the Contractor. All system test equipment shall be approved by the Owner/ Architect / Engineer prior to application.

H. The Owner / Architect / Engineer reserve the right to spot test 5 percent of the installed cabling plant to verify documented test results. Where the Owner / Architect / Engineer have determined that the installed cable plant does not agree with the documented test results, the contractor shall be responsible for re-testing the installed voice/data/fiber cabling plant and revising/updating all test documentation as required.

I. Instruments required for tests shall be furnished by the Contractor.

3.8 Testing Voice/Data Station

A. Each user voice and data station cable system shall be electronically verified. The voice / data system shall be tested in the permanent LINK (from the workstation outlet jack to the termination equipment patch panel port/cross-connect port) configuration. Each voice and data permanent LINK shall meet or

exceed the EIA / TIA Solution Manufacturer's specified parameters of components within each permanent LINK. The respondent's test plan will specify the procedures for the following tests:

1. Wire Map - A continuity test to determine correct 568A/B eight position pin-out. The test inherently verifies correct circuit identification.
2. Length - Each cable pair is TDR scanned to determine each pair's individual length. The test results are recorded in feet. The EIA/TIA specification limit of 90 meters is used to qualify the overall length of each circuit.
3. Attenuation - This test measures the loss or attenuation that each pair exhibits to determine whether or not high speed data packets will be discernible at their destination.
4. Induced Noise - The noise test measures the presence of external signals at three critical frequency ranges. The test results of each pair are recorded. The three ranges to be tested are as follows:
   a. Low Band (10Hz-150 Khz)
   b. Mid Band (150 Khz-16 Mhz)
   c. High Band (16 Mhz-100 Mhz)
5. Resistance - a) Loop resistance, pair balance, pair-to-pair unbalance
6. Near End Crosstalk (NEXT) - The NEXT of each pair is measured as impacted by every other possible pair combination. The test sweeps the specification bandwidth to determine the worst case NEXT frequency for a particular pair. Both the NEXT value and occurring frequency are documented for each possible pair combination. The order of testing is as follows:
   a. Pair 1 & 2 to Pair 3 & 6
   b. Pair 1 & 2 to Pair 4 & 5
   c. Pair 1 & 2 to Pair 7 & 8
   d. Pair 3 & 6 to Pair 4 & 5
   e. Pair 3 & 6 to Pair 7 & 8
   f. Pair 4 & 5 to Pair 7 & 8
7. Test for Return Loss, Delay, Delay Skew, NEXT, PSNEXT, ELFEXT, PSELFEXT, ACR and PSACR shall be as required by the latest edition of EIA / TIA Level III tests and the latest edition of the Manufacturer's/Source's Channel Solution Program to verify adherence to these specifications of the cabling system.
8. All tests shall pass without any "marginals".

B. The contractor shall provide independent 3rd party testing of 10 percent of all installed voice and data outlets. This independent testing shall be assembled in a separate binder and submitted along with the test reports in the O&M manual. Significant discrepancies in test results between the independent testing and the Contractor's testing shall be addressed by the Contractor to the Engineer and the Owner's satisfaction.

C. Provide a hard copy of the test results of each and every voice and data channel tested to the Owner. Documentation shall be in the following format:

1. Cable ID
2. Test parameter used
3. Date of test
4. Length
5. Pass / Fail result
6. Provide an electronic copy of the LINK/CHANNEL testing done with a cable analyzer and saved on removable media. Test results saved in a proprietary file type shall be included with software for reading the test results on the Owner's computer system. Test results shall be verified by the Owner as part of the acceptance procedure. Provide with hard copies and a removable media containing the electronic files with the O&M Manuals.

3.9 Coordination With Communications Service Providers – Not Applicable

3.10 Training Requirements – Not Applicable

3.11 System Acceptance Requirements

A. The contractor shall submit printed test results per the testing specification requirements for review by the Engineer/Owner prior to system acceptance. Any cable components that have not passed the full requirements of the system testing shall be replaced and re-tested at the contractor's expense prior to system acceptance.

3.12 As-Built Documentation

A. Refer to Section 27 05 01 for submittal requirements.

B. Copies of all approved shop drawings with the Engineer's stamp.

C. Owner's manuals for every item of equipment when available from the manufacturer. These shall be the technical manuals provided by the manufacturer and shall not consist of generic sales brochures. Technical manuals shall provide complete specifications for the equipment as well as complete operating, maintenance, troubleshooting and product repair/replacement information. Where available only in electronic format, the contractor may provide a CD with electronic versions of Owner's manuals. CDs containing electronic versions of Owner's manuals must contain the proper software viewers for each document type.

1. Termination cabinets, panels and enclosures

D. Technology drawings updated with final as-Built information. This shall be in the form of a complete set of Technology drawings with as-built information indicated in colored pen based upon actual field conditions.

1. AutoCAD architectural floor plans at a scale of 0.125 inches =1 foot-0 inches on 30x42 size sheets showing the location and label of each workstation outlet, IDF closet and MDF closet. Labeling shall match the labeling installed in the field. These drawings shall be as-built conditions.
2. AutoCAD architectural floor plans at a scale of 0.25 inches =1 foot-0 inches on 30x42, 24x36 size sheets showing the telecommunications equipment layout in each IDF closet and the MDF closet. This layout shall include the racks, backboards, cable tray, conduit sleeves, 120V power, etc. Each piece of equipment where labeled in the field shall have the corresponding label on these plans. These drawings shall be as-built conditions.
3. System schematic and block diagrams for every system updated with final as-built information. These drawings shall define the exact arrangement of each system including wiring configuration, device locations and cable types.
4. Rack elevations for all systems with rack mounted equipment. The details shall indicate each piece of telecommunications equipment in each rack including equipment labels such as patch panel, wire management panel, blank panel, space, etc. Each port of each patch panel shall be fully labeled to match the labeling installed in the field.

E. Cable Test Results - Provide bound documents of all cable test results in printed format and in software version on a compact disc. Software version must include any required reader software where file formats are proprietary or non-standard text files. Cable test results shall be organized by media (fiber, copper) and by closet. Information must be included in O&M Manuals.

1. Copper Test Results
   a. Documentation shall be in the following format:
      1) Cable ID
      2) Test parameter used
      3) Date of test
      4) Length

5) Pass / Fail result

F. Create a detailed records sheet for the station cabling including floor plans showing outlet locations and which jacks are in which outlet. Records shall indicate connection rack/backboard, patch panel / cross-connect and jack / port, at both ends, for each cable. Provide with O&M Manual.

G. The entire structured cabling system as specified herein shall be guaranteed against defects in workmanship and materials as described herein. Provide a written statement of this warranty as part of the shop drawing submittal and included in the O&M Manuals.

3.13 Warranty

A. The entire structured cabling system as specified herein shall be guaranteed against defects in workmanship and materials. Period shall commence after system has been commissioned by the Owner, Engineer and Architect. The Installing Contractor shall provide the initial warranty service. The extended warranty shall be provided by the manufacturer. Provide a written statement of this warranty as part of the shop drawing submittal and included in the O&M Manuals.

B. The entire voice / data station cabling system warranty shall be a listed cabling system solution from a single Manufacturer / Source. The system shall carry an industry standard, performance based warranty, by the manufacturer, for a period of at least 20 years on the horizontal cabling; including patch panels, patch cables, terminations and labor. The remaining portions of the system shall be warranted for a period of three (3) years from date of substantial completion.

C. The warranty shall not be affected by the use of power over Ethernet on any or all of the links.

D. The warranty shall not be affected by selected links required to have transition points from OSP to indoor where serving underground conduits to floor boxes. It shall be the Contractors responsibility to provide manufacturer’s approved transition points to maintain system warranty on any affected runs.

3.14 Certification

A. The contractor shall be responsible for filing all required paperwork on behalf of the Owner to acquire the system performance warranty and certification as outlined in the Structured Cabling System Solution.

PART 4 - UNIT PRICES

4.1 Unit Price Schedule

A. The Contractor(s) shall provide a unit price for the following items listed in this document. All unit prices shall reflect the total installed cost including labor, material, termination, testing, and any other incremental costs such as patch panel port:

1. Office Data Outlet with two (2) data ports and one (1) voice port, 200 feet cable length to wiring closet, patch cables on both ends, terminated, tested.
2. Classroom teacher outlet, 200 feet cable length to wiring closet (voice/data/CATV) and 50 cable length AV, patch cables both ends, terminated, tested.

END OF SECTION

SECTION 28 05 00 – COMMON WORK RESULTS FOR ELECTRONIC SAFETY AND SECURITY

PART 1 - GENERAL

1.1 PREFACE

A. The Work shall be performed under the General Contracting (GC) / Single-Prime Contractor project delivery method and the Design-Bid-Build process. References to Work to be performed by different Trades Contractors or Subcontractors are all subject to the Scope of Work by the Prime Contractor. Any conflicts regarding Scope of Work shall be directed to the Prime Contractor for resolution. **THE PRIME CONTRACTOR FOR THIS PROJECT SHALL ALSO BE KNOWN AS THE LEAD CONTRACTOR.**

B. **Terminology:** The terms below will be used throughout Division 28, in accordance with Division 00 and Division 01.
   1. Owner: Mount Gilead Exempted Village Schools.
      a. Contracting Authority: .
      b. Using Agency (Facility): Mount Gilead Preschool.
      c. Owner's Agent: .
   2. Architect/Engineer (A/E): Schorr Architects, Inc. / Roger D. Fields Associates, Inc.
   3. Contractors:
      a. All Trade Contractors listed below, other than the Lead Contractor, are Subcontractors.
      b. General Trades: Refer to Divisions 02 through 14.
      c. Fire Suppression: Refer to Division 21.
      d. Plumbing: Refer to Division 22.
      e. HVAC: Refer to Division 23.
      f. Electrical: Refer to Division 26.
      g. Communications: Refer to Division 27.
      h. Electronic Safety and Security (ES&S): Refer to Division 28.
      i. Site: Refer to Divisions 31 through 35.
   4. Authority Having Jurisdiction (AHJ) mentioned in Division 28:
      a. City of Columbus, Department of Building and Zoning Services.
      b. City of Columbus, Department of Public Safety, Division of Fire, Fire Prevention Bureau.
      c. City of Columbus Public Health Agency.
      d. Franklin County Economic Development and Planning Department.
      e. City of (Franklin County) Fire Department.
      f. Franklin County Board of Health.
      g. (City of) (County) Building Department.
      h. (City of) (County) (Local) Fire Department.
      i. (City of) (County) (Local) Health Department.
      j. State of Ohio Department of Commerce, Division of Industrial Compliance.
      k. State of Ohio Department of Commerce, Division of State Fire Marshal.
      l. State of Ohio Department of Health.
      m. .

C. Scope of Work Summary for the Contractor Performing ES&S Work on this Project:
   1. .

2. [redacted].
3. [redacted].

D. OAKS-CI: The OAKS Capital Improvements (OAKS-CI) website system (http://ofcc.ohio.gov/OAKS-CI), sponsored by the Ohio Facilities Construction Commission, shall be used to manage this project. Project documents, including subcontractor declarations, pay requests, requests for information, shop drawings, Operating and Maintenance Manuals, etc., shall be submitted electronically via OAKS-CI.

E. LEED: This project has been designed and shall be constructed utilizing the Leadership in Energy and Environmental Design (LEED) green building rating system. Refer to Section 26 05 00.35, "Special Procedures for Electrical," for additional information.

F. WELL: This project has been designed and shall be constructed utilizing the WELL Building Standard™ rating system. Refer to Division 01 and Section 26 05 00.35, "Special Procedures for Electrical," for additional information.

1.2 RELATED DOCUMENTS

A. Refer to the additional Divisions below for specific requirements, responsibilities, and methods relating to Division 28 Work. If there is a conflict, comply with the more restrictive requirements.
   1. Division 00, "Procurement and Contracting Requirements": All sections.
      a. The "General Conditions" will provide additional information on the Contractor's Scope of Work responsibilities.
   2. Division 01, "General Requirements": All sections.
   3. Division 26, "Electrical": All sections.

B. Read the entire Specification covering other branches of the Work. Contractor shall be held responsible for the coordination of its work with the work performed by other Trades.

1.3 DESCRIPTION

A. ES&S Work includes the Work described in Division 28, "Electronic Safety and Security," Sections 28 00 00 through 28 99 99 (as included), unless otherwise noted.

B. In the Sections listed above, the term "Contractor" shall mean the Contractor performing ES&S Work on this Project, unless otherwise noted.

C. ES&S Work includes, but is not limited to, the following:
   1. Life safety systems:
      a. Gas detection and alarm.
      b. Refrigerant detection and alarm.
      c. Fire alarm systems.
      d. Electronic personal protection system.
      e. Electronic personal safety detection system.
   2. Specialized systems: Detection monitoring and control system.

D. All applicable provisions and requirements of Division 26, "Electrical," apply to ES&S Work, including, but not limited to, the following:
   1. Shop drawings. Refer to Section 26 05 00.33, "Shop Drawing Submittals for Electrical."
   2. Safety and environmental procedures; LEED requirements; WELL requirements. Refer to Section 26 05 00.35, "Special Procedures for Electrical."
   3. Quality requirements. Refer to Section 26 05 00.40, "Quality Requirements for Electrical."

4. Testing and inspecting services. Refer to Section 26 05 00.45, "Testing and Inspecting Services for Electrical."
5. Temporary facilities and controls. Refer to Section 26 05 00.50, "Temporary Facilities and Controls for Electrical."
6. Product requirements. Refer to Section 26 05 00.60, "Product Requirements for Electrical."
7. Examination and preparation. Refer to Section 26 05 00.71, "Examination and Preparation for Electrical."
8. Execution, including access panels, cutting and patching, and painting. Refer to Section 26 05 00.73, "Execution of Electrical."
9. Cleaning and waste management. Refer to Section 26 05 00.74, "Cleaning and Waste Management for Electrical."
10. Closeout procedures and submittals, including Operation and Maintenance Manuals. Refer to Section 26 05 00.77, "Closeout Submittals for Electrical," and Section 26 05 00.78, "Closeout Procedures for Electrical."
11. Demonstration and training. Refer to Section 26 05 00.79, "Demonstration and Training for Electrical."
12. Selective demolition work. Refer to Section 26 05 05, "Selective Demolition for Electrical."
13. Grounding and bonding. Refer to Section 26 05 26, "Grounding and Bonding for Electrical Systems."
14. Hangers and supports; concrete work. Refer to Section 26 05 29, "Hangers and Supports for Electrical Systems."
15. Raceways. Refer to Section 26 05 33, "Raceway and Boxes for Electrical Systems."
16. Excavation and backfill; underground raceways. Refer to Section 26 05 43, "Underground Ducts and Raceways for Electrical Systems."
17. Sleeves and sleeve seals. Refer to Section 26 05 44, "Sleeves and Sleeve Seals for Electrical Raceways and Cabling."
18. Identification. Refer to Section 26 05 53, "Identification for Electrical Systems."

E. Contractor is responsible for the more restrictive requirement between these general provisions and other requirements contained elsewhere in the Contract Documents.

F. Furnish material, labor, tools, accessories, and equipment to complete and leave ready for operation all ES&S systems of this Project as described in these Specifications and as shown on the Drawings.

G. Use sufficient skilled workers and competent supervisors in the execution of this portion of the Work to ensure proper and adequate installation throughout.

H. Maintain existing facilities in operation whenever possible. Occupied sections of the building will remain in use throughout construction. Coordinate with the A/E and Owner.

I. All ES&S systems shall be provided as complete and operational, and shall not be considered complete unless, and until, at a minimum, all Code and Governing Agency requirements are satisfied.

1.4 COORDINATION MEETINGS AND COORDINATION DRAWINGS

A. Terminology:
1. Coordination Meetings: Coordination Meetings shall be held to identify Coordination Areas and the need for a Coordination Drawing for any Coordination Area. The Lead Contractor shall schedule and conduct the Coordination Meetings.

2. Coordination Areas: Areas of the project that require special attention, i.e., where there are potential conflicts between Trades.
3. Coordination Drawings: Drawings and electronic files prepared by the Coordination Participants to demonstrate how multiple-system and interdisciplinary work shall be coordinated.
4. Coordination Participants: All Contractors shall participate in the process of developing the Coordination drawings, including, at a minimum, the following Trades:
   a. General Trades.
   b. Fire Suppression.
   c. HVAC.
   d. Electrical.
   e. Communications.
   f. Electronic Safety and Security.

B. Refer to Section 23 05 00, "Common Work Results for HVAC," for additional requirements.

1.5 QUALITY ASSURANCE

A. Standards: The following is a list of referenced standards. Not all of these standards necessarily apply to this Project. Refer to individual Specification Sections. If a standard is undated, the referenced edition or most recent version of the standard applies.
   1. Americans with Disabilities Act (ADA) Accessibility Guidelines.
   2. Electronic Industries Association / Telecommunications Industry Association (EIA/TIA) Recommended Standards:
      a. RS-232.
      b. RS-485.
   3. Federal Communications Commission (FCC):
      a. Part 15, Class A.
      b. Part 15, Sub-part C.
      c. Part 15m, Sub-part B, Class B.
      d. Part 90.
   4. International Organization for Standardization (ISO):
      a. ISO 9001, Quality Real-Time Locating System.
      b. ISO 9002.
   5. National Electrical Manufacturers Association (NEMA).
   6. National Fire Protection Association (NFPA):
      a. 2023 NFPA 262, "Standard Method of Test for Flame Travel and Smoke of Wires and Cables for Use in Air-Handling Spaces."
      b. 2022 NFPA 72, "National Fire Alarm and Signaling Code."
      c. 2023 NFPA 70, "National Electrical Code® (NEC)," including Article 760.
   7. Underwriters Laboratories Label (UL):
      a. UL 508, "Standard for Safety for Industrial Control Equipment."
      b. UL 864, "Standard for Safety for Control Units and Accessories for Fire Alarm Systems."
      c. UL 1820, "Standard for Fire Test of Pneumatic Tubing for Flame and Smoke Characteristics."
      d. UL 1887, "Standard for Fire Test of Plastic Sprinkler Pipe for Visible Flame and Smoke Characteristics."

END OF SECTION 28 05 00

SECTION 28 05 00.33 – SHOP DRAWING SUBMITTALS FOR ELECTRONIC SAFETY AND SECURITY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Division 01, "General Requirements."

B. Section 28 05 00, "Common Work Results for Electronic Safety and Security."

1.2 DESCRIPTION

A. Submittal dates:
   1. Within (14) calendar days after Award of Contract, submit complete materials list of all items proposed to be provided on this Project.
   2. Submit shop drawings within (28) days after Award of Contract.

B. Materials and equipment installed under the Electronic Safety and Security (ES&S) Work shall meet all the requirements of the Contract Documents. Do not order or install materials or equipment until submittals are reviewed by the A/E.

C. Submit shop drawings for the installation of the ES&S Work for review by the A/E before any ES&S Work is installed, enlarged, or extended. Under **NO** circumstances shall any ES&S Work be performed prior to receiving shop drawings reviewed by the A/E.

D. The A/E's review is **ONLY** for conformance with the design concept of the Project and with the Contract Documents.

E. Catalog data for equipment reviewed by the A/E shall not take precedence over the requirements of the Contract Documents. Review by the A/E shall not relieve the Contractor from the responsibility for deviations from Drawings or Specifications, nor from the responsibility for providing proper clearance and coordination with other Contractors.

F. Color Selections: The Architect shall approve all color selections for ES&S equipment.

1.3 SHOP DRAWINGS

A. Submit shop drawings for each manufactured item of equipment and all components to be used in the Work. Refer to the Shop Drawing Log attached to this Section and to the Sections listed in Section 28 05 00, Article 1.03, for items.

B. Submit shop drawings electronically in Portable Document Format (PDF). Submit number of copies indicated in Division 01. Contractor shall be responsible for making all copies for distribution and file.

C. Include the following information:
   1. Complete original PDF or first-generation scanned PDF copies of the Manufacturer's catalog sheets, brochures, diagrams, schedules, performance charts, illustrations, and other standard descriptive product data.
   2. Brand name.
   3. Catalog number.
   4. Specific performance data.
   5. Material description.
   6. Characteristics.
   7. Ratings.
   8. Capacities.

9. Dimensional data.
10. Material gauge or thickness.
11. Wiring diagrams and control diagrams.
12. Arrangement of component parts, physical dimensions, clearances, materials, service requirements, colors (where required), controls, and accessories.

D. Clearly mark or highlight each shop drawing copy to identify pertinent materials, products, models, and colors (where appropriate).

E. Coordinate each submittal with requirements of the Work and the Contract Documents.

F. When (2) or more items of the same material or equipment are required, they shall be of the same Manufacturer.

G. Completely review shop drawings, product data, and samples prior to submission.

H. When submitted for review, all shop drawings shall bear the Contractor's stamped and signed certification of the following:
1. Contractor has reviewed, checked, and approved the shop drawings.
2. Contractor has coordinated shop drawings with the requirements of the Project and with the provisions of the Contract Documents.
3. Contractor has ensured that the equipment shown on the shop drawings meets all the requirements of the Contract Documents.
4. Contractor has determined and verified all of the following:
   a. Materials.
   b. Field measurements.
   c. Field construction criteria.
   d. Catalog numbers and similar data.
   e. Conformance with Specifications.
   f. Quantities and sizes.

I. **UNSIGNED COPIES WILL NOT BE REVIEWED.**

J. Notify the A/E, in writing, at the time of submission, of any deviations in the submittals from the requirements of the Contract Documents.

K. Provide the following certifications information:
1. Test Agency results verifying capacities, operating conditions, and power requirements at design conditions.
2. Manufacturer's statement of compliance with Standards discussed in individual Specification Sections.
3. Equipment labels indicating Certification requirements.
4. Quality standard designations on each unit piece, e.g., each device, luminaire, or component.
5. Typed verification that noted testing procedures were complied with.
6. Other Certifications listed in other Sections of the Specifications.

L. Contractor shall make submittals promptly in accordance with the approved schedule, and in such sequence as to cause no delay either in its Work or in the work of any other Contractor.

M. If a submittal is rejected, immediately make any corrections or changes required by the A/E. Resubmit until accepted.

N. If the Contractor orders equipment or materials, or begins installation, fabrication, or work prior to the return of approved submittals, it shall be "at the Contractor's own risk."

O. Incorporate Shop Drawings into the Operating and Maintenance Manuals.

1.4 REQUIRED SUBMITTAL INFORMATION

A. The form attached to this section contains a list of required submittals. This list may not be a complete list of all required submittals. Submit for approval all items to be provided, whether listed or not.

END OF SECTION 28 05 00.33

SHOP DRAWING LOG

Roger D. Fields Associates, Inc.
580 N. 4th Street, Suite 240
Columbus, Ohio 43215-2156
614-451-2248

Project Name: Mount Gilead EVSD – Preschool Expansion & District Office Renovation

Project Number: RDFA #25096 / SAI #2604

SUBMITTAL KEY

A	Catalog Cuts/Shop Drawings	G	Completed start-up test forms
B	Installation instructions	H	Coordination Drawings / Studies
C	Color samples	I	Calculations
D	Product samples	J	Schedule
E	Typed statement of material to be furnished	K	Sample of finish
F	Typed verification of compliance with certification requirements		

STATUS KEY

APP	Approved (conforms)
CAN	Corrections Are Noted (conforms as noted)
ICN	Incorporate Corrections Noted
R&R	Revise & Resubmit
R	Rejected

ES&S Submittals Required	Specification Section	Submittal Key	Contractor	Original Submittal			Re-submittal			Remarks / Reviewed by
				Date A/E Received	Date A/E Returned	Status Key	Date A/E Received	Date A/E Returned	Status Key	
Division 28										
Conventional Fire Alarm System Components	28 46 13.02	A, G								
Conventional Fire Alarm System Wiring Diagram	28 46 13.02	A								

SECTION 28 05 00.77 – CLOSEOUT PROCEDURES FOR ELECTRONIC SAFETY AND SECURITY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Division 01, “General Requirements.”

B. Section 26 05 00.45, “Testing and Inspecting Services for Electrical.”

C. Section 26 05 00.73, “Execution of Electrical.”

D. Section 26 05 00.74, “Cleaning and Waste Management for Electrical.”

E. Section 26 05 00.79, “Demonstration and Training for Electrical.”

F. Section 26 05 53, “Identification for Electrical Systems.”

G. Section 28 05 00.33, “Shop Drawing Submittals for Electronic Safety and Security.”

H. Section 28 05 00.78, “Closeout Submittals for Electronic Safety and Security.”

1.2 DESCRIPTION

A. Complete and submit the following list, which is a partial list of the items required prior to Contract Completion:

ITEM	**REFER TO SECTION**
Operational inspection, testing, adjusting, and balancing of all equipment and systems	26 05 00.45, as well as other Sections
Protection	26 05 00.73, as well as other Sections
Painting	26 05 00.73
Cleaning	26 05 00.74
Instruction of the Owner’s personnel	26 05 00.79, as well as other Sections
Equipment identification	26 05 53
Shop drawing submittals	28 05 00.33
Operating and Maintenance Manuals	28 05 00.78
All required certifications and labels	28 05 00.78, as well as other Sections
Guarantees and equipment warranties	28 05 00.78, as well as other Sections
Spare parts	28 05 00.78, as well as other Sections
As-Built Documents	28 05 00.78

B. Provide or perform all of the above items before Contract Completion.

1.3 PUNCH LIST PROCEDURE

A. Refer to Division 01.

END OF SECTION 28 05 00.77

SECTION 28 05 00.78 – CLOSEOUT SUBMITTALS FOR ELECTRONIC SAFETY AND SECURITY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Division 00, “Procurement and Contracting Requirements.”

B. Division 01, “General Requirements.”

C. Section 26 05 00.79, “Demonstration and Training for Electrical.”

D. Section 28 05 00.77, “Closeout Procedures for Electronic Safety and Security.”

E. Section 28 46 13.02, “Conventional Fire-Alarm Systems.”

1.2 OPERATING AND MAINTENANCE MANUALS

A. An Operating and Maintenance Manual, approved by the A/E, is required for Contract Completion. Compile and submit a draft of the Operating and Maintenance Manual to the A/E (90) days before Contract Completion.

B. Submit the final corrected Operating and Maintenance Manual (7) days before Contract Completion.

C. Upon approval, provide:
1. (1) Operating and Maintenance Manual in the physical format described below.
2. A Portable Document Format (PDF) file containing a copy of the Operating and Maintenance Manual saved on a Universal Serial Bus (USB) flash drive.

C. The following items, together with any other pertinent data, shall be included in each Operating and Maintenance Manual. This list is not necessarily complete and shall be used only as a guide. Format of manual is to be as follows:
1. Operating and Maintenance Manual binders shall be heavy-duty, loose-leaf, 3-ring, vinyl-covered binders, no larger than 11 in. wide x 12 in. high, with pocket inside the covers to receive folded oversized sheets.
2. Identify each binder on front and spine with the printed title “OPERATION AND MAINTENANCE MANUAL,” project name, and subject matter of contents.
3. Material shall be typewritten or printed and shall be fully legible.
4. Inside cover:
    a. Title of Project.
    b. Date of Project completion.
    c. Name and address of the Owner.
    d. Date of submittal.
    e. Name and address of the Contractor.
    f. Name and address of the Architect.
    g. Name and address of the Engineer.
5. Second Page: Index.
6. Each section shall be divided by labeled tabs.
7. First Section: A copy of each shop drawing and approved submittal with an index at the beginning of the section.
8. Second Section:
    a. A list of all equipment used on the job.
    b. Complete list of all devices installed and cross-referenced to room number or location.

c. Parts list with numbers of replaceable items, including sources of supply.
d. Model and serial numbers of components of systems installed.
e. Suppliers and Manufacturers List:
1) Typed statement of material to be furnished.
2) Manufacturers' and nearest Factory Representatives' names, addresses, telephone numbers, and e-mail addresses.
3) Routine and 24-hour emergency service/repair information:
a) Name, address, telephone number, and e-mail address of servicing agency.
b) Names of personnel to be contacted for service arrangements.

9. Third Section:
a. Description of systems.
b. Manufacturer's literature describing each piece of equipment, including the following:
1) Operating and maintenance instructions.
2) Start-up and shutdown procedures.
3) Routine and emergency servicing instructions.
c. Special keys, etc.
d. Copies of all testing and adjusting reports.
e. Prints of all system wiring and control diagrams.
f. All certifications and related information.
1) Typed verification of compliance with certification requirements.
g. Copies of all written warranties.
h. The Owner's receipt of spare parts.
i. The Owner's statement of completion of instruction. Refer to Section 26 05 00.79.

D. Refer to Division 01 for additional requirements.

1.3 GUARANTEES AND WARRANTIES

A. Guarantee: Contractor shall guarantee its equipment, workmanship, and materials for a period of (1) year from the date of Contract Completion. Should defects develop within this period, the Contractor shall, at no cost to the Owner, remedy the defects and reimburse the Owner for all damage to other Work caused either by the defects or as a result of the work of correcting the same.

B. Post-Warranty Service:
1. The products and Manufacturers identified throughout these Specifications represent reputable suppliers that generally have an inventory of spare parts, and a network of authorized service providers that can support the products installed on this Project.
2. Contractor shall, for a reasonable charge, assist the Owner for a period of (7) years in obtaining parts and service on the products installed.
3. Once the Contractor's 1-year guarantee has expired, the Owner will pay the cost of these parts and service.
4. If the item cannot be repaired, the Contractor shall recommend an equivalent replacement item at a reasonable cost to the Owner.

C. Refer also to Division 00, "General Conditions," Division 01, and other Specification Sections that define the starting date of the guarantee period, or that discuss either additional warranty requirements, or extended equipment warranties beyond the standard period.

1.4 PROJECT AS-BUILT DOCUMENTS

A. Contractor shall maintain, at the job site, (1) copy of the As-Built Documents, including the following items related to its Trade:
   1. Contract Drawings.
   2. Specifications.
   3. Addenda.
   4. Reviewed Shop Drawings.
   5. Change Orders.
   6. Other modifications to Contract.
   7. Field Test Records and Start-Up Reports.
   8. Minutes of Coordination and Progress Meetings.
   9. (1) set of the Contract Drawings that will be used for As-Built Drawings. This set shall be used exclusively for documenting and recording the exact location of all installed Work.
   10. **Option:** With the approval of the A/E and Owner, As-Built Documents may be made available in an electronic format via an Internet-accessible server.

B. Do not use As-Built Documents for construction purposes.

C. Store As-Built Documents apart from documents used for construction at the Contractor's temporary field office, or in another location readily available to the A/E.

D. Provide files and racks for storage of As-Built Documents, as appropriate, with As-Built Documents identified.

E. Maintain As-Built Documents in clean, dry, legible condition.

F. Use red ballpoint pen for all marking of As-Built Documents.

G. Make As-Built Documents available at all times for inspection by the A/E and Owner.

H. As-Built Drawings:
   1. As-Built Drawings shall be legibly marked to record actual "as-built" construction with the following information (some of these items may not be applicable):
      a. Horizontal and vertical location of above-ground and underground utilities and appurtenances referenced to permanent surface improvements.
      b. Location of internal utilities and appurtenances concealed in construction referenced to visible and accessible features of structure.
      c. Field changes of dimension and detail.
      d. Changes made by Change Order.
      e. Details not on the original Contract Drawings.
   2. Do not permanently conceal any work until the required information has been recorded.
   3. Record the location of all concealed utilities on the As-Built Drawings.
   4. Record deviations in locations of concealed conduit, wiring, equipment, and all buried or concealed utility lines and services, etc., dimensioned from a fixed control point, including depth of bury, and required for further reference.
   5. Minor conduit and wiring variations need not be recorded.
   6. Record locations of abandoned conduit and wiring, including exterior lines.

7. Record deviations made necessary to incorporate equipment different from the Design Base equipment.
8. Record all Addendum Items.
9. Mark locations of access panels on the As-Built Drawings.

I. Include a complete list of all devices installed and cross-referenced to room number or location.

J. At completion of project, the Contractor shall deliver (1) printed copy of its As-Built Documents to the A/E.

K. Contractor shall accompany its As-Built Documents with a transmittal letter, in duplicate, containing the following information:
1. Date.
2. Project title and number.
3. Contractor's name and address.
4. Title and number of each As-Built Document.
5. Certification that each As-Built Document as submitted is complete and accurate.
6. Signature of the Contractor or its Authorized Representative.

1.5 SPARE PARTS

A. Provide a receipt, signed by the Owner, for (1) complete set of all the operating appurtenances and loose items related to the operation and maintenance of the completed Project for the Owner's use after the guarantee period expires. Insert the receipt in the Operating and Maintenance Manual. These appurtenances and items include, but not are limited to, the following:
1. Keys to panels and other devices not directly provided to the Owner from the Manufacturer.
2. Operating handles, levers, cranks, specialized wrenches or drivers, remote controls, and similar items.
3. Extra materials (e.g., attic stock) listed below. This list may not be a complete list of all spare parts. Provide all spare parts, whether listed or not.

SPARE PART AND QUANTITY	**SPECIFICATION SECTION**
Division 28 items	
Spare monitor modules — 10%, (3) minimum	28 46 13.01
Spare visual alarm strobes — 10%, (3) minimum of each type	28 46 13.02
Spare heat detectors — (3) minimum	28 46 13.02
Spare smoke detectors — (3) minimum	28 46 13.02
Any other parts mentioned elsewhere	

END OF SECTION 28 05 00.78

SECTION 28 05 01 - BASIC ELECTRONIC SAFETY AND SECURITY REQUIREMENTS

PART 1 - GENERAL

1.1 Refer to Section 26 05 01 Basic Electrical Requirements which are hereby made part of Division 28 – Electronic Safety and Security.

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SECTION 28 05 02 - AGREEMENT AND WAIVER FOR USE OF ELECTRONIC FILES

PART 1 - GENERAL

1.1 The Engineer, at his sole discretion and without obligation, makes graphic portions of the contract documents available for use by the contractor in electronic format. These electronic files are proprietary, and remain the Engineer's Instruments of Service and shall be for use solely with respect to this project, as provided in the Standard Form of Agreement between Owner/Architect and Engineer.

1.2 Electronic files shall be released only after bids have been received for the project and contracts have been signed with the contractors.

1.3 The contractor shall acknowledge receipt of electronic files in the requested format for this project. The electronic files are provided as a convenience to the User, for use in preparing shop drawings and/or coordination drawings related to the construction of only the project identified in the Agreement. The electronic files and the information contained within are the property of the Engineer and/or the Architect and/or the Owner, and may not be reproduced or used in any format except in conjunction with the project identified in the Agreement.

1.4 The User acknowledges that the information provided in the electronic files is not a substitution or replacement for the Contract Documents and does not become a Contract Document. The User acknowledges that neither the Engineer, the Architect, the Consultants, the Client or the Owner make any warrant or representation that the information contained in the electronic files reflect the Contract Documents in their entirety. The User assumes full responsibility in the use of the electronic files, including the responsibility to see that all manual modifications, addenda, bulletins, clarifications and Change Orders to the drawings executed as a part of the Contract Documents have been incorporated.

1.5 The User acknowledges that the receipt of electronic files in no way relieves the User from the responsibility for the preparation of shop drawings or other schedules as set forth in the Contract between the Contractor and the Owner.

1.6 Electronic files are available in the AutoCAD .DWG or Revit model format for a cost as indicated in the Agreement and Waiver Form. Providing the documents in the .DXF format will be an additional charge per sheet as indicated in the Agreement and Waiver Form. Charges are for the Engineer's time to prepare the documents in the format stated. They are available through the Engineer's office on a C.O.D. basis only. A sample of the format will be provided by the Engineer upon request by the contractor, for the purpose of testing the compatibility of the format to contractor's systems.

1.7 Projects developed using AutoCAD MEP will have all drawings converted to the AutoCAD format, when requested to be DWG or DXF format.

1.8 Project models will be furnished without views.

1.9 The electronic files shall be stripped of the Project's name and address, the Architect's / and / Engineer's / and / any consultant's name and address, and any professional licenses indicated on the contract documents, (and all dimensions, verbiage, and statistical information). Use of these electronic files is solely at the contractor's risk, and shall in no way alter the contractor's Contract for Construction.

1.10 The User agrees to indemnify, hold harmless and defend the Engineer, the Architect, the Consultants, the Owner, the Client and any of their agents from any litigation resulting from the use of (by any means of reproduction or electronic media) these files. The Engineer makes no representation regarding fitness for any particular purpose, or suitability for use with any software or hardware, and shall not be responsible or liable for errors, defects, inexactitudes, or anomalies in the data, information, or documents (including drawings and specifications) caused by the Engineer's or its consultant's computer software or hardware defects or

errors; the Engineer's or its consultant's electronic or disk transmittal of data, information or documents; or the Engineer's or its consultant's reformatting or automated conversion of data, information or documents electronically or disk transmitted from the Engineer's consultants to the Engineer.

1.11 The contractor waives all claims against the Engineer, its employees, officers and consultants for any and all damages, losses, or expenses the contractor incurs from such defects or errors in the electronic files. Furthermore, the contractor shall indemnify, defend, and hold harmless the Engineer, and its consultants together with their respective employees and officers, harmless from and against any claims, suits, demands, causes of action, losses, damages or expenses (including all attorney's fees and litigation expenses) attributed to errors or defects in data, information or documents, including drawings and specifications, resulting from the contractor's distribution of electronic files to other contractors, persons, or entities.

PART 2 - PRODUCTS – NOT USED

PART 3 - EXECUTION

3.1 Attached "Agreement" shall be submitted with accompanying payment to the Engineer prior to delivery of electronic files.

END OF SECTION

Heapy Engineering
MEP Design Technology Planning Commissioning Energy
Nationally Recognized Leader in Sustainability

ELECTRONIC FILES
HEAPY RELEASE FORM TO CONTRACTORS

Project: Mt. Gilead Public Schools
145 N. Cherry St.
Mount Gilead, OH 43338

Owner: Mt Gilead Public Schools

Heapy Engineering Project Number: 2026-91002.00

Heapy Engineering Project Manager: Michael Jankowski

The Provider, named below, will furnish the Recipient, named below, certain documents prepared by the Provider or its sub consultants in an electronic format. These documents are hereinafter collectively referred to as "Electronic Files". The Electronic Files are instruments of the Provider services performed solely for the Owner's benefit and to be used solely for this Project. The Provider does not represent that the information contained in the Electronic Files are suitable for use on any other project or for any other purpose. If the Electronic Files are used for any other project or purpose without the Provider's specific written permission, the risk of such use shall be assumed solely by the Recipient or other user.

Prior to the use of the Electronic Files the Provider and the Recipient agree to the following terms and conditions:

1. The Provider and Recipient fully understand that the data contained in these electronic files are part of the Provider's Instruments of Service. The Provider shall be deemed the author of the drawings and data, and shall retain all common law, statutory law and other rights, including copyrights.

2. The Recipient confirms their request to the Provider for Electronic Files for the Project listed above, which the Recipient understands are to be provided only in accordance with, and conditioned upon, the terms and conditions of this Agreement and Waiver for Use of Electronic Files.

3. The Provider agrees that the Recipient may use the Electronic Files for the sole purpose of preparing shop drawings and/or coordination drawings for the above Project only. Any Electronic Files provided are strictly for the use of the Recipient in regard to the Project named above, and shall not be utilized for any other purpose or provided by the Recipient to any entity other than its subcontractors for the Project named above.

4. The Recipient acknowledges that the furnishing of Electronic Files in no way relieves the Recipient from the responsibility of shop drawings or other schedules as set forth in the Contract between the Contractor and the Owner.

5. The Recipient acknowledges:

    a. That the Electronic Files do not contain all of the information of the Bid Documents or Contract Documents for the construction of the Project above.

    b. That information in the Bid Documents or Contract Documents may be revised or modified in the future.

    c. The Provider does not have, and will not have, any duty or obligation to advise or give notice to the Recipient of any such revisions or modifications.

    d. That the Recipient agrees that its use of the Electronic Files is at the Recipient's sole risk of liability, and that the Recipient shall make no claim or demand of any kind against the Provider arising out of Recipient's receipt or use of the Electronic Files.

6. The Provider makes no representation or warranty of any kind, express or implied, with respect to the Electronic Files and specifically makes no warranty that the Electronic Files shall be merchantable or fit for any particular purpose, or accurate or complete. Furthermore, any description of said Electronic Files shall not be deemed to create an implied or express warranty that such Electronic Files shall conform to said description.

7. Due to the unsecured nature of the Electronic Files and the inability of the Provider or the Recipient to establish controls over their use, the Provider assumes no responsibility for any consequences arising out of the use of the data. It is the sole responsibility of the Recipient to check the validity of all information contained within the Electronic Files. The Recipient shall at all times refer to the Construction Documents of the project during all phases of the project. The Recipient shall assume all risks and liabilities resulting from the use of this data, and the Recipient agree(s) to waive any and all claims and liability against the Provider and its sub consultants resulting in any way from the use of the Electronic Files.

8. Electronic Files are provided strictly as a courtesy by the Provider solely for the convenience of the Recipient, and are not part of the Bid Documents or Contract Documents for the Project. The Electronic Files do not replace or supplement the paper copies of any drawings, specifications, or other documents included in the Contract Documents for use on the project.

    a. The Recipient assumes full responsibility in the use of Electronic Files, including the responsibility to see that all manual modifications, addenda, bulletins, clarifications and Change Orders to the drawings executed as a part of the Contract Documents have been incorporated.

9. As stated herein, the possibility exists that the Electronic Files provided may differ from the Bid Documents or Contract Documents for construction of the Project. The Provider shall not be responsible, nor be held responsible, for differences between Electronic Files, the Bid Documents, and Contract Documents. The Bid Documents or Contract Documents for the Project may be modified by the Provider at any time, either before or after construction begins. The Provider has no responsibility, either before or after any such modification, to determine or to advise the Recipient whether any such modification causes Electronic Files provided to the Recipient to be out of date, inconsistent with the Bid Documents or Contract Documents, or otherwise unsuitable or unfit for use in any way.

10. The Recipient assumes all risk and liability for any losses, damages, claims, or expenses (including defense and attorney fees) resulting from its receipt, use, or possession of Electronic Files furnished by the Provider. The Provider makes no representation, warranty or guarantee that the Electronic Files:

    a. Are suitable for any other usage or purpose.

    b. Have any particular durability.

    c. Will not damage or impair the Recipient's computer or software.

    d. Contain no errors or mechanical flaws or other discrepancies that may render them unsuitable for the purpose intended by the Recipient.

11. Recipient agrees to indemnify, defend and hold harmless the Provider, agents, employees, and the Owner from, and against, any and all claims, suits, losses, damages or costs, of any kind or nature, including attorney's fees, arising from or by reason of the Recipient's use of Electronic Files provided by the Provider, and such defense and indemnification obligation duties shall survive any use under this Agreement and Waiver for Use of Electronic Files.

12. The Recipient agrees that the Provider shall have no responsibility whatsoever for problems of any nature arising from transmitting and storing electronic files at a Recipient requested FTP or project management site or the conversion of the Electronic Files by the Recipient or others for use in non-native applications. The Provider will not provide Electronic Files in compressed formats. Recipient agrees to accept the files in the format provided by the Provider, and that Recipient's conversion or electronic file storage at the Recipient's requested site, shall be at Recipient's sole risk.

13. Recipient acknowledges:

a. That the Electronic Files provided by the Provider are a graphical representation of the building in order to generate two-dimensional industry standard drawings.

b. That the data contained in the Electronic Files may not be 100% accurate and should not be used for dimensional control, building layout, shop drawings, or any other similar purpose

c. That any schedule of materials produced directly from the Electronic Files has not been checked for accuracy.

d. That the information in the Electronic Files should be used only for comparative purposes and shall not be relied upon for accurate quantity estimates or used in establishing pricing.

14. Electronic Files provided by the Provider will only contain elements and content that the Provider deems necessary and appropriate to share. No specific Level of Detail (LoD) is implied or expected. The Recipient agrees that no proprietary content, MvParts or Revit Families or any other AutoCAD MEP or Revit MEP content shall be removed from the model and/or used for any other purpose but to support this specific project.

15. The Provider, at its sole discretion, may modify the Electronic files before they are provided to the Recipient. Such modifications may include, but are not necessarily limited to, removal of certain information. The Provider, at its sole discretion, may refuse to provide some or all Electronic Files requested by Recipient.

16. The availability of Electronic Files that were not prepared by the Provider is subject to the consent of the Owner or consultant that prepared those Electronic Files. The Provider will not negotiate with the Owner or consultant or repeatedly solicit the Owner or consultant to obtain such consent. Neither this Agreement and Waiver for Use of Electronic Files nor any such separate Consultant's consent may be assigned or transferred by Recipient to any other person or entity.

Provider (Name of Company): _____

Recipient (Name of Company): _____

Recipient Address: _____

Name of authorized Recipient Representative: _____

Title of authorized Recipient Representative: _____

E-mail address of authorized Recipient Representative: _____

Signature of authorized Recipient Representative: _____

Date: _____

NOTE: Select requested Electronic File format and complete applicable cost summary.

1. ☐ DWG / DXF Format - List of Drawings Requested: ___

_____

2. ☐ Revit Project Model Requested (Model only, no Views included)

The following costs are applicable to Delivery of Electronic Files (select one):

☐ CD-ROM ☐ Heapy FTP ☐ User's FTP site ☐ Flash Drive

Requested Electronic DWG / DXF file format (select one):

☐ 2010 DWG ☐ 2007 DWG ☐ 2004 DWG ☐ 2000 DWG ☐ R12 DWG
☐ 2010 DXF ☐ 2007 DXF ☐ 2004 DXF ☐ 2000 DXF ☐ R12 DXF

Cost of Preparation of Division 28 Electronic DWG / DXF Files:

First Drawing: $50.00			$50.00
Additional Drawings $15.00 each	_____ x $15.00	=	$ _____
Conversion to DXF Format: $5.00 additional/sheet	_____ x $ 5.00=	$ _____	

Total Cost: (Please make check payable to Heapy Engineering and include a copy of this form.) $ _____

All files will be bound together.
Requested electronic Revit file format (Select One):

☐ 2025 RVT

Cost of Preparation of Division 28 Electronic Revit Model Files:

Revit Project Model without Views	$500.00

Total Cost: (Please make check payable to Heapy Engineering and include a copy of this form.) $ _____

28 13 00 - SECURITY MANAGEMENT SYSTEM

PART 1 - GENERAL

1.1 Scope of Work

A. These specifications shall be utilized for the expansion to the existing Verkada system.

B. These Specifications shall be utilized for the extension of the existing Verkada system at the existing school. New card readers shall be provided at the renovated elevator within the facility.

1.2 Scope of Work

A. Provide a Security Management System (SMS) which fully integrates all the functions and features specified herein for door access control and intrusion alarm and badge creation. Additionally, the SMS shall provide integration with the digital CCTV system covered under a separate specification section. Refer to system description below for required integration.

B. The scope includes all hardware, software, training and services required to provide a fully operational system, programmed to the Owner's requirements and containing all software and licenses required to perform the specified functions.

C. These specifications contained herein describe specific functional requirements of the SMS as required by the Owner. It is the intent of these specifications to detail and describe the performance of the system. The system features outlined in the specifications are deemed mandatory for the project. References to model numbers are intended only for descriptive purposes. Systems that deviate from these Performance Specifications shall be considered alternate systems.

1.3 System Description

A. The SMS shall provide for graphical based control and monitoring of local door access, elevator access and intrusion alarm within each building and centralized, graphical based control and monitoring through the owner's LAN/WAN. The SMS shall also provide software integration with the digital CCTV system. The SMS shall consist of four basic modules:

1. The Communications and database server module (Existing).
    a. The server shall provide network communications (both thru the dedicated hardwired network and the Owner's LAN) to all remote hardware and software components of the system. The server shall provide system communications to remote control panels, administer the database and provide system programming. The SMS server shall utilize industry standard relational database management for the storage and manipulation of related data. The server shall only be required on the SMS to perform programming and administrative functions. The SMS remote components shall be capable of operating without the presence of the server once the system is programmed.
2. Door access control module (ACM).
    a. The ACM shall control access and provide positional status at exterior doors and all controlled doors through the use of proximity cards, proximity card readers and door sensors.
    b. The ACM shall interface with the electronic door hardware to provide lock/unlock signaling based upon valid card reads, schedules, real time control from user workstation or remote pushbuttons, and programming.
    c. The ACM shall consist of Request to Exit devices where shown on the drawings or as required by system operation. These devices shall consist of either motion detectors or contacts in panic hardware and shall provide alarm free exit of card reader doors without the need to de-activate the alarm system.
    d. The ACM shall provide interface with handicap door operators at access control doors to prevent activation of door opener if door is in locked position. Additional interface may be

required for free egress to unlock doors when the Request-To-Exit handicap opener is pressed.

e. The ACM shall interface with the elevator controllers to provide lock-out of floors/elevators based upon card holder privileges for card readers. Card readers will be installed in elevator cabs or elevator lobby as indicated on drawings.

f. Each building is provided with a handicap operators on interior and exterior main doors. The General trades package will supply the operators and pushbuttons (1 exterior, 2 vestibules, 1 interior) with low voltage wiring whips left above accessible ceiling. The electrical Contractor will make all required 120V connections. The security contractor will be responsible for making all low voltage wiring connections from the handicap opener, handicap push buttons, door hardware electrified hinge (electronic latch retraction and RX switch in panic hardware), magnetic door contact switch (provided under the security scope), door hardware power supply and the SMS system door control panels for a fully functional entry. The security contractor is to coordinate the proper operation, interlocking, timing and sequencing of doors and door operators with door hardware supplier.

g. The ACM shall also provide door position annunciation for all exterior doors and through all card reader controlled doors through the use of flush frame door contacts. Real time door position annunciation shall be provided by the remote software.

h. The ACM shall provide TOD schedule and real-time control of all exterior doors equipped with Magnetic locking devices. In addition, The ACM shall integrate with the building fire alarm system to provide code required release of mag lock doors under fire alarm conditions.

i. The ACM shall provide interface and controls of electromagnetic door hold opens to close doors on TOD schedules and on Panic/duress situations. Where hold open doors are connected to the FA system, the ACM shall signal the FA system to release the associated doors.

j. Panic/Duress – The ACM shall provide for immediate TOD schedule override on all access doors under panic/duress alarm. In addition, the ACM shall provide immediate override of card holder privileges and restrict valid card reads to a select group of users during panic/duress alarm. ACM shall also interface with fire alarm system to drop ALL door hold opens under panic/duress alarm.

k. The ACM control software must provide a graphical floor plan of the finished building with real time interactive annunciation and control of monitored and controlled doors. The graphical floor plan shall be entered and configured as part of this contract. User interface shall provide visual indication of door position status and hot links at each door on the floor plan drawing.

l. This module shall contain remote access and control software installed on individual building workstations as directed by the Owner. These workstations, through the LAN connection, shall be able to perform access, control, monitoring and programming features. The software shall be provided with all required licensing and password protected.

m. The ACM shall provide for any combination of real time and calendar based, Time Of Day operation for all controlled doors.

1.4 Quality Assurance

A. All system components shall be UL listed.

B. Installation shall be in compliance with the National Electric Code and all other applicable codes. The system shall be in compliance withal FCC Rules and Regulations.

C. All equipment described herein shall be the product of a manufacturer of established reputation and experience, who shall have produced similar equipment for a period of at least 2 years and who shall be able to refer to similar installations within a 75 mile radius now rendering satisfactory service.

D. The manufacturer and their local agent shall show satisfactory evidence upon request that they maintain a fully equipped service center capable of furnishing adequate inspection and service to the equipment including standard replacement parts. The manufacturer and /or agent shall be prepared to offer a service contract for the maintenance of the system after the warranty period.

E. To establish continuity in the manufacturer, systems components shall be the standard product of one manufacturer. Further, an effort shall be made to establish common sources for equipment of all systems. The manufacturer will have a minimum of five (5) years' experience in the manufacture of progressive products specified.

F. All materials furnished under this contract shall be new, of highest quality and shall be of a regularly manufactured line, currently in production at the time of installation.

G. All material furnished under this contract shall meet or exceed minimum performance and operational requirements as established by the system vendors for the configurations being implemented for this project.

H. System shall conform to the following standards:
1. National Fire Protection Association.
2. NFPA 730 – Guide for Premises Security
3. NFPA 731 – Standard for the Installation of Electronic Premises Security Systems
4. National Electric Code.
5. American with Disabilities Act.
6. Underwriter's Laboratory.
7. Latest ANSI TIA/EIA-568, 569, 606, 607 Standards and Eleventh Edition (or later).
8. BICSI Telecommunications Distribution Methods Manual (TDMM).

1.5 Contractor Qualifications

A. The Security Management System shall be furnished, installed and programmed by a contractor who meets all the requirements listed herein. It shall not be acceptable for the SMS contractor to utilize a sub-contractor for any portion of the work, unless the sub-contractor has been approved in writing by the Engineer based upon adherence to the qualifications listed herein.

B. The Contractor shall maintain a fully equipped, factory certified service organization capable of providing full maintenance and service of the installed system within 24 hours. This facility shall be available for inspection by the Engineer.

C. The Contractor shall employ factory trained service personnel for the service and maintenance of the system.

D. The Contractor shall have had a minimum of 1 year experience with the specified SMS. This experience shall include having completed a minimum of 2 installations in the past 24 months of similar size and scope. The Contractor shall provide references and contact information for the project sites in which the qualifying installations occurred.

1.6 Shop Drawings – The submittals shall consist of the following information:

A. Job specific system block diagram indicating the actual hardware required for the project including part numbers and interconnecting wiring requirements.

B. Details of interconnection with CCTV system.

C. Complete and comprehensive Equipment Catalog Specification Sheets of each component provided, job specific.

D. 30x42 floor plans at a scale of not less than 1/8 inches=1 feet-0 inches showing location of all items of equipment. Drawings shall also indicate each location where 120 power is required.

E. Scale elevation of all racks including configuration of equipment within racks and interconnection diagrams.

F. Software Data: The data package shall consist of descriptions of the operation and capability of system and application software as specified. This shall also include licensing information where applicable.

G. Submittals that do not contain all the above information will be rejected.

1.7 Related Work by Others

A. The door hardware and associated power supplies are being provided under the General trades Contract. The electrical branch circuitry, conduit and box rough-ins are being provided under the Electrical trades package.

1.8 Related Sections

A. 28 23 01 – Video Surveillance - IP

PART 2 - PRODUCTS

2.1 Product Equivalency

A. Where products are listed with multiple manufacturers, these manufacturers will be approved as equals if all specified features are provided. Any equipment not specifically approved in writing prior to the bid date will not be considered regardless of qualifications. Failure to provide the “precise functional equivalent" shall result in the removal of the alternate equipment at the Contractor’s expense.

B. Different manufacturers may require various options, accessories, converters, patch cables, etc. to perform the specified features and functions. Therefore, all material and/or equipment necessary for proper operation of the system shall be deemed part of these specifications.

C. This specification is intended to establish a carefully planned minimum level of quality and performance for all components, and will be rigorously enforced by Owner. Acceptable manufacturer of components described herein are:

1. Verkada

D. The SMS shall be a regularly manufactured system offered by a single manufacturer/source as an integrated system.

E. Contractors shall submit reference letter with information regarding current installations utilizing the listed manufacturer pairings along with contact information at each installation site. Reference letter shall include brief summary of system scope for both CCTV and SMS and level of integration being utilized.

F. Final approval of systems listed above shall be at the discretion of the owner/engineer pending review of system reference information and back-up documentation. Upon request by Owner/Engineer, contractor and/or manufacturer may provide on-site product demonstration to validate system ability to meet specified level of integration.

2.2 General

A. The main control panel and all door control panels shall be backed up by internal batteries or provided with UPS units as required to provide a minimum of 1 hour operation upon loss of building power. Refer to additional requirements for back-up of SMS server PC.

2.3 Access Control Module

A. Door Control Panel(s) shall consist of network communications via Ethernet based IP loop and shall contain all electronics and on-board memory to provide door access and interface with card readers,

door position sensors, electronic door hardware, auxiliary I/O points, and the local fire alarm system in the event of loss of server communications. The panel(s) shall provide access control, alarm monitoring, and time zone control for both access and egress of selected areas. The panel shall have the capability for system expansion. Panels shall support both centralized and distributed locations with IP and PoE to distributed locations for panel connectivity and power.

B. Credential Readers – Provide readers as indicated on plans. Readers shall either mount to gang wall box or to door mullion as indicated on drawings. Readers shall employ proximity, NFC, Bluetooth, biometric, etc. as specified herein.

C. Door position sensors – Recessed mounted door magnetic switch contacts to function as door position sensors and alarm points. Refer to drawings for locations. Utilize sensors to provide door position status during occupied hours as required by Owner's programming and alarm points when so programmed or required by the Owner's sequence of operation.

D. Electronic door hardware – Provide wiring and controls to electronic door hardware to remotely lock/unlock selected doors in real time via the software GUI, through local credential readers, through TOD schedules, interface with intercom system, or remote push button devices. System shall provide the Owner with the ability to remotely control doors from the remote access workstations, head end server, associated credential readers, request-to-exit devices, intercom system and the fire alarm system. Electronic door hardware with operating power supplies are supplied by the General Trades Contract with wiring pig tails. Electronic hardware is being installed in the door frames by others. This contract shall be responsible for connecting all low voltage wiring from door hardware and power supplies to the access control system for a complete, functional and operating system.

E. Handicap Operator Doors – Provide wiring and interface with local secured door electronic hardware to interlock operator with Electronic Access Control System.

F. Electromagnetic door hold opens – Provide controls to electromagnetic door hold open devices to release selected doors through real time (via the GUI interface), TOD schedules, or in panic/duress operation. Devices connected to the FA system shall be controlled via signaling from the SMS to the FA system. Electronic hardware is being installed at the door by others. This contract shall be responsible for connecting all wiring from door hold open hardware and power supplies to the access control system for a complete, functional and operating system.

G. Provide push button/switch units as indicated on plans to provide remote unlock of selected access control doors.

H. Request to Exit Devices (alarm shunt) – Provide REX devices such as motion detectors or contacts in push bar panic hardware to provide alarm free exit of monitored doors during system operation. REX devices shall be installed, powered, wired and programmed as part of this contract.

I. Request to Exit Devices (door unlock) – Provide REX devices such as motion detectors, contacts in push bar panic hardware, or wall mount button stations to provide alarm free exit of monitored doors during system operation. REX devices shall be installed, powered, wired and programmed as part of this contract.

J. Provide wall mounted panic/duress button with locking/reset feature as indicated on plans. Duress buttons shall initiate panic/duress condition in SMS as follows:

1. The ACM shall provide for immediate TOD schedule override on all access doors to lock doors.
2. The ACM shall provide immediate override of card holder privileges and restrict valid card reads to a select group of users.
3. The ACM shall also interface with fire alarm system to drop ALL door hold opens.
4. The ACM shall signal to the Central Monitoring Agency the Panic/Duress alarm condition.
5. Upon de-activation of panic and re-set of panic button, system shall return to currently scheduled operation.

K. Provide battery back-up for door control panels to provide 1 hour operation.

L. Contractor shall include all necessary wire, cable and accessories for a complete working system.

2.4 Cable Management System

M. Provide pre-manufactured cable supports. Cable supports shall be secured to building structure through threaded rod, beam clamps or other UL approved supports as required by site conditions. Components shall provide a minimum cable support point spacing of 48 inches.

N. Cable management devices must be sized to accommodate 100 percent spare capacity of the final installed cable base.

O. Cable management system shall be secured to building structure utilizing manufactured approved methods and hardware.

P. Cable management system support components shall be designed with wide support surfaces that do not cause cables to be bent, crushed or otherwise deformed when installed within component loading parameters. Cable management system shall meet UL standards and be UL labeled. Utilizing elements of the building's structure such as beams, joists, etc. to hang cable from will not be acceptable.

Q. Bridle rings shall not be acceptable.

R. Manufactured by Caddy, Mineralac or B-Line.

2.5 Contractor shall include all necessary wire, cable and accessories for a complete working system.

PART 3 - INSTALLATION

3.1 General Installation

A. Install systems in accordance with UL, NEC and all other applicable codes. Install system to comply with drawings and final shop drawings in compliance with manufacturer instructions. Provide all required hardware and labor for rack mounting of head-end system components.

B. Refer to plans for locations and quantities of equipment. Equipment locations shown on plans will be required to be field coordinated to ensure proper system operation.

C. No items of equipment shall be installed in such a manner as to void or reduce the proper operating characteristics of individual components or of the system. Devices such as motion detectors, audio detectors, glass break sensors, etc. shall be installed following the manufacturer's recommendations.

D. Perform all work under the on-site supervision of a factory authorized trained technician. It shall be the responsibility of the technician to check, inspect and adjust this installation to the engineer's and Owner approval. A CSR of the installing contractor or manufacturer shall train the Owner's personnel on the proper operation and maintenance of the equipment. Perform all work in conjunction with this installation in accordance with good engineering practices as established by NEC.

3.2 Wiring Installation

A. All wiring between devices shall be run open wired above accessible ceilings. Where existing cable management systems are in place and there is adequate capacity to install the SMS wiring, the contractor may utilize these pathways providing they have coordinated with all other wiring contractor on site.

B. Where pathways do not exist for SMS wiring, this contract shall be responsible for providing all required cable management systems such as sleeves, conduits, J-hooks, etc. to support communications cabling to meet building codes and manufacturer's recommendations.

C. All cabling installed in ceiling spaces that are used for air distribution plenums shall be UL plenum rated.

D. This contract shall be responsible for furnishing and installing all required cabling between components to form a complete and operational system meeting all the requirements of this specifications.

E. The SMS contractor shall be responsible for interconnection and signaling including all wiring and terminations at both ends for the following auxiliary systems

1. Fire Alarm – for control of doors during fire alarm, and for release of door hold opens connected directly to the FA system
2. Paging System – Connection to the building wide paging system for pre-alarm all-call tone/announcement
3. Building automation System – Connection to the building automation system for signaling for morning entry (first valid swipe and alarm de-activation) and evening vacancy (alarm activation).
4. Intercom – Connection to the intercom system I/) panel for signaling of electronic door locks via pushbutton operation of intercom master stations.
5. IP CCTV – Connection to the IP CCTV system for video file links and live video icons on the graphical floor plans.

3.3 Grounding

A. The installing contractor shall be responsible for ensuring the grounding integrity of all installed equipment to eliminate the potential for equipment or personnel hazards due to improperly or inadequately grounded systems.

B. All grounding and bonding shall be in conformance with the National Electric Code, article 250 and as recommended by EIA/TIA-607.

C. The Division 26 Contractor has provided 120V branch circuitry for use by the SMS system contractor. The branch circuitry is run with a dedicated equipment grounding conductor which shall be utilized by the SMS system equipment. In no case shall the SMS system installation compromise the integrity of the Building Electrical Grounding System.

3.4 Programming

A. It is the Contractor's responsibility to program the system in this section according to the Owner's wishes. This involves day and night restrictions, time schedules, building zoning, access control schedules, sequence of operation, etc.

B. The Contractor shall meet with the Owner and/or Engineer and reach agreement on the programming. This programming agreement shall then be written out in detail and forwarded to the Engineer for approval.

C. After approval is granted, proceed with final programming. The programming shall include the following at a minimum:

1. Input of all student and staff personal records into the card holder database
2. Creation of door and elevator access groups. Assigning door and elevator access groups to access card holders.
3. Creation of alarm codes in all buildings for all staff including building and zone privileges for each code.

4. Creation of multiple Time Of Day schedules for all controlled doors, alarm devices and security zones to account for various modes of operation (normal, holiday, snow day, in-service day, etc.) in all buildings.
5. Creation of security zones within each building including assigning associated alarm devices to respective zones and creation of arm/disarm codes for each zone.
6. Software interface with CCTV system for camera icons on the Graphical floor plans, TOD operations and alarm modes.
7. Software interface with FA system for release of door hold opens and for release of door locks on fire alarm
8. Software interface with building paging system to initiate pre-alarm all-call.

D. Alarm dialer codes and numbers to communicate with Central Station.

3.5 Identification/Labeling

A. Contractor shall identify all major items of equipment and tag all cables with permanent type markers to denote equipment served. Cables shall be tagged at both ends and at each point where the cable is administered.

B. All labeling and recording shall be approved by the Owner and the Engineer prior to application.

3.6 Testing

A. The Contractor shall provide all personnel, equipment, instrumentation, and supplies necessary to perform all site testing. The Owner will witness all performance verification. Original copies of all data produced during performance verification shall be turned over to the Owner at the conclusion of testing prior to final approval.

B. The field testing shall as a minimum include:

1. Verification that alarm points are received, annunciated properly and transmitted through the central monitoring station.
2. Verification that all motion detectors have the proper coverage patterns and that false alarms are not being generated due to motion coverage patterns into adjacent areas.
3. Verification that all user input and control features are accessible at each keypad and operators control station.
4. Verification that the final system programming including schedules and sequence of operation are performing as expected.
5. Verification that access control features including door control and door position sensing are operating properly and as required by the Owner and as established during the programming phase.

C. The Contractor shall deliver a report describing results of functional tests, diagnostics, and calibrations including written certification to the Owner that the installed complete system has been calibrated, tested, and is ready to begin performance verification testing. The report shall also include a copy of the approved performance verification test procedure.

D. Performance Verification Test: The Contractor shall demonstrate that the completed SMS complies with the contract requirements. Using approved test procedures, all physical and functional requirements of the project shall be demonstrated and shown. The performance verification test, as specified, shall not be started until receipt by the Contractor of written permission from the Owner, based on the Contractor's written report. This shall include certification of successful completion of Contractor Field Testing as specified in paragraph "Contractor's Field Testing," and upon successful completion of training as specified. The Owner may terminate testing at any time when the system fails to perform as specified.

3.7 System Acceptance Requirements

A. The contractor shall demonstrate proper operation of all aspects of the system to the Owner's representative.

3.8 Warranty

A. Warrant all workmanship, equipment, material and software entering into this contract for a period of three (3) years from date of final acceptance or date of beneficial use, as agreed to between Contractor and Architect or Construction Manager. Any materials or equipment proving to be defective during the warranty period shall be made good without expense to the Owner. Provide a statement of this warranty with the O & M Manuals.

B. Make available a service contract offering continuing factory authorized service of this system after the initial warranty period. Provide estimated cost of this service contract within the proposal.

C. Contractor shall be responsible to provide service during normal working hours within (8) hours after notification by the Owner for normal service or within (2) hours for emergency service. Emergency service is defined as the loss of any system component inhibiting access to the system operation, or the loss of the main server.

D. If equipment cannot be repaired with 24 hours of service visit, the Contractor shall provide "loaner" equipment to the Owner at no charge.

E. Proper identification is required and must be visible while on-site for warranty/service calls. Provide notification of completion to the Owner prior to departing the site.

3.9 O&M Manuals

A. Copies of all approved shop drawings with the Engineer's stamp.

B. Owner's manuals for every item of equipment when available from the manufacturer. These shall be the technical manuals provided by the manufacturer and shall not consist of generic sales brochures. Technical manuals shall provide complete specifications for the equipment as well as complete operating, maintenance, troubleshooting and product repair/replacement information. Where available only in electronic format, the contractor may provide a CD with electronic versions of Owner's manuals. CDs containing electronic versions of Owner's manuals must contain the proper software viewers for each document type.
   1. Access Control System Component Manuals
      a. Card readers
      b. Door Control Panels

C. Technology drawings updated with final as-Built information. This shall be in the form of a complete set of Technology drawings with as-built information indicated in colored pen based upon actual field conditions.

D. System schematic and block diagrams for every system updated with final as-built information. These drawings shall define the exact arrangement of each system including wiring configuration, device locations and cable types.

E. Rack elevations for all systems with rack mounted equipment.

F. System Operating Instructions: Provide a clear and concise description of operation which gives, in detail, the information required to properly operate the equipment and system.

G. Warranty: Provide statement of warranty with O&M manuals.

END OF SECTION

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SECTION 28 23 01 - VIDEO SURVEILLANCE - IP

PART 1 - GENERAL

1.1 General

A. These specifications shall be utilized for the expansion of the existing district-wide Milestone system as specified herein and as shown on the bid documents for the renovation of the Pre-Schools space. Cameras shall be as provided by Avigilon.

1.2 Scope of Work

A. These Specifications contained herein describe specific functional requirements of the CCTV system. It is not the intent of these specifications to detail and describe the exact performance of the system. The system features outlined in the Specifications are deemed mandatory for the project. References to model numbers are intended only for descriptive purposes. Systems that deviate from these Performance Specifications shall be considered alternate systems.

B. IP based video surveillance supporting a single building, single site, multiple buildings/multiple sites.

1. The system shall provide a true client-server architecture enabling the total system to appear as a single logical device regardless of the number of cameras or individual NVS/NVR units that are utilized across either the LAN or WAN. System shall be Single Site, Multiple Site Enterprise Class, Multiple Site Global Class.

C. Interior Camera System - System consists of multiple IP based cameras with specified housings, mounting, lenses, features, etc. throughout the building interior as indicated on the drawings and as specified herein.

D. Video Management - Equipment and software to process video from all cameras and provide control/distribution as required for storage, archive, preview, and live monitoring of all video files and streams.

E. Video Recording - Equipment and software to receive, store and archive the network video from all cameras as indicated on the drawings and as specified herein.

F. Video Clients – Equipment and software to provide direct, real-time, GUI based access to live and recorded video.

G. Video Monitoring – Equipment and software to provide reception, decoding and display of real-time encoded network video.

H. Network Electronics – Provided under section 27 21 00.

I. Network Camera Cabling

1. Data/Video Provided under section 27 15 13
2. Low voltage power – Provided under this section

1.3 Quality Assurance

A. All system components shall be UL listed.

B. Installation shall be in compliance with the National Electric Code and all other applicable codes. The system shall be in compliance withal FCC Rules and Regulations.

C. All equipment described herein shall be the product of a manufacturer of established reputation and experience, who shall have produced similar equipment for a period of at least 2 years and who shall be able to refer to similar installations within a 75 mile radius now rendering satisfactory service.

D. The manufacturer and their local agent shall show satisfactory evidence upon request that they maintain a fully equipped service center capable of furnishing adequate inspection and service to the equipment including standard replacement parts. The manufacturer and /or agent shall be prepared to offer a service contract for the maintenance of the system after the warranty period.

E. To establish continuity in the manufacturer, like systems components (e.g. all cameras) shall be the standard product of one manufacturer. The manufacturer will have a minimum of two (2) years' experience in the manufacture of products specified.

F. All materials furnished under this contract shall be new, of highest quality and shall be of a regularly manufactured line, currently in production at the time of installation.

G. All material furnished under this contract shall meet or exceed minimum performance and operational requirements as established by the system vendors for the configurations being implemented for this project.

H. System shall conform to the following standards:
1. National Fire Protection Association.
2. NFPA 730 – Guide for Premises Security
3. NFPA 731 – Standard for the Installation of Electronic Premises Security Systems
4. National Electric Code.
5. American with Disabilities Act.
6. Underwriter's Laboratory.
7. FCC Class B.
8. NEMA Type 4AX.
9. NEMA Type 1.
10. NTSC/EIA.
11. ISO/IEC 14496-2 MPEG-4.
12. H.264.
13. Latest ANSI TIA/EIA-568, 569, 606, 607 Standards and Eleventh Edition (or later).
14. BICSI Telecommunications Distribution Methods Manual (TDMM)

1.4 Contractor Qualifications

A. The Closed Circuit Television System shall be furnished, installed and programmed by a contractor who meets all the requirements listed herein. It shall not be acceptable for the CCTV contractor to utilize a sub-contractor for any portion of the work, unless the sub-contractor has been approved in writing by the Engineer based upon adherence to the qualifications listed herein.

B. The Contractor shall maintain a fully equipped, factory certified service organization capable of providing full maintenance and service of the installed system within 24 hours. This facility shall be available for inspection by the Engineer.

C. The Contractor shall employ factory trained service personnel for the service and maintenance of the system.

D. The Contractor shall have had a minimum of 1 year experience with the specified CCTV system. This experience shall include having completed a minimum of 2 installations in the past 12 months of similar size and scope. The Contractor shall provide references and contact information for the project sites in which the qualifying installations occurred.

1.5 Shop Drawings - Submit shop drawings including product data sheets and wiring diagrams per requirements in the General Conditions including the following:

A. A complete list of materials with model and part numbers and references to the Part 2 specification paragraph numbers.

B. Manufacturers Data Sheets of all products and cabling, specific to the project. Data sheets shall show the exact parts, with model numbers and options as required and clearly identified.

C. Qualifications

1. A statement of contractor's qualifications to verify compliance with other provisions within the specifications, unless the contractor has been pre-approved.

D. Job specific wiring diagrams.

1. This indicates a block diagram that shows all major items of equipment required for the contract project and the actual interconnection that will be installed.
2. Details of interconnection with other systems. Refer to section 28 11 00.

E. Supplier shall provide rack elevations showing the configuration of all rack mounted equipment including detailed interconnection diagrams between equipment

F. 30x42 floor plans at a scale of not less than 1/8 inch =1 foot-0 inches showing the location of all items of equipment. Drawings shall also indicate each location where electrical power is required, and the specific configuration of that power connection (voltage, plug type, mounting height, etc.)

G. Software data – The data package shall consist of manufacturer's data sheets of all system and application software being provided with sufficient information to verify that all specified features and functions are being addressed.

H. Submittals that do not contain all the required information will be REJECTED unless prior approval for partial submittals has been approved.

PART 2 - PRODUCTS

2.1 Product Equivalency

A. Where products are listed with multiple manufacturers, these manufacturers will be approved as equals if all specified features are provided. Any equipment not specifically approved in writing prior to the bid date will not be considered regardless of qualifications. Failure to provide the "precise functional equivalent" shall result in the removal of the alternate equipment at the Contractor's expense.

B. Different manufacturers may require various options, accessories, converters, patch cables, etc. to perform the specified features and functions. Therefore, all material and/or equipment necessary for proper operation of the system shall be deemed part of these specifications.

C. This specification is intended to establish a carefully planned minimum level of quality and performance for all components, and will be rigorously enforced by Owner. Acceptable manufacturers of components described herein are listed within the specific product section.

2.2 Cameras

A. The following sub-paragraphs define the basic camera/lens/housing types and minimum performance specifications that must be met by the selected products. The contract documents indicate which of these features/functions/housings/etc. must be included with each specific camera.

B. IP based, IPv6 compliant, Cameras shall be Open Network Video Interface Forum (ONVIF) compliant:
   1. Profile S – For streaming video, Streaming and Configuration
   2. Profile C - For IP-based basic access control, Site information and configuration, Event and alarm management, , Door access control.
   3. Profile G - For edge storage and retrieval, Configure, request and control recording, Receive audio and metadata stream.
   4. Profile Q - For quick installation, Easy setup, Discovery, configuration and control of conformant devices
   5. Profile A -For broader access control configuration, Granting/revoking credentials, Creating schedules, Assigning access rules.
   6. Profile T -For advanced video streaming, H.264 / H.265 video compression, Imaging settings, Motion alarm and tampering events.

C. Camera shall have removable media storage provisions comprised of purpose built minimum micro SDHC/SDXC cards slots that have been optimized for 24/7 video storage and retrieval with ext4 file system, 20MBs read/write speed, up to 128GB capacity.

D. Environment

   1. Exterior Domes – Housing shall be IP66/outdoor rated.
   2. Interior Domes – Housings shall be heavy duty and shall utilize smoked polycarbonate domes. Unless otherwise noted, all interior cameras shall be unitized domes.
   3. Vandal Resistant – Housings shall utilize all vandal/tamper resistant hardware and impact resistant polycarbonate domes.

E. Mounting

   1. Surface – Wall. Unit shall mount on directly on wall surface/utilizing a wall mounted arm to a recessed electrical outlet box as indicated on the drawings.
   2. Surface - Ceiling. Unit shall mount on surface of ceiling to either an electrical outlet box or directly on the ceiling surface as indicated on the drawings.
   3. Recessed – Ceiling. Unit shall mount recessed in an accessible ceiling via the use of ceiling grid support hardware or shall be recessed directly into a fixed ceiling system with appropriate hardware.

F. CODEC
   1. Compression
      a. Up to 8MP - MJPEG, H.264.
      b. 4K and above - MJPEG, H.264, H.265, proprietary dynamic compression.
   2. Streams – Minimum 3 streams, each at full resolution.

G. Connectivity

   1. IP Cameras – Camera to utilize integral NIC for 100MBs minimum Ethernet connection.

H. Power

   1. IP - Interior cameras to utilize IEEE 802.3af Power over Ethernet (PoE).
   2. Exterior pole mounted cameras to be provided with local 120V power supplies.
   3. All exterior cameras to be provided with surge arrestors on the power/signaling cabling.

2.3 Camera Hardware

A. Dual Head Ceiling Mounted Indoor Camera – Type “IA”
   1. Image Sensor: 1/2.8” progressive scan CMOS
   2. Max Apeture: F1.6

3. Horizontal Field of View:
   a. Wide: 96 Degrees
   b. Tele: 40 Degrees
4. Vertical Field of View
   a. Wide: 70 Degrees
   b. Tele: 30 Degrees
5. Image Sensor Resolution: 3 MP
6. Imaging Area: 5.18 mm x 3.89 mm
7. Aspect Ratio: 4:3, 16:9
8. Maximum Streaming Resolutions – By Sensor:
   a. Primary (4:3): 2048x1536
   b. Primary (16:9): 2048x1152
   c. Secondary (4:3): 1760x1320
   d. Secondary (16:9): 1920x1080
9. Lens Focal Length:
   a. Wide: 3.24mm
   b. Tele: 7.33mm
10. IR Illumination: 30 m
11. Minimum Illumination Without IR:
    a. Monochrome: 0 lux
    b. Color: 0.0005 lux in Monochrome Mode, 0.02 lux in Color Mode
12. Streaming Protocol/Image Compression Method: H.264, H.265, Motion JPEG

B. Multi Head Ceiling Mounted Indoor Camera – Type “IB” and “ID”
1. Image Sensor: 1/2.8” progressive scan CMOS
2. Apeture Range: F1.5-F1.9
3. Horizontal Field of View: 53-99 Degrees
4. Vertical Field of View: 29-69 Degrees
5. Image Sensor Resolution: 3 MP
6. Aspect Ratio: 4:3, 16:9
7. Active Pixels – By Sensor:
   a. 4:3 Aspect Ratio: 2048x1536
   b. 16:9 Aspect Ratio: 1920x1080
8. IR Illumination: 30 m
9. Minimum Illumination Without IR:
   a. Monochrome: 0.018 lux
   b. Color: 0.02 lux in Color Mode
10. Streaming Protocol/Image Compression Method: H.264, H.265, Motion JPEG
    a. Refer to Plans for number of image sensors needed per camera location

C. Single Sensor Wall Mounted Indoor Camera – Type “IC”
1. Image Sensor: 1/1.8” progressive scan CMOS
2. Apeture Range: F1.3
3. Horizontal Field of View: 47-111 Degrees
4. Vertical Field of View: 26-57 Degrees
5. Image Sensor Resolution: 4 MP
6. Aspect Ratio: 4:3, 16:9
7. Active Pixels – By Sensor:
   a. 4:3 Aspect Ratio: 1984x1488
   b. 16:9 Aspect Ratio: 2688x1520
8. IR Illumination:
   a. 50 m – Full Wide
   b. 25 m - Tele
9. Minimum Illumination Without IR:
   a. Monochrome: 0.003 lux
   b. Color: 0.008 lux in Color Mode
10. Streaming Protocol/Image Compression Method: H.264, H.265, Motion JPEG

a. Refer to Plans for number of image sensors needed per camera location

2.4 Distribution Equipment

A. Fiber Converters

1. Fiber Transmitter and Receiver (Ethernet) – Unit IP full duplex, 10/100 ethernet conversion from UTP to fiber optics over standard multimode fiber optic cable (1310 nm wavelength, 20dB power budget) up to distances of 1KM.
2. Unit in building shall be rack mount chassis, modular with integrated low voltage power supply. Provide quantity of IP converters as required to serve exterior pole mounted cameras.
3. Unit at lighting pole shall be rated for outdoor use and shall be installed in pole base or supplemental pull box provided by this contractor as required. Provide mounting kits and remote low voltage power supplies as required.
4. Provide all required fiber optic and copper jumpers to patch units into fiber backbone and local camera for a complete and operational system.

2.5 CCTV Data/Video Cabling

A. Refer to section 27 15 13 Communications Copper Horizontal Cabling.

2.6 Power Wiring – The following cable types are approved for use. The Contractor shall be responsible for selecting the proper wire type for the installation conditions with regards to codes, environment and signal quality.

A. Indoor Power Cable - Provide plenum 1-pair power cable from each camera to remote power supply as required by camera power draw and voltage drop calculations.

B. All outdoor power cables shall be transitioned to indoor rated, plenum rated cable upon entrance to building. Transition point shall include all required lightning and grounding protection as required by NEC and the manufacturer.

C. Cable as manufactured by WestPenn, Belden, or CommScope.

2.7 Low Voltage Camera Power Supplies – The following power supplies are listed for use. It shall be the contractor's responsibility to provide all operating power for all cameras regardless of voltage, current and distance requirements.

A. Multi-camera 120V to 24VAC, 60Hz power supply with individual 1.85A max current, self-resetting overcurrent on each circuit. Provide quantity of units in each building as required by quantity of cameras to be powered. Provide 120V branch circuit and connection to each unit.

B. Multi-camera for outdoor cameras, 120V to 24VAC, 60Hz power supply with high power 4A individual circuits, isolated and fused outputs and built in system surge protection. Provide quantity of units in each building as required by quantity of cameras to be powered. Provide 120V branch circuit and connection to each unit.

C. Individual 120V to 24VAC, 60Hz, 80VA power supply with surge protection and screw terminals for 120V input. Provide unit in junction box above ceiling near camera. Provide 120V branch circuit and connection to unit.

D. Individual 120V to 24VAC, 60Hz, 80VA power supply with screw terminals for 120V input. Provide unit in weatherproof junction box mounted to structure near camera. Provide 120V branch circuit and connection to unit.

E. Where local 120V power is provided and transformed at individual cameras, provide line isolation transformers to prevent noise and interference due to ground loops, unbalanced voltages, etc.

F. Power supplies as manufactured by Altronix, Pelco or Preferred Power Products.

2.8 Network Electronics – Refer to 27 21 00 Network Electronics

2.9 Cable Management System

A. Provide pre-manufactured cable supports. Cable supports shall be secured to building structure through threaded rod, beam clamps or other UL approved supports as required by site conditions. Components shall provide a minimum cable support point spacing of 48 inches.

B. Cable management devices must be sized to accommodate 100 percent spare capacity of the final installed cable base.

C. Cable management system shall be secured to building structure utilizing manufactured approved methods and hardware.

D. Cable management system support components shall be designed with wide support surfaces that do not cause cables to be bent, crushed or otherwise deformed when installed within component loading parameters. Cable management system shall meet UL standards and be UL labeled. Utilizing elements of the building's structure such as beams, joists, etc. to hang cable from will not be acceptable.

E. Bridle rings shall not be acceptable.

F. Manufactured by Panduit, Caddy, Mineralac or B-Line.

PART 3 - EXECUTION

3.1 General Installation

A. Install systems in accordance with UL, NEC and all other applicable codes. Install system to comply with drawings and final shop drawings in compliance with manufacturer instructions. Provide all required hardware and labor for rack mounting of head-end system components.

B. Refer to plans for locations and quantities of equipment. Equipment locations shown on plans will be required to be field coordinated to ensure proper system operation. The contractor shall provide adequate costs in the bid to locate interior cameras within 10 feet in any direction of the location indicated on the bid drawings. Exact location of each camera shall be coordinated with the owner in the field prior to installation. This coordination shall include a site survey with the owner in which the use of a field of view comparator is employed.

C. No items of equipment shall be installed in such a manner as to void or reduce the proper operating characteristics of individual components or of the system. Camera placement shall be coordinated with glass and exterior exposures to reduce or eliminate the requirement for sever back light compensation.

D. Perform all work under the on-site supervision of a factory authorized trained technician. It shall be the responsibility of the technician to check, inspect and adjust this installation to the engineer's and owner approval. A CSR of the installing contractor or manufacturer shall train the owner's personnel on the proper operation and maintenance of the equipment. Perform all work in conjunction with this installation in accordance with good engineering practices as established by NEC.

E. Camera Mounts: The Contractor shall install the camera mounts as specified by the manufacturer and as shown; provide mounting hardware sized appropriately to secure the mount, camera and housing, provide electrical and signal transmission cabling to the mount location as specified.

F. Cameras: The Contractor shall install the cameras with power and signal lines to the camera; aim camera to give field of view as required by owner.

G. Monitors: The Contractor shall install the monitors as shown and specified; connect all signal inputs and outputs as shown and specified; terminate video input signals as required; and connect the monitor to AC power and video distribution equipment.

H. Video Recording Equipment: The Contractor shall install the video recording equipment as shown and as specified by the manufacturer; connect video signal inputs and outputs as shown and specified; connect alarm signal inputs and outputs as shown and specified; and connect video recording equipment to AC power.

I. Delivery of all loose equipment which is to be turned over to owner shall be carefully coordinated and scheduled with owner prior to shipment

3.2 Wiring Installation

A. CCTV wiring shall be furnished and installed in accordance with manufacturer's recommendations in compliance with all Local, State and National codes. This contract shall be responsible for furnishing and installing all required cabling between components to form a complete and operational system meeting all the requirements of this specifications.

B. Provide firestop material and seal all cable penetrations in the building.

C. All wiring between devices shall be run open wired above accessible ceilings. Where existing cable management systems are in place and there is adequate capacity to install the CCTV wiring, the contractor may utilize these pathways providing they have coordinated with all other wiring contractor on site. Where multiple runs are required all cables shall be bundled with approved cable ties on four foot centers.

D. Where pathways do not exist for SMS wiring, this contract shall be responsible for providing all required cable management systems such as J-hooks to support communications cabling to meet building codes and manufacturer’s recommendations.

E. Cables shall not be laid upon ceilings or supported in a manner that would violate any codes or standards.

F. All cabling installed in ceiling spaces that are used for air distribution plenums shall be UL plenum rated.

G. All control and signal cable shall be installed continuous and without splices. Provide appropriate connectors or pre-manufactured cables for each application.

3.3 Telecommunications Rooms

A. The lay-out of the telecommunications rooms as depicted on the drawings shall be utilized as a general guide for bidding purposes. The final room layout shall be carefully coordinated with input from the owner and from other trades with equipment and/or cabinets to be placed in the room. Final configuration of telecom rooms shall be submitted to Engineer as a coordination drawing with information from all other trades occupying the same room for review prior to permanent mounting of equipment or termination of cabling.

B. Coordinate lay-out of telecom rooms to avoid placing telecommunications equipment and cabinets under water piping (other than sprinkler heads) or HVAC units.

C. Coordinate lay-out of telecom rooms with electrical plans and locations of electrical outlets.

D. Lay-out of telecommunications equipment cabinets and racks shall provide a minimum of 36 inches isle in front and behind equipment racks and cabinets which is clear of obstructions or equipment protrusions.

E. Coordinate rack locations and orientation to maintain required clearances including any equipment depths that may have to be accounted for. Some equipment, such as UPS units may have special mounting requirements that need additional coordination.

3.4 Grounding

A. The installing contractor shall be responsible for ensuring the grounding integrity of all installed equipment to eliminate the potential for equipment or personnel hazards due to improperly or inadequately grounded systems.

B. All grounding and bonding shall be in conformance with the National Electric Code, article 250 and as recommended by EIA/TIA-607.

C. The Division 16 Contractor has provided 120V branch circuitry for use by the CCTV system contractor. The branch circuitry is run with a dedicated equipment grounding conductor which shall be utilized by the CCTV system equipment. In no case shall the CCTV system installation compromise the integrity of the Building Electrical Grounding System.

3.5 Programming

A. It is the Contractor's responsibility to program the system in this section according to the Owner's wishes. This involves camera labeling, camera operation sequences, camera and recorder schedules, etc. The Contractor shall meet with the Owner and/or Engineer and reach agreement on the programming. This programming agreement shall then be written out in detail and forwarded to the Engineer for approval. After approval is granted, proceed with final programming.

B. Each building shall have the following minimum programming:

1. Camera labels programmed in each NVS/NVR.
2. Camera record rates based upon TOD schedules, alarm events, motion events.
3. Camera motion detection recording based upon TOD schedules. Motion detection scene masking.
4. PTZ cameras – Home position, tours, alarm pre-sets.
5. Camera username/password changed from the default to owner selected.

C. Additional programming at each building shall include set-up of graphical floor plans with interactive camera icons for all cameras local to that building. District NOC shall include set-up of graphical floor plans with interactive camera icons for all sites.

D. Set-up of passwords and a minimum of four (4) user access levels including assignment of specific privileges for each user access level.

3.6 Identification/Labeling

A. Contractor shall identify all major items of equipment and tag all cables with permanent type markers to denote equipment served. Cables shall be tagged at both ends and at each point where the cable is administered.

B. The contractor shall be responsible for generating and programming the labeling for camera information within the recorder software.

C. All labeling and recording shall be approved by the Owner and the Engineer prior to application.

3.7 Site Testing

A. General: The Contractor shall provide all personnel, equipment, instrumentation, and supplies necessary to perform all site testing. The Owner will witness all performance verification.

B. Contractor's Field Testing: The contractor shall place the entire system into operation and shall field verify that all aspects of the CCTV system including camera video, recording schedules, alarm events, GUI operation, System administration, etc. At the completion of testing, the contractor shall produce a written document indicating successful system testing.

C. Performance Verification Test: The Contractor shall demonstrate to the owner that all aspects, features and functions of the completed CCTV system comply with the contract requirements. The performance verification test, as specified, shall not be started until receipt by the Contractor of written permission from the Owner, based on the Contractor's Field Testing sign-off. The Owner may terminate testing at any time when the system fails to perform as specified.

3.8 Training Requirements

A. Provide the owner with a minimum of ~~24~~ ***40*** hours of training designed to make all users familiar with the operation of the system.

1. The Contractor shall conduct training courses for designated personnel in the maintenance and operation of the CCTV system as specified. The training shall be oriented to the specific system being installed under this contract. Training manuals shall be delivered for each trainee with two additional manuals delivered for archiving at the project site. The Contractor is responsible for furnishing all audio-visual equipment and all other training materials and supplies. A training day is Monday through Friday, during normal working hours for the trained staff at the facility. Approval of the planned training schedule shall be obtained from the Owner at least 14 days prior to the training.
2. The course shall be taught at the project site only after successful completion of the Contractor's Performance Verification Testing. No part of the training given during this course will be counted toward completion of the performance verification test. The course shall consist of classroom instruction, hands-on training, instruction on the specific hardware configuration of the installed system, and specific instructions for operating the installed system. The course shall demonstrate system start up, system operation, system shutdown, system recovery after a failure, the specific hardware configuration, and operation of the system and its software. The Contractor shall prepare and insert additional training material in the training manuals when the need for additional material becomes apparent during instruction. The course shall include:
    a. General CCTV hardware, installed system architecture and configuration.
    b. Functional operation of the installed system and software.
    c. Operator commands.
    d. Fault diagnostics and correction.
    e. General system maintenance.
    f. Replacement of failed components and integration of replacement components into the operating CCTV system.
3. Provide all training and utilize specified manuals and record documentation. All training shall be provided at the project site and coordinated with the Owner.

B. Training shall utilize the equipment provided at the project site. Coordinate use, time and availability of equipment with the Owner.

C. Demonstrate adjustment, operation and maintenance of the system including each component and control.

D. This training period shall be scheduled with the Owner after the successful completion of the system. Training plan, time line, and agenda shall be provided to District IT personnel and signed off by District and Contractor.

E. Provide owner with a digital video copy of all training.

F. Training to occur in 2 (or 4) hour increments.

G. Training to be completed by a certified manufacturer instructor.

3.9 As Built Documentation

A. Copies of all approved shop drawings with the Engineer's stamp.

B. Owner's manuals for every item of equipment when available from the manufacturer. These shall be the technical manuals provided by the manufacturer and shall not consist of generic sales brochures. Technical manuals shall provide complete specifications for the equipment as well as complete operating, maintenance, troubleshooting and product repair/replacement information. Where available only in electronic format, the contractor may provide a CD with electronic versions of Owner's manuals. CDs containing electronic versions of owner's manuals must contain the proper software viewers for each document type.

1. Interior Camera assembly including housing and lens
2. Exterior Camera Assembly including housing and lens.
3. Each type of camera power supply
4. Camera recorder
5. Racks/Cabinets
6. System Software.

C. Technology floor plan/site drawings updated with final as-Built information. This shall be in the form of a complete set of Technology drawings with as-built information indicated in colored pen based upon actual field conditions.

D. System schematic and block diagrams for every system updated with final as-built information. These drawings shall define the exact arrangement of each system including wiring configuration, device locations and cable types.

E. Rack elevations for all systems with rack mounted equipment.

F. Provide statement of warranty.

3.10 Warranty

A. Warrant all workmanship, equipment, material and software entering into this contract for a period of three (3) years from the date of final acceptance or date of beneficial use, as agreed to between Contractor and Architect. Any materials or equipment proving to be defective during the warranty period shall be made good without expense to the Owner. Provide statement of this warranty with the O&M manuals.

B. During the first year's warranted operation, the Contractor shall perform two inspections at 6-month intervals or less. This work shall be performed during regular working hours, Monday through Friday, excluding legal holidays. These inspections shall include:

1. Visual checks and operational test of the multiplexer, peripheral equipment, interface panels, recording devices, monitors, video equipment electrical and mechanical controls, and a check of the picture quality from each camera.
2. Correct all diagnosed problems.
3. Resolve any previous outstanding problems.

C. Make available a service contract offering continuing factory authorized service of this system after the initial warranty period.

D. The Contractor shall be responsible to provide service during normal working hours within (4) hours after notification by the Owner for normal service or within (2) hours for emergency service. Emergency service is defined as the loss of 25 percent or more of system component operation, or the

loss of the video switcher or other head-end equipment. Provide an on-site authorized factory technician within 24 hours if required.

3.11 Certification

A. Upon completion of the testing, the manufacturer or representative shall issue to the Owner a letter of certification attesting to the fact that he has tested and adjusted the system, that all components are properly installed and free of defects, and that the system is in compliance with this specification

END OF SECTION

SECTION 28 46 13.02 – CONVENTIONAL FIRE-ALARM SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Section 26 05 00.45, “Testing and Inspecting Services for Electrical.”

B. Section 26 05 00.78, “Closeout Submittals for Electrical.”

C. Section 28 05 00.78, “Closeout Submittals for Electronic Safety and Security.”

D. Section 28 05 00.33, “Shop Drawing Submittals for Electronic Safety and Security.”

1.2 DESCRIPTION

A. Relocate existing conventional zoned fire-alarm control panel, as shown on the Drawings.

B. New components and installation shall be compatible with the existing FIRE-LITE MS-10UD-7 fire alarm control panel.

C. Software and Programming: Contractor and Manufacturer shall provide any software and field-programming time required to provide a fully operational fire alarm system.

D. Provide cellular communicator and remove analog phone line.

E. Work Not Included: Fire Suppression

F. Work shall include the following work:
1. Provide sprinkler waterflow switches.
2. Provide exterior electric sprinkler alarm bell.

1.3 QUALITY ASSURANCE

A. Standards:
1. American National Standards Institute (ANSI) EIA-485.
2. Americans with Disabilities Act (ADA) Accessibility Guidelines.
3. National Electrical Manufacturers Association (NEMA).
4. National Fire Protection Association (NFPA):
   a. 2023 NFPA 70, “National Electrical Code® (NEC),” Article 760.
   b. 2022 NFPA 72, “National Fire Alarm and Signaling Code,” Chapter 7.
   c. 2023 NFPA 262, “Standard Method of Test for Flame Travel and Smoke of Wires and Cables for Use in Air-Handling Spaces.”
5. Underwriters Laboratories, Inc. (UL)
   a. UL 268, “Standard for Smoke Detectors”
   b. UL 864, “Standard for Safety for Control Units and Accessories for Fire Alarm Systems.”
6. Ohio Administrative Code (OAC): OAC 1301:7-7: 2024 Ohio Fire Code.

B. Entire installation shall comply with the above NFPA Standards, as well as with the requirements of the AHJ.

C. Contractor Certification:
1. Contractor shall be specifically licensed by the AHJ to install all fire alarm panels, initiating devices, wiring, etc., required for this Project.
2. Only licensed and certified Fire Alarm Installers shall perform fire alarm Work.

1.4 SUBMITTALS

A. Prior to installation of system, submit (2) sets of the following for preliminary review by the A/E:
   1. Riser diagram of system showing all equipment, interconnecting field wiring requirements, and wire specifications.
   2. Equipment cut sheets.
   3. Battery calculations.
   4. Other information required by the AHJ.

B. Submit stamped and signed fire alarm drawings, battery calculations, and equipment cut sheets from a certified fire alarm designer for final approval to the AHJ.

C. Refer to Section 28 05 00.33 “Shop Drawing Log” for additional requirements.

PART 2 - PRODUCTS

2.1 ALARM CONTROL PANEL

A. The existing FIRE-LITE MS-10UD-7 fire alarm control panel shall remain but be relocated.

B. Provide output relays to control elevator recall.

C. Provide sufficient 120-volt power to operate all smoke dampers and fire doors that are to close upon receipt of any building alarm.

2.2 INITIATING AND ALARM-SIGNALING (NOTIFICATION) DEVICES

ITEM	**HONEYWELL MODEL NO.**
15 Degree F. Rate of Rise and 135 Degree F. Fixed Heat Detectors	
Photoelectric Ceiling Smoke Detectors with 135 Degree F. Heat Element and Base	
Multi-Candela Audio/Visual Alarm Horn/Strobes (ADA)	
Multi-Candela Visual Alarm Strobes (ADA)	

A. Strobes in large open areas shall be a minimum of 110 candelas. All other visual alarm strobes shall be a minimum of 15 candelas.

B. **ALL** visual alarm strobes shall be synchronized. Provide module and wiring to existing alarm control panel.

2.3 CENTRAL MONITORING SERVICE

A. Arrange for cellular monitoring by the Central Monitoring Service.

B. The Owner will pay for monitoring service charges.

2.4 POWER SUPPLIES

A. Provide as required to power devices, including audible and/or visual notification appliances.

2.5 WIRING AND CABLE

A. Acceptable Manufacturers: Belden or approved equal by Anixter or West Penn Wire Co.

B. Furnish only wire recommended by the Fire Alarm System Manufacturer.

C. Power-limited, solid or stranded (7-strand minimum) copper, twisted, shielded or unshielded, color-coded 300-volt vinyl insulation, red vinyl jacket, 2023 NFPA 262-listed, plenum-rated.

D. All wire and cable shall be UL-listed and UL-labeled in accordance with 2023 NEC Article 760.

E. Program cellular communicator required for Central Monitoring Service.

2.6 SMOKE DAMPER CONTROL

A. Provide 120-volt power to operate all smoke dampers that are to close upon receipt of an alarm.

PART 3 - EXECUTION

3.1 PHASING OF FIRE ALARM SYSTEM WORK

A. The combined fire alarm system coverage shall conform to all State and Local Code requirements. Coordinate phasing of changeover with the Owner, A/E, and AHJ.

B. New zones shall be tested and made operational, and approval obtained, as each building area is completed and occupied.

C. **SHUTDOWN OF EXISTING SERVICES: AT NO TIME SHALL THE OWNER'S PROPERTY BE LEFT UNPROTECTED BY EITHER THE EXISTING OR NEW FIRE ALARM SYSTEM. DO NOT DISCONNECT OR SHUT DOWN ANY PART OF THE EXISTING FIRE ALARM SYSTEM WITHOUT PRIOR WRITTEN PERMISSION OF THE OWNER AND A/E. NOTIFY ALL PARTIES THAT MIGHT BE AFFECTED.**

3.2 ZONE SCHEDULE

A. Update the existing Zone Schedule.

3.3 INSTALLATION

A. Make final connection to equipment and devices under the direct supervision of a Representative of the Fire Alarm Manufacturer.

3.4 ALARM CONTROL PANEL

A. Wire digital alarm communicator transmitter (DACT) to dual-path fire alarm cellular and IP LTE communicator.

B. Install control panels with top mounted at 6 ft. - 0 in. above finished floor

3.5 INITIATING AND ALARM DEVICES

A. Update existing building floor plan indicating what each zone covers and all initiating devices. Enclose building floor plan in a mitered wood frame with a clear Lexan cover panel and removable back; install on wall adjacent to alarm control panel and remote annunciator panel. Coordinate size of enclosure with the A/E.

B. Alarm Devices:
   1. Mount all alarm-indicating devices with the bottom 80 in. above finished floor, or 6 in. below the ceiling, whichever is lower from the ceiling.
   2. Identify devices with nomenclature as directed by the Owner.

C. Detectors:
   1. Heat detectors: Coordinate the location of all ceiling heat detectors with the Architectural Reflected Ceiling Plan, sprinklers, grilles, registers, diffusers, luminaires, lighting controls, speakers, and other ceiling-mounted items.
   2. Smoke detectors: Provide ceiling smoke detectors, relays, and wiring to the fire alarm system for elevator recall as required.
      a. Ceiling smoke detectors:
         1) Coordinate all locations with the Architectural Reflected Ceiling Plan, sprinklers, grilles, registers, diffusers, luminaires, lighting controls, speakers, and other ceiling-mounted items.
         2) Install a minimum of 3 ft. away from air supply outlets.

D. Unless otherwise approved by the A/E, label all initiating devices (, heat detectors, smoke detectors, etc.) with laminated plastic nameplates so that each device's number is legible from the floor.

3.6 WIRING AND CABLE

A. Follow the wiring instructions and drawings of the Manufacturer. File with the Owner a complete digest of the wiring by its assigned purpose in the system.

B. Provide a drawing showing the conduit layout of the system, so service or future expansion of the system can be accomplished with minimum of retrofitting.

C. Install **ALL** wiring, **INCLUDING PLENUM-RATED WIRING,** in conduit.
   1. **Option:** Contractor may use red conduit for fire alarm wiring.

D. Terminate all wires with ring or split terminal crimp on connectors.

E. Wire manual and automatic alarm-initiating stations in parallel with #14 AWG wire.

F. Fire Suppression Equipment:
   1. Sprinkler alarm panel and electric alarm signals: Provide wiring.
   2. Wire all sprinkler valve supervisory (tamper) switches to trouble input modules.
   3. Confirm number and location of all sprinkler waterflow, pressure, and tamper switches with the Fire Suppression Work.

3.7 SMOKE DAMPER CONTROL

A. Provide 120-volt power to operate all smoke dampers that are to close upon receipt of an alarm.

B. Provide sufficient 24-volt transformer kVA capacity and relays for disconnecting power and to close all smoke dampers.

C. Each smoke damper shall be closed by a duct smoke detector having auxiliary contacts. Provide power for damper operation.

3.8 ELEVATOR CONTROL SEQUENCE

A. Heat Detectors: Detectors, located within 2 ft. of sprinklers in the elevator machine room and in the elevator shaft, shall be wired to the alarm control panel and to a shunt-trip disconnect to shut off power to the elevator controller whenever any heat detector is activated, and prior to activation of sprinkler. Coordinate with the Fire Suppression Work.

B. Smoke Detectors: Elevator machine room, elevator shaft, and elevator lobby smoke detectors shall be wired to the alarm control panel. Additional detector contacts shall energize the elevator controller to run the elevator to the primary floor. If smoke is

detected at the primary floor, the elevator shall discharge passengers at the secondary floor if approved by the AHJ.

C. Fireman's key system, provided as part of the Elevator Work, shall then permit firefighters to take over control of the elevators.

3.9 SEQUENCE OF OPERATION

A. Upon activation or operation of any (existing) sprinkler flow switch, manual pull station, or fire alarm detection device, the existing fire alarm system shall indicate the alarm and zone of alarm on the existing alarm control panel and (existing) remote annunciator, and shall initiate the following sequence of events:
   1. Existing Audible alarm devices shall sound, and visual alarm devices shall flash, throughout the building.
   2. The elevator shall be recalled.
   3. On the floor of the alarm only, each smoke damper shall close when its smoke detector is activated.
   4. Remote annunciator shall indicate zone in alarm.
   5. Existing digital communicator shall call the Central Monitoring Service.

B. Operation of the silence switch shall stop the sounding of existing audible alarm devices and the flashing of existing visual alarm strobes. All indicator lights on the existing)alarm control panel shall remain illuminated until the manual pull station or detection device and the existing alarm control panel are reset by authorized personnel.

C. A trouble buzzer and the associated indicator lamps on the existing alarm control panel shall be activated upon any derangement of the panel, wiring, or connected devices or upon loss of communications. A trouble indication shall be provided for each initiation circuit. Operation of the trouble silence switch shall stop the sounding of the trouble buzzer. All trouble indicator lights shall remain illuminated until all trouble conditions have been cleared. Upon failure of AC input power, the fire alarm system shall automatically transfer to battery power and indicate the "ON BATTERY" condition at the (existing) alarm control panel both visually and audibly.

3.10 TESTING AND QUALITY CONTROL

A. Operate each initiating device and verify the operation and reporting of each device, including remote signaling of alarm. Arrange to have all testing witnessed and approved by the AHJ.

B. Inspect, test, and make final power connections to the system to maintain Manufacturer's warranties. Test and adjust the system under the supervision of Manufacturer's Representative.

C. At the completion of the installation, test and demonstrate the system in accordance with 2022 NFPA 72 and Local Fire Department requirements, under the supervision of a Manufacturer's factory technician, in the presence of the Owner and A/E's Representative, and as follows:
   1. Demonstrate that the complete system is free from grounds, opens, and short circuits.
   2. Perform tests to indicate that **ALL** alarm initiating devices and supervisory devices are operating normally and that all alarm and trouble signals are transmitted to the existing alarm control panel, existing remote annunciator, and reported to the Central Monitoring Station.

3. Perform airflow, fault, and sensitivity tests on the completed, installed system. Perform time delay tests for detector response using a strip chart recorder. Adjust the time delay settings to avoid unwanted alarms. Document all tests.
4. Perform tests on system response to verify it is within the specified range. Correct any problems and repeat tests.

D. Refer to Section 26 05 00.45 for additional requirements.

3.11 SYSTEM RESPONSIBILITY

A. Certify that the system was installed and wired in full accordance with the Drawings and Specifications and with the wiring diagrams and written instructions furnished by the Fire Alarm System Manufacturer.

END OF SECTION 28 46 13.02

LIMITED ASBESTOS CONTAINING MATERIALS INSPECTION REPORT

Mount Gilead Exempted Village School District
District Office Building
145 North Cherry Street
Mount Gilead, Ohio 43338

(L&A Project 26-0195)

Prepared for:

Mr. Larry Rancour
Vice President, Project Executive
Schorr Architects, Inc.
230 Bradenton Avenue
Dublin, Ohio 43017
(614) 798-2096

Prepared by:

Lawhon & Associates, Inc.
1441 King Ave
Columbus, Ohio 43212
(614) 481-8600

June 15, 2026

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Section 4.1 Asbestos Containing Materials

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Limited Asbestos Containing Materials Inspection Report
Mount Gilead Exempted Village School District Office Building
145 North Cherry Street, Mt. Gilead, Ohio 43338

1.0 Introduction

Lawhon & Associates, Inc. (L&A) conducted a limited asbestos containing materials inspection at the Mount Gilead Exempted Village School District Office Building, located at 145 North Cherry Street, Mount Gilead, Ohio 43338. The inspection was conducted on My 28, 2026, by Mr. Jordan Mederer Ohio Environmental Protection Agency (OEPA) Certified Asbestos Hazard Evaluation Specialist (CAHES) [AHES #ES35005], and Mr. Austin Coldren, (AHES #548697) of L&A. The consultant's certifications are attached in **Appendix A**.

The inspection was limited to materials projected to impacted by the upcoming second floor window replacement and elevator installation project. L&A utilized historical sampling data from the report titled "Asbestos Hazard Evaluation" dated March 22, 2024, attached in **Appendix F.** L&A inspected all accessible materials (for the presence of asbestos containing materials) associated with second floor window systems and elevator installation throughout the renovation areas outlined in the Program Verification dated January 16, 2026. This report should not be utilized as full building assessments. This report conforms to the EPA NESHAPs regulations prior to renovation for this project.

2.0 Asbestos Containing Material Summaries

Asbestos containing materials are governed by the Environmental Protection Agency's (EPA) National Emission Standards of Hazardous Air Pollutants (NESHAP) during a renovation. These materials are defined as containing greater than one percent asbestos. The Occupational Safety and Health Administration (OSHA) govern building materials containing any amount of asbestos.

The Clean Air Act (CAA) of 1970 required the EPA to develop and enforce regulations to protect the general public from exposure to airborne contaminants that are known to be hazardous to human health; therefore, EPA promulgated the National Emission Standards for Hazardous Air Pollutants (NESHAP) (Title 40, CFR Part 61) on April 6, 1973. NESHAP is intended to minimize the release of asbestos fibers during certain activities (i.e., renovations, demolition, and installations). It specifies work practices to be followed during renovations of buildings (except apartment buildings that have no more than four dwelling units), which contain a specific amount of friable asbestos. NESHAP requires that buildings be inspected for asbestos containing building materials (ACBM) prior to renovation/demolition projects regardless of the age of the structure.

NESHAP also requires owners and operators subject to the asbestos rules to notify delegated state and local agencies and/or the regional EPA offices before demolition or renovation activities begin. In addition, NESHAP requires the removal of all regulated asbestos containing materials (RACM) prior to demolition. Regulated Asbestos-Containing Materials (RACM) are (a) friable asbestos material, which are materials easily reduced to powder with hand pressure (b) Category I non-friable ACM that has become friable, (c) Category I non-friable ACM that will be or has been subjected to sanding, grinding, cutting or abrading, or (d) Category II non-friable ACM that has a high probability of becoming or has become crumbled, pulverized, or reduced to powder by the forces expected to act on the material in the course of demolition or renovation operations. (Category I non-friable materials consist of materials such as resilient floor

covering products, roofing products, gaskets, and packing. Category II non-friable materials consist of all other non-friable materials such as transite.). NESHAP also requires all ACM (including Category I and II) be removed prior to intentional burning, such as for a fire department training exercise.

The Ohio Environmental Protection Agency (EPA) regulates asbestos activities within the state. Professionals performing asbestos related activities must be certified/ licensed by OEPA.

2.1 Methodology

A list of suspect ACMs was compiled from the investigation of the building. Materials were categorized into RACM, Category I, and Category II materials. L&A inventoried and procured confirmatory samples of suspect asbestos containing materials.

Materials suspected of containing asbestos were grouped into homogeneous areas for bulk sampling purposes. A homogeneous area is composed of specific material that appears to be the same in color, texture, date of installation or location (e.g., grey spray-applied fireproofing in a specific construction unit).

The number of bulk samples to be procured for each identified homogeneous area of suspected Surfacing Materials, Thermal System Insulations, and Miscellaneous Materials were determined in accordance with 40 CFR 763.

Specifically, Friable and Nonfriable Surfacing Materials (i.e., fireproofing, acoustical plaster, decorative plaster, hard plaster, and textured coatings) were sampled following the guidelines set forth by the USEPA in the document "Asbestos in Buildings - Simplified Sampling Scheme Friable Surfacing Materials." Based upon the square footage of the homogenous surfacing materials, either a minimum of 3, 5, or 7 bulk samples were randomly procured and analyzed. For Thermal System Insulation (TSI), at least 3 random samples of each homogeneous area of TSI were procured and analyzed and 1 sample of patched TSI if it was <6 linear or square feet. For Miscellaneous Materials (MM), at least 2 random samples of each homogeneous area of MM were procured and analyzed.

Bulk sample locations for suspect materials sampled by L&A, and the name and signature and asbestos hazard evaluation specialist number of each person who collected samples are shown on the Asbestos Bulk Sample Diagram found in **Appendix B**.

Samples were placed into clean sealed containers and identified with a unique sample number. Sampling tools were decontaminated between each sampling episode.

All samples were sent to certified National Voluntary Lab Accredited Program laboratories. The lab utilized for bulk sample Polarized Light Microscopy (PLM) analysis for this assessment was SanAir Technologies Laboratory, SATL (NVLAP #600227-0) located at 11709 Chesterdale Road, Cincinnati, OH 45246. Samples were analyzed by the EPA Polarized Light Microscopy (PLM) 600 Method. Samples reported with low concentrations of asbestos, <3% asbestos content, were reanalyzed using the EPA Point Count Method to more accurately determine content.

3.0 Asbestos Containing Materials Summaries

The following tables present ACM summaries. A site diagram depicting bulk sample locations can be found in **Appendix B.**. A bulk sample summary form summarizing the asbestos bulk samples collected and analyzed is attached in **Appendix C**. An inventory of ACM projected to be impacted or included in the scope of work can be found in **Appendix D** Laboratory analysis certificates and chain of custody information can be found in **Appendix E.**

3.1 Confirmed Asbestos Containing Materials

The following is a list of materials projected to be impacted by the renovation project confirmed to contain asbestos:

Confirmed Asbestos Containing Material	
Acoustical Ceiling Plaster (1) (4)	Exterior Window Caulk (2)
9” Floor Tile and Associated Mastic Presumed Beneath Linoleum and Casework (3) (4)	

Notes: (1) RACM
(2) Category II Non-Friable ACM
(3) Category I Non-Friable ACM
(4) Previously sampled in historical report dated March 22, 2024.

3.2 Assumed Asbestos Containing Materials

The following is a list of materials which were assumed to contain asbestos. Any Materials not listed in this report or in the historical report dated March 22, 2024, should be assumed to contain asbestos and remain undisturbed until further testing proves otherwise.

Assumed Asbestos Containing Materials
Grey Sink Undercoating (1)

Notes: (1) Category II Non-Friable ACM

3.3 Non-Asbestos Containing Materials

The following table lists materials sampled with laboratory analysis revealing no asbestos detected. If any additional suspect materials not listed in this table or already confirmed or assumed to contain asbestos are identified, those materials must be assumed to contain asbestos until further analysis proves otherwise.

Non-Asbestos Containing Material	
Window Glazing Compound	Hard Plaster Systems (1)

Notes: (1) Previously sampled in historical report dated March 22, 2024.

4.0 Conclusions

Lawhon & Associates, Inc. (L&A) conducted a limited asbestos containing materials inspection at the Mount Gilead Exempted Village School District Office Building located at 145 Cherry Street, Mount Gilead, Ohio 43338. The inspection was conducted on May 28, 2026, by Mr. Jordan Mederer and Mr. Austin Coldren.

The inspection was limited to materials projected to be impacted by the second floor window replacement and elevator installation for the upcoming renovation. L&A inspected all accessible materials associated with second floor window systems and elevator installation for the presence of asbestos containing materials throughout the replacement areas indicated in the Program Verification dated January 16, 2026. L&A utilized historical sampling data from the report titled “Asbestos Hazard Evaluation”, dated March 22, 2024. This report should not be utilized as full building assessments. This report conforms to the EPA NESHAPs regulations prior to renovation for this project.

4.1 Asbestos Containing Materials

As a result of the limited asbestos containing materials survey conducted on May 28, 2026, at the Mount Gilead Exempted Village School District Office Building, the following suspect materials are confirmed and/or assumed to be asbestos containing and projected to be impacted by the project. These materials must be removed by an OEPA licensed asbestos abatement contractor prior to impact by renovation activities. Encountered materials not listed in this report or in the historical report dated March 22, 2024, should be assumed to be asbestos containing until further analysis proves otherwise.

- Acoustical Ceiling Plaster – RACM
- Exterior Window Caulking – Category II Non-Friable ACM
- Grey Sink Undercoating (Assumed) – Category II Non-Friable ACM
- 9” Floor Tile and Associated Mastic Presumed Beneath Linoleum and Casework (Assumed) – Category I Non-Friable ACM

This report conforms to the EPA NESHAPs requirements prior to renovation. If you have any questions, please contact Jordan Mederer at (614) 481-8600.

Sincerely,

Austin Coldren
Environmental Technician

Jordan Mederer
Practice leader, HBM

APPENDIX A

Inspector's Certifications

7/14/2025

Jordan Mederer
Lawhon & Associates, Inc.
1441 King Avenue
Columbus, OH 43212

RE: Evaluation Specialist
Certification Number: ES35005
Expiration Date: 8/8/2026

Dear Jordan Mederer:

This letter and enclosed certification card approves your request to be certified as an asbestos Evaluation Specialist. You must present your card upon request at any project site while performing duties. Copies of cards are not acceptable as proof of certification.

This certification may be revoked by the Director of the Ohio Environmental Protection Agency (EPA) for violation of any of the requirements of 3745-22 or 3745-20 of the Ohio Administrative Code.

If you have any questions, please contact the Asbestos Program at 614-644-0226 or by email at asbestoslicensing@epa.ohio.gov.

Sincerely,

Brandon M. Schwendeman

Brandon Schwendeman
Manager, Business Operations Support Section
Ohio EPA - Division of Air Pollution Control

The InService Training Network

Asbestos Building Inspector and Management Planner Refresher Courses

Jordan Mederer

has successfully completed the Asbestos Building Inspector and Management Planner Refresher Courses and passed by at least 70% the course examinations for accreditation under Section 206 of the Toxic Substance Control Act, Title II, and Indiana 326 IAC 18-2
Provided by: The InService Training Network, Inc., 705D Lakeview Plaza Blvd, Worthington, OH 43085 (614) 436-0980

Course Dates: **April 15, 2026**

Examination Date: **April 15, 2026**

Course Director: Kurt Varg

Course Location: **Worthington, Ohio**

Expiration Date: **April 15, 2027**

Certificate Numbers: **ITNIR7933 & ITNMPR7933**

6/1/2026

Austin Coldren
Lawhon & Associates, Inc.
1441 King Avenue
Columbus, OH 43212

RE: Evaluation Specialist
Certification Number: ES548697
Expiration Date: 5/30/2027

Dear Austin Coldren:

This letter and enclosed certification card approves your request to be certified as an asbestos Evaluation Specialist. You must present your card upon request at any project site while performing duties. Copies of cards are not acceptable as proof of certification.

This certification may be revoked by the Director of the Ohio Environmental Protection Agency (EPA) for violation of any of the requirements of 3745-22 or 3745-20 of the Ohio Administrative Code.

If you have any questions, please contact the Asbestos Program at 614-644-0226 or by email at asbestoslicensing@epa.ohio.gov.

Sincerely,

Brandon M. Schwendeman

Brandon Schwendeman
Manager, Business Operations Support Section
Ohio EPA - Division of Air Pollution Control

State of Ohio
Environmental Protection Agency
Asbestos Program

Asbestos Hazard Evaluation Specialist

Austin
Coldren

Lawhon & Associates, Inc.
1441 King Avenue
Columbus OH 43212

DOB: 2/21/98

Certification Number	Expiration Date
ES548697	5/30/27

Card not Valid if Altered

The InService Training Network

Asbestos Building Inspector and Management Planner Refresher Courses

Austin Coldren

has successfully completed the Asbestos Building Inspector and Management Planner Refresher Courses and passed by at least 70% the course examinations for accreditation under Section 206 of the Toxic Substance Control Act, Title II, and Indiana 326 IAC 18-2
Provided by: The InService Training Network, Inc., 705D Lakeview Plaza Blvd, Worthington, OH 43085 (614) 436-0980

Course Dates: March 4, 2026

Examination Date: March 4, 2026

Course Director: Kurt Varg

Course Location: Columbus, Ohio

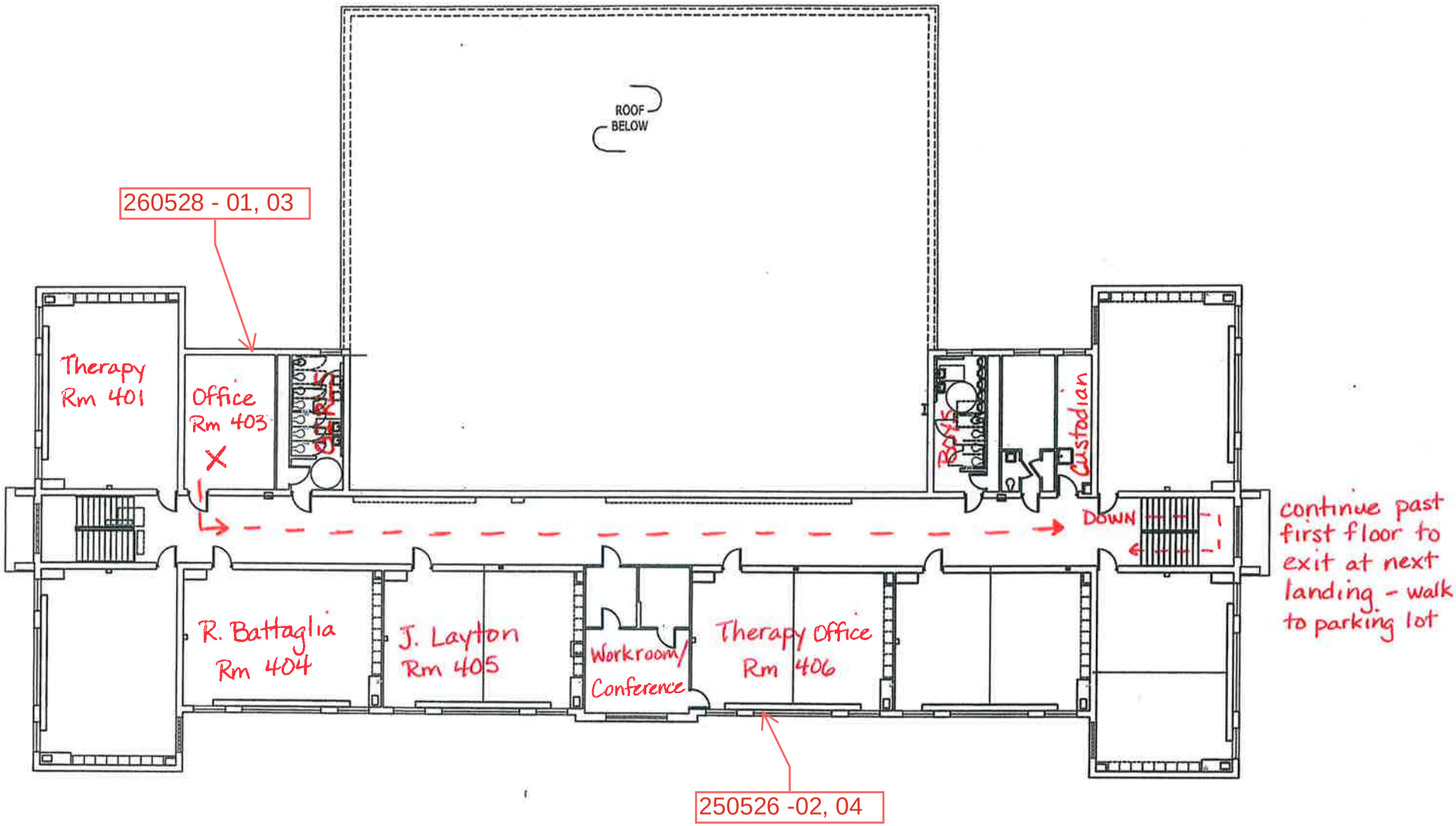
Expiration Date: March 4, 2027

Certificate Numbers: ITNIR7919 & ITNMPR7919

APPENDIX B

Asbestos Bulk Sample Location Diagram

In Case of Fire, exit as directed below in an orderly manner



N

SECOND FLOOR PLAN

1/16" = 1'-0"

Asbestos Bulk Sample Location Diagram
Collected on May 28, 2026
Collected by:

Jordan Mederer, AHES 35005

Austin Coldren, AHES 548697

APPENDIX C

Asbestos Bulk Sample Summary

BULK SAMPLE SUMMARY
Mount Gilead Exempted Village School District Office Building
145 North Cherry Street, Mt. Gilead, Ohio 43338

Sample Number	Hom. Area #	Material Sampled	Sample Location	Percent Asbestos
260528 – 01	1	Window Glazing Compound	406	NAD
260528 – 02	1	Window Glazing Compound	403	NAD
260528 – 03	**2**	**Exterior Window Caulk**	**406**	**NAD**
260528 – 04	**2**	**Exterior Window Caulk**	**403**	**4.4% Chrysotile (PC)**

Bold text denotes an Asbestos Containing Material; as defined by EPA and OSHA

Italic Text denotes an Material Containing Less than 1% Asbestos; for OSHA only

Legend

Abbreviation:	**Definition:**
PC	Point Count Method Performed
NAD	No Asbestos Detected

APPENDIX D

Inventory of Asbestos Containing Materials

INVENTORY OF ASBESTOS CONTAINING MATERIALS
Mount Gilead Exempted Village School District Office Building
145 North Cherry Street, Mt. Gilead, Ohio 43338

ACM	Locations	Approximate Quantity (1)	EPA NESHAP Classification & Comments
Acoustical Ceiling Plaster	Stairwell (Ceiling of 1st Floor)	400 square feet	RACM
Exterior Window Caulk	Second Floor Classroom Windows	195 square feet (Approximately 51 Windows)	Category II Non-Friable
Grey Sink Undercoating (Assumed)	Second Floor Classrooms (1 Per Classroom)	Approximately 9 Each	Category II Non-Friable
9" Floor Tile and Associated Mastic (Assumed)	Beneath Linoleum and Casework Room 405 (2)	25 square feet	Category I Non-Friable

Notes: (1) Approximate quantities are only for what was visually observed in the locations assessed. These materials may be in other areas of the building. These materials must be treated as ACM anywhere they are encountered in the building.

(2) ACM flooring may be present beneath all casework throughout the second floor.

APPENDIX E

Asbestos Laboratory Analysis Certificates

&

Chain of Custody

SanAir Technologies Laboratory

The Identification Specialists

Analysis Report prepared for Lawhon & Associates, Inc.

Report Date: 6/4/2026

Project Name: Mt Gilead Admin Bldg Wdws

Project #: 26-0195

SanAir ID#: 26031609

NVLAP TESTING

NVLAP LAB CODE 600227-0

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

SanAir Technologies Laboratory

SanAir ID Number
26031609
FINAL REPORT
6/4/2026 3:46:32 PM

Name: Lawhon & Associates, Inc.
Address: 1441 King Ave
Columbus, OH 43212
Phone: 614-481-8600 ext. 142

Project Number: 26-0195
P.O. Number:
Project Name: Mt Gilead Admin Bldg Wdws
Collected Date: 5/28/2026
Received Date: 6/1/2026 10:05:00 AM

Dear Jordan Mederer,

We at SanAir would like to thank you for the work you recently submitted. The 4 sample(s) were received on Monday, June 01, 2026 via FedEx. The final report(s) is enclosed for the following sample(s): 260528-01, 260528-02, 260528-03, 260528-04.

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:
- 4 samples in Good condition.

SanAir Technologies Laboratory

SanAir ID Number
26031609
FINAL REPORT
6/4/2026 3:46:32 PM

Name: Lawhon & Associates, Inc.
Address: 1441 King Ave
Columbus, OH 43212
Phone: 614-481-8600 ext. 142

Project Number: 26-0195
P.O. Number:
Project Name: Mt Gilead Admin Bldg Wdws
Collected Date: 5/28/2026
Received Date: 6/1/2026 10:05:00 AM

Analyst: Graham, Daniel

Asbestos Bulk PLM EPA 600/R-93/116

	Stereoscopic	Components		
SanAir ID / Description	Appearance	% Fibrous	% Non-fibrous	Asbestos Fibers
260528-01 / 26031609-001 WGC, 406	White Non-Fibrous Homogeneous		100% Other	None Detected
260528-02 / 26031609-002 WGC, 403	White Non-Fibrous Homogeneous		100% Other	None Detected
260528-03 / 26031609-003 WC, 406	Grey Non-Fibrous Homogeneous		100% Other	None Detected
260528-04 / 26031609-004 WC, 403	Grey Non-Fibrous Homogeneous		98% Other	2% Chrysotile

Analyst:

Analysis Date: 6/1/2026

Approved Signatory:

Date: 6/4/2026

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

Lawhon & Associates, Inc.

1441 King Avenue
Columbus, OH 43212
Phone: (614) 481-8600
Fax: (614) 481-8610

SanAir ID Number
26031609

Received by RB on 6/1/26 at 10:05 AM
Page 1 of 1

Sent To: SanAir

VIA: FEDEx

No. 6517

Page 1 of 1

Date: 5-28-26

Turn around: 3-day

ASBESTOS BULK SAMPLE CHAIN-OF-CUSTODY RECORD

Project Name:	Project No.:	Project Contact:	Sampler (print):	Signature
Mt. Gilead Admin Bldg Wdws	26-0197	Jordan Medevar	Austin Coldren	

Sample I.D. No.	Homog. Area No.	Sample /Homogeneous Area Description	Sample Location	Remarks
260528-01	1	WGC	406	
-02	1	〃	403	
-03	2	WC	406	
-05	1	〃	403	

SAMPLE ANALYSIS BY EPA METHOD 600/R-93/116 UNLESS OTHERWISE NOTED.
POINT COUNT FRIABLES AND NOB'S 3% OR LESS ASBESTOS.

☐ Stop 1st Positive ☒ Analyze All Samples

Relinquished by: (signature)	Date / Time	Received by: (signature)	Date / Time	Relinquished by: (signature)	Date / Time	Received by: (signature)	Date / Time
	5-29 1400						

Distributor: White - Lab; Yellow - File

SanAir Technologies Laboratory

The Identification Specialists

Analysis Report prepared for Lawhon & Associates, Inc.

Report Date: 6/8/2026

Project Name: Mt. Gilead Admin Bldg Wdws

Project #: 26-0195

SanAir ID#: 26032752

NVLAP TESTING

NVLAP LAB CODE 600227-0

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

SanAir ID Number
26032752
FINAL REPORT
6/8/2026 1:43:00 PM

Name: Lawhon & Associates, Inc.
Address: 1441 King Ave
Columbus, OH 43212
Phone: 614-481-8600 ext. 142

Project Number: 26-0195
P.O. Number:
Project Name: Mt. Gilead Admin Bldg Wdws
Collected Date: 5/28/2026
Received Date: 6/5/2026 9:00:00 AM

Dear Jordan Mederer,

We at SanAir would like to thank you for the work you recently submitted. The 1 sample(s) were received on Friday, June 05, 2026 via COC further analysis. The final report(s) is enclosed for the following sample(s): 260528-04.

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:
- 1 samples in Good condition.

SanAir Technologies Laboratory

SanAir ID Number
26032752
FINAL REPORT
6/8/2026 1:43:00 PM

Name: Lawhon & Associates, Inc.
Address: 1441 King Ave
Columbus, OH 43212
Phone: 614-481-8600 ext. 142

Project Number: 26-0195
P.O. Number:
Project Name: Mt. Gilead Admin Bldg Wdws
Collected Date: 5/28/2026
Received Date: 6/5/2026 9:00:00 AM

Analyst: Graham, Daniel

Asbestos Bulk EPA PLM NOB EPA 600/R-93/116

SanAir ID / Description	Appearance	% Fibrous	% Non Fibrous	Asbestos Types	% Total Asbestos
26032752-001 / 260528-04 WC, 403	Grey Non-Fibrous Homogeneous		95.6 %	Chrysotile	4.4 %

EPA 400 Point Count with Gravimetric Reduction.

Analyst:
Analysis Date: 6/8/2026

Approved Signatory:
Date: 6/8/2026

Disclaimer and Additional Information:
Method for the Determination of Asbestos in Bulk Building Materials
EPA 600/R-93/116 July 1993 PLM EPA NOB

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. When the client requires samples to be tested that deviates from a specific method or condition, all reported results may be affected by the deviation. Where noted on the COC, 400 point count with gravimetric reduction was employed with this analysis. 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. Samples are held for a period of 60 days.

Revision#02, 6/21/2024

Lawhon & Associates, Inc.

1441 King Avenue
Columbus, OH 43212
Phone: (614) 481-8600
Fax: (614) 481-8610

Rev SanAir ID Number
26031609
Received by RB on 6/1/26 at 10:05 AM
Page 1 of 1

NOB 26032752

Sent To: SanAir
VIA: FEDEx

No. 6517

Page 1 of 1

Date: 5-28-26

Turn around: 3-day

ASBESTOS BULK SAMPLE CHAIN-OF-CUSTODY RECORD

Project Name:	Project No.:	Project Contact:	Sampler (print):	Signature
Mt. Gilead Admin Bldg Wdws	26-0197	Jordan Medrer	Austin Cochren	

Sample I.D. No.	Homog. Area No.	Sample /Homogeneous Area Description	Sample Location	Remarks
260528-01	1	WGC	406	
-02	1	1	403	
-03	2	WC	406	
-05	2	1	403	

SAMPLE ANALYSIS BY EPA METHOD 600/R-93/116 UNLESS OTHERWISE NOTED.
POINT COUNT FRIABLES AND NOB'S 3% OR LESS ASBESTOS.

☐ Stop 1st Positive ☒ Analyze All Samples

Relinquished by: (signature)	Date / Time	Received by: (signature)	Date / Time	Relinquished by: (signature)	Date / Time	Received by: (signature)	Date / Time
[signature]	5-29 1400						

Distributor: White - Lab; Yellow - File

United States Department of Commerce
National Institute of Standards and Technology

Certificate of Accreditation to ISO/IEC 17025:2017

NVLAP LAB CODE: 600227-0

SanAir Technologies Laboratory, Inc.

Cincinnati, OH

is accredited by the National Voluntary Laboratory Accreditation Program for specific services, listed on the Scope of Accreditation, for:

Asbestos Fiber Analysis

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2017. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (refer to joint ISO-ILAC-IAF Communique on ISO/IEC 17025).

2026-01-01 through 2026-12-31

Effective Dates

For the National Voluntary Laboratory Accreditation Program

National Voluntary Laboratory Accreditation Program

SCOPE OF ACCREDITATION TO ISO/IEC 17025:2017

SanAir Technologies Laboratory, Inc.
11709 Chesterdale Road
Cincinnati, OH 45246
Maureen Haley
Phone: 513-438-6006 X301
Email: mhaley@sanair.com
www.sanair.com

ASBESTOS FIBER ANALYSIS **NVLAP LAB CODE 600227-0**

Bulk Asbestos Analysis

Code	*Description*
18/A01	EPA -- 40 CFR Appendix E to Subpart E of Part 763, Interim Method of the Determination of Asbestos in Bulk Insulation Samples
18/A03	EPA 600/R-93/116: Method for the Determination of Asbestos in Bulk Building Materials

Airborne Asbestos Analysis

Code	*Description*
18/A02	U.S. EPA's "Interim Transmission Electron Microscopy Analytical Methods-Mandatory and Nonmandatory-and Mandatory Section to Determine Completion of Response Actions" as found in 40 CFR, Part 763, Subpart E, Appendix A.

For the National Voluntary Laboratory Accreditation Program

APPENDIX F

Historical Data

Asbestos Hazard Evaluation

OF

145 N. Cherry St.,
Mt. Gilead, OH 43338

TKEC PROJECT #24714 F

BY

TURN-KEY ENVIRONMENTAL CONSULTANTS, INC.

31 South Main Street, Suite 214
DAYTON, OHIO 45402
(937) 335-8807

March 22, 2024

Contents

EXECUTIVE SUMMARY 4
DESCRIPTION OF BUILDING SURVEY AND SAMPLING METHODOLOGY 5
RESULTS 6
RECOMMENDATIONS 10

Attachments

Attachment 1: Bulk Sample Log
Attachment 2: Bulk Sample Data Summary
Attachment 3: Laboratory Report
Attachment 4: Site Sketch and Photographs
Attachment 5: Asbestos Hazard Evaluation Specialist Certificates
Attachment 6: OEPA 10-Day Notification Form and Instructions

Turn-Key Environmental Consultants, Inc.
790 Barnhart Rd. 31 South Main St. STE 214, Phone: 937-335-8807
Troy, OH 45373 Dayton, OH 45402 Fax: 937-339-4882

March 22, 2024

Mr. Tom Mignery
Burges & Niple, Inc.
330 Russh Alley, Suite 700
Columbus, Ohio 43215

RE: Pre-renovation Asbestos Hazard Evaluation for the Property located at 145 N. Cherry St., Mt. Gilead, OH.
TKEC Project# 24714 F

Dear Mr. Mignery:

Turn-Key Environmental Consultants, Inc. (TKEC) conducted asbestos sampling of the structure located at 145 N. Cherry St., Mt. Gilead, Ohio (subject property). The purpose of the visit was to perform an Asbestos Hazard Evaluation of the structure to identify asbestos containing materials (ACMs) prior to renovation and/or demolition activities being performed. Please let our team know if you have any questions regarding this report.

Thank you,

Linda Treasure

Linda Treasure
President
Turn-Key Environmental Consultants, Inc.
tkec@turn-keyenvironmental.com
(937)-335-8807

EXECUTIVE SUMMARY

On March 14, 2024, Mr. Jonathan Treasure (Ohio EPA Certified Asbestos Hazard Evaluation Specialist (AHES) No. ES36341) of Turn-Key Environmental Consultants, Inc. (TKEC) performed a comprehensive asbestos inspection of the subject property. Fifty-one (51) samples of suspect materials were collected from the residential structure. The samples were shipped overnight to an accredited laboratory for analysis. The samples were analyzed by method EPA 600/R-93, M-4/82-020 (PLM). Some of the samples were comprised of layers which resulted in the analysis of a total of seventy-six (76) samples.

The structure contained >5,000 SF of smooth plaster/skim coat on the walls and >5,000 SF of smooth plaster/skim coat on the ceilings. This Category 2 Friable material was represented by seven (7) randomly located samples on the walls and seven (7) randomly located samples on the ceilings. These samples did not contain asbestos.

The structure contained approximately 17,000 SF of acoustical plaster on the ceilings of the first and second floor. This material was represented by seven (7) randomly located samples on the first and second floor ceilings. This material contained 20% Chrysotile asbestos.

*Occupancy of the structure limited the ability to sample all flooring types on the first and second floors.

*Roofing materials are assumed ACM.

Laboratory analysis indicated that thirty-one (31) samples contained 1% or greater asbestos:

Basement/Crawl Space

- **Small Diameter TSI**
- **Medium Diameter TSI**
- **Large Diameter TSI**
- **Small Diameter TSI Fittings**
- **Medium Diam TSI Fittings**
- **Large Diameter TSI Fittings**
- **Floor Tile/Mastic**
- **TSI Debris in Crawl Space**

1st/2nd Floor

- **Acoustical Plaster**
- **Medium Diameter TSI**
- **Green 9” Floor Tile**
- **Brown 9” Floor Tile**

Site Information:

Property Address	145 N. Cherry St., Mt. Gilead, OH
Property Owner	Mt Gilead Ex Village Schools
Property Owner Address	145.5 N. Cherry St., Mt. Gilead, OH 43338
Building Type	Commercial
Construction Type	Frame

DESCRIPTION OF BUILDING SURVEY AND SAMPLING METHODOLOGY

A room-by-room inspection of the house was performed, and homogenous materials were identified. Sampling locations were determined in a statistically random manner for surfacing materials, or randomly distributed manner for thermal system insulation that is representative of the homogeneous area. Each bulk sample was collected using cleaned hand tools and placed in a clean, zip-lock plastic bag and labeled with a unique sample identification number. Pertinent information was recorded on a Bulk Sample Log Sheet, including sample identification number, date of collection, name of inspector, building name, a brief description and location of the sample, and the type of material sampled (e.g. thermal insulation, fireproofing, acoustical plaster). The samples were shipped via overnight courier to Hayes Microbial Consulting, an accredited and recognized laboratory under the National Voluntary Laboratory Accreditation Program (NVLAP) and analyzed for asbestos content by polarized-light microscopy (PLM) and dispersion staining (Method Reference: EPA 600/R-93, M-4/82-020 (PLM). This analytical method, which the EPA currently recommends for the determination of asbestos in bulk samples of suspect material can be used for qualitative identification of six (6) morphologically different types of asbestos fibers: chrysotile, amosite, crocidolite, anthophyllite, tremolite and actinolite asbestos.

The method specifies that the asbestos content in a bulk sample shall be estimated and reported as a finite percentage (rounded to the nearest percentage) within the range of 0 to 100. The result of the bulk sample analysis is reported in a standard written laboratory report. This report includes the clients name, the project number, the laboratory identification number, the sample number assigned to the bulk sample upon receipt at the laboratory, and the field number assigned to the bulk sample upon collection. If the bulk sample contains more than one distinct layer of material, each layer is analyzed separately. The composition of the bulk sample is reported in percentages of asbestos and non-asbestos components. A summary of the bulk samples collected from this structure is included in Attachment 1, Table 1 – Bulk Sample Log.

RESULTS

TKEC collected samples from wall and ceiling systems, flooring materials, roofing materials, duct insulation, blown-in insulation and window glaze. Analytical results confirmed that the following sampled suspect asbestos-containing building materials contain asbestos.

Basement

- Three (3) samples of small diameter TSI, representing approximately 800 LF of a Category 2 Friable material.
- Three (3) samples of medium diameter TSI, representing approximately 600 LF of a Category 2 Friable material.
- Three (3) samples of large diameter TSI, representing approximately 350 LF of a Category 2 Friable material.
- Three (3) samples of small diameter TSI fittings, representing approximately 60 fittings of a Category 2 Friable material.
- Three (3) samples of medium diameter TSI fittings, representing approximately 30 fittings of a Category 2 Friable material.
- Three (3) samples of large diameter TSI fittings, representing approximately 10 fittings of a Category 2 Friable material.
- TSI Debris in crawl space of basement representing approximately 750 SF of a Category 2 Friable material.
- Two (2) samples of floor tile, representing approximately 10,500 SF of a Category 1 non-friable material.

1st/2nd Floor

- Seven (7) samples of acoustic plaster on the first and second floors, representing approximately 17,000 SF of a Category 2 Friable material.
- Three (3) samples of medium diameter TSI, representing approximately 600 LF of a Category 2 Friable material.

- Two (2) samples of green 9" floor tile on the first floor, representing approximately 100 SF of a Category 1 non-friable material.

- Two (2) samples of brown 9" floor tile on the second floor, representing approximately 500 SF of a Category 1 non-friable material.

A summary of the results of the sample analyses can be found in Attachment 2, Table 2 – Bulk Sample Data Summary. Table 2 also contains the locations, condition, amount, NESHAP category and type of ACM identified in the structure.

A copy of the laboratory report for this structure is included in Attachment 3. A site sketch that illustrates the approximate sample locations is included in Attachment 4. Photographs of representative sample locations and an overall structural summary is also included in Attachment 4.

RECOMMENDATIONS

Based on the findings of this asbestos survey and NESHAP regulations, the following recommendations are presented for consideration:

1. Advance notification must be provided to the Ohio EPA at least ten (10) working days prior to the start of abatement activities.

2. The fact that asbestos containing materials were observed in or on the building should be noted on the demolition notification form along with the name and certification number of the inspector Mr. Jonathan Treasure (Ohio EPA Certified Asbestos Hazard Evaluation Specialist # ES36341).

TKEC made every effort to locate suspect ACM that may be concealed; however, suspect ACM which may be located behind hard plaster walls or ceilings, hard walled chases, under flooring or subflooring, etc., were not assessed or quantified. If through demolition suspect materials are discovered, they should be documented and handled appropriately.

This report is prepared to assist the client, construction managers and asbestos abatement contractors in locating ACMs. This report is not intended to be used as a bidding document or project specifications.

Attached are the following TKEC documents: 1) Table I – Bulk Sample Log; 2) Table 2 – Bulk Sample Data Summary; 3) Laboratory Report; 4) Building Sketch/Photographs; 5) Inspector's Certification; and 6) OEPA 10-Day Notification and Instructions. If we can be of further assistance on this or other projects, do not hesitate to call us at (937) 335-8807.

Respectfully submitted,
TURN-KEY ENVIRONMENTAL CONSULTANTS, INC.

Jonathan Treasure
Sr. Project Manager
OEPA AHES, No. ES36341
Exp. Date 8/8/2024

Kennon Burroughs
OEPA Asbestos Hazard Evaluation Specialist
No. ES546185, Exp. Date 1/20/2025

Attachment 1

Bulk Sample Log

ASBESTOS BULK SAMPLE LOG
Project - 145 N. Cherry St., Mt. Gilead, OH

TKEC Project: 24714 F

Sample #	Date	Color	Type	Location	Collected By
1-1	3/14/24	grey	Small Diameter TSI run	Caf.	
1-2		"	"	Kitchen storage	
1-3		"	"	Kitchen Storage	
2-1		"	Mid Diameter TSI run	Caf.	
2-2		"	"	Caf.	
2-3		"	"	Kitchen	
3-1		"	large Diameter TSI run	Kitchen	
3-2		"	"	Kitchen storage	
3-3		"	"	Basement Hall	
4-1		"	Small Diameter TSI fitting	Caf.	
4-2		"	"	Basement Hall	
4-3		"	"	Caf.	
5-1		"	Mid Diameter TSI fitting	Caf.	
5-2		"	"	Caf.	
5-3		"	"	Caf.	
6-1		"	Large Diameter Fitting	Kitchen	
6-2		"	"	Basement Hall	
6-3		"	"	"	
7-1		white/grey	2 layers Floor tile/mastic	Caf.	
7-2		"	"	"	

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SHIP: FEDEX - PAK SO
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ASBESTOS

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SHIP: FEDEX - PAK SO
DATE: 03-18-2024

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ASBESTOS
24011405

ASBESTOS BULK SAMPLE LOG
Project - 145 N. Cherry St., Mt. Gilead, OH

TKEC Project: 24714 F

Sample #	Date	Color	Type	Location	Collected By
8-1	3/14/24	white	Smooth Plaster/SC - ceiling	Kitchen	
8-2				Basement Hall	
8-3				Girls locker Bath	
8-4				1st Floor Maintenance	
8-5				Womans Bath 2nd Floor	
8-6				Mens Bath Second floor	
8-7				2nd Floor Custodian	
9-1			Plaster/Skim Coat - walls	South Stairs	
9-2				Center stairs	
9-3				2nd floor storage	
9-4				Therapy Rm 401	
9-5				Women Bath 2nd Floor	
9-6				Rm 405	
9-7				2nd Floor central storage	
10-1		white	Acoustical Plaster	mens Bath 1st Floor	
10-2				Maintenace staff storage	
10-3				Central Stair	
10-4				2nd Floor Storage	
10-5				~~Rm 405~~ Therapy Rm 401	
10-6				Rm 405	
10-7				2nd Floor central storage	

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JM 3/18/24

N FEDEX - PAK SO
DATE: 03-18-2024
8178 9251 2291

ASBESTOS
24011405

ASBESTOS BULK SAMPLE LOG
Project - 145 N. Cherry St., Mt. Gilead

TKEC Project: 24714 F

Sample #	Date	Color	Type	Location	Collected By
11-1		green	9" Floor tile/Mastic	Storage Bath	
11-2		"	"	"	
12-1		Cream	12" Floor tile/Mastic	Therapy RM 401	
12-2		"	"	"	
13-1		white	window glaze	"	
13-2		"	"	"	
14-1		yellow	Carpet Mastic	"	
14-2		"	"	"	
15-1		Brown	9" floor tile/Mastic	RM 408	
15-2			"	"	

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Attachment 2

Bulk Sample Data Summary

145 N. Cherry St., Mt. Gilead, OH

Pre-Demolition Asbestos Survey

Table 2 - Bulk Sample PLM Data Summary

TKEC Project: 24714 F

Homogeneous Area						Quantity & Condition			
Bulk Sample No.	Sample Description /Location	Material	Color	NSHAP Category	ACM Type	Good	Fair	Poor	Asbestos Content
1-1	Gray | Small Diameter TSI Run | Caf.	Insulation	Gray	Cat 2 Friable	TSI		800 LF		40% Chrysotile
1-2	Gray | Small Diameter TSI Run | Kitchen Storage	Insulation	Gray						(Not Analyzed, Positive Stop)
1-3	Gray | Small Diameter TSI Run | Kitchen Storage	Insulation	Gray						(Not Analyzed, Positive Stop)
2-1	Gray | Mid Diameter TSI Run | Caf.	Insulation	Gray	Cat 2 Friable	TSI		1200 LF		40% Chrysotile
2-2	Gray | Mid Diameter TSI Run | Caf.	Insulation	Gray						(Not Analyzed, Positive Stop)
2-3	Gray | Mid Diameter TSI Run | Kitchen	Insulation	Gray						(Not Analyzed, Positive Stop)
3-1	Gray | Large Diameter TSI Run | Kitchen	Insulation	Gray	Cat 2 Friable	TSI		350 LF		40% Chrysotile
3-2	Gray | Large Diameter TSI Run | Kitchen Storage	Insulation	Gray						(Not Analyzed, Positive Stop)
3-3	Gray | Large Diameter TSI Run | Basement Hall	Insulation	Gray						(Not Analyzed, Positive Stop)
4-1	Gray | Small Diameter TSI Fitting | Caf.	Insulation	Gray	Cat 2 Friable	TSI		60 fittings		55% Chrysotile
4-2	Gray | Small Diameter TSI Fitting | Basement Hall	Insulation	Gray						(Not Analyzed, Positive Stop)
4-3	Gray | Small Diameter TSI Fitting | Caf.	Insulation	Gray						(Not Analyzed, Positive Stop)

145 N. Cherry St., Mt. Gilead, OH

Pre-Demolition Asbestos Survey

Table 2 - Bulk Sample PLM Data Summary

TKEC Project: 24714 F

Homogeneous Area						Quantity & Condition			
Bulk Sample No.	Sample Description /Location	Material	Color	NSHAP Category	ACM Type	Good	Fair	Poor	Asbestos Content
5-1	**Gray | Mid Diameter TSI Fitting | Caf.**	**Insulation**	**Gray**	**Cat 2 Friable**	**TSI**		**30 fittings**		**55% Chrysotile**
5-2	**Gray | Mid Diameter TSI Fitting | Caf.**	**Insulation**	**Gray**						**(Not Analyzed, Positive Stop)**
5-3	**Gray | Mid Diameter TSI Fitting | Caf.**	**Insulation**	**Gray**						**(Not Analyzed, Positive Stop)**
6-1	**Gray | Large Diameter Fitting | Kitchen**	**Insulation**	**Gray**	**Cat 2 Friable**	**TSI**		**10 fittings**		**55% Chrysotile**
6-2	**Gray | Large Diameter Fitting | Basement Hall**	**Insulation**	**Gray**						**(Not Analyzed, Positive Stop)**
6-3	**Gray | Large Diameter Fitting | Basement Hall**	**Insulation**	**Gray**						**(Not Analyzed, Positive Stop)**
7-1	White/Gray | 2 Layers Floor Tile/Mastic | Caf.	Floor Tile	White	Cat 1 non-Friable	Misc		**10,500 SF**		ND
7-1	White/Gray | 2 Layers Floor Tile/Mastic | Caf.	Adhesive	Yellow						ND
7-1	**White/Gray | 2 Layers Floor Tile/Mastic | Caf.**	**Floor Tile**	**Gray**						**5% Chrysotile**
7-1	White/Gray | 2 Layers Floor Tile/Mastic | Caf.	Mastic	Black						ND
7-2	White/Gray | 2 Layers Floor Tile/Mastic | Caf.	Floor Tile	White						ND
7-2	White/Gray | 2 Layers Floor Tile/Mastic | Caf.	Adhesive	Yellow						ND

145 N. Cherry St., Mt. Gilead, OH

Pre-Demolition Asbestos Survey

Table 2 - Bulk Sample PLM Data Summary

TKEC Project: 24714 F

Homogeneous Area						Quantity & Condition			
Bulk Sample No.	**Sample Description /Location**	**Material**	**Color**	**NSHAP Category**	**ACM Type**	**Good**	**Fair**	**Poor**	**Asbestos Content**
7-2	**White/Gray | 2 Layers Floor Tile/Mastic | Caf.**	**Floor Tile**	**Gray**						**(Not Analyzed, Positive Stop)**
7-2	White/Gray | 2 Layers Floor Tile/Mastic | Caf.	Mastic	Black						ND
8-1	White | Smooth Plaster/SC - Ceiling | Kitchen	Skim Coat	White	Cat 2 Friable	Surf				ND
8-1	White | Smooth Plaster/SC - Ceiling | Kitchen	Rough Coat	Gray						ND
8-2	White | Smooth Plaster/SC - Ceiling | Basement Hall	Skim Coat	White						ND
8-2	White | Smooth Plaster/SC - Ceiling | Basement Hall	Rough Coat	Gray						ND
8-3	White | Smooth Plaster/SC - Ceiling | Girl's Locker Bath	Skim Coat	White						ND
8-3	White | Smooth Plaster/SC - Ceiling | Girl's Locker Bath	Rough Coat	Gray						ND
8-4	White | Smooth Plaster/SC - Ceiling | 1st Floor Maintenance	Skim Coat	White						ND
8-4	White | Smooth Plaster/SC - Ceiling | 1st Floor Maintenance	Rough Coat	Gray						ND
8-5	White | Smooth Plaster/SC - Ceiling | Women's Bath 2nd Fl	Skim Coat	White						ND
8-5	White | Smooth Plaster/SC - Ceiling | Women's Bath 2nd Fl	Rough Coat	Gray						ND

145 N. Cherry St., Mt. Gilead, OH

Pre-Demolition Asbestos Survey

Table 2 - Bulk Sample PLM Data Summary

TKEC Project: 24714 F

Homogeneous Area						Quantity & Condition			
Bulk Sample No.	Sample Description /Location	Material	Color	NSHAP Category	ACM Type	Good	Fair	Poor	Asbestos Content
8-6	White | Smooth Plaster/SC - Ceiling | Men's Bath 2nd Fl	Skim Coat	White						ND
8-6	White | Smooth Plaster/SC - Ceiling | Men's Bath 2nd Fl	Rough Coat	Gray						ND
9-1	White | Plaster/Skim Coat - Walls | South Stairs	Skim Coat	White	Cat 2 Friable	Surf				ND
9-1	White | Plaster/Skim Coat - Walls | South Stairs	Rough Coat	Gray						ND
9-2	White | Plaster/Skim Coat - Walls | Center Stairs	Skim Coat	White						ND
9-2	White | Plaster/Skim Coat - Walls | Center Stairs	Rough Coat	Gray						ND
9-3	White | Plaster/Skim Coat - Walls | 2nd Fl Storage	Skim Coat	White						ND
9-3	White | Plaster/Skim Coat - Walls | 2nd Fl Storage	Rough Coat	Gray						ND
9-4	White | Plaster/Skim Coat - Walls | Therapy Rm 401	Skim Coat	White						ND
9-4	White | Plaster/Skim Coat - Walls | Therapy Rm 401	Rough Coat	Gray						ND
9-5	White | Plaster/Skim Coat - Walls | Women's Bath 2nd Fl	Skim Coat	White						ND
9-5	White | Plaster/Skim Coat - Walls | Women's Bath 2nd Fl	Rough Coat	Gray						ND
9-6	White | Plaster/Skim Coat - Walls | Rm 405	Skim Coat	White						ND

145 N. Cherry St., Mt. Gilead, OH

Pre-Demolition Asbestos Survey

Table 2 - Bulk Sample PLM Data Summary

TKEC Project: 24714 F

Homogeneous Area						Quantity & Condition			
Bulk Sample No.	**Sample Description /Location**	**Material**	**Color**	**NSHAP Category**	**ACM Type**	**Good**	**Fair**	**Poor**	**Asbestos Content**
9-6	White | Plaster/Skim Coat - Walls | Rm 405	Rough Coat	Gray						ND
9-7	White | Plaster/Skim Coat - Walls | 2nd Fl Central Storage	Skim Coat	White						ND
9-7	White | Plaster/Skim Coat - Walls | 2nd Fl Central Storage	Rough Coat	Gray						ND
10-1	**White | Acoustical Plaster | Men's Bath 1st Fl**	**Insulation**	**Cream**	**Cat 2 Friable**	**Surf**		**17,000 SF**		**20% Chrysotile**
10-2	**White | Acoustical Plaster | Maint. Staff Storage**	**Insulation**	**Cream**						**(Not Analyzed, Positive Stop)**
10-3	**White | Acoustical Plaster | Central Stair**	**Insulation**	**Cream**						**(Not Analyzed, Positive Stop)**
10-4	**White | Acoustical Plaster | 2nd Fl Storage**	**Insulation**	**Cream**						**(Not Analyzed, Positive Stop)**
10-5	**White | Acoustical Plaster | Therapy Rm 401**	**Insulation**	**Cream**						**(Not Analyzed, Positive Stop)**
10-6	**White | Acoustical Plaster | Rm 405**	**Insulation**	**Cream**						**(Not Analyzed, Positive Stop)**
10-7	**White | Acoustical Plaster | 2nd Fl Central Storage**	**Insulation**	**Cream**						**(Not Analyzed, Positive Stop)**
11-1	**Green | 9" Floor Tile/Mastic | Storage Bath**	**Floor Tile**	**Green**	**Cat 1 non-Friable**	**Misc**		**500 SF**		**6% Chrysotile**
11-1	Green | 9" Floor Tile/Mastic | Storage Bath	Mastic	Black						ND

145 N. Cherry St., Mt. Gilead, OH

Pre-Demolition Asbestos Survey

Table 2 - Bulk Sample PLM Data Summary

TKEC Project: 24714 F

Homogeneous Area						Quantity & Condition			
Bulk Sample No.	**Sample Description /Location**	**Material**	**Color**	**NSHAP Category**	**ACM Type**	**Good**	**Fair**	**Poor**	**Asbestos Content**
11-2	**Green | 9" Floor Tile/Mastic | Storage Bath**	**Floor Tile**	**Green**						**(Not Analyzed, Positive Stop)**
11-2	Green | 9" Floor Tile/Mastic | Storage Bath	Mastic	Black						ND
12-1	Cream | 12" Floor Tile/Mastic | Therapy Rm 401	Floor Tile	Cream	Cat 1 non-Friable	Misc				ND
12-1	Cream | 12" Floor Tile/Mastic | Therapy Rm 401	Adhesive	Yellow						ND
12-2	Cream | 12" Floor Tile/Mastic | Therapy Rm 401	Floor Tile	Cream						ND
12-2	Cream | 12" Floor Tile/Mastic | Therapy Rm 401	Adhesive	Yellow						ND
13-1	White | Window Glaze | Therapy Rm 401	Glazing	White	Cat 2 non-Friable	Misc				ND
13-2	White | Window Glaze | Therapy Rm 401	Glazing	White						ND
14-1	Yellow | Carpet Mastic | Therapy Rm 401	Carpet	Multi-colored	Cat 1 non-Friable	Misc				ND
14-1	Yellow | Carpet Mastic | Therapy Rm 401	Adhesive	Yellow						ND
14-2	Yellow | Carpet Mastic | Therapy Rm 401	Carpet	Multi-colored						ND
14-2	Yellow | Carpet Mastic | Therapy Rm 401	Adhesive	Yellow						ND
15-1	**Brown | 9" Floor Tile/Mastic | Rm 408**	**Floor Tile**	**Brown**	**Cat 1 non-Friable**	**Misc**		**500 SF**		**5% Chrysotile**

145 N. Cherry St., Mt. Gilead, OH

Pre-Demolition Asbestos Survey

Table 2 - Bulk Sample PLM Data Summary

TKEC Project: 24714 F

Homogeneous Area						Quantity & Condition			
Bulk Sample No.	**Sample Description /Location**	**Material**	**Color**	**NSHAP Category**	**ACM Type**	**Good**	**Fair**	**Poor**	**Asbestos Content**
15-1	Brown | 9" Floor Tile/Mastic | Rm 408	Mastic	Black						ND
15-2	**Brown | 9" Floor Tile/Mastic | Rm 408**	**Floor Tile**	**Brown**						**(Not Analyzed, Positive Stop)**
15-2	Brown | 9" Floor Tile/Mastic | Rm 408	Mastic	Black						ND

Attachment 3

Laboratory Report

HAYES MICROBIAL CONSULTING

#24011405

Analysis Report prepared for

Turn-Key Environmental Consultants

790 Barnhart Road
Troy, OH 45373

Phone: **(937) 335-8807**

24714
145 N Cherry St.

Collected: **March 14, 2024**
Received: **March 18, 2024**
Reported: **March 21, 2024**

We would like to thank you for trusting Hayes Microbial for your analytical needs!
We received 50 samples by FedEx in good condition for this project on March 18th, 2024.

The results in this analysis pertain only to this job, collected on the stated date, and should not be used in the interpretation of any other job. Information supplied by the customer can affect the validity of results. These results apply only to the samples as received. This report may not be duplicated, except in full, without the written consent of Hayes Microbial Consulting, LLC.

All information provided to Hayes Microbial is confidential information relating to our customers and their clients. We will not disclose, copy, or distribute any information verbally or written, except to those designated by the customer(s). We take confidentiality very seriously. No changes to the distribution list will be made without the express consent of the customer.

This laboratory bears no responsibility for sample collection activities, analytical method limitations, or your use of the test results. Interpretation and use of test results are your responsibility. Any reference to health effects or interpretation of mold levels is strictly the opinion of Hayes Microbial. In no event, shall Hayes Microbial or any of its employees be liable for lost profits or any special, incidental or consequential damages arising out of the use of these test results.

Steve Hayes, BSMT(ASCP)
Laboratory Director
Hayes Microbial Consulting, LLC.

EPA Laboratory ID: VA01419

Lab ID: #188863

DPH License: #PH-0198

Jon Treasure
Turn-Key Environmental Consultants
790 Barnhart Road
Troy, OH 45373
(937) 335-8807

24714
145 N Cherry St.

#24011405

Asbestos PLM Bulk

EPA 600/R-93/116; EPA 40 CFR Appendix E to Subpart E of Part 763

#	Sample	Material Description	Non-Fibrous	Non-Asbestos Fibers	Asbestos Fibers
1	1-1 - Gray | Small Diameter TSI Run | Caf.	Homogenous / Insulation / Gray	50%	10% Cellulose Fibers	40% Chrysotile
2	1-2 - Gray | Small Diameter TSI Run | Kitchen Storage	Homogenous / Insulation / Gray			(Not Analyzed, Positive Stop)
3	1-3 - Gray | Small Diameter TSI Run | Kitchen Storage	Homogenous / Insulation / Gray			(Not Analyzed, Positive Stop)
4	2-1 - Gray | Mid Diameter TSI Run | Caf.	Homogenous / Insulation / Gray	50%	10% Cellulose Fibers	40% Chrysotile
5	2-2 - Gray | Mid Diameter TSI Run | Caf.	Homogenous / Insulation / Gray			(Not Analyzed, Positive Stop)
6	2-3 - Gray | Mid Diameter TSI Run | Kitchen	Homogenous / Insulation / Gray			(Not Analyzed, Positive Stop)
7	3-1 - Gray | Large Diameter TSI Run | Kitchen	Homogenous / Insulation / Gray	50%	10% Cellulose Fibers	40% Chrysotile
8	3-2 - Gray | Large Diameter TSI Run | Kitchen Storage	Homogenous / Insulation / Gray			(Not Analyzed, Positive Stop)
9	3-3 - Gray | Large Diameter TSI Run | Basement Hall	Homogenous / Insulation / Gray			(Not Analyzed, Positive Stop)
10	4-1 - Gray | Small Diameter TSI Fitting | Caf.	Homogenous / Insulation / Gray	42%	3% Cellulose Fibers	55% Chrysotile
11	4-2 - Gray | Small Diameter TSI Fitting | Basement Hall	Homogenous / Insulation / Gray			(Not Analyzed, Positive Stop)

Collected: **Mar 14, 2024** Received: **Mar 18, 2024** Reported: **Mar 21, 2024**

Project Analyst: Megan Audia, Megan Audia — Date: **03 - 20 - 2024**

Reviewed By: Brian Keith, — Date: **03 - 21 - 2024**

HAYES MICROBIAL CONSULTING
3005 East Boundary Terrace, Suite F. Midlothian, VA. 23112 (804) 562-3435 contact@hayesmicrobial.com

Jon Treasure
Turn-Key Environmental Consultants
790 Barnhart Road
Troy, OH 45373
(937) 335-8807

24714
145 N Cherry St.

#24011405

Asbestos PLM Bulk

EPA 600/R-93/116; EPA 40 CFR Appendix E to Subpart E of Part 763

#	Sample	Material Description	Non-Fibrous	Non-Asbestos Fibers	Asbestos Fibers
12	4-3 - Gray | Small Diameter TSI Fitting | Caf.	Homogenous / Insulation / Gray			(Not Analyzed, Positive Stop)
13	5-1 - Gray | Mid Diameter TSI Fitting | Caf.	Homogenous / Insulation / Gray	42%	3% Cellulose Fibers	55% Chrysotile
14	5-2 - Gray | Mid Diameter TSI Fitting | Caf.	Homogenous / Insulation / Gray			(Not Analyzed, Positive Stop)
15	5-3 - Gray | Mid Diameter TSI Fitting | Caf.	Homogenous / Insulation / Gray			(Not Analyzed, Positive Stop)
16	6-1 - Gray | Large Diameter Fitting | Kitchen	Homogenous / Insulation / Gray	42%	3% Cellulose Fibers	55% Chrysotile
17	6-2 - Gray | Large Diameter Fitting | Basement Hall	Homogenous / Insulation / Gray			(Not Analyzed, Positive Stop)
18	6-3 - Gray | Large Diameter Fitting | Basement Hall	Homogenous / Insulation / Gray			(Not Analyzed, Positive Stop)
19	7-1 - White/Gray | 2 Layers Floor Tile/Mastic | Caf.	Homogenous / Floor Tile / White	100%		**None Detected**
		Homogenous / Adhesive / Yellow	100%		**None Detected**
		Homogenous / Floor Tile / Gray	95%		5% Chrysotile
		Homogenous / Mastic / Black	100%		**None Detected**

Collected: **Mar 14, 2024** Received: **Mar 18, 2024** Reported: **Mar 21, 2024**

Project Analyst: Megan Audia, Megan Audia Date: **03 - 20 - 2024**

Reviewed By: Brian Keith, Date: **03 - 21 - 2024**

HAYES MICROBIAL CONSULTING
3005 East Boundary Terrace, Suite F. Midlothian, VA. 23112 (804) 562-3435 contact@hayesmicrobial.com

Jon Treasure
Turn-Key Environmental Consultants
790 Barnhart Road
Troy, OH 45373
(937) 335-8807

24714
145 N Cherry St.

#24011405

Asbestos PLM Bulk

EPA 600/R-93/116; EPA 40 CFR Appendix E to Subpart E of Part 763

#	Sample	Material Description	Non-Fibrous	Non-Asbestos Fibers	Asbestos Fibers
20	7-2 - White/Gray | 2 Layers Floor Tile/Mastic | Caf.	Homogenous / Floor Tile / White	100%		**None Detected**
		Homogenous / Adhesive / Yellow	100%		**None Detected**
		Homogenous / Floor Tile / Gray			(Not Analyzed, Positive Stop)
		Homogenous / Mastic / Black	100%		**None Detected**
21	8-1 - White | Smooth Plaster/SC - Ceiling | Kitchen	Homogenous / Skim Coat / White	100%		**None Detected**
		Heterogenous / Rough Coat / Gray	97%	3% Cellulose Fibers	**None Detected**
22	8-2 - White | Smooth Plaster/SC - Ceiling | Basement Hall	Homogenous / Skim Coat / White	100%		**None Detected**
		Heterogenous / Rough Coat / Gray	97%	3% Cellulose Fibers	**None Detected**
23	8-3 - White | Smooth Plaster/SC - Ceiling | Girl's Locker Bath	Homogenous / Skim Coat / White	100%		**None Detected**
		Heterogenous / Rough Coat / Gray	97%	3% Cellulose Fibers	**None Detected**

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24714
145 N Cherry St.

#24011405

Asbestos PLM Bulk

EPA 600/R-93/116; EPA 40 CFR Appendix E to Subpart E of Part 763

#	Sample	Material Description	Non-Fibrous	Non-Asbestos Fibers	Asbestos Fibers
24	8-4 - White | Smooth Plaster/SC - Ceiling | 1st Floor Maintenance	Homogenous / Skim Coat / White	100%		**None Detected**
		Heterogenous / Rough Coat / Gray	97%	3% Cellulose Fibers	**None Detected**
25	8-5 - White | Smooth Plaster/SC - Ceiling | Women's Bath 2nd Fl	Homogenous / Skim Coat / White	100%		**None Detected**
		Heterogenous / Rough Coat / Gray	97%	3% Cellulose Fibers	**None Detected**
26	8-6 - White | Smooth Plaster/SC - Ceiling | Men's Bath 2nd Fl	Homogenous / Skim Coat / White	100%		**None Detected**
		Heterogenous / Rough Coat / Gray	97%	3% Cellulose Fibers	**None Detected**
28	9-1 - White | Plaster/Skim Coat - Walls | South Stairs	Homogenous / Skim Coat / White	100%		**None Detected**
		Heterogenous / Rough Coat / Gray	97%	3% Cellulose Fibers	**None Detected**
29	9-2 - White | Plaster/Skim Coat - Walls | Center Stairs	Homogenous / Skim Coat / White	100%		**None Detected**
		Homogenous / Rough Coat / Gray	97%	3% Cellulose Fibers	**None Detected**

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Asbestos PLM Bulk

EPA 600/R-93/116; EPA 40 CFR Appendix E to Subpart E of Part 763

#	Sample	Material Description	Non-Fibrous	Non-Asbestos Fibers	Asbestos Fibers
30	9-3 - White | Plaster/Skim Coat - Walls | 2nd Fl Storage	Homogenous / Skim Coat / White	100%		**None Detected**
		Heterogenous / Rough Coat / Gray	97%	3% Animal Hair	**None Detected**
31	9-4 - White | Plaster/Skim Coat - Walls | Therapy Rm 401	Homogenous / Skim Coat / White	100%		**None Detected**
		Heterogenous / Rough Coat / Gray	97%	3% Cellulose Fibers	**None Detected**
32	9-5 - White | Plaster/Skim Coat - Walls | Women's Bath 2nd Fl	Homogenous / Skim Coat / White	100%		**None Detected**
		Heterogenous / Rough Coat / Gray	97%	3% Cellulose Fibers	**None Detected**
33	9-6 - White | Plaster/Skim Coat - Walls | Rm 405	Homogenous / Skim Coat / White	100%		**None Detected**
		Heterogenous / Rough Coat / Gray	97%	3% Cellulose Fibers	**None Detected**
34	9-7 - White | Plaster/Skim Coat - Walls | 2nd Fl Central Storage	Homogenous / Skim Coat / White	100%		**None Detected**
		Heterogenous / Rough Coat / Gray	97%	3% Cellulose Fibers	**None Detected**
35	10-1 - White | Acoustical Plaster | Men's Bath 1st Fl	Homogenous / Insulation / Cream	45%	35% Mineral/Glass wool	20% Chrysotile

Jon Treasure
Turn-Key Environmental Consultants
790 Barnhart Road
Troy, OH 45373
(937) 335-8807

24714
145 N Cherry St.

#24011405

Asbestos PLM Bulk

EPA 600/R-93/116; EPA 40 CFR Appendix E to Subpart E of Part 763

#	Sample	Material Description	Non-Fibrous	Non-Asbestos Fibers	Asbestos Fibers
36	10-2 - White | Acoustical Plaster | Maint. Staff Storage	Homogenous / Insulation / Cream			(Not Analyzed, Positive Stop)
37	10-3 - White | Acoustical Plaster | Central Stair	Homogenous / Insulation / Cream			(Not Analyzed, Positive Stop)
38	10-4 - White | Acoustical Plaster | 2nd Fl Storage	Homogenous / Insulation / Cream			(Not Analyzed, Positive Stop)
39	10-5 - White | Acoustical Plaster | Therapy Rm 401	Homogenous / Insulation / Cream			(Not Analyzed, Positive Stop)
40	10-6 - White | Acoustical Plaster | Rm 405	Homogenous / Insulation / Cream			(Not Analyzed, Positive Stop)
41	10-7 - White | Acoustical Plaster | 2nd Fl Central Storage	Homogenous / Insulation / Cream			(Not Analyzed, Positive Stop)
42	11-1 - Green | 9" Floor Tile/Mastic | Storage Bath	Homogenous / Floor Tile / Green	94%		6% Chrysotile
		Homogenous / Mastic / Black	100%		**None Detected**
43	11-2 - Green | 9" Floor Tile/Mastic | Storage Bath	Homogenous / Floor Tile / Green			(Not Analyzed, Positive Stop)
		Homogenous / Mastic / Black	100%		**None Detected**

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Asbestos PLM Bulk

EPA 600/R-93/116; EPA 40 CFR Appendix E to Subpart E of Part 763

#	Sample	Material Description	Non-Fibrous	Non-Asbestos Fibers	Asbestos Fibers
44	12-1 - Cream | 12" Floor Tile/Mastic | Therapy Rm 401	Homogenous / Floor Tile / Cream	100%		**None Detected**
		Homogenous / Adhesive / Yellow	100%		**None Detected**
45	12-2 - Cream | 12" Floor Tile/Mastic | Therapy Rm 401	Homogenous / Floor Tile / Cream	100%		**None Detected**
		Homogenous / Adhesive / Yellow	100%		**None Detected**
46	13-1 - White | Window Glaze | Therapy Rm 401	Homogenous / Glazing / White	100%		**None Detected**
47	13-2 - White | Window Glaze | Therapy Rm 401	Homogenous / Glazing / White	100%		**None Detected**
48	14-1 - Yellow | Carpet Mastic | Therapy Rm 401	Heterogenous / Carpet / Multi-colored	2%	98% Synthetic Fibers	**None Detected**
		Homogenous / Adhesive / Yellow	100%		**None Detected**
49	14-2 - Yellow | Carpet Mastic | Therapy Rm 401	Heterogenous / Carpet / Multi-colored	2%	98% Synthetic Fibers	**None Detected**
		Homogenous / Adhesive / Yellow	100%		**None Detected**

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790 Barnhart Road
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24714
145 N Cherry St.

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Asbestos PLM Bulk

EPA 600/R-93/116; EPA 40 CFR Appendix E to Subpart E of Part 763

#	Sample	Material Description	Non-Fibrous	Non-Asbestos Fibers	Asbestos Fibers
50	15-1 - Brown | 9" Floor Tile/Mastic | Rm 408	Homogenous / Floor Tile / Brown	95%		5% Chrysotile
		Homogenous / Mastic / Black	100%		**None Detected**
51	15-2 - Brown | 9" Floor Tile/Mastic | Rm 408	Homogenous / Floor Tile / Brown			(Not Analyzed, Positive Stop)
		Homogenous / Mastic / Black	100%		**None Detected**

Jon Treasure
Turn-Key Environmental Consultants
790 Barnhart Road
Troy, OH 45373
(937) 335-8807

24714
145 N Cherry St.

#24011405

Asbestos Analysis Information

Analysis Details	All samples were received in acceptable condition unless otherwise noted on the report. This report must not be used by the client to claim product certification, approval, or endorsement by AIHA, NIST, NVLAP, NY ELAP, or any agency. The results relate only to the items tested. Hayes Microbial Consulting reserves the right to dispose of all samples after a period of 60 days in compliance with state and federal guidelines.
PLM Analysis	All Polarized Light Microscopy (PLM) results include an inherent uncertainty of measurement associated with estimating percentages by PLM. Materials with interfering matrix, low asbestos content, or small fiber size may require additional analysis via TEM Analysis.
TEM Analysis	Analysis by TEM is capable of providing positive identification of asbestos type(s) and semi-quantitation of asbestos content.
Definitions	'None Detected' - Below the detected reporting limit of 1% unless point counting is performed, then the detected reporting limit is .25%.
New York ELAP	Per NY ELAP198.6 (NOB), TEM is the only reliable method to declare an NOB material as Non-Asbestos Containing. Any NY ELAP samples that are subcontracted to another laboratory will display the name and ELAP Lab Identification number in the report page heading of those samples. The original report provided to Hayes Microbial Consulting is available upon request.

HAYES
MICROBIAL CONSULTING

Turn-Key Environmental Consultants
790 Barnhart Road
Troy, OH 45373

N

SHIP: FEDEX - PAK SO
DATE: 03-18-2024

8178 9251 2291

ASBESTOS

24011405

Job Number: 24714	Job Name: 145 N. Cherry St.		
Collector: Jon Treasure		Mobile:	Email: tkec@turn-keyenvironmental.com
Date Collected: 3/14/24		Note:	

Analysis Type		Analysis Methods	Turnaround Times					
PLM	Bulk	EPA 600*	3 Hour*	Same Day*	1 Day	2 Day	3 Day	5 Day
	Point Count	400 Point*, 1000 Point*	3 Hour*	Same Day*	1 Day	2 Day	3 Day	5 Day
	Vermiculite	EPA 600*, Cincinnati Method	3 Hour*	Same Day*	1 Day	2 Day	3 Day	5 Day
	Soil	EPA 600*, CARB 435	3 Hour*	Same Day*	1 Day	2 Day	3 Day	5 Day
TEM	Air	EPA AHERA, NIOSH 7402	-	Same Day	1 Day	2 Day	3 Day	5 Day
	Bulk	Chatfield	-	Same Day	1 Day	2 Day	3 Day	5 Day
	Wipe	ASTM D6480-05	-	Same Day	1 Day	2 Day	3 Day	5 Day
	Microvac	ASTM D5755-09	-	Same Day	1 Day	2 Day	3 Day	5 Day
PCM	Air	NIOSH 7400	3 Hour	Same Day	1 Day	2 Day	3 Day	5 Day

#	Group	Number	Sample Name	Analysis Type	Turnaround	Volume / Area	Stop (+)
1			See attached sample log	EPA 600	4-day		Positive stop
2							
3							
4							
5							
6							
7							
8							
9							
10							
11							
12							
13							
14							
15							
16							

Released by:	Date: 3/14/24	Received By: JW	Date: 3/18/24

ASBESTOS BULK SAMPLE LOG
Project - 145 N. Cherry St., Mt. Gilead, OH

TKEC Project: 24714 F

Sample #	Date	Color	Type	Location	Collected By
1-1	3/14/24	grey	Small Diameter TSI run	Caf.	
1-2		"	"	Kitchen storage	
1-3		"	"	Kitchen Storage	
2-1		"	Mid Diameter TSI run	Caf.	
2-2		"	"	Caf.	
2-3		"	"	Kitchen	
3-1		"	large Diameter TSI run	Kitchen	
3-2		"	"	Kitchen storage	
3-3		"	"	Basement Hall	
4-1		"	Small Diameter TSI fitting	Caf.	
4-2		"	"	Basement Hall	
4-3		"	"	Caf.	
5-1		"	Mid Diameter TSI fitting	Caf.	
5-2		"	"	Caf.	
5-3		"	"	Caf.	
6-1		"	Large Diameter Fitting	Kitchen	
6-2		"	"	Basement Hall	
6-3		"	"	"	
7-1		white/grey	2 layers Floor tile/mastic	Caf.	
7-2		"	"	"	

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JM 3/18/24

N

SHIP: FEDEX - PAK SO
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ASBESTOS

24011405

SHIP: FEDEX - PAK SO
DATE: 03-18-2024

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ASBESTOS
24011405

ASBESTOS BULK SAMPLE LOG
Project - 145 N. Cherry St., Mt. Gilead, OH

TKEC Project: 24714 F

Sample #	Date	Color	Type	Location	Collected By
8-1	3/14/24	white	Smooth Plaster/SC - ceiling	Kitchen	
8-2				Basement Hall	
8-3				Girls locker Bath	
8-4				1st Floor Maintenance	
8-5				Womans Bath 2nd Floor	
8-6				Mens Bath Second floor	
8-7				2nd Floor Custodian	
9-1			Plaster/Skim Coat - walls	South Stairs	
9-2				Center stairs	
9-3				2nd floor storage	
9-4				Therapy Rm 401	
9-5				Women Bath 2nd Floor	
9-6				Rm 405	
9-7				2nd Floor central storage	
10-1		white	Acoustical Plaster	mens Bath 1st Floor	
10-2				Maintenace staff storage	
10-3				Central Stair	
10-4				2nd Floor Storage	
10-5				~~Rm 405~~ Therapy Rm 401	
10-6				Rm 405	
10-7				2nd Floor central storage	

41

JM 3/18/24

N FEDEX - PAK SO
DATE: 03-18-2024
8178 9251 2291

ASBESTOS
24011405

ASBESTOS BULK SAMPLE LOG
Project - 145 N. Cherry St., Mt. Gilead

TKEC Project: 24714 F

Sample #	Date	Color	Type	Location	Collected By
11-1		green	9" Floor tile/Mastic	Storage Bath	
11-2		"	"	"	
12-1		Cream	12" Floor tile/Mastic	Therapy RM 401	
12-2		"	"	"	
13-1		white	window glaze	"	
13-2		"	"	"	
14-1		yellow	Carpet Mastic	"	
14-2		"	"	"	
15-1		Brown	9" floor tile/Mastic	RM 408	
15-2			"	"	

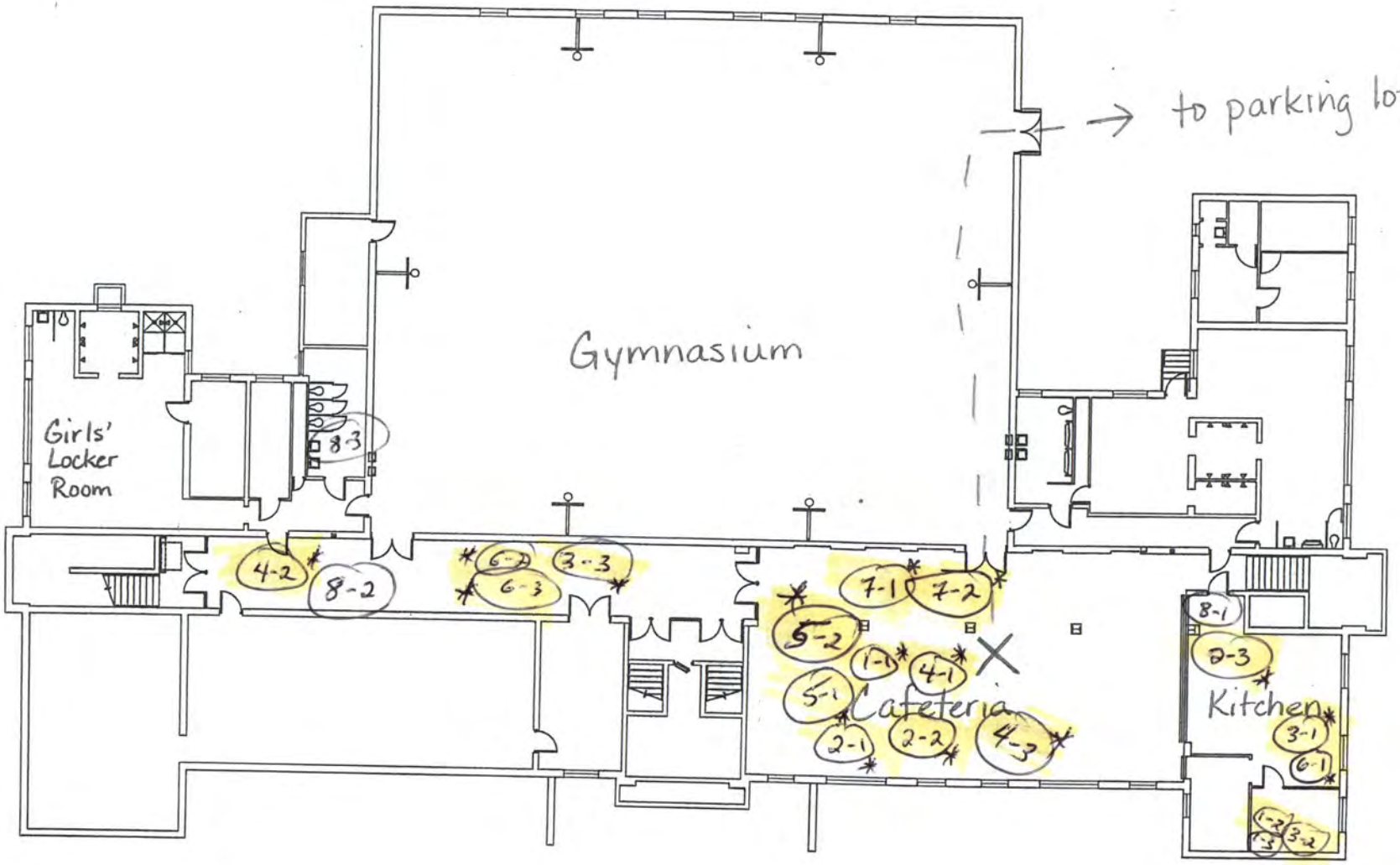
5l

JM 3/18/24

Attachment 4

Site Sketch and Photographs

In Case of Fire, exit as directed below in an orderly manner

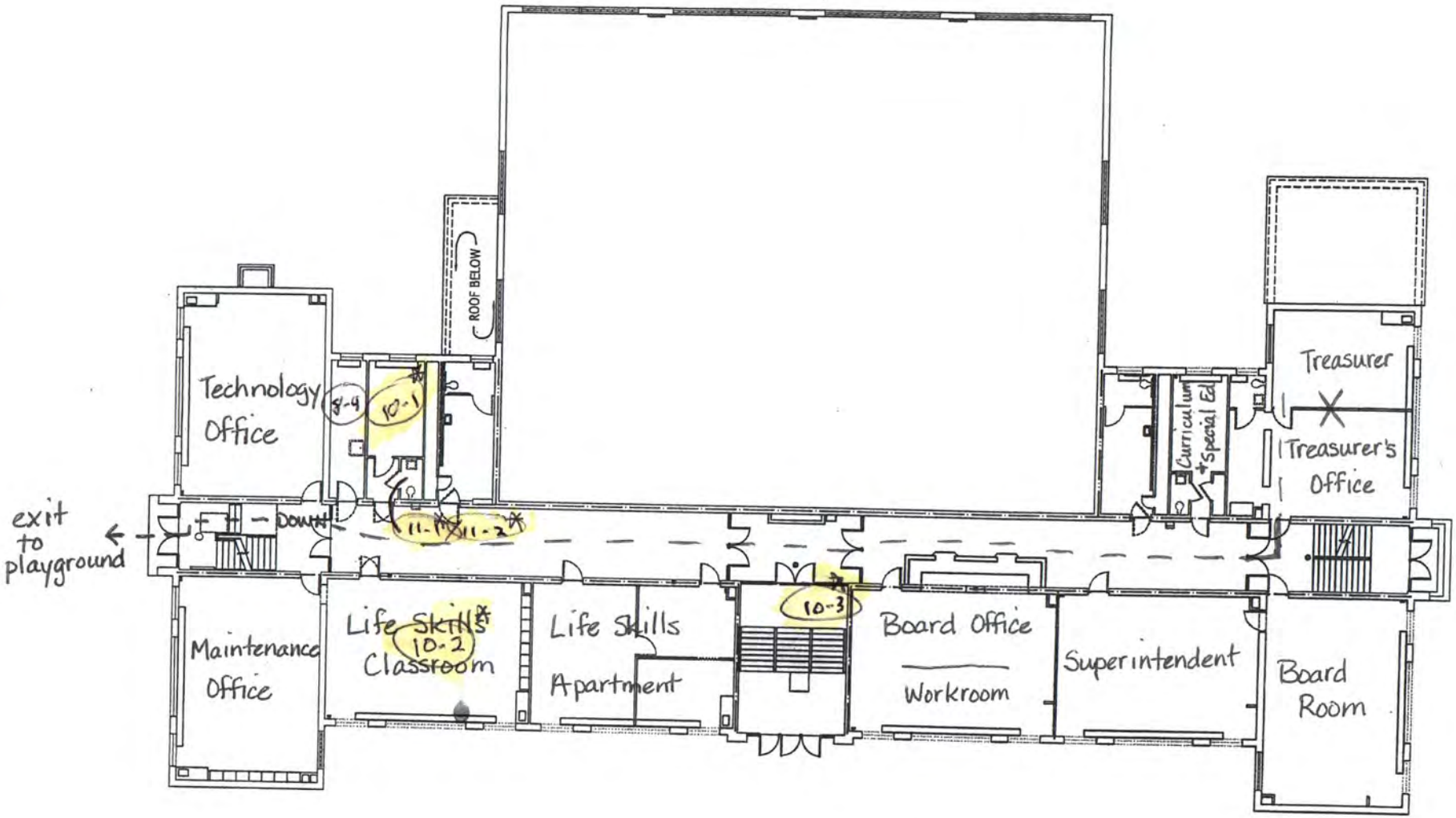


N

BASEMENT FLOOR PLAN

1/16" = 1'-0"

In Case of Fire, exit as directed below in an orderly manner

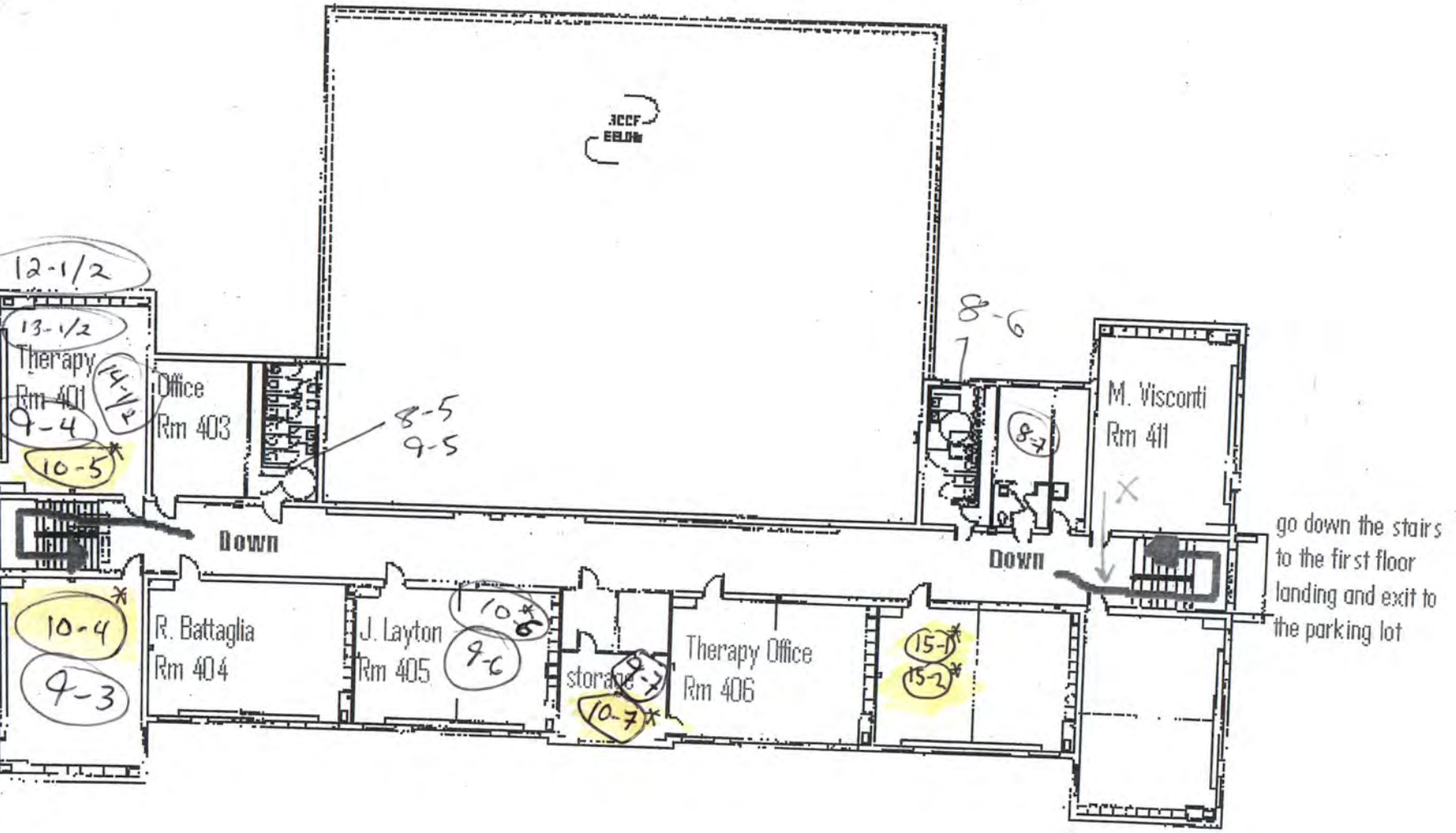


N

FIRST FLOOR PLAN

1/16" = 1'-0"

SE OF FIRE Exit as directed below in an orderly manner.



N

SECOND FLOOR PLAN

1/16" = 1'-0"

145 N Cherry St

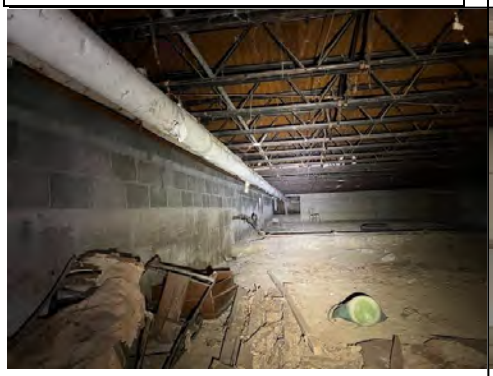
TSI Runs and Elbows (Basement)

TSI Runs and Elbows (Basement)

TSI Runs and Elbows (Basement)

TSI Runs and Elbows (Basement)

TSI Runs and Elbows (Basement)



TSI Runs and Elbows (Basement)

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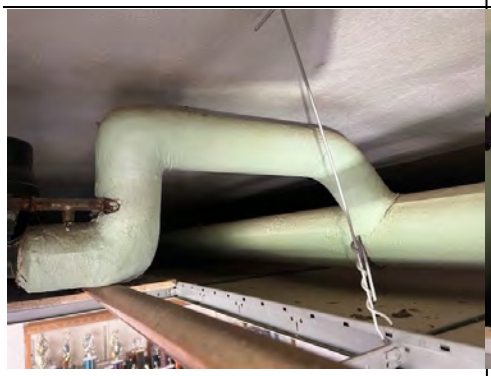
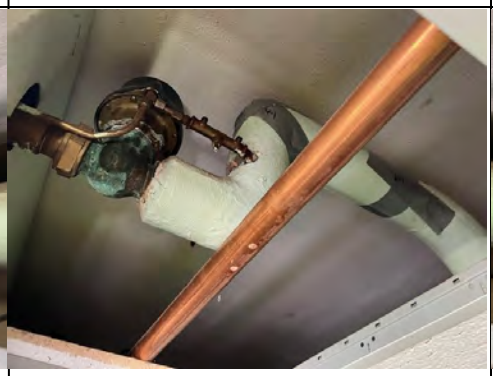
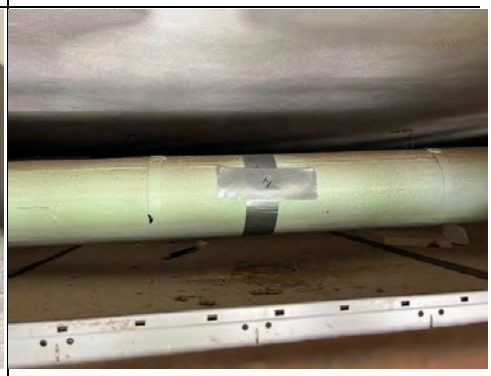
TSI Runs and Elbows (Basement)



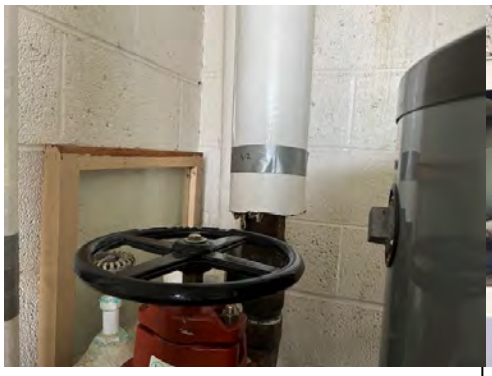
TSI Runs and Elbows (Basement)



TSI Runs and Elbows (Basement)



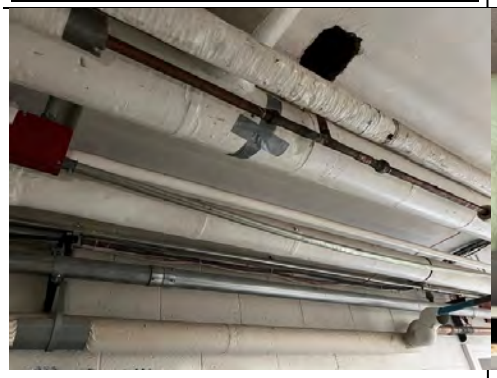
TSI Runs and Elbows (Basement)



TSI Runs and Elbows (Basement)

TSI Runs and Elbows (Basement)

TSI Runs and Elbows (Basement)

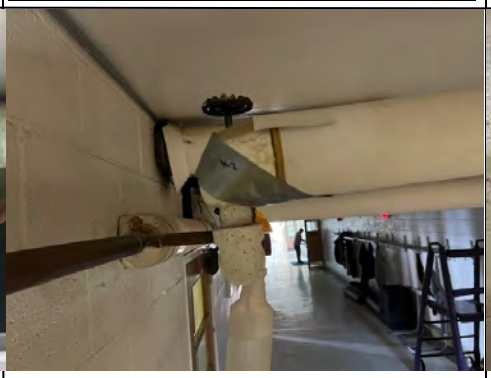


TSI Runs and Elbows (Basement)

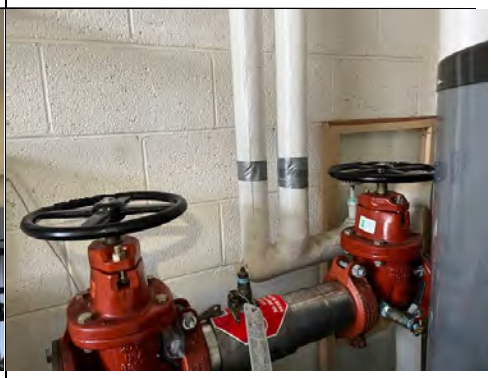
TSI Runs and Elbows (Basement)

TSI Runs and Elbows (Basement)

TSI Runs and Elbows (Basement)



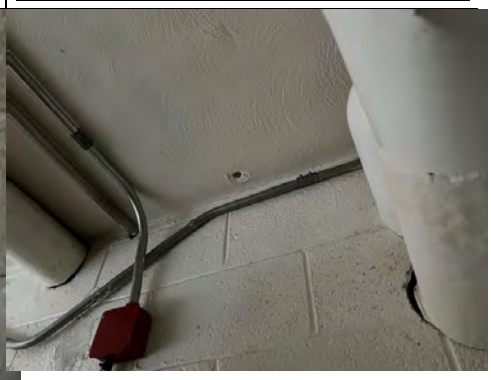
TSI Runs and Elbows (Basement)



TSI Runs and Elbows (Basement)

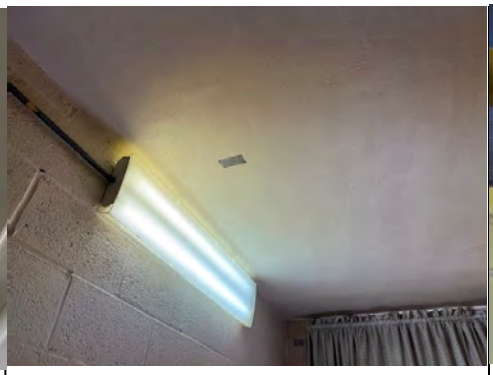
Sample 7-1/2, Floor Tile/Mastic

Plaster/Skim Coat– Ceilings



Plaster/Skim Coat– Ceilings

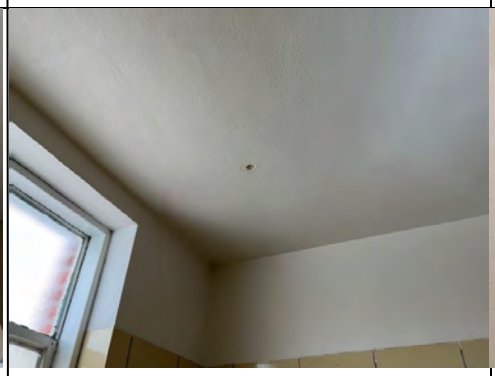
Plaster/Skim Coat– Ceilings



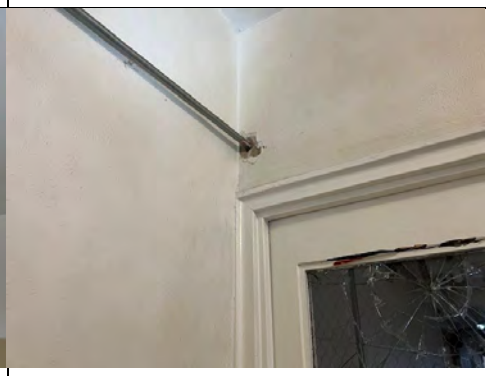
Plaster/Skim Coat– Ceilings

Plaster/Skim Coat– Ceilings

Plaster/Skim Coat– Ceilings



Plaster/Skim Coat– Ceilings



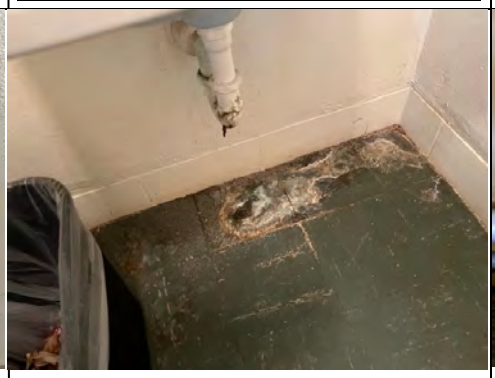
Plaster/Skim Coat-Walls

Plaster/Skim Coat-Walls

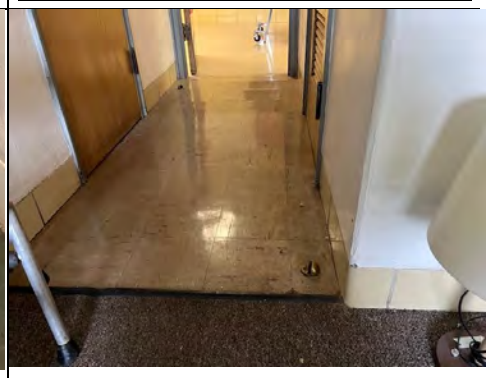
Plaster/Skim Coat-Walls

Plaster/Skim Coat-Walls

Soft Plaster/Skim Coat-Ceilings



Floor Tile/Mastic

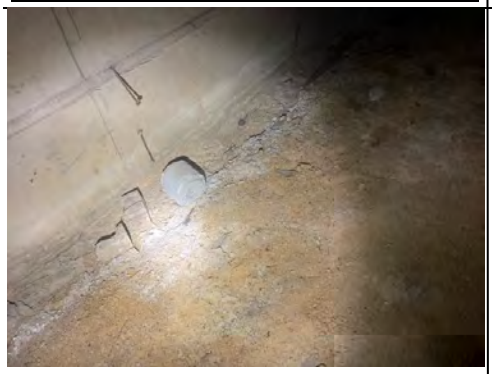


Floor Tile/Mastic

TSI Debris In Crawl

TSI Debris In Crawl

TSI Debris In Crawl



TSI Debris In Crawl

Attachment 5

Asbestos Hazard Evaluation Specialist Certification

Ohio Environmental Protection Agency

Mike DeWine, Governor
Jon Husted, Lt. Governor
Anne M. Vogel, Director

7/24/2023

Jonathan Treasure
Turn-Key Environmental Consultants, Inc
790 Barnhart Rd
Troy, OH 45373

RE: Evaluation Specialist
Certification Number: ES36341
Expiration Date: 8/8/2024

Dear Jonathan Treasure:

This letter and enclosed certification card approves your request to be certified as an asbestos Evaluation Specialist. You must present your card upon request at any project site while performing duties. Copies of cards are not acceptable as proof of certification.

This certification may be revoked by the Director of the Ohio Environmental Protection Agency (EPA) for violation of any of the requirements of 3745-22 or 3745-20 of the Ohio Administrative Code.

If you have any questions, please contact the Asbestos Program at 614-644-0226 or by email at asbestoslicensing@epa.ohio.gov.

Sincerely,

Brandon M. Schwendeman
Brandon Schwendeman
Manager, Business Operations Support Section
Ohio EPA - Division of Air Pollution Control

Ohio Environmental Protection Agency

Mike DeWine, Governor
Jon Husted, Lt. Governor
Anne M. Vogel, Director

1/17/2024

Herbert Burroughs III
Turn-Key Environmental Consultants, inc
790 Barnhart Rd
Troy, OH 45373

RE: Evaluation Specialist
Certification Number: ES546185
Expiration Date: 1/20/2025

Dear Herbert Burroughs III:

This letter and enclosed certification card approves your request to be certified as an asbestos Evaluation Specialist. You must present your card upon request at any project site while performing duties. Copies of cards are not acceptable as proof of certification.

This certification may be revoked by the Director of the Ohio Environmental Protection Agency (EPA) for violation of any of the requirements of 3745-22 or 3745-20 of the Ohio Administrative Code.

If you have any questions, please contact the Asbestos Program at 614-644-0226 or by email at asbestoslicensing@epa.ohio.gov.

Sincerely,

Brandon M. Schwendeman

Brandon Schwendeman
Manager, Business Operations Support Section
Ohio EPA - Division of Air Pollution Control

Attachment 6

OEPA 10-Day Notification Form
And Instructions

Notification of Demolition and Renovation/Abatement

Section 1: General Information

Division of Air Pollution Control

Work on projects cannot begin until 10 working days after a COMPLETE original notification form, **including payment**, is submitted to Ohio EPA. Instructions and a worksheet for fee calculation are available at ***epa.ohio.gov/asbestos***. This form can be completed, and payment made, at ***ebiz.epa.ohio.gov***. Questions? ***asbestos@epa.ohio.gov*** or (614) 466-0061.

Ohio EPA Use Only	Notification #:	Postmarked: / /	Received: / /	☐ Hand-Delivered

1) Notification Information (Check all that apply)

☐ Original	☐ Revision # (count):	☐ Installation	☐ Emergency	☐ Annual	☐ Cancellation	**Project County:**
☐ NESHAP Residential Exemption						

2) Owner, Asbestos Abatement Contractor, Billing and Fire Department Information **Revised?** ☐

Owner		
Name:		Is this a company? ☐ Yes ☐ No
Address:	Contact Person:	
City:	State:	Zip: -
Email:	Phone: ( ) -	Fax: ( ) -
Asbestos Abatement Contractor (if applicable)		
Name:	License #: AC	Expiration Date: / /
Address:	Contact Person:	
City:	State:	Zip: -
Email:	Phone: ( ) -	Fax: ( ) -
Billing Contact		
Is this contact associated with the ☐ Owner, ☐ Asbestos Abatement Contractor, or ☐ Demolition Contractor (if not installation)?		
Address:	Contact Person:	
City:	State:	Zip: -
Email:	Phone: ( ) -	Fax: ( ) -
Fire Department (if applicable)		
Name:		
Address:	Contact Person:	
City:	State:	Zip: -
Email:	Phone: ( ) -	Fax: ( ) -

3) Ohio Asbestos Hazard Evaluation Specialist and Evaluation Procedure **Revised?** ☐

Evaluation Specialist: Jonathan Treasure	Certification #: ES 36341	Expiration Date: 8/ 8 / 24

Procedure, including analytical methods, employed to detect the presence of and to estimate the quantity of regulated asbestos-containing material (RACM) and Category I and Category II non-friable asbestos-containing material: ☒ PLM ☒ Point Count ☐ TEM ☐ Other Method (Explain Below):

4) Procedures to be followed should unexpected RACM be discovered (check all that apply) **Revised?** ☐

☐ Stop work and keep wet	☐ Evacuate area	☐ Demarcate area	☐ Contact licensed abatement contractor
☐ Contact district office/local air authority			
☐ Other (Explain):			

5) Planned Demolition (check all that apply) **Revised?** ☐

Describe demolition work to be performed and method(s) to be employed, including demolition techniques to be used:
☐ Implosion ☐ Fire Training ☐ Wet Methods ☐ Manual Demolition ☐ Mechanical Demolition ☐ Other (Explain):

Description of affected facility components (include attachment if necessary):

Mail completed form and payment to:
Ohio EPA, DAPC – Asbestos
P.O. Box 1049, Columbus, OH 43216-1049

Notification of Demolition and Renovation/Abatement

Section 1: General Information

Continued

6) Asbestos Description and Engineering Controls (if asbestos is being abated) **Revised?** ☐

For the material listed in each project, describe the type(s) of ACM to be abated, engineering controls and work practices to be used to minimize emissions and ensure proper waste handling:					
Type of ACM to be abated:	☐ Surfacing	☐ Mechanical	☐ Other		
Engineering Controls:	☐ Wet Methods	☐ Glove Bag	☐ NPE	☐ AFD	☐ Other:
Work Practices:	☐ Intact Removal	☐ Manual	☐ Mechanical	☐ Other:	

7) Asbestos Waste Transporter (if applicable) **Revised?** ☐

Transporter #1 Name:		
Address:	Contact Person:	
City:	State:	Zip: -
Email:	Phone: ( ) -	Fax: ( ) -
Transporter #2 Name (if applicable):		
Address:	Contact Person:	
City:	State:	Zip: -
Email:	Phone: ( ) -	Fax: ( ) -

8) Asbestos Waste Disposal Site (if applicable) **Revised?** ☐

Name:		
Address:	Contact Person:	
City:	State:	Zip: -
Email:	Phone: ( ) -	Fax: ( ) -

9) Emergency Demolition (complete if you checked "Emergency" above and "Demolition" for any project) **Revised?** ☐

A copy of the issued order, including the following information, **must be attached** to this notification.	
Government Official Issuing Order:	Title:
Agency:	Authority of Order (Citation of Code):
Date of Order: / /	Demolition Date: / /

10) Emergency Renovation/Abatement (complete if you checked "Emergency" above and "Renovation/Abatement" for any project) **Revised?** ☐

Date of Emergency: / /	Time of Emergency: : ☐ a.m. ☐ p.m.
Description of Sudden, Unexpected Event:	
Explanation of how the event caused unsafe conditions or equipment damage:	

11) Attestation **Revised?** ☐

In accordance with Ohio Administrative Code rule 3745-20-03(A)(4)(p), I certify that at least one person trained as required by paragraph (B) of rule 3745-20-04 of the Administrative Code will supervise the stripping and removal described by this notification. I acknowledge that the submission of false or misleading statements is prohibited by law and I certify that facts contained in this notification are true, accurate, and complete.	
Signature:	Date: / /
Name:	Title:
Organization:	

Mail completed form and payment to:
Ohio EPA, DAPC – Asbestos
P.O. Box 1049, Columbus, OH 43216-1049

Notification of Demolition and Renovation/Abatement

Section 1: General Information

Continued

Notification of Demolition and Renovation/Abatement
Section 2: Project Address Specific Information
Division of Air Pollution Control

Please complete Section 2 for the address included with this notification. If the project is an "Installation" per OAC 3745-20, complete a separate Section 2 page for each address associated with this notification.

Ohio EPA Use Only	Project ID #:

A. Facility Description **Revised?** ☐

Building Name (if applicable):	Site Location (specific):	
Address:		
City:	State: OH	Zip: -
Building Size (square feet):	No. of Floors:	Age:
Present Use:	Prior Use:	

B. Type of Operation (check all that apply) **Revised?** ☐

☐ Demolition	☐ Renovation/Abatement – Type: ☐ Removal ☐ Repair ☐ Encapsulation ☐ Enclosure

C. Asbestos Present (check one) **Revised?** ☐

☐ Yes	☐ No	☐ No, previously abated Year Abated:

D. Approximate Amount of Asbestos-Containing Materials (complete table below and Section 1 #6 if asbestos is present) **Revised?** ☐

	Material to be Removed			Material NOT to be Removed	
		Non-friable Asbestos-Containing Material		Non-friable Asbestos-Containing Material	
	RACM	Category I	Category II	Category I	Category II
Pipes (linear feet)					
Surface area on other facility components (ft^2)					
Volume if length or area cannot be measured (ft^3)					

E. Asbestos Abatement Schedule and Abatement Specialist (original notification is required 10 working days prior to the start of work) **Revised?** ☐

Setup Date: / /		Abatement Date: / /			Complete Date: / /		
(Shift 1) Time start/end on site	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
Abatement Specialist Name:			Certification #: AS			Expiration Date: / /	
(Shift 2) Time start/end on site	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
Abatement Specialist Name:			Certification #: AS			Expiration Date: / /	

F. Demolition Contractor (if applicable) **Revised?** ☐

Name:		
Address:	Contact Person:	
City:	State:	Zip: -
Email:	Phone: ( ) -	Fax: ( ) -

G. Demolition Schedule (original notification is required 10 working days prior to the start of work) **Revised?** ☐

Start Date: / /	Complete Date: / /

H. Project Hold **Revised?** ☐

Hold Begin Date: / /	Work Resume Date: / /

OHIO ENVIRONMENTAL PROTECTION AGENCY
INSTRUCTIONS FOR COMPLETING
NOTIFICATION OF DEMOLITION AND RENOVATION/ABATEMENT FORM

General Information

These directions are for submitting hardcopy notifications to the Ohio EPA. Ohio EPA strongly encourages notifications to be submitted electronically via the Ohio EPA eBusiness Center located at ebiz.epa.ohio.gov.

Who must submit this notification? *[OAC 3745-20-03 and OAC 3745-22-04(C)(4)]*

- The owner or operator means any person who leases, operates, controls, or supervises the facility being demolished or renovated, or any person who owns, leases, operates, controls or supervises the demolition or renovation (activity), or both.
- Asbestos Abatement Contractor means a contractor who is currently licensed by the Ohio EPA as an Asbestos Hazard Abatement Contractor.

The Ohio EPA notification of demolition and renovation form is required for:

- Every demolition of a facility, regardless of whether asbestos is involved. This includes all structures that will be intentionally burned for fire training purposes.
- A renovation when the amount of regulated asbestos-containing material (RACM) stripped, removed, dislodged, cut, drilled, or similarly disturbed exceeds 260 linear feet on pipes or 160 square feet on other facility components or 35 cubic feet off facility components.
- An abatement when the activity involves the removal, renovation, enclosure, repair or encapsulation of friable asbestos-containing material in an amount greater than 50 linear feet on pipes or 50 square feet on other facility components.

When must I submit this notification?

ORIGINAL: The original notification must be **postmarked** or **hand delivered** to the Ohio EPA Central Office at least 10 working days (Monday-Friday excluding weekends) before operations begin. Please see example table below to help determine when to submit the original notification.
E-mail or FAX is not acceptable for original notification.

July

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
	1	2	3 day 1	4 day 2	5 day 3	6
7	8 day 4	9 day 5	10 day 6	11 day 7	12 day 8	13
14	15 day 9	16 day 10	17 *	18	19	20
21	22	23	24	25	26	27
28	29	30	31			

Post mark date (and Day 1 of 10-day clock): July 3rd.
Note: Holidays are counted when they fall on a working day.
Completion of 10-day prior notification period: July 16th.
* First day work can commence (day following the 10th working day): July 17th.

REVISIONS: A revised notification must be submitted if there is any change in the notification which renders information in the notification no longer accurate. Examples of changes include but are not limited to: if the amount of RACM changes by at least 20 percent, any changes in work schedules (dates or hours), any change in owner or operator, a change in the asbestos hazard abatement specialist onsite, or any change in the name or location of selected waste disposal site. A revised notification may be initiated by phone, however, must be followed in writing by either email or fax. Revisions shall be submitted as soon as possible but not later than one working day following discovery of the change.

EMERGENCY DEMOLITION OR RENOVATIONS: The notification must be submitted as early as possible before, but not later than, the following working day from start of demolition or renovation/abatement activities. The notification must include the supplemental information required in Sections 9 or 10.

Where do I send my notification?

Send the notification to: Ohio EPA Central Office, Division of Air Pollution Control, P.O. Box 1049, Columbus, Ohio 43216-1049.

How does Ohio EPA assess fees? [*ORC 3745.11(G) and OAC 3745-22-04(C)*]

Per ORC 3745.11(G), an owner or operator who is responsible for an asbestos demolition or renovation/abatement project regulated under OAC Chapter 3745-20, shall pay the fees set forth in the following schedule. This applies when thresholds are greater than or equal to: 260 linear feet; 160 square feet; or 35 cubic feet.

- Each notification $75 plus,
- Asbestos removal $3/unit (1 unit = any combination of linear feet or square feet equal to fifty) and/or
- Asbestos cleanup $4/cubic yard

Per OAC 3745-22-04(C), if the renovation/abatement project involves removal, encapsulation, enclosure or repair of greater than 50 square feet or 50 linear feet of RACM, the Ohio EPA licensed asbestos hazard abatement contractor is responsible for paying the fees set forth in the following schedule.

- If notification is not an installation, $65 fee, or
- If notification is an installation, $65 fee for each address where RACM exceeds 50 square feet or 50 linear feet.

The fees shall be submitted with the original notification. Check or Money Order shall be made payable to: Treasurer, Sate of Ohio. Projects may be subject to both regulatory fee requirements above. Please be aware that some local air agencies may have additional fees.

Who can help answer questions about completing this notification?

Contact the Ohio EPA Central Office at 614-466-0061 or by email at asbestos@epa.ohio.gov.

Line-by-line Instructions

[Below listed instructions are for hardcopy form submission only]

Section 1: General Information

1. Check the type of notification (all that apply):

- o "Original" is the first notification submitted for a project; hardcopy is required to be post-marked or hand-delivered 10 working-days prior to start of work.

- o "Revision" is any notification submitted after the original due to any change which renders information on the form no longer accurate. Examples of changes requiring a revision include but are not limited to: if the amount of RACM changes by at least 20 percent, any changes in work schedules (dates or hours), any change in owner or operator, a change in the asbestos hazard abatement specialist onsite, or any change in the name or location of selected waste disposal site. Revisions shall be numbered chronologically with Revision #1 being the first time any items on the notification form were changed. If revision is marked, please include the Revision # and check the "Revised" box for each section where information is revised. A "Revised" box is located near the upper right hand side of each section throughout the form.

- o "Installation" means any building or structure or any group of buildings or structures at a single demolition or renovation/abatement site that are under the control of the same owner or operator, or owner or operator under common control. This would include projects where multiple addresses are included in a common project, have the same owner, and are being completed in the same county (i.e. land banks, residential cooperatives, highway projects involving multiple facility demolitions, etc.). If the project includes more than one structure or address, be sure to complete a separate "Section 2: Project Address Specific Information" page for each address.

- o "Emergency" includes emergency demolitions and emergency renovation/abatement operations. Emergency demolition means any demolition operation conducted under a written order issued by a state or local

governmental agency because a facility is structurally unsound and in danger of imminent collapse. Emergency renovation/abatement means a renovation/abatement operation that was not planned but results from a sudden, unexpected event that, if not immediately attended to, presents a safety or public health hazard, is necessary to protect equipment from damage, or is necessary to avoid imposing an unreasonable financial burden. This term includes operations necessitated by non-routine failures of equipment, by actions of fire or emergency medical personnel pursuant to duties within their official capacities, or by significantly damaged friable asbestos-containing material causing an environmental health hazard (as assessed by an asbestos hazard evaluation specialist). The notification must be submitted as early as possible before, but not later than, the following working day from start of demolition or renovation/abatement activities. The notification must include the supplemental information required in Sections 9 or 10.

- "Annual" refers to planned renovation operations over a calendar year involving a series of non-scheduled operations that are collectively greater than the threshold limits; these notifications must be submitted in the month prior to the beginning of the calendar year. See separate guidance document or contact Ohio EPA Central Office to determine if the project will meet Annual notification requirements.

- "Cancellation" is submitted to indicate a project has been cancelled and work will not be completed.

- "County" is for listing the County in which the project will occur.

- "NESHAP Residential Exemption" is for a project that meets the residential building exemption requirements of OAC 3745-20 rules, however, a notification is still required due to OAC 3745-22 rules (RACM exceeds 50 square feet or 50 linear feet). Checking this box will indicated that the $65 notification fee per OAC 3745-22-04(C) still applies, however, the $75 notification fee + RACM fees per ORC 3745.11(G) will <u>not</u> apply.

2. Provide owner, asbestos abatement contractor, billing, fire department Information (all that apply):

- In the "Owner" line, list the property owner [individual(s) who own(s) the property at the time of demolition/renovation (Note, this may be a government or private entity)] or list the Coordinating Entity (i.e., land bank, municipality, etc.) if the facility is part of a larger project or installation. Include address, contact person, phone, fax, and email for the listed Owner.

- Specify the name, address, contact person, phone, fax, email, and Ohio Environmental Protection Agency license number (ACXXXX) for the "Asbestos Abatement Contractor" (if regulated asbestos containing material(s) is being abated).

- Specify the billing contact for the project notification fees, either the Owner, the Asbestos Abatement Contractor, or the Demolition Contractor (if project is not an installation).

- Specify the name, address, contact person, phone, fax, email, for the "Fire Department" (if demolition of a facility is by intentional burning).

3. For any project subject to OAC 3745-20, include the Asbestos Hazard "Evaluation Specialist" Name, "Certification # (ESXXXX)", and "procedure used to detect and analyze asbestos". Analytical methods could include the collection of samples and sample analyses by polarized light microscopy (PLM) with dispersion staining. For samples that test under 10% asbestos content: An owner or operator may (a) elect to assume material to be greater than 1% asbestos, or, (b) require verification by point counting in which the point counting result will supersede the PLM estimation; Both choice and result should be stated on the notification. Explain any other method(s) used. All owners/operators should have the records of the asbestos assessment and analyses (inspection/survey report) on-site during active operations for reference and inspection. Such records would include a list of materials assessed, locations sampled and the sample results; this information can be found within the asbestos inspection report.

4. Describe the specific procedures to be followed in the event unexpected regulated asbestos-containing material (RACM) is found or non-friable asbestos-containing material becomes friable RACM.

<u>Examples:</u>

A. Stop work, evacuate area, and demarcate the area.

B. Wetting of ACM with amended water and using wet cleaning methods.

Should the discovery of unexpected RACM change the original amount of asbestos to be abated by 20 percent or more, you

must submit a revised notification pursuant to OAC 3745-20-03. A revised notification must reflect the change in the amount of affected asbestos-containing material. The revised notification must also reflect the new asbestos removal start date, if applicable.

5. Select the appropriate box (*Implosion, Fire Training, Wet Methods, Manual Demolition, Mechanical Demolition or Other*). Underneath the check boxes, write a brief summary of the specific method to be used on this project. In the box *Description of affected facility components*, include detailed information for each component where RACM is being removed. "Fire Training" refers to the demolition of a facility by intentional burning. All asbestos containing material, including Category I and Category II non-friable ACM, must be removed in accordance with OAC 3745-20 before burning. Additional requirements also apply; please contact the Ohio EPA District Office or Local Air Agency with jurisdiction for additional information (See attached map).

6. For the materials listed in each project, on the line for *Type of ACM to be abated*, check the appropriate box (*Surfacing, Mechanical or Other*). If "*Other"* is selected, specify what the asbestos material is. At least one box must be checked, but if multiple types of asbestos are being removed, multiple boxes may be checked. On the line for *Engineering Controls*, select the appropriate box (*Wet Methods, Glove Bag, NPE, AFD or Other*). If "*Other"* is selected, specify the method(s) to be used. At least one type of engineering control must be selected, but multiple methods may be selected. On the line for *Work Practices*, select the appropriate box (*Intact Removal, Manual, Mechanical or Other*). If "*Other"* is selected, specify what the work practice method is. At least one work practice box must be selected but more than one may be selected.

7. Please complete the information for this section if asbestos containing material is being removed. On the name line, enter the name of the transporter company (example: *Jones Waste Hauler*) and complete the other fields in accordance to the information relating to this company. If more than one transporter is being used, complete the information for the second transporter in this same manner. **NOTE: you must also complete a Waste Shipment Record prior to consigning any asbestos containing waste materials (ACWM).**

8. Enter the name of the waste disposal site and complete all the other fields based on the physical location of the site. Check the following Ohio EPA website for an updated list of approved asbestos accepting waste disposal sites: www.epa.ohio.gov/dapc/atu/asbestos.aspx

9. This section must be completed for emergency demolitions that meet the definitions and requirements of the regulation. If a facility is not in imminent danger of collapse, it is not an emergency demolition even though it may be ordered to be demolished due to hazardous conditions. Provide the name, title and agency of the state or local governmental representative who has ordered the demolition. The Authority of Order is the applicable state or local regulation under which the demolition order has been issued. **You must attach a copy of the demolition order to the notification.**

10. This section shall be completed for emergency renovations/abatement that meet criteria described in OAC 3745-20-01 and OAC 3745-22-03(H). **You must provide detail on the four items listed in this section, including a description of how the project meets the "emergency" requirements of OAC 3745-22-03(H). A separate sheet may be needed.**

11. The person signing this notification is attesting to the fact that in accordance with Ohio Administrative Code rule 3745-20-03(A)(4)(p), they are certifying that at least one person trained as required by paragraph (B) of rule 3745-20-04 of the Administrative Code will supervise the stripping and removal described by this notification, and are acknowledging that the submission of false or misleading statements is prohibited by law and certifying that facts contained in this notification are true, accurate, and complete.

Section 2: Project Address Specific Information

Please complete Section 2 for the address included with this notification. If the project is an "Installation" per OAC 3745-20, complete a separate Section 2 page for each address associated with this notification.

A. Describe the building(s) or structure(s) affected by the operations. Include building size in square feet, specific site location, number of floors, and age in years. Also include the present and prior use (i.e., industrial, commercial, institutional, residential, vacant, etc.) of the building(s).

B. Identify the type of operation. Definitions of these terms can be found in OAC 3745-20-01.

- "Demolition" means the wrecking, or taking out of any load-supporting structural member of a facility together with any related handling operations or the intentional burning of any facility.

- "Renovation" means altering a facility or one or more facility components in any way, including the stripping or removal of regulated asbestos-containing material in an amount greater than 260 linear feet, 160 square feet, or 35 cubic feet from a facility component. Operations in which load-supporting structural members are wrecked or taken out are demolitions.

- "Abatement" refers to any Asbestos hazard abatement activity involving the removal, renovation, enclosure, repair, or encapsulation of reasonably related friable asbestos-containing materials in an amount greater than 50 linear feet or 50 square feet. Asbestos hazard abatement activity also includes any such activity involving such asbestos-containing materials in an amount of 50 linear or 50 square feet or less if, when combined with any other reasonably related activity in terms of time and location of the activity, the total amount is in an amount greater than 50 linear or 50 square feet.

C. Declare whether or not asbestos is present in any quantity. This includes assumed asbestos containing materials such as roofing and flooring. Also specify if the facility was previously abated and year when previous asbestos abatement occurred (if applicable).

D. Specify the amount of regulated asbestos-containing material (RACM) to be removed as follows: linear feet on pipes, square feet (surface area) on facility components, and total cubic feet (volume) on or off all facility components. Asbestos containing demolition debris and related materials shall be quantified in cubic feet (volume) Convert any cubic yardage measurements to cubic feet (1 cubic yard = 27 cubic feet). Estimate the approximate amount of Category I and Category II non-friable asbestos-containing material in the affected part of the facility that will be removed before demolition. Estimate the approximate amount of Category I and Category II non-friable asbestos-containing material in good condition in the affected part of the facility that will not be removed before demolition.

E. Specify the scheduled dates for asbestos removal, the hours of operation, and the days of the week that asbestos removal operations will be active onsite. Please note, the setup date must be at least 10 working-days after postmark or hand-deliver date. Also include the name, certification number, and expiration date of the asbestos hazard abatement specialist scheduled to be onsite in charge of the asbestos abatement project. Additional boxes have been provided in the event the project involves more than one shift.

F. Specify the name, address, contact person, phone, fax, and email for the Demolition Contractor, if applicable.

G. Specify the starting and ending dates for demolition even when no asbestos-containing materials are present. Should the demolition not begin on the start date listed, a revised notification form shall be submitted prior to the listed start date. Please note the start date must be at least 10 working-days after postmark or hand-deliver date.

H. If a project is being placed on hold, specify the dates as follows:

- "Hold Begin Date" indicate date that the regularly scheduled demolition or renovation/abatement operations will be put on hold at the facility.

- "Work Resume Date" indicate date that the regularly scheduled demolition or renovation/abatement operations will resume at the facility. If a project was previously placed "On Hold", the Ohio EPA must receive notification of returning to the project at least one (1) working day prior to resuming demolition and/or renovation/abatement activities.

Be sure to indicate the correct page numbers across the bottom of the notification once all the pages are complete.

The asbestos regulations, notification forms, guidance, local contacts, and other information can be found on Ohio EPA's asbestos program web site at www.epa.ohio.gov/dapc/atu/asbestos.aspx

SanAir Technologies Laboratory

The Identification Specialists

Analysis Report
prepared for
Turn-Key Environmental Consultants, Inc.

Report Date: 3/6/2025

Project Name: 145 Cherry St

Project #: 25137

SanAir ID#: 25014805

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 Technologies Laboratory

SanAir ID Number
25014805
FINAL REPORT
3/6/2025 12:11:31 PM

Name: Turn-Key Environmental Consultants, Inc.
Address: 790 Barnhart Road
Troy, OH 45373
Phone: 937-335-8807

Project Number: 25137
P.O. Number:
Project Name: 145 Cherry St
Collected Date: 3/3/2025
Received Date: 3/6/2025 10:30:00 AM

Analyst: Hedge, Emily

Asbestos Bulk PLM EPA 600/R-93/116

	Stereoscopic	Components		
SanAir ID / Description	Appearance	% Fibrous	% Non-fibrous	Asbestos Fibers
1-1 / 25014805-001 Cork Mastic, Cork	Brown Non-Fibrous Homogeneous	5% Cellulose	95% Other	None Detected
1-1 / 25014805-001 Cork Mastic, Mastic	Yellow Non-Fibrous Homogeneous	5% Cellulose	95% Other	None Detected
1-2 / 25014805-002 Cork Mastic, Cork	Brown Non-Fibrous Homogeneous	5% Cellulose	95% Other	None Detected
1-2 / 25014805-002 Cork Mastic, Mastic	Yellow Non-Fibrous Homogeneous	5% Cellulose	95% Other	None Detected
2-1 / 25014805-003 Window Caulk	Grey Non-Fibrous Homogeneous	2% Cellulose	98% Other	< 1% Chrysotile
2-2 / 25014805-004 Window Caulk	Grey Non-Fibrous Homogeneous	2% Cellulose	98% Other	< 1% Chrysotile
3-1 / 25014805-005 Window Glaze	Grey Non-Fibrous Homogeneous	2% Cellulose	98% Other	< 1% Chrysotile
3-2 / 25014805-006 Window Glaze	Grey Non-Fibrous Homogeneous	2% Cellulose	98% Other	< 1% Chrysotile

Analyst: Approved Signatory:

Analysis Date: 3/6/2025 Date: 3/6/2025

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: 25014805

Company: Turn-Key Environmental	Project #: 25137	Collected by:
Address: 790 Barnhart Rd	Project Name: 145 cherry st.	Phone #: 937-335-8807
City, St., Zip: Troy, OH, 45373	Date Collected: 3/3/25	Fax #:
State of Collection: OH Account#: 1549	P.O. Number:	Email: tkec@turn-keyenvironm

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

Water

ABHE	EPA 100.2	☐

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	☐

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

Sample #	Sample Identification/Location	Volume or Area	Sample Date	Flow Rate*	Start – Stop Time*	
1-1	Cork mastic					
1-2	"					
2-1	Window caulk					
2-2	"					
3-1	window glaze					
3-2	"					

Relinquished by	Date	Time	Received by	Date	Time
	3/3/25	17:00	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.

Page_____of_____

SanAir Technologies Laboratory

The Identification Specialists

Analysis Report
prepared for
Turn-Key Environmental Consultants, Inc.

Report Date: 3/11/2025

Project Name: 145 Cherry St

Project #: 25137

SanAir ID#: 25015696

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 Technologies Laboratory

SanAir ID Number
25015696
FINAL REPORT
3/11/2025 4:49:32 PM

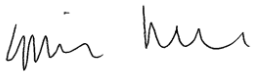
Name: Turn-Key Environmental Consultants, Inc.
Address: 790 Barnhart Road
Troy, OH 45373
Phone: 937-335-8807

Project Number: 25137
P.O. Number:
Project Name: 145 Cherry St
Collected Date: 3/3/2025
Received Date: 3/10/2025 2:45:00 PM

Analyst: Hedge, Emily

Asbestos Bulk EPA PLM NOB EPA 600/R-93/116

SanAir ID / Description	Appearance	% Fibrous	% Non Fibrous	Asbestos Types	% Total Asbestos
25015696-001 / 2-1 Window Caulk	Grey Non-Fibrous Homogeneous		99.5 %	Chrysotile	0.5 %
25015696-002 / 2-2 Window Caulk	Grey Non-Fibrous Homogeneous		99.4 %	Chrysotile	0.6 %
25015696-003 / 3-1 Window Glaze	Grey Non-Fibrous Homogeneous		99.5 %	Chrysotile	0.5 %
25015696-004 / 3-2 Window Glaze	Grey Non-Fibrous Homogeneous		99.5 %	Chrysotile	0.5 %

Analyst: 

Approved Signatory:

Analysis Date: 3/11/2025

Date: 3/11/2025

25015696

From: Turn-Key Environmental <tkec@turn-keyenvironmental.com>
Sent: Monday, March 10, 2025 2:32 PM
To: Support <support@sanair.com>
Subject: Re: Fw: [Reply Needed] Re: Analysis Report for Job 25014805 is complete.

EXTERNAL EMAIL: DO NOT CLICK on links or attachments unless you recognize the sender and know the content is safe.

Good afternoon,

Confirmed. Please place these on a 1 day TAT.
Thank you,
Jon

On Fri, Mar 7, 2025 at 10:31 AM Support <support@sanair.com> wrote:

> Good Morning,
>
> I am following up on the point count request (please see emails below). Please confirm the lab is approved to proceed with ABBEN (PLM EPA NOB) analysis.
>
> Please confirm the turnaround time you would like.
>
> - 1 Day
> - 2 Day
> - 3 Day
> - 4 Day
> - 5 Day
>
> Please let me know if you have any questions.
>
> Respectfully,
>
> Cecelia Toler
> Customer Service Representative
> SanAir Technologies Laboratory, Inc.
> 10501 Trade Court
> N. Chesterfield, VA 23236
> Phone 804-897-1177 Ext 208
> Fax 804-897-0070
> www.SanAir.com
>
> SanAir Technologies Laboratory
> The Identification Specialists
> Asbestos, Lead & Metals, Microbiology, Legionella, Materials Science Testing

RMB MAR 10 2025 2:45pm

2018, 2019, 2020, and 2021 Winner of Top work places in Richmond

25015696

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From: Support <support@sanair.com>
Sent: Thursday, March 6, 2025 1:55 PM
To: Turn-Key Environmental <tkec@turn-keyenvironmental.com>
Subject: [Reply Needed] Re: Analysis Report for Job 25014805 is complete.

Request Received; For this request, we will need to analyze the samples using ABBEN (PLM EPA NOB), which requires your approval. Please confirm this is acceptable so we can proceed with analysis.

Additionally, the fastest we can offer this analysis is on a 1-Day turnaround time. Would you like to proceed with this or go for a longer turnaround around?

Please let me know if you have any questions.

Respectfully,

Cecelia Toler
Customer Service Representative
SanAir Technologies Laboratory, Inc.
10501 Trade Court
N. Chesterfield, VA 23236
Phone 804-897-1177 Ext 208
Fax 804-897-0070
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From: Turn-Key Environmental <tkec@turn-keyenvironmental.com>
Sent: Thursday, March 6, 2025 1:37 PM

RMB MAR 10 2025 2:45pm

25015696

To: Lab Reports <labreports@sanair.com>
Subject: Re: Analysis Report for Job 25014805 is complete.

EXTERNAL EMAIL: DO NOT CLICK on links or attachments unless you recognize the sender and know the content is safe.

Hello

Please run 400 point counts on the caulk and glaze on a positive stop and 3hr tat.

Thank you
Jon

Turn-Key Environmental Consultants, Inc.

The Hub at the Arcade
31 South Main St. Suite 214
Dayton, OH 45402
937-335-8807

790 Barnhart Road
Troy, OH 45373
www.turn-keyenvironmental.com

On Thu, Mar 6, 2025 at 12:11 PM SanAir Technologies Laboratory <labreports@sanair.com> wrote:

> Your Analysis is complete. It is available on the web at https://www.sanair.net/reports/. Information is periodically added to our additional information and disclaimer pages so please check them for updates.
>
> Thank you for your continued business, SanAir
>
> The information in this message may contain confidential information intended for use by the recipient only. If this information was received in error, please reply to the message and delete it.

--

Turn-Key Environmental Consultants, Inc.

The Hub at the Arcade
31 South Main St. Suite 214
Dayton, OH 45402
937-335-8807

790 Barnhart Road
Troy, OH 45373
www.turn-keyenvironmental.com

RMB MAR 10 2025 2:45pm

25015696

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: ~~2504805~~

Company: Turn-Key Environmental	Project #: 25137	Collected by:
Address: 790 Barnhart Rd	Project Name: 145 cherry st.	Phone #: 937-335-8807
City, St., Zip: Troy, OH, 45373	Date Collected: 3/3/25	Fax #:
State of Collection: OH Account#: 1549	P.O. Number:	Email: tkec@turn-keyenvironm

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

Water

ABHE	EPA 100.2	☐

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	☐

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

Sample #	Sample Identification/Location	Volume or Area	Sample Date	Flow Rate*	Start – Stop Time*	
1-1	Cork mastic					
1-2	"					
2-1	Window Caulk					
2-2	"					
3-1	window glaze					
3-2	"					

Relinquished by	Date	Time	Received by	Date	Time
	3/3/25	17:00	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.

Page_____of_____

7/31/2025

Jonathan Treasure
Turn-Key Environmental Consultants, Inc
790 Barnhart Rd
Troy, OH 45373

RE: Evaluation Specialist
Certification Number: ES36341
Expiration Date: 8/8/2026

Dear Jonathan Treasure:

This letter and enclosed certification card approves your request to be certified as an asbestos Evaluation Specialist. You must present your card upon request at any project site while performing duties. Copies of cards are not acceptable as proof of certification.

This certification may be revoked by the Director of the Ohio Environmental Protection Agency (EPA) for violation of any of the requirements of 3745-22 or 3745-20 of the Ohio Administrative Code.

If you have any questions, please contact the Asbestos Program at 614-644-0226 or by email at asbestoslicensing@epa.ohio.gov.

Sincerely,

Brandon M. Schwendeman

Brandon Schwendeman
Manager, Business Operations Support Section
Ohio EPA - Division of Air Pollution Control

State of Ohio
Environmental Protection Agency
Asbestos Program

Asbestos Hazard Evaluation Specialist

Jonathan
Treasure

Turn-Key Environmental Consultants, I
790 Barnhart Rd
Troy OH 45373

DOB: 11/12/84

Card not Valid if Altered

Certification Number **Expiration Date**
ES36341 8/8/26

• P.O. Box 1049 • Columbus, OH 43216-1049
) 644-3020 • (614) 644-3184 (fax)

SECTION 003300- CAST-IN-PLACE CONCRETE

1.1 SUMMARY

A. Section includes cast-in-place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes.

B. Related Requirements:

1. Section 312000 "Earth Moving" for drainage fill under slabs-on-grade.
2. Section 321313 "Concrete Paving" for concrete pavement and walks.

1.2 DEFINITIONS

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

B. W/C Ratio: The ratio by weight of water to cementitious materials.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Design Mixtures: For each concrete mixture. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.

1. Indicate amounts of mixing water to be withheld for later addition at Project site.

C. Steel Reinforcement Shop Drawings: Placing Drawings that detail fabrication, bending, and placement. Include bar sizes, lengths, material, grade, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, splices and laps, mechanical connections, tie spacing, hoop spacing, and supports for concrete reinforcement.

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

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

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer and manufacturer.

B. Welding certificates.

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

1. Cementitious materials.
2. Admixtures.
3. Steel reinforcement and accessories.
4. Fiber reinforcement.
5. Water stops.
6. Curing compounds.
7. Floor and slab treatments.
8. Bonding agents.
9. Adhesives.
10. Vapor retarders.
11. Semirigid joint filler.
12. Joint-filler strips.
13. Repair materials.

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

1. Aggregates**:** Include service record data indicating absence of deleterious expansion of concrete due to alkali aggregate reactivity.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer who employs on Project personnel qualified as ACI-certified Flatwork Technician and Finisher and a supervisor who is an ACI-certified Concrete Flatwork Technician.

B. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.

1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities."

C. Welding Qualifications: Qualify procedures and personnel according to AWS D1.4/D 1.4M.

1.6 PRECONSTRUCTION TESTING

A. Preconstruction Testing Service: Engage a qualified testing agency to perform preconstruction testing on concrete mixtures.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage. Avoid damaging coatings on steel reinforcement.

B. Water stops: Store water stops under cover to protect from moisture, sunlight, dirt, oil, and other contaminants.

1.8 FIELD CONDITIONS

A. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.

1. When average high and low temperature is expected to fall below 40 deg F for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301.
2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.

B. Hot-Weather Placement: Comply with ACI 301 and as follows:

1. Maintain concrete temperature below 90 deg F) at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

PART 2 - PRODUCTS

2.1 CONCRETE, GENERAL

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

1. ACI 301
2. ACI 117

2.2 FORM-FACING MATERIALS

A. Smooth-Formed Finished Concrete: Form-facing panels that provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.

1. Plywood, metal, or other approved panel materials.

a. B-B (Concrete Form), Class 1 or better; mill oiled and edge sealed.

B. Rough-Formed Finished Concrete: Plywood, lumber, metal, or another approved material. Provide lumber dressed on at least two edges and one side for tight fit.

C. Forms for Cylindrical Columns, Pedestals, and Supports: Metal, glass-fiber-reinforced plastic, paper, or fiber tubes that produce surfaces with gradual or abrupt irregularities not exceeding specified formwork surface class. Provide units with sufficient wall thickness to resist plastic concrete loads without detrimental deformation.

D. Chamfer Strips: Wood, metal, PVC, or rubber strips, 3/4 by 3/4 inch minimum.

E. Rustication Strips: Wood, metal, PVC, or rubber strips, kerfed for ease of form removal.

F. Form-Release Agent: Commercially formulated form-release agent that does not bond with, stain, or adversely affect concrete surfaces and does not impair subsequent treatments of concrete surfaces.

1. Formulate form-release agent with rust inhibitor for steel form-facing materials.

G. Form Ties: Factory-fabricated, removable or snap-off glass-fiber-reinforced plastic or metal form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.

1. Furnish units that leave no corrodible metal closer than 1 inch to the plane of exposed concrete surface.
2. Furnish ties that, when removed, leave holes no larger than 1 inch in diameter in concrete surface.
3. Furnish ties with integral water-barrier plates to walls indicated to receive dampproofing or waterproofing.

2.3 STEEL REINFORCEMENT

A. Reinforcing Bars: ASTM A 615/A 615M, Grade 60, deformed.

B. Low-Alloy-Steel Reinforcing Bars: ASTM A 706/A 706M, deformed.

C. Steel Bar Mats: ASTM A 184/A 184M, fabricated from ASTM A 615/A 615M, Grade 60 , deformed bars, assembled with clips.

D. Plain-Steel Wire: ASTM A 1064/A 1064M, as drawn.

E. Deformed-Steel Wire: ASTM A 1064/A 1064M.

F. Plain-Steel Welded-Wire Reinforcement: ASTM A 1064/A 1064M, plain, fabricated from as-drawn steel wire into flat sheets.

G. Deformed-Steel Welded-Wire Reinforcement: ASTM A 1064/A 1064M, flat sheet.

2.4 REINFORCEMENT ACCESSORIES

A. Joint Dowel Bars: ASTM A 615/A 615M, Grade 60, plain-steel bars, cut true to length with ends square and free of burrs.

B. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded-wire reinforcement in place. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice," of greater compressive strength than concrete and as follows:

1. For concrete surfaces exposed to view, where legs of wire bar support contact forms, use CRSI Class 1 plastic-protected steel wire or CRSI Class 2 stainless-steel bar supports.

2.5 CONCRETE MATERIALS

A. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, obtain aggregate from single source, and obtain admixtures from single source from single manufacturer.

B. Cementitious Materials:

1. Portland Cement: ASTM C 150/C 150M, Type I/II, gray.
2. Fly Ash: ASTM C 618, Class F.
3. Slag Cement: ASTM C 989/C 989M, Grade 100 or 120.

C. Normal-Weight Aggregates: ASTM C 33/C 33M, Class 3S coarse aggregate or better, graded. Provide aggregates from a single source with documented service record data of at least 10 years' satisfactory service in similar applications and service conditions using similar aggregates and cementitious materials.

1. Maximum Coarse-Aggregate Size: See mix designs.
2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.

D. Air-Entraining Admixture: ASTM C 260/C 260M.

E. Chemical Admixtures: Certified by manufacturer to be compatible with other admixtures and that do not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.

1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
2. Retarding Admixture: ASTM C 494/C 494M, Type B.
3. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.
4. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.
5. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.
6. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.

F. Set-Accelerating Corrosion-Inhibiting Admixture: Commercially formulated, anodic inhibitor or mixed cathodic and anodic inhibitor; capable of forming a protective barrier and minimizing chloride reactions with steel reinforcement in concrete and complying with ASTM C 494/C 494M, Type C.

G. Water: ASTM C 94/C 94M and potable.

2.6 FIBER REINFORCEMENT

A. Synthetic Micro-Fiber: Monofilament polypropylene micro-fibers engineered and designed for use in concrete, complying with ASTM C 1116/C 1116M, Type III, 1/2 to 1-1/2 inches long.

B. Synthetic Macro-Fiber: Polyolefin macro-fibers engineered and designed for use in concrete, complying with ASTM C 1116/C 1116M, Type III, 1 to 2-1/4 inches long.

2.7 WATERSTOPS

A. Flexible Rubber Water stops: CE CRD-C 513, with factory-installed metal eyelets, for embedding in concrete to prevent passage of fluids through joints. Factory fabricate corners, intersections, and directional changes.

1. Profile: Flat dumbbell without center bulb.
2. Dimensions: 4 inches by 3/16 inch thick; non-tapered.

2.8 VAPOR RETARDERS

A. Sheet Vapor Retarder: ASTM E 1745, Class A. Include manufacturer's recommended adhesive or pressure-sensitive tape.

B. Sheet Vapor Retarder: Polyethylene sheet, ASTM D 4397, not less than 15 mils thick.

2.9 LIQUID FLOOR TREATMENTS

A. Penetrating Liquid Floor Treatment: Clear, chemically reactive, waterborne solution of inorganic silicate or silicone materials and proprietary components; odorless; that penetrates, hardens, and densifies concrete surfaces.

2.10 CURING MATERIALS

A. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.

B. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. when dry.

C. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.

D. Water: Potable.

E. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, dissipating.

F. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, no dissipating, certified by curing compound manufacturer to not interfere with bonding of floor covering.

G. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, 18 to 25 percent solids, no dissipating, certified by curing compound manufacturer to not interfere with bonding of floor covering.

H. Clear, Waterborne, Membrane-Forming Curing and Sealing Compound: ASTM C 1315, Type 1, Class A.

2.11 RELATED MATERIALS

A. Expansion- and Isolation-Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber or ASTM D 1752, cork or self-expanding cork.

B. Semirigid Joint Filler: Two-component, semirigid, 100 percent solids, aromatic polyurea with a Type A shore durometer hardness range of 90 to 95 according to ASTM D 2240.

C. Bonding Agent: ASTM C 1059/C 1059M, Type II, nonredispersible, acrylic emulsion or styrene butadiene.

D. Reglets: Fabricate reglets of not less than 0.022-inch thick, galvanized-steel sheet. Temporarily fill or cover face opening of reglet to prevent intrusion of concrete or debris.

E. Dovetail Anchor Slots: Hot-dip galvanized-steel sheet, not less than 0.034 inch thick, with bent tab anchors. Temporarily fill or cover face opening of slots to prevent intrusion of concrete or debris.

2.12 REPAIR MATERIALS

A. Repair Underlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/8 inch and that can be feathered at edges to match adjacent floor elevations.

1. Cement Binder: ASTM C 150/C 150M, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
2. Primer: Product of underlayment manufacturer recommended for substrate, conditions, and application.
3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by underlayment manufacturer.
4. Compressive Strength: Not less than 4100 psi at 28 days when tested according to ASTM C 109/C 109M.

B. Repair Overpayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/4 inch (6.4 mm) and that can be filled in over a scarified surface to match adjacent floor elevations.

1. Cement Binder: ASTM C 150/C 150M, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
2. Primer: Product of topping manufacturer recommended for substrate, conditions, and application.
3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch (3.2 to 6 mm) or coarse sand as recommended by topping manufacturer.
4. Compressive Strength: Not less than 5000 psi (34.5 MPa) at 28 days when tested according to ASTM C 109/C 109M.

2.13 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, according to ACI 301 (ACI 301M).

1. Use a qualified independent 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: 25 percent.
2. Combined Fly Ash and Pozzolan: 25 percent.
3. Slag Cement: 50 percent.
4. Combined Fly Ash or Pozzolan and Slag Cement: 50 percent portland cement minimum, with fly ash or pozzolan not exceeding 25 percent.

C. Limit water-soluble, chloride-ion content in hardened concrete to 0.15 percent by weight of cement.

D. Admixtures: Use admixtures according to manufacturer's written instructions.

1. Use water-reducing, high-range water-reducing, or plasticizing admixture in concrete, as required, for placement and workability.
2. Use water-reducing and -retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
3. Use water-reducing admixture in pumped concrete, concrete for heavy-use industrial slabs and parking structure slabs, concrete required to be watertight, and concrete with a w/c ratio below 0.50.

2.14 CONCRETE MIXTURES FOR BUILDING ELEMENTS

A. Interior Footings: Normal-weight concrete (Class I).

1. Minimum Compressive Strength: 3000 psi (20.7 MPa) at 28 days.
2. Maximum W/C Ratio: 0.50.
3. Slump Limit: 6 inches for concrete with verified slump of 2 to 4 inches before adding high-range water-reducing admixture or plasticizing admixture, plus or minus 1 inch (25 mm).
4. Air Content: Entrapped to a maximum of 3%
5. Nominal maximum aggregate size: 1 ½”.

B. Exterior and Perimeter Footings: Normal-weight concrete (Class II).

1. Minimum Compressive Strength: 4000 psi (20.7 MPa) at 28 days.
2. Maximum W/C Ratio: 0.47.
3. Slump Limit: 6 inches for concrete with verified slump of 2 to 4 inches before adding high-range water-reducing admixture or plasticizing admixture, plus or minus 1 inch (25 mm).
4. Air Content: Entrained to 5%, +/- 1%

5. Nominal maximum aggregate size: 1 ½".

C. Interior Slabs-on-Grade (Class III): Normal-weight concrete.

1. Minimum Compressive Strength: 3500 psi (24.1 MPa) at 28 days.
2. Maximum W/C Ratio: 0.45.
3. Minimum Cementitious Materials Content: 540 lb/cu. yd. (320 kg/cu. m).
4. Slump Limit: 6 inches for concrete with verified slump of 2 to 4 inches before adding high-range water-reducing admixture or plasticizing admixture, plus or minus 1 inch (25 mm).
5. Air Content: Do not allow air content of trowel-finished floors to exceed 3 percent.
6. Synthetic Micro-Fiber: Uniformly disperse in concrete mixture at manufacturer's recommended rate, but not less than a rate of 1.5 lb/cu. yd. (0.90 kg/cu. m).
7. Nominal maximum aggregate size: 1".

D. Exterior Slabs-on-Grade (Class IV): Normal-weight concrete.

1. Minimum Compressive Strength: 4500 psi (31.0 MPa) at 28 days.
2. Maximum W/C Ratio: 0.45.
3. Minimum Cementitious Materials Content: 611 lb/cu. yd. (365 kg/cu. m).
4. Slump Limit: 6 inches for concrete with verified slump of 2 to 4 inches before adding high-range water-reducing admixture or plasticizing admixture, plus or minus 1 inch (25 mm).
5. Air Content: Entrained to 6%, +/- 1.5%
6. Synthetic Micro-Fiber: Uniformly disperse in concrete mixture at manufacturer's recommended rate, but not less than a rate of 1.0 lb/cu. yd. (0.90 kg/cu. m).
7. Nominal maximum aggregate size: 1".

E. Exterior Walls, piers, and columns (Class VI): Normal-weight concrete.

1. Minimum Compressive Strength: 4500 psi (31.0 MPa) at 28 days.
2. Maximum W/C Ratio: 0.45.
3. Minimum Cementitious Materials Content: 611 lb/cu. yd. (365 kg/cu. m).
4. Slump Limit: 6 inches for concrete with verified slump of 2 to 4 inches before adding high-range water-reducing admixture or plasticizing admixture, plus or minus 1 inch (25 mm).
5. Air Content: Entrained to 6%, +/- 1.5%
6. Nominal maximum aggregate size: 3/4".

F. Interior Slabs-on-Grade (Class III): Normal-weight concrete.

1. Minimum Compressive Strength: 4000 psi (27.6 MPa) at 28 days.
2. Maximum W/C Ratio: 0.50.
3. Minimum Cementitious Materials Content: 564 lb/cu. yd. (325 kg/cu. m).
4. Slump Limit: 6 inches for concrete with verified slump of 2 to 4 inches before adding high-range water-reducing admixture or plasticizing admixture, plus or minus 1 inch (25 mm).
5. Nominal maximum aggregate size: 3/4".

2.15 FABRICATING REINFORCEMENT

A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

2.16 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94/C 94M and furnish batch ticket information.

1. When air temperature is between 85 and 90 deg F (30 and 32 deg C), reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F (32 deg C), reduce mixing and delivery time to 60 minutes.

PART 3 - EXECUTION

3.1 FORMWORK INSTALLATION

A. Design, erect, shore, brace, and maintain formwork, according to ACI 301 (ACI 301M), to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads.

B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117 (ACI 117M).

C. Limit concrete surface irregularities, designated by ACI 347 as abrupt or gradual, as follows:

1. Class A, 1/8 inch (3.2 mm) for smooth-formed finished surfaces.
2. Class B, 1/4 inch (6 mm) for rough-formed finished surfaces.

D. Construct forms tight enough to prevent loss of concrete mortar.

E. Construct forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast-concrete surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical.

1. Install keyways, reglets, recesses, and the like, for easy removal.
2. Do not use rust-stained steel form-facing material.

F. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces. Provide and secure units to support screed strips; use strike-off templates or compacting-type screeds.

G. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations.

H. Chamfer exterior corners and edges of permanently exposed concrete.

I. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work. Determine sizes and locations from trades providing such items.

J. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.

K. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.

L. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

3.2 EMBEDDED ITEM INSTALLATION

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. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

1. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of AISC 303.
2. 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. Install dovetail anchor slots in concrete structures as indicated.

3.3 REMOVING AND REUSING FORMS

A. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing material are not acceptable for exposed surfaces. Apply new form-release agent.

B. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints. Align and secure joints to avoid offsets. Do not use patched forms for exposed concrete surfaces unless approved by Architect.

3.4 VAPOR-RETARDER INSTALLATION

A. Sheet Vapor Retarders: Place, protect, and repair sheet vapor retarder according to ASTM E 1643 and manufacturer's written instructions.

1. Lap joints 6 inches (150 mm) and seal with manufacturer's recommended tape.

3.5 STEEL REINFORCEMENT INSTALLATION

A. General: Comply with CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.

1. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.

B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that reduce bond to concrete.

C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover. Do not tack weld crossing reinforcing bars.

1. Weld reinforcing bars according to AWS D1.4/D 1.4M, where indicated.

D. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.

E. Install welded-wire reinforcement in longest practicable lengths on bar supports spaced to minimize sagging. Lap edges and ends of adjoining sheets at least one mesh spacing. Offset laps of adjoining sheet widths to prevent continuous laps in either direction. Lace overlaps with wire.

3.6 JOINTS

A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.

B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.

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

1. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch- (3.2-mm-) wide joints into concrete when cutting action does not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks.

D. Isolation Joints in Slabs-on-Grade: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.

1. Extend joint-filler strips full width and depth of joint, terminating flush with finished concrete surface unless otherwise indicated.

E. Doweled Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or asphalt coat one-half of dowel length to prevent concrete bonding to one side of joint.

3.7 WATERSTOP INSTALLATION

A. Flexible Waterstops: Install in construction joints and at other joints indicated to form a continuous diaphragm. Install in longest lengths practicable. Support and protect exposed waterstops during progress of the Work. Field fabricate joints in waterstops according to manufacturer's written instructions.

3.8 CONCRETE PLACEMENT

A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections are completed.

B. Do not add water to concrete during delivery, at Project site, or during placement unless approved by Architect.

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

C. 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. If a section cannot be placed continuously, provide construction joints as indicated. Deposit concrete to avoid segregation.

1. Deposit concrete in horizontal layers of depth not to exceed formwork design pressures and in a manner to avoid inclined construction joints.
2. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301 (ACI 301M).
3. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches (150 mm) into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. 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.

D. 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. Consolidate concrete during placement operations, so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
2. Maintain reinforcement in position on chairs during concrete placement.
3. Screed slab surfaces with a straightedge and strike off to correct elevations.
4. Slope surfaces uniformly to drains where required.
5. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess bleedwater appears on the surface. Do not further disturb slab surfaces before starting finishing operations.

3.9 FINISHING FORMED SURFACES

A. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defects repaired and patched. Remove fins and other projections that exceed specified limits on formed-surface irregularities.

1. Apply to concrete surfaces not exposed to public view.

B. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and

defects. Remove fins and other projections that exceed specified limits on formed-surface irregularities.

1. Apply to concrete surfaces exposed to public view.

C. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces unless otherwise indicated.

3.10 FINISHING FLOORS AND SLABS

A. General: Comply with ACI 302.1R recommendations for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.

B. Trowel Finish: After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.

1. Apply a trowel finish to surfaces indicated.
2. Finish surfaces to the following tolerances, according to ASTM E 1155 (ASTM E 1155M), for a randomly trafficked floor surface:
   a. Specified overall values of flatness, F(F) 35; and of levelness, F(L) 25; with minimum local values of flatness, F(F) 24; and of levelness, F(L) 17; for slabs-on-grade.

C. Trowel and Fine-Broom Finish: Apply a first trowel finish to surfaces indicated. While concrete is still plastic, slightly scarify surface with a fine broom.

1. Comply with flatness and levelness tolerances for trowel-finished floor surfaces.

D. Broom Finish: Apply a broom finish to exterior concrete platforms, steps, ramps, and elsewhere as indicated.

1. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route. Coordinate required final finish with Architect before application.

3.11 MISCELLANEOUS CONCRETE ITEM INSTALLATION

A. Equipment Bases and Foundations:

1. Coordinate sizes and locations of concrete bases with actual equipment provided.
2. Construct concrete bases 4 inches (100 mm) high unless otherwise indicated, and extend base not less than 6 inches (150 mm) in each direction beyond the maximum dimensions of supported equipment unless otherwise indicated or unless required for seismic anchor support.
3. Minimum Compressive Strength: 4000 psi (27.6 MPa) at 28 days.

4. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch (450-mm) centers around the full perimeter of concrete base.
5. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete substrate.
6. Prior to pouring concrete, place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
7. Cast anchor-bolt insert into bases. Install anchor bolts to elevations required for proper attachment to supported equipment.

B. Steel Pan Stairs: Provide concrete fill for steel pan stair treads, landings, and associated items. Cast-in inserts and accessories as shown on Drawings. Screed, tamp, and trowel finish concrete surfaces.

3.12 CONCRETE PROTECTING AND CURING

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 301 (ACI 301M) for hot-weather protection during curing.

B. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h (1 kg/sq. m 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.

C. Formed Surfaces: Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces. If forms remain during curing period, moist cure after loosening forms. If removing forms before end of curing period, continue curing for remainder of curing period.

D. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed surfaces, including floors and slabs, concrete floor toppings, and other surfaces.

E. Cure concrete according to ACI 308.1, by one or a combination of the following methods:

1. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches (300 mm), and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period, using cover material and waterproof tape.

    a. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive floor coverings.
    b. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive penetrating liquid floor treatments.
    c. Cure concrete surfaces to receive floor coverings with either a moisture-retaining cover or a curing compound that the manufacturer certifies does not interfere with bonding of floor covering used on Project.

2. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.

    a. Removal: After curing period has elapsed, remove curing compound without damaging concrete surfaces by method recommended by curing compound manufacturer unless manufacturer certifies curing compound does not interfere with bonding of floor covering used on Project.

3.13 LIQUID FLOOR TREATMENT APPLICATION

A. Penetrating Liquid Floor Treatment: Prepare, apply, and finish penetrating liquid floor treatment according to manufacturer's written instructions.

1. Remove curing compounds, sealers, oil, dirt, laitance, and other contaminants and complete surface repairs.
2. Do not apply to concrete that is less than 28 days' old.
3. Apply liquid until surface is saturated, scrubbing into surface until a gel forms; rewet; and repeat brooming or scrubbing. Rinse with water; remove excess material until surface is dry. Apply a second coat in a similar manner if surface is rough or porous.

3.14 JOINT FILLING

A. Prepare, clean, and install joint filler according to manufacturer's written instructions.

1. Defer joint filling until concrete has aged at least one month. Do not fill joints until construction traffic has permanently ceased.

B. Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave contact faces of joints clean and dry.

C. Install semirigid joint filler full depth in saw-cut joints and at least 2 inches (50 mm) deep in formed joints. Overfill joint and trim joint filler flush with top of joint after hardening.

3.15 CONCRETE SURFACE REPAIRS

A. Defective Concrete: Repair and patch defective areas when approved by Architect. Remove and replace concrete that cannot be repaired and patched to Architect's approval.

B. Patching Mortar: Mix dry-pack patching mortar, consisting of 1 part portland cement to 2-1/2 parts fine aggregate passing a No. 16 (1.18-mm) sieve, using only enough water for handling and placing.

C. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.

1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch (13 mm) in any dimension to solid concrete. Limit cut depth to 3/4 inch (19 mm). Make edges of cuts perpendicular to concrete surface. Clean, dampen with water, and brush-coat holes and voids with bonding agent. Fill and compact with patching mortar before bonding agent has dried. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.
2. Repair defects on surfaces exposed to view by blending white portland cement and standard portland cement so that, when dry, patching mortar matches surrounding color. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching. Compact mortar in place and strike off slightly higher than surrounding surface.
3. Repair defects on concealed formed surfaces that affect concrete's durability and structural performance as determined by Architect.

D. Repairing Unformed Surfaces: Test unformed surfaces, such as floors and slabs, for finish and verify surface tolerances specified for each surface. Correct low and high areas. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.

1. Repair finished surfaces containing defects. Surface defects include spalls, popouts, honeycombs, rock pockets, crazing and cracks in excess of 0.01 inch (0.25 mm) wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.
2. After concrete has cured at least 14 days, correct high areas by grinding.
3. Correct localized low areas during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete.
4. Correct other low areas scheduled to receive floor coverings with a repair underlayment. Prepare, mix, and apply repair underlayment and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface. Feather edges to match adjacent floor elevations.
5. Correct other low areas scheduled to remain exposed with a repair topping. Cut out low areas to ensure a minimum repair topping depth of 1/4 inch (6 mm) to match adjacent floor elevations. Prepare, mix, and apply repair topping and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.
6. Repair defective areas, except random cracks and single holes 1 inch (25 mm) or less in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose steel reinforcement with at least a 3/4-inch (19-mm) clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mixture as original concrete, except without coarse aggregate. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.
7. Repair random cracks and single holes 1 inch (25 mm) or less in diameter with patching mortar. Groove top of cracks and cut out holes to sound concrete and clean off dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Place patching mortar before bonding agent has dried. Compact patching mortar and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.

E. Perform structural repairs of concrete, subject to Architect's approval, using epoxy adhesive and patching mortar.

F. Repair materials and installation not specified above may be used, subject to Architect's approval.

3.16 FIELD QUALITY CONTROL

A. Special Inspections: Owner will engage a special inspector and qualified testing and inspecting agency to perform field tests and inspections and prepare test reports.

B. Inspections:

1. Steel reinforcement placement.
2. Steel reinforcement welding.
3. Headed bolts and studs.
4. Verification of use of required design mixture.
5. Concrete placement, including conveying and depositing.
6. Curing procedures and maintenance of curing temperature.
7. Verification of concrete strength before removal of shores and forms from beams and slabs.

C. Concrete Tests: Testing of composite samples of fresh concrete obtained according to ASTM C 172/C 172M shall be performed according to the following requirements:

1. Testing Frequency: Obtain one composite sample for each day's pour of each concrete mixture exceeding 5 cu. yd. (4 cu. m), but less than 25 cu. yd. (19 cu. m), plus one set for each additional 50 cu. yd. (38 cu. m) or fraction thereof.

    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 C 143/C 143M; 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. Perform additional tests when concrete consistency appears to change.
3. Air Content: ASTM C 231/C 231M, pressure method, for normal-weight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
4. Concrete Temperature: ASTM C 1064/C 1064M; one test hourly when air temperature is 40 deg F (4.4 deg C) and below or 80 deg F (27 deg C) and above, and one test for each composite sample.
5. Compression Test Specimens: ASTM C 31/C 31M.

    a. Cast and laboratory cure two sets of two standard cylinder specimens for each composite sample.

6. Compressive-Strength Tests: ASTM C 39/C 39M; test one set of two laboratory-cured specimens at 7 days and one set of two specimens at 28 days.

    a. 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.

7. 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 (3.4 MPa).
8. Test results shall be reported in writing to Architect, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.
9. 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.
10. Additional Tests: 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. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42/C 42M or by other methods as directed by Architect.
11. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
12. Correct deficiencies in the Work that test reports and inspections indicate do not comply with the Contract Documents.

D. Measure floor and slab flatness and levelness according to ASTM E 1155 (ASTM E 1155M) within 24 hours of finishing.

3.17 PROTECTION OF LIQUID FLOOR TREATMENTS

A. Protect liquid floor treatment from damage and wear during the remainder of construction period. Use protective methods and materials, including temporary covering, recommended in writing by liquid floor treatments installer.

END OF SECTION 033000

SECTION 011000 – SUMMARY

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:

1. Project information.
2. Work covered by Contract Documents.
3. Work by Owner.
4. Access to site.
5. Work restrictions.
6. Specification and drawing conventions.

1.3 PROJECT INFORMATION

A. Project Identification:

1. Project Location: Mount Gilead District Office, 145 N. Cherry Street, Mount Gilead, Ohio 43338 & Mount Gilead Preschool, 145 N. Cherry Street, Mount Gilead, Ohio 43338

B. Owner: Board of Education Mount Gilead Exempted Village Schools.

1. Owner's Contact: Dr. Jeremy Froehlich, Superintendent /Tina Gabler, Treasurer

2. Project Manager: Larry Rancour, 230 Bradenton Avenue, Dublin, Ohio 43017.

C. Architect's Consultants: The Architect has retained the following design professionals who have prepared designated portions of the Contract Documents:

1. Plumbing/HVAC/Electrical Consultant: Roger D. Fields Associates, 4588 Kenny Road, Columbus, Ohio 43220.
2. Technology Consultant: Heapy Engineering, 1800 Watermark Drive, Columbus Ohio 43215.
3. Structural Consultant: SMBH, Inc. 1166 Dublin Road , Columbus , Ohio 43215 .
4. Interiors and FF7E: Community Design Alliance, 236 High Street , Hamilton Ohio 45011

1.4 WORK COVERED BY CONTRACT DOCUMENTS

A. The Work of this Project is defined by the Contract Documents and consists of the expansion & renovation of the Mount Gilead Exempted Village Schools District Office located at 145 N. Cherry Street, Mount Gilead, Ohio 43338 and Mount Gilead Exempted Village Schools Preschool located at 145 N. Cherry Street, Mount Gilead, Ohio 43338. Including all site related materials removal, demolition and improvements.

B. Type of Contract:

1. Project will be constructed under a Single Prime Contract (GC) delivery method.

C. Throughout the contract documents various work scopes have been indicated. Not all work scopes have been indicated.

D. Throughout the Division 1 specification sections where “Contractor” is used, it refers to the “GC”

1.5 WORK BY OTHERS

A. General: Cooperate fully so work may be carried out smoothly, without interfering with or delaying work under this Contract or Others. Coordinate the Work of this Contract with work performed by Others. There will be a Window Replacement project going on simultaneously with this project schedule.

1.6 ACCESS TO SITE

A. General: GC should have limited use of Project site for construction operations. Reference project site limits on the plans.

1.7 WORK RESTRICTIONS

A. Work Restrictions, General: Comply with restrictions on construction operations.

1. Comply with limitations on use of public streets and with other requirements of authorities having jurisdiction.

2. Mount Gilead is a Drug free/ Tobacco free/ Vaping free zone, including outdoor spaces area. Offenders will be removed from the project.

1.8 SPECIFICATION AND DRAWING CONVENTIONS

A. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:

1. Imperative mood and streamlined language are generally used in the Specifications. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.
2. Specification requirements are to be performed by GC unless specifically stated otherwise.

B. Division 01 General Requirements: Requirements of Sections in Division 01 apply to the Work of all Sections in the Specifications.

C. Drawing Coordination: Requirements for materials and products identified on Drawings are described in detail in the Specifications. One or more of the following are used on Drawings to identify materials and products:

1. Terminology: Materials and products are identified by the typical generic terms used in the individual Specifications Sections.
2. Abbreviations: Materials and products are identified by abbreviations scheduled on Drawings.

1.9 PERMITS

A. The A/E will secure the Plan Approvals from the State of Ohio Department of Commerce . Contactors are required to secure individual trade permits and register with the State as required in order to work on this project.

1.10 BACKGROUND CHECKS

A. Contractor and any Subcontractor employees who will be on site will be required to have a full FBI and BCI background check. The District would need the individuals to pass and would need full access to these reports on an as needed basis. If any background reports pass with questions, there will need to be a discussion with the District. Contractors will be required to pay for all required background checks.

PART 2 - RODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 011000

SECTION 012100 – ALLOWANCES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and General Provisions of Contract, including General/Supplementary Conditions, other Division 1 Specification Sections, apply to Work of this Section.

1.2 SUMMARY

A. Types of allowances include the following:

1. Lump sum allowances
2. Unit cost allowances
3. Fixed contingency

B. Designate in Construction Schedule delivery dates for product.

C. Designate in Schedule of Values separate item for cost allowances for Work.

1.3 LUMP SUM ALLOWANCES

A. Purchase product/material under allowance only as directed by Architect.

B. Amount of allowance includes;

1. Net cost of product.
2. Delivery to the site.
3. Applicable taxes.

C. In addition to amount of allowance, include in base bid, for inclusion in Contract Sum, Contractor’s costs for:

1. Handling at site including unloading, uncrating, and storage.
2. Protection from elements, from damage.
3. Labor, installation and finishing.
4. Other expenses (e.g., testing, adjusting, and balancing) required to complete installation.
5. Overhead and profit.
6. Allowances which will be adjusted by Unit Prices as listed on the Bid Proposal Form or subsequently renegotiated, should include Overhead and Profit and all associated costs. Monetary allowances which will not be adjusted by Unit Prices should not include Overhead and Profit. Overhead and Profit on monetary allowances should be carried elsewhere within the Contractor’s bid.

1.4 UNIT COST ALLOWANCE

A. Include the unit cost amounts in Base Bid for inclusion in the Contract Sum as indicated on the Bid Form.

1.5 FIXED CONTINGENCY (CASH ALLOWANCE)

A. Provide Work under allowance only as directed by Architect and Owner and pursuant to Change Order executed in accordance with the Contract Documents.

B. Include following amounts in bid for inclusion in Contract Sum:

1. Allowance for those items and Work hidden, undetectable, or unforeseen and not visible from prebid, onsite observation, or not shown, called for, or reasonably implied in the Contract Documents.

C. Amount of Allowance includes:

1. New cost of product.
2. Delivery to the site.
3. Applicable taxes.
4. Handling at site including unloading, uncrating, and storage.
5. Protection from elements, from damage.
6. Labor, installation and finishing.
7. Other expenses (e.g., testing, adjusting and balancing required to complete installation).

1.6 SELECTION OF PRODUCT/MATERIAL

A. Architect Duties

1. Consult with Contractor for consideration of product/material and suppliers.
2. Make selection, designate product/material to be used.
3. Notify Contractor in writing, designating:

a. Product, size, color and texture.
b. Supplier.
c. Cost, delivered at site.

B. Contractor’s Duties

1. Assist in determining qualified suppliers.
2. Obtain proposals from supplies when requested by Architect/Engineer.
3. Make appropriate recommendations for consideration by Architect/Engineer.
4. Notify in writing, of effect anticipated by selection of product or supplier under consideration on:

a. Construction Schedule
b. Contract Sum

5. On notification of selection enter into purchase agreement with designated supplier.

1.7 DELIVERY

A. Contractor Responsibility:

1. Arrange for delivery and unloading.
2. Promptly inspect product for damage or defects.
3. Submit claims for transportation damage.

1.8 INSTALLATION

A. Comply with reference Specification Section requirements.

1.9 ADJUSTMENT OF CASH ALLOWANCES

A. Unused amounts of monies included under allowances shall be credited to the Owner by deduct Change Order prior to approval of Final Application for Payment.

PART 2 – PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine products covered by an allowance promptly on delivery for damage or defects. Return damaged or defective products to manufacturer for replacement.

3.2 PREPARATION

A. Coordinate materials and their installation for each allowance with related materials and installations to ensure that each allowance item is completely integrated and interfaced with related work.

3.3 SCHEDULE OF ALLOWANCES

A. Description: Fixed Contingency

1. Allowance 1: Construction Testing Services = $10,000.00

2. Allowance 2: Asbestos Abatement = $50,000.00

3. Allowance 3: Electric Co. Aid to Construction

B. Total of $70,000.00 must be included in the Base Bid amount on the Bid Form.

END OF SECTION 012100

SECTION 012600 - CONTRACT MODIFICATION PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for handling and processing Contract modifications.

B. Related Requirements:

1. "Unit Prices" for adding to or deleting from the Contract after the Contract award.
2. Section 01 25 00 "Substitution Procedures" for administrative procedures for handling requests for substitutions made after the Contract award.

1.3 PROPOSAL REQUESTS

A. Owner-Initiated Proposal Requests: Architect will issue a detailed description of proposed changes in the Work that may require adjustment to the Contract Sum or the Contract Time. If necessary, the description will include supplemental or revised Drawings and Specifications.

1. Work Change Proposal Requests issued by Architect are not instructions either to stop work in progress or to execute the proposed change.
2. Within time specified in Proposal Request or 20 days, when not otherwise specified, after receipt of Proposal Request, submit a quotation estimating cost adjustments to the Contract Sum and the Contract Time necessary to execute the change.

    a. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
    b. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
    c. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
    d. Quotation Form: Use forms acceptable to A/E.

B. Contractor-Initiated Proposals: If latent or changed conditions require modifications to the Contract, Contractor may initiate a claim by submitting a request for a change to A/E.

1. Include a statement outlining reasons for the change and the effect of the change on the Work. Provide a complete description of the proposed change. Indicate the effect of the proposed change on the Contract Sum and the Contract Time.
2. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
3. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
4. Comply with requirements in Section 01 25 00 "Substitution Procedures" if the proposed change requires substitution of one product or system for product or system specified.
5. Proposal Request Form: Use form acceptable to Architect.

1.4 ADMINISTRATIVE CHANGE ORDERS

A. Unit-Price Adjustment: See “Bid Form" for administrative procedures for preparation of Change Order Proposal for adjusting the Contract Sum to reflect measured scope of unit-price work.

1.5 CHANGE ORDER PROCEDURES

A. On Owner's approval of a Work Changes Proposal Request, Architect will issue a Change Order for signatures of Owner and Supplier on Architect’s form.

1.6 CONSTRUCTION CHANGE DIRECTIVE

A. Work Change Directive: Architect may issue a Work Change Directive on A/E form.

1. Work Change Directive instructs Supplier to proceed with a change in the Work, for subsequent inclusion in a Change Order.
2. Work Change Directive contains a complete description of change in the Work. It also designates method to be followed to determine change in the Contract Sum or the Contract Time.

B. Documentation: Maintain detailed records on a time and material basis of work required by the Work Change Directive.

1. After completion of change, submit an itemized account and supporting data necessary to substantiate cost and time adjustments to the Contract.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 012600

SECTION 012900 - PAYMENT PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements necessary to prepare and process Applications for Payment.

B. Related Requirements:

1. "Unit Prices" for administrative requirements governing the use of unit prices.
2. Section 012600 "Contract Modification Procedures" for administrative procedures for handling changes to the Contract.

1.3 DEFINITIONS

A. Schedule of Values: A statement furnished by Contractor allocating portions of the Contract Sum to various portions of the Work and used as the basis for reviewing Contractor's Applications for Payment.

1.4 SCHEDULE OF VALUES

A. Coordination: Coordinate preparation of the schedule of values.

1. Coordinate line items in the schedule of values with other required administrative forms and schedules, including the following:

   a. Application for Payment forms with continuation sheets.
   b. Submittal schedule.

2. Submit the schedule of values to A/E at earliest possible date, but no later than fourteen days after the notice to proceed date.
3. Sub schedules for Separate Design Contracts: Where the Owner has retained design professionals under separate contracts who will each provide certification of payment requests, provide sub schedules showing values coordinated with the scope of each design services contract as described in Section 011000 "Summary."

B. Format and Content: Use Project Manual table of contents as a guide to establish line items for the schedule of values. Provide at least one line item for each Specification Section.

1. Identification: Include the following Project identification on the schedule of values:

    a. Project name and location.
    b. Name of A/E
    c. Project number.
    d. Contractor's name and address.
    e. Date of submittal.

2. Arrange schedule of values consistent with format of Form provided by Ohio Department of Natural Resources.
3. Arrange the schedule of values in tabular form with separate columns to indicate the following for each item listed:

    a. Related Specification Section or Division.
    b. Description of the Work.
    c. Name of subcontractor.
    d. Name of manufacturer or fabricator.
    e. Name of supplier.
    f. Change Orders (numbers) that affect value.
    g. Dollar value of the following, as a percentage of the Contract Sum to nearest one-hundredth percent, adjusted to total 100 percent.

        1) Materials.
        2) Equipment.

4. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Coordinate with Project Manual table of contents. Provide multiple line items for principal subcontract amounts.

    a. Include separate line items for EDGE subcontractors and material suppliers.

5. Round amounts to nearest whole dollar; total shall equal the Contract Sum.
6. Provide a separate line item in the schedule of values for each part of the Work where Applications for Payment may include materials or equipment purchased or fabricated and stored.
7. Allowances: Provide a separate line item in the schedule of values for each allowance. Show line-item value of unit-cost allowances, as a product of the unit cost, multiplied by measured quantity. Use information indicated in the Contract Documents to determine quantities.
8. Each item in the schedule of values and Applications for Payment shall be complete. Include total cost.
9. Schedule Updating: Update and resubmit the schedule of values before the next Applications for Payment when Change Orders or Construction Change Directives result in a change in the Contract Sum.

1.5 APPLICATIONS FOR PAYMENT

A. Each Application for Payment following the initial Application for Payment shall be consistent with previous applications and payments as certified by Architect and paid for by Owner.

1. Initial Application for Payment, Application for Payment at time of Substantial Completion, and final Application for Payment involve additional requirements.

B. Payment Application Times: The date for each progress payment is indicated in the Agreement between Owner and Contractor. The period of construction work covered by each Application for Payment is the period indicated in the Agreement.

C. Payment Application Times: Submit Application for Payment to Architect by the seventh day of the month. The period covered by each Application for Payment is one month, ending on the last day of the month.

1. Submit draft copy of Application for Payment seven days prior to due date for review by Architect.

D. Application for Payment Forms: Submit forms for approval with initial submittal of schedule of values.

E. Application Preparation: Complete every entry on form. Notarize and execute by a person authorized to sign legal documents on behalf of Contractor. A/E will return incomplete applications without action.

1. Entries shall match data on the schedule of values and Contractor's construction schedule. Use updated schedules if revisions were made.
2. Include amounts for work completed following previous Application for Payment, whether or not payment has been received. Include only amounts for work completed at time of Application for Payment.
3. Include amounts of Change Orders and Construction Change Directives issued before last day of construction period covered by application.
4. Indicate separate amounts for work being carried out under Owner-requested project acceleration.

F. Submit each Application for Payment to A/E. One copy shall include waivers of lien and similar attachments if required.

1. Transmit each copy with a transmittal form listing attachments and recording appropriate information about application.

G. Waivers of Mechanic's Lien: With each Application for Payment, submit waivers of mechanic's lien from entities lawfully entitled to file a mechanic's lien arising out of the Contract and related to the Work covered by the payment.

1. Submit partial waivers on each item for amount requested in previous application, after deduction for retainage, on each item.
2. When an application shows completion of an item, submit conditional final or full waivers.
3. Owner reserves the right to designate which entities involved in the Work must submit waivers.
4. Waiver Forms: Submit executed waivers of lien on forms acceptable to Owner.

H. Waivers of Mechanic's Lien: With each Application for Payment, submit waivers of mechanic's liens from subcontractors, sub-subcontractors, and suppliers for construction period covered by the previous application.

1. Submit partial waivers on each item for amount requested in previous application, after deduction for retainage, on each item. When an application shows completion of an item, submit conditional final or full waivers.
2. Owner reserves the right to designate which entities involved in the Work must submit waivers.
3. Submit final Application for Payment with or preceded by conditional final waivers from every entity involved with performance of the Work covered by the application who is lawfully entitled to a lien.
4. Waiver Forms: Submit executed waivers of lien on forms, acceptable to Owner.

I. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of first Application for Payment include the following:

1. List of subcontractors.
2. Schedule of values.
3. Contractor's schedule (preliminary if not final).
4. Combined Contractor’s schedule (preliminary if not final) incorporating Work of multiple contracts, with indication of acceptance of schedule by each Contractor.
5. Products list (preliminary if not final).
6. Schedule of unit prices.
7. Submittal schedule (preliminary if not final).
8. List of Contractor's staff assignments.
9. List of Contractor's principal consultants.
10. Copies of authorizations and licenses from authorities having jurisdiction for performance of the Work.
11. Initial progress report.
12. Certificates of insurance and insurance policies.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 012900

SECTION 013000- PROJECT MEETINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 DESCRIPTION

A. Responsibility for meetings is as follows:

1. Trade coordination meetings shall be scheduled and conducted by the General Contractor.
2. Progress meetings with the A/E shall be scheduled not more than (1) per week.

B. The Architect's responsibilities include:

1. Prepare all meeting agenda
2. Make physical arrangements for meetings
3. Notify all parties of scheduled meetings
4. Preside at meetings
5. Prepare and distribute minutes of all meetings

1.3 PRE-CONSTRUCTION MEETING

A. A meeting will be scheduled after Award of Contract

B. Location: At site of the Project

C. Attendance: Contractors, Owner's Representative and Architect

D. Agenda:

1. Sign-in and introductions
2. Wage compliance
3. Safety and security:

a. Working hours
b. Security and storage
c. Emergency contact list
d. Temporary facilities

4. Supervision:

a. Contractor's Superintendent
b. Contractor's Daily Report

5. Payment Procedures:

    a. Contract Cost Breakdown
    b. Payment procedures
    c. Final payment
    d. Tax exempt status

6. Change Orders:

    a. Design generated changes
    b. Field condition generated changes

7. Insurance:

    a. Liability insurance
    b. Builder's Risk insurance
    c. State Worker's Compensation
    d. Bonding

1.2 PRE-CONSTRUCTION MEETING

A. Shop Drawing Submittals

B. Schedule

1. Project schedule
2. Submittals/material lead time/fabrication time
3. Open Discussion

1.5 COORDINATION MEETINGS

A. Contractors shall anticipate weekly coordination meetings with Contractors and material suppliers for each school that has additional work.

B. Record and distribute minutes to all parties.

1.6 JOB PROGRESS MEETINGS

A. Progress meetings will be scheduled weekly and generally be held on the same day and hour of the week for the duration of the construction period.

B. Additional meetings as progress of work dictates may be required.

C. Location of progress meetings; construction field office or other designated location such as Park District Office.

D. Attendance:

1. Contractors

2. Contractor's representative
3. Architect
4. Owner's representative

E. Minimum agenda:
1. Review and approve minutes of previous meeting.
2. Review work progress since last meeting.
3. Note and discuss field observations, problems, and decisions.
4. Identify problems which impede planned progress.
5. Review of off-site fabrication problems.
6. Develop corrective measures and procedures to regain planned schedule.
7. Revise construction schedule as required.
8. Plan progress during next work period.
9. Review submittal schedules and expedite as required to facilitate ordering of equipment.
10. Review quality and work standards.
11. Discuss and complete other current business.

F. Unexcused absence of a meeting will result in a $1,500.00 reduction in contract amount for each occurrence.

END OF SECTION 013000

SECTION 013100 – PROJECT MANAGEMENT AND COORDINATION

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 administrative provisions for coordinating construction operations on Project including, but not limited to, the following:

1. General coordination procedures.
2. Requests for Information (RFIs).
3. Project meetings.

1.3 DEFINITIONS

A. RFI: Request from Owner, Architect, or Contractor seeking information required by or clarifications of the Contract Documents.

1.4 GENERAL COORDINATION PROCEDURES

A. Coordination: Contractor shall coordinate its construction operations to ensure efficient and orderly installation of each part of the Work.

1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
2. Coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair.
3. Make adequate provisions to accommodate items scheduled for later installation.

B. Prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.

C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:

1. Preparation of Contractor’s construction schedule.
2. Preparation of the schedule of values.
3. Installation and removal of temporary facilities and controls.
4. Delivery and processing of submittals.
5. Progress meetings.

6. Preinstallation conferences.
7. Project closeout activities.
8. Startup and adjustment of systems.

D. Conservation: Coordinate construction activities to ensure that operations are carried out with consideration given to conservation of energy, water, and materials. Coordinate use of temporary utilities to minimize waste.

1.5 REQUESTS FOR INFORMATION (RFIs)

A. General: Immediately on discovery of the need for additional information or interpretation of the Contract Documents, Contractor shall prepare and submit an RFI in the form specified.

1. Architect will return RFIs submitted to Architect by other entities controlled by Contractor with no response.
2. Coordinate and submit RFIs in a prompt manner so as to avoid delays in Contractor's work or work of Subcontractors.

B. Content of the RFI: Include a detailed, legible description of item needing information or interpretation and the following:

1. Project name.
2. Project number.
3. Date.
4. Name of Contractor.
5. Name of Architect.
6. RFI number, numbered sequentially.
7. RFI subject.
8. Specification Section number and title and related paragraphs, as appropriate.
9. Drawing number and detail references, as appropriate.
10. Field dimensions and conditions, as appropriate.
11. Contractor's suggested resolution. If Contractor's suggested resolution impacts the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
12. Contractor's signature.
13. Attachments: Include sketches, descriptions, measurements, photos, Product Data, Shop Drawings, coordination drawings, and other information necessary to fully describe items needing interpretation.

    a. Include dimensions, thicknesses, structural grid references, and details of affected materials, assemblies, and attachments on attached sketches.

C. RFI Forms:

1. Request for Interpretation.

D. Architect's action: Architect will review each RFI, determine action required, and respond. Allow three working days for Architect's response for each RFI.

1. The following Contractor-generated RFIs will be returned without action:

    a. Requests for approval of submittals.

b. Requests for approval of substitutions.
c. Requests for approval of Contractor's means and methods.
d. Requests for coordination information already indicated in the Contract Documents.
e. Requests for adjustments in the Contract Time or the Contract Sum.
f. Requests for interpretation of Architect's actions on submittals.
g. Incomplete RFIs or inaccurately prepared RFIs.

2. Architect's action may include a request for additional information, in which case Architect's time for response will start from time of receipt of additional information.
3. Architect's action on RFIs that may result in a change to the Contract Time or the Contract Sum may be eligible for Contractor to submit Change Proposal.

a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Architect in writing within 7 days of receipt of the RFI response.

E. On receipt of Architect's action, immediately distribute the RFI response to affected parties. Review response and notify Architect within seven days if Contractor disagrees with response.

1. Identification of related Minor Change in the Work, Construction Change Directive, and Proposal Request, as appropriate.
2. Identification of related Field Order, Work Change Directive, and Proposal Request, as appropriate.

1.6 PROJECT MEETINGS

A. Preconstruction Conference: Architect will schedule and conduct a preconstruction conference before starting construction, at a time convenient to Owner and Architect.

1. Conduct the conference to review responsibilities and personnel assignments.
2. Attendees: Authorized representatives of Owner, Architect, Contractor and its superintendent, major subcontractors, suppliers, and other concerned parties shall attend the conference. Participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
3. Agenda: Discuss items of significance that could affect progress, including the following:

a. Tentative construction schedule.
b. Sequencing.
c. Designation of key personnel and their duties.
d. Lines of communications.
e. Procedures for processing field decisions and Change Orders.
f. Procedures for RFIs.
g. Submittal procedures.
h. Preparation of record documents.
i. Use of the premises and existing building.
j. Work restrictions.
k. Working hours.
l. Owner's occupancy requirements.

m. Responsibility for temporary facilities and controls.
n. Procedures for moisture and mold control.
o. Procedures for disruptions and shutdowns.
p. Construction waste management and recycling.
q. Parking availability.
r. Office, work, and storage areas.
s. Equipment deliveries and priorities.
t. First aid.
u. Security.
v. Progress cleaning.

4. Minutes: Architect will record discussions and will upload minutes.

B. Progress Meetings: Architect to conduct progress meetings at weekly intervals.

1. Attendees: In addition to representatives of Owner and Architect, Contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
2. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.

a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's construction schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.

1) Review schedule for next period.

3. Minutes: Architect will record discussions and will upload minutes.

C. Coordination Meetings: The Contractor shall conduct Project coordination meetings at weekly intervals. Project coordination meetings are in addition to specific meetings held for other purposes, such as progress meetings and preinstallation conferences.

1. Attendees: Contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the meetings shall be familiar with Project and authorized to conclude matters relating to the Work.
2. Agenda: Review and correct or approve minutes of the previous coordination meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.

a. Construction Schedule: Review progress since the last coordination meeting. Determine whether each contract is on time, ahead of schedule, or behind

schedule, in relation to construction schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.

b. Schedule Updating: Revise construction schedule after each coordination meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with report of each meeting.

c. Review present and future needs of each Contractor present, including the following:

1) Interface requirements.
2) Sequence of operations.
3) Access.
4) Site utilization.
5) Temporary facilities and controls.
6) Work hours.
7) Hazards and risks.
8) Progress cleaning.
9) Quality and work standards.
10) Deliveries.

3. Minutes: Contractor to record discussions and upload minutes.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 013100

SECTION 013216 - CPM PROGRESS SCHEDULE

PART 1 GENERAL

1.1 DESCRIPTION

A. This Section includes specifications for the general requirements for the preparation, updating, revision and submittal of project progress schedules and the Monthly Progress Status Report. Progress schedules required include the Project CPM Schedule and Updated Project CPM Schedules.

1.2 RELATED DOCUMENTS

A. Drawings and general provisions of the contract, and other Division 1 specification sections, apply to this section.

1.3 GENERAL

A. The purpose of the project schedule is to allow the Contractor to prepare an orderly guide to aid in the timely completion of the project.

B. The approved construction schedule shall be used to measure the progress of the work, to aid in evaluation time extensions, and to provide the basis for all progress payments.

C. Progress schedules shall represent a practical plan to complete the Work within the Contract Time, and shall convey the Contractor’s intent in the manner of persecution and progress of the Work.

D. The scheduling and execution of construction in accordance with the Contract Documents are the responsibility of the Contractor. The Contractor shall involve and coordinate all subcontractors and material suppliers in the development and updating of progress schedules.

E. The submittal of progress schedules shall be understood to be the Contractor’s representation that the progress schedule meets the requirements of the Contract Documents and that the Work will be executed in the sequence and duration indicated in the progress schedule.

1.4 PROJECT SCHEDULING SEQUENCE REQUIREMENTS

A. Upon receipt of a Notice to Proceed, the Contractor shall prepare a construction schedule for all work included under the scope of this contract, in accordance with general conditions of the contract for construction.

B. All Contractors shall provide all construction schedule requirements specified herein to the Contractor so that they can prepare a fully coordinated Construction Schedule.

1.5 SUBMITTALS

A. Progress schedules shall take the form of a time-scaled network diagram and shall be submitted on sheets no smaller than eleven inches wide by seventeen inches.

B. All progress schedule submittals shall include one reproducible and six full size copies with two of six full size copies being in color.

C. Re-submittals shall conform to the same requirements as original submittals.

D. The Project CPM Schedule shall be prepared so that a CPM activity, or group of activities, corresponds directly with the Schedule of Values breakdown. The Contractor's failure to submit the Project CPM Schedule and Schedule of Values breakdown as required may result in the withholding of progress payments until such submission requirements are met.

E. The Project CPM Schedule submittal, and all subsequent Project CPM schedule updates, and time extension requests shall consist of a computer-generated time-scaled network diagram, accompanying reports, and a monthly progress report.

1. The reports generated by the computer program shall include a tabulation of each activity. The following information shall be furnished as a minimum for each activity of work item:

a. Preceding and succeeding event numbers.
b. Activity description end number.
c. Responsible subcontractor, vendor, or other party for each activity.
d. Estimated duration of each activity.
e. Resource loading for each activity. Indicate the quantity of daily workforce necessary to accomplish the work in the times indicated.
f. Earliest start date (by calendar date).
g. Earliest finish date (by calendar date).
h. Latest start date (by calendar date).
i. Latest finish date (by calendar date).
j. Total float and free float.
k. Percentage of activity completed and number of days remaining (for updates only).
l. Actual start date (by calendar date) (for updates only).
m. Actual finish date (by calendar date) (for updates only).

PART 2 - PRODUCTS

2.1 SCHEDULE SOFTWARE

A. The Construction Schedule shall be prepared using one of the following project management software systems or an approved equal.

1. Primavera Project Planner (P3) Primavera Systems
2. Microsoft Project, Microsoft

PART 3 - EXECUTION

3.1 USE OF THE CRITICAL PATH METHOD

A. The Critical Path Method (CPM) of network calculations shall be used to generate the project schedule. The lead contractor shall provide the project schedule in either the Precedence Diagram Method (PDM) or the Arrow Diagram Method (ADM).

B. A calendar time-scaled and resource loaded CPM network diagram schedule covering the complete project shall be submitted within thirty days following the date of the Notice to Proceed.

C. The schedule shall be in accordance with the Contract with the Contract requirements at the time of the Notice to Proceed.

D. A schedule found to be impractical for any reason shall be revised by the Contractor and resubmitted.

3.2 APPROVED CHANGES CERTIFICATION

A. Only construction schedule changes that have been previously approved shall be included in the schedule submission. The narrative report shall specifically reference, on an activity by activity basis, all changes made since the previous period and relate each change documented, approved schedule changes.

B. The Contractor shall prosecute the work in accordance with the approved Construction Schedule. Out of sequence construction, defined as a change from the Construction Schedule in the Contractor's actual operations, requires prior approval.

C. Upon the approval of a change order the agreed upon change order activities, activity duration's, logic and impacts shall be reflected in the next schedule submittal by the Contractor.

D. No change to the approved activities, original activity duration's, logic, interdependencies, milestones, planned sequence of operations, or resource loading of the construction schedule shall be made without prior written approval. If the Contractor desires to make a change to the approved Construction Schedule, the Contractor shall request permission in writing, stating the reasons for the change as well as the specifics, such as the proposed changes in activities, original activity duration's, logic, interdependencies, milestones, planned sequence of operations, or resource loading of the baseline Construction Schedule.

E. A change will be considered of a major nature if the time estimated for an activity is varied from the original plan to the degree that there is reasonable doubt that the Contract completion date or milestones will be met, or if the change impacts the work of other contractors at the job site. Changes to activities having adequate float shall be considered as minor changes may be considered a major change when such changes affect the contract completion date or milestones.

END OF SECTION 013216

SECTION 013300 – SUBMITTAL PROCEDURES

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 requirements for the submittal schedule and administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other submittals.

B. Related Requirements:

1. Section "Operation and Maintenance Data" 017823 for submitting operation and maintenance manuals.
2. Section "Project Record Documents" 017839 for submitting record Drawings, record Specifications, and record Product Data.
3. Section "Demonstration and Training" 017900 for submitting video recordings of demonstration of equipment and training of Owner's personnel.

1.3 DEFINITIONS

A. Action Submittals: Written and graphic information and physical samples that require Architect's responsive action. Action submittals are those submittals indicated in individual Specification Sections as "action submittals."

B. File Transfer Protocol (FTP): Communications protocol that enables transfer of files to and from another computer over a network and that serves as the basis for standard Internet protocols. An FTP site is a portion of a network located outside of network firewalls within which internal and external users are able to access files.

C. Portable Document Format (PDF): An open standard file format licensed by Adobe Systems used for representing documents in a device-independent and display resolution-independent fixed-layout document format.

1.4 ACTION SUBMITTALS

A. Submittal Schedule: Submit a schedule of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, ordering, manufacturing, fabrication, and delivery when establishing dates. Include additional time required for making corrections or revisions to submittals noted by Architect and additional time for handling and reviewing submittals required by those corrections.

1. Coordinate submittal schedule with list of subcontracts, the schedule of values, and Contractor's construction schedule.
2. Initial Submittal: Submit concurrently with startup construction schedule. List those submittals required to maintain orderly progress of the Work and those required early because of long lead time for manufacture or fabrication.
3. Final Submittal: Submit concurrently with the first complete submittal of Contractor's construction schedule.

    a. Submit revised submittal schedule to reflect changes in current status and timing for submittals.

4. Format: Arrange the following information in a tabular format:

    a. Scheduled date for first submittal.
    b. Specification Section number and title.
    c. Submittal category: Action; informational.
    d. Name of subcontractor.
    e. Description of the Work covered.
    f. Scheduled date for Architect's final release or approval.
    g. Scheduled date of fabrication.
    h. Scheduled dates for purchasing.
    i. Scheduled dates for installation.
    j. Activity or event number.

1.5 SUBMITTAL ADMINISTRATIVE REQUIREMENTS

A. Architect's Digital Data Files: Electronic digital data files of the Contract Drawings will be provided by Architect for Contractor's use in preparing submittals.

1. Architect will furnish Contractor digital data drawing files of the Contract Drawings for use in preparing Shop Drawings.

    a. Architect makes no representations as to the accuracy or completeness of digital data drawing files as they relate to the Contract Drawings.
    b. Contractor shall execute a data licensing agreement on the form attached to this Section.

B. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.

1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
2. Submit all submittal items required for each Specification Section concurrently unless partial submittals for portions of the Work are indicated on approved submittal schedule.
3. Submit action submittals and informational submittals required by the same Specification Section as separate packages under separate transmittals.
4. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.

a. Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.

C. Processing Time: Allow time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Architect's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.

1. Initial Review: Allow 7 days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Architect will advise Contractor when a submittal being processed must be delayed for coordination.
2. Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.
3. Resubmittal Review: Allow 3 days for review of each resubmittal.

D. Electronic Submittals: All submittals are to be submitted electronically. Identify and incorporate information in each electronic submittal file as follows:

1. Assemble complete submittal package into a single indexed file incorporating submittal requirements of a single Specification Section and transmittal form with links enabling navigation to each item.
2. Provide means for insertion to permanently record Contractor's review and approval markings and action taken by Architect.
3. Transmittal Form for Electronic Submittals: Use electronic form acceptable to Owner and Architect**,** containing the following information:

a. Project name.
b. Date.
c. Name and address of Architect.
d. Name of Contractor.
e. Name of firm or entity that prepared submittal.
f. Names of subcontractor, manufacturer, and supplier.
g. Category and type of submittal.
h. Submittal purpose and description.
i. Specification Section number and title.
j. Specification paragraph number or drawing designation and generic name for each of multiple items.
k. Drawing number and detail references, as appropriate.
l. Location(s) where product is to be installed, as appropriate.
m. Related physical samples submitted directly.
n. Indication of full or partial submittal.
o. Transmittal number, numbered consecutively.
p. Submittal and transmittal distribution record.
q. Other necessary identification.
r. Remarks.

E. Options: Identify options requiring selection by Architect.

F. Deviations and Additional Information: On an attached separate sheet, prepared on Contractor's letterhead, record relevant information, requests for data, revisions other than those requested by Architect on previous submittals, and deviations from requirements in the Contract

Documents, including minor variations and limitations. Include same identification information as related submittal.

G. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.

1. Note date and content of previous submittal.
2. Note date and content of revision in label or title block and clearly indicate extent of revision.
3. Resubmit submittals until they are marked with approval notation from Architect's action stamp.

H. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.

I. Use for Construction: Retain complete copies of submittals on Project site. Use only final action submittals that are marked with approval notation from Architect's action stamp.

PART 2 - PRODUCTS

2.1 SUBMITTAL PROCEDURES

A. General Submittal Procedure Requirements: Prepare and submit submittals required by individual Specification Sections. Types of submittals are indicated in individual Specification Sections.

1. Post electronic submittals as PDF electronic files.

a. Architect will return annotated file. Annotate and retain one copy of file as an electronic Project record document file.

2. Submit electronic submittals via email as PDF electronic files.

a. Architect will return annotated file. Annotate and retain one copy of file as an electronic Project record document file.

3. Certificates and Certifications Submittals: Provide a statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity.

a. Provide a digital signature with digital certificate on electronically submitted certificates and certifications where indicated.
b. Provide a notarized statement on original paper copy certificates and certifications where indicated.

B. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.

1. If information must be specially prepared for submittal because standard published data are not suitable for use, submit as Shop Drawings, not as Product Data.
2. Mark each copy of each submittal to show which products and options are applicable.
3. Include the following information, as applicable:

    a. Manufacturer's catalog cuts.
    b. Manufacturer's product specifications.
    c. Standard color charts.
    d. Statement of compliance with specified referenced standards.
    e. Testing by recognized testing agency.

4. Submit Product Data before or concurrent with Samples.
5. Submit Product Data in the following format:

    a. PDF electronic file.

C. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data.

1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:

    a. Identification of products.
    b. Notation of dimensions established by field measurement.

2. Sheet Size: Except for templates, patterns, and similar full-size drawings, submit Shop Drawings on sheets at least 8-1/2 by 11 inches, but no larger than 30 by 42 inches.

3. Submit Shop Drawings in the following format:

    a. PDF electronic file.

D. Samples: Submit Samples for review of kind, color, pattern, and texture for a check of these characteristics with other elements and for a comparison of these characteristics between submittal and actual component as delivered and installed.

1. Transmit Samples that contain multiple, related components such as accessories together in one submittal package.
2. Identification: Attach label on unexposed side of Samples that includes the following:

    a. Generic description of Sample.
    b. Product name and name of manufacturer.
    c. Sample source.
    d. Number and title of applicable Specification Section.
    e. Specification paragraph number and generic name of each item.

3. For projects where electronic submittals are required, provide corresponding electronic submittal of Sample transmittal, digital image file illustrating Sample characteristics, and identification information for record.

4. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.

    a. Samples not incorporated into the Work, or otherwise designated as Owner's property, are the property of Contractor.

5. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available.

    a. Number of Samples: Submit two full set(s) of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Architect will return submittal with options selected.

E. Maintenance Data: Comply with requirements specified in Section 017823 "Operation and Maintenance Data."

F. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, contact information of Architect and Owners, and other information specified.

G. Installer Certificates: Submit written statements on manufacturer's letterhead certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.

H. Manufacturer Certificates: Submit written statements on manufacturer's letterhead certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.

I. Product Certificates: Submit written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.

J. Material Certificates: Submit written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.

K. Material Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.

L. Product Test Reports: Submit written reports indicating that current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.

PART 3 - EXECUTION

3.1 CONTRACTOR’S REVIEW

A. Action and Informational Submittals: Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Architect.

B. Project Closeout and Maintenance Material Submittals: See requirements in Section 017700 "Closeout Procedures."

C. Approval Stamp: Stamp each submittal with a uniform, approval stamp. Include Project name and location, submittal number, Specification Section title and number, name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.

3.2 ARCHITECT'S ACTION

A. Action Submittals: Architect will review each submittal, make marks to indicate corrections or revisions required. Architect will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action.

B. Informational Submittals: Architect will review each submittal and will not return it, or will return it if it does not comply with requirements. Architect will forward each submittal to appropriate party.

C. Partial submittals prepared for a portion of the Work will be reviewed when use of partial submittals has received prior approval from Architect.

D. Incomplete submittals are unacceptable, will be considered nonresponsive, and will be returned for resubmittal without review.

E. Submittals not required by the Contract Documents may be returned by the Architect without action.

END OF SECTION 013300

SECTION 013600 – CONSTRUCTION MILESTONES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Special conditions and other Division 01 Specification Sections, apply to this Section.

1.2 DESCRIPTION

A. Provide (3) copies of the final Project Time Schedule to the Architect indicating all areas of work and shop drawings submittal schedule. REVISE SCHEDULE AS CHANGES TO THE WORK OCCUR.

B. By submitting the Bid, the bidder agrees that the periods for performing the Work are reasonable, and that the bidder's work can be substantially complete by its applicable date(s) for substantial Completion, as well as by any of the milestone dates identified that are applicable to its work.

C. The milestone and completion dates below, and as agreed to at the time of contract execution, shall be adhered to unless modified by mutual agreement between the Contractor and the Architect. By submitting a bid, the contractor acknowledges that the number of days shown below establish the contract milestones and that the dates shown below are the individual milestone dates based on the Anticipated Notice to Proceed. The Contractor is responsible to maintain progress so as to achieve the milestones including shift work, overtime work, weekend work, supplemental labor and equipment, etc. at no additional cost to the Owner:

D. The phasing plan established by these milestone completion dates supersede phasing identified in other contract documents. All alternates that are accepted must be completed within the dates listed below.

MILESTONE ACTIVITY	MILESTONE DATES
Begin Bidding Phase	July 2, 2026
Bid Opening	July 24, 2026
Board Meeting for Award	August11, 2026
Contractor Notice to Proceed/Preconstruction Mtg	August 12, 2026
Preconstruction Meeting	August 19, 2026
Commence Construction	September 7, 2026
Substantial Completion	April 1, 2027
Contract Completion	May 15, 2027

NOTE: Anticipated Notice to Proceed date is indicated above. This schedule must be adhered to and will be enforced. Time of completion will be adjusted accordingly based upon the actual Notice to Proceed date and Weather days lost.

1.3 HISTORICAL WEATHER DATA

A. Contract Time may be extended by Change Order for the number of days lost due to inclement weather occurring in excess of the "Maximum Expected Days Lost" as shown on the following table. Actual weather experience will be recorded by the U.S. Department of Commerce, National Oceanic and Atmospheric Administration (USDC/NOAA). Inclement weather exists when one or more of the following occurs: the precipitation other than snow and ice exceeds 1/10" within a calendar day, when snow or ice accumulation exceeds 1.0 inch within a calendar day, when maximum temperature for the calendar day is 32 degrees F or below, or when any combination of these occurs simultaneously. The Contract Time shall not be extended unless actual inclement weather for a number of calendar days in excess of the "Maximum Expected Days Lost" for the Contract Time and that the completion of the work was, in fact, delayed because of such excess inclement weather.

1.4 SCHEDULE OF WORK

A. If at any time the Contractor's working force and equipment, in the opinion of the Architect shall be inadequate for securing the necessary progress or required quality of work as herein stipulated, the Contractor shall, if so directed, at his own expense, increase or supplement the working force and equipment and/or perform the work on an overtime or multiple shift basis to such an extent as to give reasonable assurance of compliance with the schedule of completion and the required quality of the work. When so directed, the Contractor shall submit for approval such supplementary construction schedules as may be necessary to demonstrate the manner in which such compliance will be established. Failure to make such demands shall not relieve the Contractor of his obligation to secure the quality and the rate of progress required by the Contract; and the Contractor alone shall be and remain liable and responsible for the efficiency and adequacy of his methods, materials, working force, and equipment, irrespective of whether or not he makes any change as a result of any order or orders received.

B. Should the Architect require, either for convenience or to move the completion date forward or to otherwise accelerate schedules, causing the Contractor to perform contract work outside of the normal working hours, the Contractor shall do so, in which case the Contractor shall be reimbursed for actual premium payments made for labor overtime worked, with no allowance for overhead or profit. In the event that such overtime work is required the Contractor shall, at the end of each day on which the overtime is worked, furnish daily time slips showing the name or number of each workman employed thereon with the time worked, the character of work performed and the wages to be paid. Loss of efficiency or productivity associated with multiple shift or overtime work, work whether affecting work on which overtime is spent or on work under the contract, shall not be the basis for any claim for additional compensation by the Contractor.

END OF SECTION 013600

SECTION 014000 – QUALITY REQUIREMENTS

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 administrative and procedural requirements for quality assurance and quality control.

B. Testing and inspecting services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.

1. Specific quality-assurance and -control requirements for individual construction activities are specified in the Sections that specify those activities. Requirements in those Sections may also cover production of standard products.
2. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and -control procedures that facilitate compliance with the Contract Document requirements.
3. Requirements for Contractor to provide quality-assurance and -control services required by Architect and Owner, or authorities having jurisdiction are not limited by provisions of this Section.

1.3 DEFINITIONS

A. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.

B. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that actual products incorporated into the Work and completed construction comply with requirements. Services do not include contract enforcement activities performed by Architect.

C. Mockups: Full-size physical assemblies that are constructed on-site. Mockups are constructed to verify selections made under Sample submittals; to demonstrate aesthetic effects and, where indicated, qualities of materials and execution; to review coordination, testing, or operation; to show interface between dissimilar materials; and to demonstrate compliance with specified installation tolerances. Mockups are not Samples. Unless otherwise indicated, approved mockups establish the standard by which the Work will be judged.

D. Preconstruction Testing: Tests and inspections performed specifically for Project before products and materials are incorporated into the Work, to verify performance or compliance with specified criteria.

E. Product Testing: Tests and inspections that are performed by an NRTL, an NVLAP, or a testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with specified requirements.

F. Source Quality-Control Testing: Tests and inspections that are performed at the source, e.g., plant, mill, factory, or shop.

G. Field Quality-Control Testing: Tests and inspections that are performed on-site for installation of the Work and for completed Work.

H. Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.

I. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform a particular construction operation, including installation, erection, application, and similar operations.

1. Use of trade-specific terminology in referring to a trade or entity does not require that certain construction activities be performed by accredited or unionized individuals, or that requirements specified apply exclusively to specific trade(s).

J. Experienced: When used with an entity or individual, "experienced" means having successfully completed a minimum of five previous projects similar in nature, size, and extent to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction. Additional criteria may be required in particular Section to increase, not replace, criteria of this definition.

1. Provide substantiation of experience as part of submittals when required in a Section.
2. Provide substantiation upon architect’s request regardless of specific section requirements.

K. NRTL: A nationally recognized testing laboratory according to 29 CFR 1910.7.

L. NVLAP: A testing agency accredited according to NIST’s National Voluntary Laboratory Accreditation Program

1.4 CONFLICTING REQUIREMENTS

A. General: Resolve discrepancies or conflicts during bidding by request for information and official addendum. For any unresolved conflicts comply with the following:

B. Referenced Standards: If compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer conflicting requirements that are different, but apparently equal, to Architect for a decision before proceeding.

C. If differing requirements, quantities or quality levels are indicated between drawings or between drawings and specifications, comply with the most stringent requirement and greater quantity.

D. During construction Contractor will be instructed to provide the greater quantity or quality. No increase in the Contract Amount will be considered for Contractor bidding the lower quality and lesser quantity instead of seeking clarification during bidding.

E. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to Architect for a decision before proceeding.

1.5 INFORMATIONAL SUBMITTALS

A. Testing Agency Qualifications: For testing agencies specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.

B. Schedule of Tests and Inspections: Prepare in tabular form and include the following:

1. Specification Section number and title.
2. Entity responsible for performing tests and inspections.
3. Description of test and inspection.
4. Identification of applicable standards.
5. Identification of test and inspection methods.
6. Number of tests and inspections required.
7. Time schedule or time span for tests and inspections.
8. Requirements for obtaining samples.
9. Unique characteristics of each quality-control service.

1.6 CONTRACTOR'S QUALITY-CONTROL PLAN

A. Quality-Control Plan, General: Submit quality-control plan within 10 days of Notice to Proceed, and not less than five days prior to preconstruction conference. Submit in format acceptable to Architect. Identify personnel, procedures, controls, instructions, tests, records, and forms to be used to carry out Contractor's quality-assurance and quality-control responsibilities. Coordinate with Contractor's construction schedule.

B. Quality-Control Personnel Qualifications: Engage qualified full-time personnel trained and experienced in managing and executing quality-assurance and quality-control procedures similar in nature and extent to those required for Project.

1. Project quality-control manager may also serve as Project superintendent.

C. Submittal Procedure: Describe procedures for ensuring compliance with requirements through review and management of submittal process. Indicate qualifications of personnel responsible for submittal review.

D. Testing and Inspection: In quality-control plan, include a comprehensive schedule of Work requiring testing or inspection, including the following:

1. Contractor-performed tests and inspections including subcontractor-performed tests and inspections. Include required tests and inspections and Contractor-elected tests and inspections.

E. Continuous Inspection of Workmanship: Describe process for continuous inspection during construction to identify and correct deficiencies in workmanship in addition to testing and inspection specified. Indicate types of corrective actions to be required to bring work into compliance with standards of workmanship established by Contract requirements and approved mockups.

F. Monitoring and Documentation: Maintain testing and inspection reports including log of approved and rejected results. Include work Architect has indicated as nonconforming or defective. Indicate corrective actions taken to bring nonconforming work into compliance with requirements. Comply with requirements of authorities having jurisdiction.

1.7 REPORTS AND DOCUMENTS

A. Test and Inspection Reports: Prepare and submit certified written reports specified in other Sections. Include the following:

1. Date of issue.
2. Project title and number.
3. Name, address, and telephone number of testing agency.
4. Dates and locations of samples and tests or inspections.
5. Names of individuals making tests and inspections.
6. Description of the Work and test and inspection method.
7. Identification of product and Specification Section.
8. Complete test or inspection data.
9. Test and inspection results and an interpretation of test results.
10. Record of temperature and weather conditions at time of sample taking and testing and inspecting.
11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
12. Name and signature of laboratory inspector.
13. Recommendations on retesting and reinspecting.

B. Manufacturer's Technical Representative's Field Reports: Prepare written information documenting manufacturer's technical representative's tests and inspections specified in other Sections. Include the following:

1. Name, address, and telephone number of technical representative making report.
2. Statement on condition of substrates and their acceptability for installation of product.
3. Statement that products at Project site comply with requirements.
4. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.
5. Results of operational and other tests and a statement of whether observed performance complies with requirements.

6. Statement whether conditions, products, and installation will affect warranty.
7. Other required items indicated in individual Specification Sections.

C. Factory-Authorized Service Representative's Reports: Prepare written information documenting manufacturer's factory-authorized service representative's tests and inspections specified in other Sections. Include the following:

1. Name, address, and telephone number of factory-authorized service representative making report.
2. Statement that equipment complies with requirements.
3. Results of operational and other tests and a statement of whether observed performance complies with requirements.
4. Statement whether conditions, products, and installation will affect warranty.
5. Other required items indicated in individual Specification Sections.

1.8 QUALITY ASSURANCE

A. General: Qualifications paragraphs in this article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.

B. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

C. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

D. Installer Qualifications: A firm or individual experienced in installing, erecting, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.

E. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or product that is similar in material, design, and extent to those indicated for this Project.

F. Testing Agency Qualifications: An NRTL, and NVLAP, or an independent agency with the experience and capability to conduct testing and inspecting indicated, as documented according to ASTM E 548; and with additional qualifications specified in individual Sections; and where required by authorities having jurisdiction, that is acceptable to authorities.

G. Manufacturer's Technical Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to observe and inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.

1. Manufacturer’s Representative: An experienced individual directly employed by the Manufacturer not be a subsidiary company, sales representative company, or installer.

H. Factory-Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.

1. Factory Representative: An experienced individual or firm employed by the Manufacturer not by a subsidiary company. Not a manufacturer's sales representative company; not an installer of the manufacturer's products on this Project.

I. Preconstruction Testing: Where testing agency is indicated to perform preconstruction testing for compliance with specified requirements for performance and test methods, comply with the following:

1. Contractor responsibilities include the following:

a. Provide test specimens representative of proposed products and construction.
b. Submit specimens in a timely manner with sufficient time for testing and analyzing results to prevent delaying the Work.
c. Provide sizes and configurations of test assemblies, mockups, and laboratory mockups to adequately demonstrate capability of products to comply with performance requirements.
d. Build site-assembled test assemblies and mockups using installers who will perform same tasks for Project.
e. Build laboratory mockups at testing facility using personnel, products, and methods of construction indicated for the completed Work.
f. When testing is complete, remove test specimens, assemblies, mockups, and laboratory mockups; do not reuse products on Project.

2. Testing Agency Responsibilities: Submit a certified written report of each test, inspection, and similar quality-assurance service to Architect with copy to Contractor Interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from the Contract Documents.

J. Mockups: Before installing portions of the Work requiring mockups, build mockups for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work:

1. Build mockups in location and of size indicated or, if not indicated, as directed by Architect.

a. Construct mockups showing exterior elements in an open, unshaded area with the finish side of the mockup facing south.

2. Notify Architect seven days in advance of dates and times when mockups will be constructed.
3. Demonstrate the proposed range of aesthetic effects and workmanship.
4. Obtain Architect's approval of mockups before starting work, fabrication, or construction.
5. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
6. Demolish and remove mockups when directed, unless otherwise indicated.

1.9 QUALITY CONTROL

A. Owner Responsibilities: Where quality-control services are indicated as Owner's responsibility, Owner (through the Architect) will engage a qualified testing agency to perform these services.

1. Owner will furnish Contractor with names, addresses, and telephone numbers of testing agencies engaged and a description of types of testing and inspecting they are engaged to perform.
2. Payment for these services will be made by the Owner.
3. Costs for retesting and reinspecting construction that replaces or is necessitated by work that failed to comply with the Contract Documents will be charged to Contractor.

B. Manufacturer's Field Services:

1. Where indicated provide a Manufacturer’s Technical Representative to observe construction activities and to inspect field assembled components and equipment installation including service connections.
2. Where indicated engage a Manufacturer’s Factory Representative to inspect field-assembled components and equipment installation, including service connections.
3. Where Sections indicate that a manufacturer’s technical or factory representative is to review the start of work, the work in progress or completion, or to provide certification of installed work, arrange for a technical or factory representative to be on site to perform such reviews and instructions at the appropriate times and to avoid delays in the Work.
4. Report results in writing following each site visit or inspection; do not delay with the intention of providing all written documentation at project completion.

    a. Where a Section indicates a time requirement following site visit for reports to be received by the Architect failure to comply may be justification for rejecting all work performed after that deadline and until the report is received.

C. Manufacturer's Technical Services: Where indicated, engage a manufacturer's technical representative to observe and inspect the Work. Manufacturer's technical representative's services include participation in preinstallation conferences, examination of substrates and conditions, verification of materials, observation of Installer activities, inspection of completed portions of the Work, and submittal of written reports.

D. Retesting/Reinspecting: Regardless of whether original tests or inspections were Contractor’s responsibility, provide quality-control services, including retesting and reinspecting, for construction that replaced Work that failed to comply with the Contract Documents.

E. Associated Services: Cooperate with agencies performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:

1. Access to the Work.
2. Incidental labor and facilities necessary to facilitate tests and inspections.
3. Adequate quantities of representative samples of materials that require testing and inspecting. Assist agency in obtaining samples.
4. Facilities for storage and field curing of test samples.

5. Delivery of samples to testing agencies.
6. Preliminary design mix proposed for use for material mixes that require control by testing agency.
7. Security and protection for samples and for testing and inspecting equipment at Project site.

F. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and -control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.

1. Schedule times for tests, inspections, obtaining samples, and similar activities.

G. Schedule of Tests and Inspections: Prepare a schedule of tests, inspections, and similar quality-control services required by the Contract Documents. Submit schedule within 30 days of date established for the Notice to Proceed.

1. Distribution: Distribute schedule to Owner, Architect, testing agencies, and each party involved in performance of portions of the Work where tests and inspections are required.

1.10 SPECIAL TESTS AND INSPECTIONS REQUIRED BY THE OHIO BUILDING CODE

A. Engage and pay a qualified testing agency to conduct special tests and inspections required by authorities as indicated on drawing Sheet S0.02.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 TEST AND INSPECTION LOG

A. Test and Inspection Log: Prepare a record of tests and inspections. Include the following:

1. Date test or inspection was conducted.
2. Description of the Work tested or inspected.
3. Date test or inspection results were transmitted to Architect.
4. Identification of testing agency or special inspector conducting test or inspection.

B. Maintain log at Project site. Post changes and revisions as they occur. Provide access to test and inspection log for Architect's and Commissioning Authority’s reference during normal working hours.

3.2 REPAIR AND PROTECTION

A. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.

1. Provide materials and comply with installation requirements specified in other Specification Sections or matching existing substrates and finishes. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible.

B. Protect construction exposed by or for quality-control service activities.

C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION 014000

SECTION 015000 - TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes requirements for temporary utilities, support facilities, and security and protection facilities.

B. Related Requirements:

1. Division 01 Section "Summary" for work restrictions.

1.3 USE CHARGES

A. General: Installation and removal of and use charges for temporary facilities shall be included in the Contract Sum unless otherwise indicated. Allow other entities to use temporary services and facilities without cost, including, but not limited to testing agencies and authorities having jurisdiction.

B. Water Service: Water-service use charges for water used by all entities for demolition operations to be paid by the Owner.

C. Electric Power Service; Electric-power-service use charges for electricity used by all entities for construction operations to be paid by the Owner.

1.4 INFORMATIONAL SUBMITTALS

A. Site Plan: Show temporary facilities, utility hookups, staging areas, and parking areas for construction personnel.

B. Erosion- and Sedimentation-Control Plan: Show compliance with requirements of EPA Construction General Permit or authorities having jurisdiction, whichever is more stringent.

C. Fire-Safety Program: Show compliance with requirements of NFPA 241 and authorities having jurisdiction. Indicate Contractor personnel responsible for management of fire-prevention program.

1.5 QUALITY ASSURANCE

A. Electric Service: Comply with NECA, NEMA, and UL standards and regulations for temporary electric service. Install service to comply with NFPA 70.

B. Tests and Inspections: Arrange for authorities having jurisdiction to test and inspect each temporary utility before use. Obtain required certifications and permits.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Fencing: Reference Drawings for requirements and location of temporary fencing for construction.

2.2 EQUIPMENT

A. Fire Extinguishers: Portable, UL rated; with class and extinguishing agent as required by locations and classes of fire exposures.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Locate facilities where they will serve Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required by progress of the Work.

B. Provide each facility ready for use when needed to avoid delay. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.

3.2 TEMPORARY UTILITY INSTALLATION

A. General: Install temporary service.

1. Arrange with utility company, Owner, and existing users for time when service can be interrupted, if necessary, to make connections for temporary services.

B. Water Service: Install water service and distribution piping in sizes and pressures adequate for construction.

C. Sanitary Facilities: Existing toilet facilities at the ballfield may be used during construction as long as they are kept free of demolition debris and mud. If any issues arise, the contractor will be required to provide separate temporary toilet facilities for use during construction.

D. Electric Power Service: Provide electric power service and distribution system of sufficient size, capacity, and power characteristics if required for demolition operations.

3.3 SECURITY AND PROTECTION FACILITIES INSTALLATION

A. Protection of Existing Facilities: Protect existing vegetation, equipment, structures, utilities, and other remaining items at Project site, except those indicated to be removed.

B. Temporary Fire Protection: Install and maintain temporary fire-protection facilities of types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 241; manage fire-prevention program.

1. Prohibit smoking and vaping throughout the entire site
2. Supervise welding operations, and similar sources of fire ignition according to requirements of authorities having jurisdiction.
3. Develop and supervise an overall fire-prevention and -protection program for personnel at Project site. Review needs with local fire department and establish procedures to be followed. Instruct personnel in methods and procedures. Post warnings and information.

END OF SECTION 015000

SECTION 016000 – PRODUCT REQUIREMENTS

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 administrative and procedural requirements for selection of products for use in Project; product delivery, storage, and handling; manufacturers' standard warranties on products; special warranties; and comparable products.

1.3 DEFINITIONS

A. Products: Items obtained for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.

1. Named Products: Items identified by manufacturer's product name, including make or model number or other designation shown or listed in manufacturer's published product literature that is current as of date of the Contract Documents.
2. New Products: Items that have not previously been incorporated into another project or facility. Products salvaged or recycled from other projects are not considered new products.
3. Comparable Product: Product that is demonstrated and approved through submittal process to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.

B. Basis-of-Design Product Specification: A specification in which a specific manufacturer's product is named and accompanied by the words "basis-of-design product," including make or model number or other designation, to establish the significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics for purposes of evaluating comparable products of additional manufacturers named in the specification.

1. Designating one product or manufacturer as the “Basis-of-Design” does not either directly or unintentionally establish a proprietary specification. It is fully expected that the other named manufacturers have standard or modified products, with or without accessory and supplementary items or methods of installation, which provide equivalent utility, function, properties and design intent to the basis-of-design.
2. Any Contractor needing clarification about the acceptability of a product or method of installation of one of the other named manufacturers shall seek clarification from the Architect during bidding by submitting complete documentation for the intended product

and a written statement of intent. Submit full substantiating documents in time for Architect's review and analysis before the cutoff date for issuing an addendum.

3. If clarification is not requested as required during bidding, comply with the Architect's instructions during Submittals Process that establish other named manufacturer product equivalency to the basis-of-design product; or provide the basis-of-design product.

1.4 QUALITY ASSURANCE

A. Compatibility of Options: If Contractor is given option of selecting between two or more products for use on Project, select product compatible with products previously selected, even if previously selected products were also options.

1. Each Contractor is responsible for providing products and construction methods compatible with products and construction methods of other Contractors. Date of Architect's favorable review shall be the date used in determining precedence.
2. If a dispute arises between Contractors over concurrently selectable but incompatible products Architect will determine which products shall be used. Provide products determined by Architect with no additional cost to Owner.

1.5 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle products using means and methods that will prevent damage, deterioration, and loss, including theft and vandalism. Comply with manufacturer's written instructions.

B. Delivery and Handling:

1. Deliver products to Project site in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
2. Inspect products on delivery to determine compliance with the Contract Documents and to determine that products are undamaged and properly protected.

C. Storage:

1. Store products to allow for inspection and measurement of quantity or counting of units.
2. Store materials in a manner that will not endanger Project structure.
3. Store cementitious products and materials on elevated platforms.
4. Protect foam plastic from exposure to sunlight, except to extent necessary for period of installation and concealment.
5. Comply with storage requirements indicated in specific specification Sections.
6. Store products that are subject to damage by the elements, in a weathertight enclosure, with ventilation adequate to prevent condensation.
7. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.
8. Protect stored products from damage and liquids from freezing.

1.6 PRODUCT WARRANTIES

A. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.

1. Manufacturer’s Warranty: Pre-printed written warranty form furnished by individual manufacturer for a particular product and then specifically dated and endorsed by manufacturer to Owner.
2. Special Warranty: Written warranty required by the Contract Documents to provide specific rights for Owner.
3. Warranty initiation date shall be the date indicated in the applicable specification section. Contractor shall obtain any additional, supplemental, or extended insurance necessary to cover insurances for the time period indicated if manufacturer-provided insurance does not cover the full timeframe required.
4. There shall be no delay in the initial start and continuation in effect of any warranty required by the Specifications for any cause, including but not limited to any obligations of performance or payment of fee(s), or other requirement between the Contractor and the product manufacturer/warranty provider.

    a. Where fee is required to initiate and bring into effect or to maintain a Warranty, the Contractor shall pay such fee(s) as part of the Work and shall provide proof of payment of fees and proof of initiation of Warranty before final payment request will be processed.

5. Warranties shall not be suspended, terminated, or revoked due to any failure of the Contractor or their sub-contractor to pay premiums or initiation-of-warranty fees.
6. For the full duration of the warranty period, an executed warranty as delivered to the Owner shall not be suspended, terminated or revoked by the manufacturer or Contractor without written documentation signed by an officer of the manufacturer and delivered to the Owner by registered mail.
7. Manufacturer Direct Inspections for Warranty Continuance: All fees for the product manufacturer’s inspections required to maintain a warranty in full force and effect throughout the warranty period shall be waived or be pre-paid and included as part of the construction Work; this applies whether the manufacturer uses their own forces or contracts with an inspection agency. This does not apply to regular maintenance inspections and service obligations of the Owner.
8. Contractor is responsible to pay all fess and to obtain any and all additional warranties or warranty extensions necessary to fulfill the requirements of this section and of specific Product Section warranties including but not limited warranty initiation date, warranty initiation fee payments, periodic inspection costs if required by the warranty, warranty termination date, and warranty work coverage, as part of the Work without additional cost to the Owner.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 016000

SECTION 017300 – EXECUTION

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 general administrative and procedural requirements governing execution of the Work including, but not limited to, the following:

1. Construction layout.
2. Field engineering and surveying.
3. Installation of the Work.
4. Cutting and patching.
5. Progress cleaning.
6. Starting and adjusting.
7. Protection of installed construction.
8. Correction of the work.

1.3 DEFINITIONS

A. Cutting: Removal of in-place construction necessary to permit installation or performance of other work.

B. Patching: Fitting and repair work required to restore construction to original conditions after installation of other work.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For land surveyor.

B. Qualification Data: For professional delegated design engineer for any cutting and patching that involves structural elements or potential structural failure.

C. Product Literature: Provide product literature for all products to be used for patching.

D. Qualifications of Workers: Patching, particularly of finishes, must be performed by experienced workers of the applicable skilled trade. Provide names of workers or subcontractors who will perform the repairs; provide experience qualifications upon request.

E. Cutting and Patching Plan: Submit plan describing procedures at least 10 days prior to the time cutting and patching will be performed; for any work affecting structure submit at least 15 work

days in advance of operations and do not proceed without favorable review by the Architect/Structural Engineer. Include the following information:

1. Extent: Describe reason for and extent of each occurrence of cutting and patching.
2. Changes to In-Place Construction: Describe anticipated results. Include changes to structural elements and operating components as well as changes in building appearance and other significant visual elements.

    a. For proposed structural cutting or change submit detailed structural engineering drawings and calculations signed and sealed by the Contractor's delegated Design Engineer for review.
    b. For operational changes proposed, submit for Engineering review.
    c. For appearance changes proposed, submit to Architect for review.

3. Dates: Indicate when cutting and patching will be performed.
4. Utilities and Mechanical and Electrical Systems: List services and systems that cutting and patching procedures will disturb or affect. List services and systems that will be relocated and those that will be temporarily out of service. Indicate length of time permanent services and systems will be disrupted.

    a. Include description of provisions for temporary services and systems during interruption of permanent services and systems.

5. Comply with any changes indicated by the Architect / Engineer's reviews of the cutting and patching proposal.

1.5 QUALITY ASSURANCE

A. Land Surveyor Qualifications: A professional land surveyor who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing land-surveying services of the kind indicated.

B. Cutting and Patching: Comply with requirements for and limitations on cutting and patching of construction elements.

1. Structural Elements: When cutting and patching structural elements, notify Architect of locations and details of cutting and await directions from Architect before proceeding. Shore, brace, and support structural elements during cutting and patching. Do not cut and patch structural elements in a manner that could change their load-carrying capacity or increase deflection
2. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety. Operational elements include the following:

    a. Primary operational systems and equipment.
    b. Fire separation assemblies.
    c. Air or smoke barriers.
    d. Fire-suppression systems.
    e. Mechanical systems piping and ducts.

f. Control systems.
g. Communication systems.
h. Fire-detection and -alarm systems.
i. Conveying systems.
j. Electrical wiring systems.

3. Other Construction Elements: Do not cut and patch other construction elements or components in a manner that could change their load-carrying capacity, that results in reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety. Other construction elements include but are not limited to the following:

a. Water, moisture, or vapor barriers.
b. Membranes and flashings.
c. Exterior curtain-wall construction.
d. Sprayed fire-resistive material.
e. Equipment supports.
f. Piping, ductwork, vessels, and equipment.
g. Noise- and vibration-control elements and systems.

4. Visual Elements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch exposed construction in a manner that would, in Architect's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.

C. Cutting and Patching Conference: Before proceeding, meet at Project site with parties involved in cutting and patching, including mechanical and electrical trades. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.

D. Manufacturer's Installation Instructions: Obtain and maintain on-site manufacturer's written recommendations and instructions for installation of products and equipment.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General: Except as otherwise indicated or as directed by the Architect, use materials for cutting and patching that are identical to existing materials and accepted in the Part 1 submittals process.

1. If identical materials are not available submit for review materials that match existing adjacent surfaces to the fullest extent possible with regard to visual effect.
2. Use materials for cutting and patching that will result in equal or better performance characteristics.

B. For replacement of new Work removed comply with Technical Specification Sections for type of Work to be performed.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Existing site survey, topography, and subsurface conditions: Existing conditions presented in drawing, report or specification form are believed accurate within normal industry tolerances but are not guaranteed. Investigate, survey, confirm and verify all conditions bearing on the Work by any means necessary before starting any Work that changes existing conditions. Report any unacceptable discrepancies to the Architect in writing before beginning operations.

1. Written claims of difference shall be accompanied by all substantiating evidence necessary to document such claim.
2. Claims of difference shall be resolved, including determination of quantities and costs and methods of Contract Modification, before work that alters such existing conditions is started.
3. Initiation of site-clearing, soil-moving operations, demolition or other activity that alters existing conditions shall be evidence that Contractor has made all investigations and evaluations it deems necessary and has accepted all existing conditions resent whether or not they conform exactly to the Contract Documents.
4. Without advance written notification of unacceptable discrepancy, no claim for extra will be considered for a claim of difference between documents and actual conditions after the Contractor has altered existing conditions.

B. Existing Conditions: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, investigate and verify the existence and location of underground utilities, and other construction affecting the Work.

1. Before construction, verify the location and invert elevation at points of connection of storm sewer, underground electrical services, and other utilities.
2. Furnish location data for work related to Project that must be performed by public utilities serving Project site.

C. Examination and Acceptance of Conditions: Before proceeding with each component of the Work, examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.

1. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
2. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.
3. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.

D. Written Report: Where a written report listing conditions detrimental to performance of the Work is required by other Sections, include the following:

1. Description of the Work.
2. List of detrimental conditions, including substrate.

3. List of unacceptable installation tolerances.
4. Recommended corrections.

E. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

F. Concealed Conditions: Concealed conditions that the contractor believes to differ substantially from Contract requirements, that change the products or performance requirements indicated, or that otherwise have a time / cost impact on the contractor's work shall be brought to the attention of the Architect immediately upon discovery.

1. Verbal or written claims of difference shall be accompanied by all substantiating evidence necessary to document such claim. Verbal claims shall be documented in writing by the contractor following discussions including full description of claim and points of understanding.
2. Claims of difference shall be resolved in writing, including determination of quantities and costs and methods of Contract Modification, before work that alters such existing conditions is started.

    a. When actual quantities remain concealed at time of discovery, the unknown quantities shall be estimated and a unit price agreed upon; as work progresses contractor shall track and document actual quantities to the Architect daily and shall not exceed estimated quantities without specific notification and further discussion.

3. Without such written agreement no claim for extra will be considered for a claim of difference between documents and actual conditions after the contractor has altered existing conditions.

3.2 PREPARATION

A. Existing Utility Information: Furnish information to local utility that is necessary to adjust, move, or relocate existing utility structures, utility poles, lines, services, or other utility appurtenances located in or affected by construction. Coordinate with authorities having jurisdiction.

B. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

C. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.

D. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents caused by differing field conditions outside the control of Contractor, submit a request for information to Architect according to requirements in Section 013100 "Project Management and Coordination."

3.3 CONSTRUCTION LAYOUT

A. Verification: Before proceeding to lay out the Work, verify layout information shown on Drawings, in relation to the property survey and existing benchmarks. If discrepancies are discovered, notify Architect promptly.

B. General: Engage a land surveyor to lay out the Work using accepted surveying practices.

1. Establish benchmarks and control points to set lines and levels at each story of construction and elsewhere as needed to locate each element of Project.
2. Establish limits on use of Project site.
3. Establish dimensions within tolerances indicated. Do not scale Drawings to obtain required dimensions.
4. Inform installers of lines and levels to which they must comply.
5. Check the location, level and plumb, of every major element as the Work progresses.
6. Notify Architect when deviations from required lines and levels exceed allowable tolerances.
7. Close site surveys with an error of closure equal to or less than the standard established by authorities having jurisdiction.

C. Site Improvements: Locate and lay out site improvements, including pavements, grading, fill and topsoil placement, utility slopes, and rim and invert elevations.

D. Building Lines and Levels: Locate and lay out control lines and levels for structures, building foundations, column grids, and floor levels, including those required for mechanical and electrical work. Transfer survey markings and elevations for use with control lines and levels. Level foundations and piers from two or more locations.

E. Record Log: Maintain a log of layout control work. Record deviations from required lines and levels. Include beginning and ending dates and times of surveys, weather conditions, name and duty of each survey party member, and types of instruments and tapes used. Make the log available for reference by Architect.

3.4 FIELD ENGINEERING

A. Reference Points: Locate existing permanent benchmarks, control points, and similar reference points before beginning the Work. Preserve and protect permanent benchmarks and control points during construction operations.

1. Do not change or relocate existing benchmarks or control points without prior written approval of Architect. Report lost or destroyed permanent benchmarks or control points promptly. Report the need to relocate permanent benchmarks or control points to Architect before proceeding.
2. Replace lost or destroyed permanent benchmarks and control points promptly. Base replacements on the original survey control points.

B. Benchmarks: Establish and maintain a minimum of two permanent benchmarks on Project site, referenced to data established by survey control points. Comply with authorities have jurisdiction for type and size of benchmark.

1. Record benchmark locations, with horizontal and vertical data, on Project Record Documents.
2. Where the actual location or elevation of layout points cannot be marked, provide temporary reference points sufficient to locate the Work.
3. Remove temporary reference points when no longer needed. Restore marked construction to its original condition.

3.5 INSTALLATION

A. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.

1. Make vertical work plumb and make horizontal work level.
2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
3. Conceal pipes, ducts, and wiring in finished areas unless otherwise indicated.
4. Maintain minimum headroom clearance of 96 inches in occupied spaces and 90 inches in unoccupied spaces.

B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.

C. Install products at the time and under conditions that will ensure the best possible results. Maintain conditions required for product performance until Contract Completion.

D. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.

E. Sequence the Work and allow adequate clearances to accommodate movement of construction items on site and placement in permanent locations.

F. Tools and Equipment: Do not use tools or equipment that produce harmful noise levels.

G. Templates: Obtain and distribute to the parties involved templates for work specified to be factory prepared and field installed. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.

H. Attachment: Provide blocking and attachment plates and anchors and fasteners of adequate size and number to securely anchor each component in place, accurately located and aligned with other portions of the Work. Where size and type of attachments are not indicated, verify size and type required for load conditions.

1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Architect.
2. Allow for building movement, including thermal expansion and contraction.
3. Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

I. Joints: Make joints of uniform width. Where joint locations in exposed work are not indicated, arrange joints for the best visual effect. Fit exposed connections together to form hairline joints.

J. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.

3.6 CUTTING AND PATCHING

A. Cutting and Patching, General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.

1. Cut in-place construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.

B. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during installation or cutting and patching operations, by methods and with materials so as not to void existing warranties.

C. Temporary Support: Provide temporary support of work to be cut.

D. Protection: Protect in-place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.

E. Existing Utility Services and Mechanical/Electrical Systems: Where existing services/systems are required to be removed, relocated, or abandoned, bypass such services/systems before cutting to minimize interruption to occupied areas.

F. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.

1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots neatly to minimum size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
2. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
3. Concrete and Masonry: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
4. Excavating and Backfilling: Comply with requirements in applicable Sections where required by cutting and patching operations.
5. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.
6. Proceed with patching after construction operations requiring cutting are complete.

G. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other work. Patch with durable seams that are as invisible as

practicable. Provide materials and comply with installation requirements specified in other Sections, where applicable.

1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate physical integrity of installation.
2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will minimize evidence of patching and refinishing.

    a. Clean piping, conduit, and similar features before applying paint or other finishing materials.
    b. Restore damaged pipe covering to its original condition.

3. Where patching occurs in a painted surface, prepare substrate and apply primer and intermediate paint coats appropriate for substrate over the patch, and apply final paint coat over entire unbroken surface containing the patch. Provide additional coats until patch blends with adjacent surfaces.
4. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition and ensures thermal and moisture integrity of building enclosure.

H. Acceptability of the Work: Architect's opinion is final for all issues of aesthetics and suitability of patching work. Unaccepted repairs shall be replaced or the repair re-performed until Architect is satisfied with the work at no additional cost to the Owner.

I. Cleaning: Clean areas and spaces where cutting and patching are performed. Remove paint, mortar, oils, putty, and similar materials from adjacent finished surfaces.

3.7 PROGRESS CLEANING

A. General: Clean Project site and work areas daily, including common areas. Enforce requirements strictly. Dispose of materials lawfully.

1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
2. Do not hold waste materials more than seven days during normal weather or three days if the temperature is expected to rise above 80 deg F.
3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.

    a. Use containers intended for holding waste materials of type to be stored.

4. Coordinate progress cleaning for joint-use areas where Contractor and other contractors are working concurrently.
5. Contractors failing to clean their work areas as indicated and directed will be back-charged costs for the Architect having the work performed; minimum back-charge costs will be a rate of $100.00 per hour plus the cost of materials and equipment.

B. Site: Maintain Project site free of waste materials and debris.

C. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the Work.

1. Remove liquid spills promptly.
2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.

D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.

E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.

F. Exposed Surfaces in Finished Areas: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Contract Completion.

G. Waste Disposal: Do not bury or burn waste materials on-site. Do not wash waste materials down sewers or into waterways. Comply with waste disposal requirements in Section 017419 "Construction Waste Management and Disposal."

H. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Contract Completion.

I. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.

J. Limiting Exposures: Supervise construction operations to assure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

3.8 STARTING AND ADJUSTING

A. Coordinate startup and adjusting of equipment and operating components with requirements in Section 019113 "General Commissioning Requirements."

B. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.

C. Adjust equipment for proper operation. Adjust operating components for proper operation without binding.

D. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

E. Manufacturer's Field Service: Comply with qualification requirements in Section 014000 "Quality Requirements."

3.9 PROTECTION OF INSTALLED CONSTRUCTION

A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Contract Completion.

B. Comply with manufacturer's written instructions for temperature and relative humidity.

3.10 CORRECTION OF THE WORK

A. Repair or remove and replace defective construction. Restore damaged substrates and finishes. Comply with requirements in “Cutting and Patching” paragraphs.

1. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment.

B. Restore permanent facilities used during construction to their specified condition.

C. Remove and replace damaged surfaces that are exposed to view if surfaces cannot be repaired without visible evidence of repair.

D. Repair components that do not operate properly. Remove and replace operating components that cannot be repaired.

E. Judgment of repair and replacement work acceptability is solely the Architect’s decision and shall not be challenged or over-ridden by time constraints or difficulty of performance.

F. Any removal and reinstallation of other work in place and all consequential repairs to other work in place shall be the responsibility of the contractor of the unaccepted work

END OF SECTION 017300

SECTION 017700 – CLOSEOUT PROCEDURES

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 administrative and procedural requirements for contract closeout, including, but not limited to, the following:

1. Prerequisites to final inspection and acceptance.
2. Inspection procedures.
3. Warranties.
4. Final cleaning.

1.3 DEFINITIONS

A. Closeout: General requirements near end of Contract Time in preparation for final acceptance, final payment, normal termination of contract, occupancy by Owner, and similar actions evidencing completion of the Work.

1.4 PREREQUISITES TO FINAL INSPECTION AND ACCEPTANCE

A. General: Before requesting Architect inspection complete the following:

1. Submit copy of itemized work as identified by the Contractor (Contractor’s Punch List) to be completed or corrected, starting at the value of items on the list, and reasons why the Work is not complete.

    a. Contractor’s List shall include all closeout documents not yet delivered to Architect or Owner.

2. Submit all record document submittals per General Conditions, and similar final record information.
3. Submit specific warranties, maintenance agreements, final certifications, and similar documents. Including but not limited to the following:

    a. Certificate occupancy operating certificates and similar releases.
    b. Inspection Certificates.
    c. Certification stating that no materials containing more than 1 percent asbestos was incorporated into the Work.
    d. Certification that all fire stopping systems installed in accordance with Contract Documents.

e. Warranties as indicated in "Warranties" Article below.

4. Deliver tools, spare parts, extra stocks of materials, and similar physical items to Owner and obtain a receipt. Label with manufacturer's name and model number where applicable.
5. Make final changeover of locks and transmit keys to Owner and advise Owner's personnel of changeover in security positions.
6. Complete start-up testing of systems and instructions of Owner's operating/maintenance along with construction tools, mock-ups, and similar elements.
7. Submit test/adjust/balance records.
8. Terminate and remove temporary facilities from Project site along with mockups, construction tools, and similar elements.
9. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.

1.5 WARRANTIES

A. Submittal Time: Submit written warranties on request of Architect for designated portions of the Work where commencement of warranties other than date of Contract Completion is indicated.

B. Organize warranty documents into an orderly sequence based on the table of contents of the Project Manual.

1. Bind warranties and bonds in heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8 ½-by-11-inch paper.
2. Provide heavy paper dividers with plastic-covered tabs for each separate warranty. Mark tab to identify the production of installation. Provide a typed description of the product or installation, including the name of the product and the name, address, and telephone number of the installer.
3. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project name, and name of Contractor.
4. Warranties are to be included in the Maintenance Manual for each material.

C. Provide additional copies of each warranty to include in operation and maintenance manuals.

D. The Owner will not accept the start of the warranty period on systems or equipment until the Certificate of Contract Completion is issued.

1. Each Contractor shall make such provisions as required to extend the manufacturer's warranty from time of initial operation of systems or equipment until Contract Completions is given in writing.

1.6 FINAL INSPECTION

A. Final Inspection: Contractor shall submit the "Contractor's Punch List" to the Architect, with a request for Final Inspection of the Work. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfilled requirements.

1. The Architect shall notify the Contractor and the Owner of scheduled time of Final Inspection.
2. Architect's Punch List will be combined with Contractor's Punch List and issued to the Contractor.

1.7 PREREQUISITES TO CONTRACT COMPLETION

A. Contractor shall request a reinspection by Architect when all "Punch List Items" have been completed. Final inspection shall occur within 30 days of issuance of Architect's Punch List.

1. Contractor shall indicate any items to be deferred in request.

B. Reinspection: Architect will reinspect work and when all items have been completed and record documents have been receive, Architect will process a Certificate of Contract Completion.

C. If punch list work is not complete at time of reinspection Architect will not process the Certificate if Contract Completion but will reissue the punch list with uncompleted work noted as not complete.

D. Contractor shall notify Architect when uncompleted items are in fact complete and shall reimburse the Architect at Architect's standard hourly rates for all time spent in additional reinspection(s) until Contractor's work is accepted as complete.

1. Architect will process Certificate of Contract Completion when work is complete, record documents have been received and when compensation for Architect's second (and beyond) reinspection time has been received.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

1. Use no high VOC containing agents.

PART 3 - EXECUTION

3.1 FINAL CLEANING

A. General: Perform final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.

B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.

1. Complete the following cleaning operations before requesting inspection for certification of Contract Completion for entire Project or for a designated portion of Project:

a. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
c. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.
d. Remove tools, construction equipment, machinery, and surplus material from Project site.
e. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
f. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
g. Damp mop concrete and resilient floor surfaces.
h. Vacuum carpet and similar soft surfaces, removing debris and excess nap; clean according to manufacturer's recommendations if visible soil or stains remain.
i. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Polish mirrors and glass, taking care not to scratch surfaces.
j. Remove labels that are not permanent.
k. Touch up and otherwise repair and restore marred, exposed finishes and surfaces. Replace finishes and surfaces that cannot be satisfactory repaired or restored or that already show evidence of repair or restoration.

1) Do not paint over “UL” and similar labels, including mechanical and electrical nameplates.

l. Wipe surfaces of mechanical and electrical equipment, elevator equipment, and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
m. Replace parts subject to unusual operating conditions.
n. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
o. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
p. Clean ducts, blowers, and coils if units were operated without filters during construction.
q. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency. Clean light fixtures, lamps, globes, and reflectors to function will full efficiency. Replace burned-out bulbs, and those noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.

r. Leave Project clean and ready for occupancy.

END OF SECTION 017700

SECTION 017823 – OPERATION AND MAINTENANCE DATA

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 administrative and procedural requirements for preparing operation and maintenance manuals, including the following:

B. Related Requirements:

1. Divisions 02 through 33 Sections for specific operation and maintenance manual requirements for the Work in those Sections.

1.3 DEFINITIONS

A. System: An organized collection of parts, equipment, or subsystems united by regular interaction.

B. Subsystem: A portion of a system with characteristics similar to a system.

1.4 CLOSEOUT SUBMITTALS

A. Manual Content: Operations and maintenance manual content is specified in individual Specification Sections to be reviewed at the time of Section submittals. Submit reviewed manual content formatted and organized as required by this Section.

1. Architect will comment on whether content of operations and maintenance submittals are acceptable.
2. Where applicable, clarify and update reviewed manual content to correspond to revisions and field conditions.

B. Format: Submit operations and maintenance manuals in the following format:

1. PDF electronic file. Assemble each manual into a composite electronically indexed file.

a. Name each indexed document file in composite electronic index with applicable item name. Include a complete electronically linked operation and maintenance directory.
b. Enable inserted reviewer Comments on draft submittals.

2. Two paper copies. Include a complete operation and maintenance directory. Enclose title pages and directories in clear plastic sleeves.

C. Final Manual Submittal: Submit each manual in final form prior to requesting inspection for Final Completion and at least 7 days before commencing demonstration and training. Architect will return copy with comments.

PART 2 - PRODUCTS

2.1 REQUIREMENTS FOR OPERATION AND MAINTENANCE MANUALS

A. Organization: Unless otherwise indicated, organize each manual into a separate section for each system and subsystem, and a separate section for each piece of equipment not part of a system. Each manual shall contain the following materials, in the order listed:

1. Title page.
2. Table of contents.
3. Manual contents.

B. Title Page: Include the following information:

1. Subject matter included in manual.
2. Name and address of Project.
3. Name and address of Owner.
4. Date of submittal.
5. Name and contact information for Contractor.
6. Name and contact information for Architect.

C. Table of Contents: List each product included in manual, identified by product name, indexed to the content of the volume, and cross-referenced to Specification Section number in Project Manual.

1. If operation or maintenance documentation requires more than one volume to accommodate data, include comprehensive table of contents for all volumes in each volume of the set.

D. Manual Contents: Organize into sets of manageable size. Arrange contents alphabetically by system, subsystem, and equipment. If possible, assemble instructions for subsystems, equipment, and components of one system into a single binder.

E. Manuals, Electronic Files: Submit manuals in the form of a multiple file composite electronic PDF file for each manual type required.

1. Electronic Files: Use electronic files prepared by manufacturer where available. Where scanning of paper documents is required, configure scanned file for minimum readable file size.
2. File Names and Bookmarks: Enable bookmarking of individual documents based on file names. Name document files to correspond to system, subsystem, and equipment names used in manual directory and table of contents. Group documents for each system and

subsystem into individual composite bookmarked files, then create composite manual, so that resulting bookmarks reflect the system, subsystem, and equipment names in a readily navigated file tree. Configure electronic manual to display bookmark panel on opening file.

F. Manuals, Paper Copy: Submit manuals in the form of hard copy, bound and labeled volumes.

1. Binders: Heavy-duty, three-ring, vinyl-covered, loose-leaf binders, in thickness necessary to accommodate contents, sized to hold 8-1/2-by-11-inch paper; with clear plastic sleeve on spine to hold label describing contents and with pockets inside covers to hold folded oversize sheets.

    a. If two or more binders are necessary to accommodate data of a system, organize data in each binder into groupings by subsystem and related components. Cross-reference other binders if necessary to provide essential information for proper operation or maintenance of equipment or system.
    b. Identify each binder on front and spine, with printed title "OPERATION AND MAINTENANCE MANUAL," Project title or name, and subject matter of contents, and indicate Specification Section number on bottom of spine. Indicate volume number for multiple-volume sets.

2. Dividers: Heavy-paper dividers with plastic-covered tabs for each section of the manual. Mark each tab to indicate contents. Include typed list of products and major components of equipment included in the section on each divider, cross-referenced to Specification Section number and title of Project Manual.
3. Protective Plastic Sleeves: Transparent plastic sleeves designed to enclose diagnostic software storage media for computerized electronic equipment.
4. Supplementary Text: Prepared on 8-1/2-by-11-inch white bond paper.
5. Drawings: Attach reinforced, punched binder tabs on drawings and bind with text.

    a. If oversize drawings are necessary, fold drawings to same size as text pages and use as foldouts.
    b. If drawings are too large to be used as foldouts, fold and place drawings in labeled envelopes and bind envelopes in rear of manual. At appropriate locations in manual, insert typewritten pages indicating drawing titles, descriptions of contents, and drawing locations.

2.2 PRODUCT MAINTENANCE MANUALS

A. Content: Organize manual into a separate section for each product, material, and finish. Include source information, product information, maintenance procedures, repair materials and sources, and warranties and bonds, as described below.

B. Source Information: List each product included in manual identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference

Specification Section number and title in Project Manual and drawing or schedule designation or identifier where applicable.

C. Product Information: Include the following, as applicable:

1. Product name and model number.
2. Manufacturer's name.
3. Color, pattern, and texture.

D. Maintenance Procedures: Include manufacturer's written recommendations and the following:

1. Types of cleaning agents to be used and methods of cleaning.
2. Schedule for routine cleaning and maintenance.
3. Repair instructions.

E. Repair Materials and Sources: Include lists of materials and local sources of materials and related services.

F. Warranties: Include copies of warranties and lists of circumstances and conditions that would affect validity of warranties or bonds.

1. Include procedures to follow and required notifications for warranty claims.

PART 3 - EXECUTION

3.1 MANUAL PREPARATION

A. Product Maintenance Manual: Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.

B. Manufacturers' Data: Where manuals contain manufacturers' standard printed data, include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data include more than one item in a tabular format, identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and delete references to information not applicable.

1. Prepare supplementary text if manufacturers' standard printed data are not available and where the information is necessary for proper operation and maintenance of equipment or systems.

C. Drawings: Prepare drawings supplementing manufacturers' printed data to illustrate the relationship of component parts of equipment and systems and to illustrate control sequence and flow diagrams. Coordinate these drawings with information contained in record Drawings to ensure correct illustration of completed installation.

END OF SECTION 017823

SECTION 017839 – PROJECT RECORD DOCUMENTS

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 administrative and procedural requirements for project record documents.

1.3 CLOSEOUT SUBMITTALS

A. Record Drawings: Comply with the following:

1. Number of Copies: Submit one set of marked-up record prints.

B. Record Specifications: Submit one paper copy of Project's Specifications.

PART 2 - PRODUCTS

2.1 RECORD DRAWINGS

A. Record Prints: Maintain one set of marked-up paper copies of the Contract Drawings and Shop Drawings, incorporating new and revised drawings as modifications are issued.

1. Preparation: Mark record prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to provide information for preparation of corresponding marked-up record prints.

a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
b. Accurately record information in an acceptable drawing technique.
c. Record data as soon as possible after obtaining it.
d. Record and check the markup before enclosing concealed installations.

2. Content: Types of items requiring marking include, but are not limited to, the following:

a. Dimensional changes to Drawings.
b. Revisions to details shown on Drawings.
c. Locations and depths of underground utilities.
d. Changes made by Change Order or Construction Change Directive.
e. Changes made following Architect's written orders.

3. Mark the Contract Drawings and Shop Drawings completely and accurately. Use personnel proficient at recording graphic information in production of marked-up record prints.
4. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at same location.
5. Mark important additional information that was either shown schematically or omitted from original Drawings.
6. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.

PART 3 - EXECUTION

3.1 RECORDING AND MAINTENANCE

A. Recording: Maintain one copy of each submittal during the construction period for project record document purposes. Post changes and revisions to project record documents as they occur; do not wait until end of Project.

B. Maintenance of Record Documents and Samples: Store record documents and Samples in the field office apart from the Contract Documents used for construction. Do not use project record documents for construction purposes. Maintain record documents in good order and in a clean, dry, legible condition, protected from deterioration and loss. Provide access to project record documents for Architect’s reference during normal working hours.

END OF SECTION 017839

SECTION 017900 – DEMONSTRATION AND TRAINING

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 administrative and procedural requirements for instructing Owner's personnel, including the following:

1. Demonstration of operation of systems, subsystems, and equipment and training in operation and maintenance of systems, subsystems, and equipment.

1.3 CLOSEOUT SUBMITTALS

A. Demonstration and Training: Submit one copy within seven days of end of each training module.

1. Identification: On each copy, provide an applied label with the following information:

a. Name of Project.
b. Name and address of videographer.
c. Name of Architect.
d. Name of Contractor.
e. Date of video recording.

2. Transcript: Prepared and bound in format matching operation and maintenance manuals. Mark appropriate identification on front and spine of each binder. Include a cover sheet with same label information as the corresponding video recording. Include name of Project and date of video recording on each page.
3. Transcript: Prepared in PDF electronic format. Include a cover sheet with same label information as the corresponding video recording and a table of contents with links to corresponding training components. Include name of Project and date of video recording on each page.
4. At completion of training, submit complete training manual(s) for Owner's use in PDF electronic file.

1.4 QUALITY ASSURANCE

A. Facilitator Qualifications: A firm or individual experienced in training or educating maintenance personnel in a training program similar in content and extent to that indicated for this Project, and whose work has resulted in training or education with a record of successful learning performance.

B. Instructor Qualifications: A factory-authorized service representative, complying with requirements in Section 014000 "Quality Requirements," experienced in operation and maintenance procedures and training.

C. Preinstruction Conference: Review methods and procedures related to demonstration and training including, but not limited to, the following:

1. Inspect and discuss locations and other facilities required for instruction.
2. Review and finalize instruction schedule and verify availability of educational materials, instructors' personnel, audiovisual equipment, and facilities needed to avoid delays.
3. Review required content of instruction.
4. For instruction that must occur outside, review weather and forecasted weather conditions and procedures to follow if conditions are unfavorable.

1.5 COORDINATION

A. Coordinate instruction schedule with Owner's operations. Adjust schedule as required to minimize disrupting Owner's operations and to ensure availability of Owner's personnel.

B. Coordinate instructors, including providing notification of dates, times, length of instruction time, and course content.

C. Coordinate content of training modules with content of approved emergency, operation, and maintenance manuals. Do not submit instruction program until operation and maintenance data has been reviewed and approved by Architect.

PART 2 - PRODUCTS

2.1 INSTRUCTION PROGRAM

A. Program Structure: Develop an instruction program that includes individual training modules for each system and for equipment not part of a system, as required by individual Specification Sections.

B. Training Modules: Develop a learning objective and teaching outline for each module. Include a description of specific skills and knowledge that participant is expected to master. For each module, include instruction for the following as applicable to the system, equipment, or component:

1. Basis of System Design, Operational Requirements, and Criteria: Include the following:

a. System, subsystem, and equipment descriptions.
b. Performance and design criteria if Contractor is delegated design responsibility.
c. Operating standards.
d. Regulatory requirements.
e. Equipment function.
f. Operating characteristics.
g. Limiting conditions.

h. Performance curves.

2. Operations: Include the following, as applicable:

a. Startup procedures.
b. Equipment or system break-in procedures.
c. Routine and normal operating instructions.
d. Regulation and control procedures.
e. Control sequences.
f. Safety procedures.
g. Instructions on stopping.
h. Normal shutdown instructions.
i. Operating procedures for emergencies.
j. Operating procedures for system, subsystem, or equipment failure.
k. Seasonal and weekend operating instructions.
l. Required sequences for electric or electronic systems.
m. Special operating instructions and procedures.

3. Adjustments: Include the following:

a. Alignments.
b. Checking adjustments.
c. Noise and vibration adjustments.
d. Economy and efficiency adjustments.

4. Maintenance: Include the following:

a. Inspection procedures.
b. Types of cleaning agents to be used and methods of cleaning.
c. List of cleaning agents and methods of cleaning detrimental to product.
d. Procedures for routine cleaning
e. Procedures for preventive maintenance.
f. Procedures for routine maintenance.
g. Instruction on use of special tools.

5. Repairs: Include the following:

a. Diagnosis instructions.
b. Repair instructions.
c. Disassembly; component removal, repair, and replacement; and reassembly instructions.
d. Instructions for identifying parts and components.
e. Review of spare parts needed for operation and maintenance.

PART 3 - EXECUTION

3.1 PREPARATION

A. Assemble educational materials necessary for instruction, including documentation and training module. Assemble training modules into a training manual organized in coordination with requirements in Section 017823 "Operations and Maintenance Data."

B. Set up instructional equipment at instruction location.

3.2 INSTRUCTION

A. Scheduling: Provide instruction at mutually agreed on times. For equipment that requires seasonal operation, provide similar instruction at start of each season.

1. Schedule training with Owner, through Architect, with at least seven days' advance notice.

B. Training Location and Reference Material: Conduct training on-site in the completed and fully operational facility using the actual equipment in-place. Conduct training using final operation and maintenance data submittals.

END OF SECTION 017900

SECTION 022820 – HAZARDOUS MATERIALS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SECTION INCLUDES

A. Investigation Information:

1. The attached Hazardous Materials Reports and Logs were prepared for use in the construction of the project. The following Reports are not part of the construction Contract Documents and are intended for informational use only in preparation of bids. Actual site conditions may vary. The Project Design Professionals and Owner do not accept any responsibility for the information contained in these reports.
2. The General Contractor acknowledges that asbestos-containing materials (ACMs) may be present within the project area. Prior to the commencement of any demolition, renovation, disturbance, or construction activities that could impact suspected or confirmed asbestos-containing materials, the General Contractor shall retain a licensed and qualified asbestos abatement contractor to perform all required inspection, testing, removal, handling, and disposal activities in accordance with all applicable federal, state, and local regulations.
3. No work that may disturb asbestos-containing materials shall proceed until the asbestos contractor has completed the required abatement activities and provided documentation demonstrating compliance with applicable environmental and occupational safety requirements. The General Contractor shall be responsible for coordinating all asbestos-related work and ensuring that project activities do not compromise the safety of workers, occupants, or the public. Typical areas suspected of containing asbestos include: Acoustical Ceiling Plaster, Exterior Window Caulking, Grey Sink Undercoating and 9 inch floor tile and associated mastic under some existing casework.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 028220

SECTION 024000 – DEMOLITION

PART 1 - GENERAL

1.1 SECTION INCLUDE

A. Protection of Utilities.

B. Soil Surface Restoration

1.2 DESCRIPTION OF WORK

A. Unless directed otherwise in the Contract Documents, the Contractor shall:

1. Remove and properly dispose of all structures, trash, rubbish, foundation walls, foundations, sidewalks, steps and driveways.
2. Remove the materials from the demolition site in accordance with federal, state and local regulations.
3. Disconnect and cap all utility services before demolition.
4. Perform site clearance, grading and restoration.
5. Complete the demolition work in accordance with the plans and these technical specifications and any special provisions included in the Contract Documents.

1.3 PROTECTION OF THE PUBLIC AND PROPERTIES

A. Streets and Roads

1. The Contractor shall be responsible for removing any demolition debris or mud from any street, alley or right-of-way resulting from the execution of the demolition work. Any cost incurred by the Owner in cleaning up any litter or mud shall be charged to the Contractor.
2. Littering of the site shall not be permitted.
3. All waste materials shall be promptly removed from the site.

B. Closures

1. If it should become necessary to close any traffic lanes, it shall be the Contractor’s responsibility to acquire the necessary obstruction permits and to place adequate barricades and warning signs as required.
2. Lane closures shall be coordinated with the District.

C. Protection of the Public

1. Sidewalks: The Contractor shall be responsible for any damage to public sidewalks abutting or adjacent to the demolition properties resulting from the execution of the demolition work.
2. Pedestrian Access: It shall be the Contractor’s responsibility to place and construct the necessary warning signs, barricades, fencing and temporary

pedestrian sidewalks and to maintain alternate pedestrian access for sidewalks around the demolition site.

3. Temporary Fence: Temporary fence shall be erected around all excavation, dangerous building(s) or structure(s) to prevent access to the public. Such fence shall be at least four feet high, consistently restrictive from top to grade, and without horizontal openings wider than two inches. The fence shall be erected before demolition and shall not be removed until the hazard is removed.

D. Demolition Hours

1. The Contractor shall comply with any restrictions to working hours as included in the Contract Documents.
2. The Contractor shall comply with all applicable ordinances and restrictions of the School District.

E. Noise Pollution

1. All construction equipment used in conjunction with this project shall be in good repair and adequately muffled. The Contractor shall comply with local noise pollution requirements.

F. Dust Control

1. The Contractor shall comply with applicable air pollution control requirements of the Jurisdiction. The Contractor shall take appropriate actions to minimize atmospheric pollution. To minimize atmospheric pollution, the project Architect shall have the authority to require that reasonable precautions be taken to prevent particulate matter from becoming airborne.

G. Requirements for the Reduction of Fire Hazards

1. Removal of Material: Before demolition of any part of any building, the Contractor shall remove loose paper, combustible trash and all other materials that might serve as ready fuel for small fires.
2. Fire Extinguishing Equipment: The Contractor shall be responsible for having and maintaining the correct type and class of fire extinguisher on site. When a cutting torch or other equipment that might cause a fire is being used, a fire extinguisher shall be placed close at hand for instant use.
3. Fires: No fires of any kind will be permitted in the demolition work area.
4. Hydrants: No material obstructions or debris shall be placed or allowed to accumulate within fifteen feet of any fire hydrant. All fire hydrants shall be accessible at all times.
5. Debris: Debris shall not be allowed to accumulate on roofs, floors or in areas outside of and around any structure being demolished. Excess debris and materials shall be removed from the site as the work progresses.

H. Protection of Public Utilities: The Contractor shall not damage existing fire hydrants, street lights, traffic signals, power poles, telephone poles, fire alarm boxes, wire cables, poles, guys, underground utilities or other appurtenances in the vicinity of the demolition sites. The Contractor shall pay for temporary relocation of utilities, which are relocated at the Contractor’s request for his convenience.

1.4 RISK OF LOSS

A. The Contractor shall accept the site in its present condition and shall inspect the site for its character and the type of structures to be demolished. The Owner assumes no responsibility for the condition of existing buildings, structures and other property within the demolition area, or the condition of the property.

1.5 VACATING OF BUILDINGS

A. The structures identified in the Contract Documents shall not be vacated before the Contractor begins work.

PART 2 – PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 DEMOLITION SCHEDULE

A. The Contractor shall be responsible for providing a minimum of twenty-four hours advance notification prior to beginning the execution of demolition of any structure.

3.2 SALVAGE OF DEMOLITION MATERIALS

A. The Contractor shall be allowed to salvage demolition materials.

B. The Contractor may salvage demolition materials as long as demolition is completed within the provisions included in the Contract Documents. All buildings, building materials and equipment resulting from this work shall become the property of the Contractor, and shall be removed from the premises at once. Salvaged material shall be removed immediately from the premises, right-of way and streets.

C. Salvage for Owner :

1. Wood Doors
2. Storefront Doors and Frames

3.3 DEMOLITION AND REMOVALS

A. Structural Parts of Buildings

1. Structural parts of buildings, such as columns, beams and joists, supporting the floor of any story shall be left in place until the walls, flooring and partitions of that story are completely removed, beginning at the top and working downward. Exceptions to this requirement will be made in the case of wood frame buildings or non-rigid frame masonry or concrete buildings. If the Contractor elects to use an approved alternate procedure for progressive or simultaneous wrecking of all

parts of the building, the Contractor shall provide proposed method such that danger to the Contractor's personnel, the public or to adjacent property will not be increased thereby.

2. No wall or part thereof shall be permitted to fall outwardly from any building except through chutes or by other controlled means or methods, which will ensure safety and minimize dust, noise and other nuisance.
3. Any part of a building, whether structural, collateral, or accessory, which has become unstable through removal of other parts, shall be removed as soon as practicable, and no such unstable part shall be left free-standing or inadequately braced against all reasonably possible causes of collapse at the end of any day's work.

B. Foundation Walls

1. All floors, footings and foundations shall be completely removed from the site unless approved before backfilling is started. The Contractor shall ensure that no excavation will remain open and exposed for more than 24 hours. The Contractor shall contact the Architect when removal is complete to schedule excavation inspection. Failure to do so may result in re-excavation at the Contractor's expense.

C. Concrete Slabs

1. The Contractor shall remove all concrete slabs, asphalt, surface obstructions, masonry slabs and appurtenances.

D. Partially Buried Objects

1. All piping, posts, reinforcing bars, anchor bolts, railings and all other partly buried objects protruding from the ground shall be removed. The remaining void shall be filled with soil and compacted in accordance with these specifications.

E. Vegetation

1. The Contractor shall remove all dead trees, trees identified for removal, stumps, all trees which are not an asset to the property, bushes, vegetation, brush and weeds, whether standing or fallen, unless specifically stated otherwise. The Contractor shall protect all trees not removed from damage by the demolition operation.

3.4 DISPOSAL OF DEMOLITION DEBRIS AND SOLID WASTE

A. Debris

1. All materials, rubbish and trash shall be removed from the demolition area leaving demolition area free of debris.

B. Disposal of Demolition Debris and Solid Waste

1. All debris and solid waste shall be delivered by the Contractor to an EPA approved disposal facility licensed in accordance with state and/or local regulations, laws and zoning. The Contractor shall be responsible to pay all fees for waste disposal. The Contractor shall submit copies of all disposal tickets for each structure demolished, where available, which identify the specific address of the origin of the debris associated with each ticket.

C. Hazardous Materials

1. The handling of material is subject to all applicable state and federal mandates.

3.5 BACKFILL, GRADING, AND CLEAN-UP

A. Backfill: When site conditions permit, on-site soil shall be used as backfill material. The top 9-12 inches of topsoil shall be stripped and stockpiled on site for use as final topsoil and grading material. Excess excavation materials shall be removed from the site. Topsoil material shall not be permitted as deep fill material. Any borrow or fill material shall be approved before and during the placing of the material. All depressions on the property shall be filled, compacted and graded to a uniform slope with adequate drainage.

B. Compaction: All excavations shall be backfilled with acceptable material and compacted.

C. Additional Fill Material: All additional fill material shall be of equal quality to the soil adjacent to the excavation, and free of rubble or organic matter. The Contractor shall provide for a minimum depth of six inches of topsoil over the excavated area.

D. Hand Labor: The Contractor shall employ hand labor where the use of power machinery is unsafe or unable to produce a finished job. Hand labor shall also be used to clean the site of any debris.

E. Grading: The site shall be graded to conform to all surrounding areas and shall be finished to have a uniform surface that shall not permit ponding of water. The Contractor shall grade and shape the site to drain, complete fine grading and final clean up.

F. Final Clean Up: Before acceptance of the demolition work, the Contractor shall remove all unused material and rubbish from the site of the work, remedy any objectionable conditions the Contractor may have created, and leave in a neat and presentable condition. The Contractor shall not make agreements that allow salvaged or unused material to remain on property. All ground occupied by the Contractor in connection with the work shall be restored. Restoration shall include appropriate smoothing to its original condition and seeding of the area.

END OF SECTION 024000

SECTION 042200 - CONCRETE UNIT MASONRY

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. Concrete unit masonry.
2. Precast concrete lintels.

1.3 PERFORMANCE REQUIREMENTS

A. Provide unit masonry that develops installed compressive strengths at 28 days, based on net area, of 1,350 psi.

1.4 SUBMITTALS

A. General: Submit each item in this Article according to the General Conditions of the Contract and Division 1 Specification Sections.

B. Product data and certifications for each different masonry unit, accessory, and other manufactured product specified.

1.5 QUALITY ASSURANCE

A. Source Limitations for Masonry Units: Obtain exposed masonry units of a uniform texture and color through one source from a single manufacturer for each product required.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store masonry units on elevated platforms, under cover, and in a dry location to prevent their deterioration or damage due to moisture, temperature changes, contaminants, corrosion, and other causes. If units become wet, do not install until they are in an air-dried condition.

B. Store 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 avoided.

D. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

1.7 PROJECT CONDITIONS

A. Protection of Masonry: During erection, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.

B. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Immediately remove grout, mortar, and soil that come in contact with such masonry.

1. Protect base of walls from rain-splashed mud and mortar splatter by coverings spread on ground and over wall surface.
2. Protect sills, ledges, and projections from mortar droppings.
3. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.
4. Turn scaffold boards near the wall on edge at the end of each day to prevent rain from splashing mortar and dirt on completed masonry.

C. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen subgrade or setting beds. Remove and replace unit masonry damaged by frost or freezing conditions. Comply with the following requirements:

1. Cold-Weather Construction: When the ambient temperature is within the limits indicated, use the following procedures:

a. 40 to 32 deg F: Heat mixing water or sand to produce mortar temperatures between 40 and 120 deg F.
b. 32 to 25 deg F: Heat mixing water and sand to produce mortar temperatures between 40 and 120 deg F. Heat grout materials to produce grout temperatures between 40 and 120 deg F. Maintain mortar and grout above freezing until used in masonry.
c. 25 to 20 deg F: Heat mixing water and sand to produce mortar temperatures between 40 and 120 deg F. Heat grout materials to produce grout temperatures between 40 and 120 deg F. Maintain mortar and grout above freezing until used in masonry. Heat masonry units to 40 deg F if grouting. Use heat on both sides of walls under construction.
d. 20 deg F and Below: Heat mixing water and sand to produce mortar temperatures between 40 and 120 deg F. Heat grout materials to produce grout temperatures between 40 and 120 deg F. Maintain mortar and grout above freezing until used in masonry. Heat masonry units to 40 deg F. Provide enclosures and use heat on both sides of walls under construction to maintain temperatures above 32 deg F within the enclosures.

2. Cold-Weather Protection: When the mean daily temperature is within the limits indicated, provide the following protection:

    a. 40 to 25 deg F: Cover masonry with a weather-resistant membrane for 48 hours after construction.
    b. 25 to 20 deg F: Cover masonry with insulating blankets or provide enclosure and heat for 48 hours after construction to prevent freezing. Install wind breaks when wind velocity exceeds 15 mi./h.
    c. 20 deg F and Below: Provide enclosure and heat to maintain temperatures above 32 deg F within the enclosure for 48 hours after construction.

3. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F and above and will remain so until masonry has dried out, but not less than 7 days after completion of cleaning.

D. Hot-Weather Requirements: Protect unit masonry work when temperature and humidity conditions produce excessive evaporation of water from mortar and grout. Provide artificial shade and wind breaks and use cooled materials as required. Do not apply mortar to substrates with temperatures of 100 deg F and above.

PART 2 - PRODUCTS

2.1 CONCRETE MASONRY UNITS

A. General: Provide shapes indicated and as follows for each form of concrete masonry unit required.

1. Provide special shapes for lintels, corners, jambs, control joints, headers, bonding, and other special conditions.
2. Provide bullnose units at all corners and where indicated.

B. Concrete Masonry Units: ASTM C 90 Type II and as follows:

1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 1900 psi.
2. Weight Classification: Normal Weight.
3. Aggregates: Do not use aggregates made from pumice, scoria, or tuff.
4. Size: Manufactured to the actual dimensions (within tolerances specified in the applicable referenced ASTM specification) for the corresponding nominal sizes as indicated on Drawings for :

    a. Smooth faced unit masonry.
    b. Ground face unit masonry.

5. Manufacturer's standard color and texture, unless otherwise indicated.

2.2 MORTAR AND GROUT MATERIALS

A. Portland Cement: ASTM C 150, Type I or II, except Type III may be used for cold-weather construction. Provide natural color or white cement as required to produce mortar color indicated.

B. Hydrated Lime: ASTM C 207, Type S.

C. Masonry Cement: ASTM C 91.

1. Available Products: Subject to compliance with requirements, products that may be incorporated in the Work include, but are not limited to, the following:

a. Lafarge North America Inc.; Magnolia Masonry Cement or Lafarge Masonry Cement.
b. Lehigh Cement Company; Lehigh Masonry Cement.
c. Holcim (US) Inc.; Holcim Masonry Cement

D. Aggregate for Mortar: ASTM C 144; except for joints less than 1/4 inch, use aggregate graded with 100 percent passing the No. 16 sieve.

E. Aggregate for Grout: ASTM C 404.

F. Water: Potable.

2.3 MASONRY CLEANERS

A. Job-Mixed Detergent Solution: Solution of 1/2-cup dry measure tetrasodium polyphosphate and 1/2-cup dry measure laundry detergent dissolved in 1 gal. of water.

2.4 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.

B. Mortar for Unit Masonry: Comply with ASTM C 270, Proportion Specification, for types of mortar indicated below:

1. For all masonry, use type S or N, per drawings.

C. Grout for Unit Masonry: Comply with ASTM C 476. Minimum compressive strength shall be 3,000 psi. Use grout of consistency (fine or coarse) at time of placement that will completely fill spaces intended to receive grout.

1. Use fine grout in grout spaces less than 2 inches in horizontal dimension, unless otherwise indicated.
2. Use coarse grout in grout spaces 2 inches or more in least horizontal dimension, unless otherwise indicated.

2.5 INTEGRAL WATER REPELLENT

A. General: For CMU and mortar, provide integral water repellent as admixture in batches as follows:

1. Available Products: Subject to compliance with requirements, products that may be incorporated in the Work include the following:

a. Acme Shield, as manufactured by Acme-Hardesty Company, Inc.
b. Rheopel, as manufactured by Master Builders
c. Dry-Block, as manufactured by Grace Construction Products, W.R. Grace & Co.

B. For Concrete Masonry Units: Add water repellent to units as recommended by water repellent manufacturer, but not less than the following dosages:

1. For Lightweight CMU: Not less than 28 fl. oz. / cwt
2. For Normal weight CMU: Not less than 16 fl. oz. / cwt

C. For mortar: Add water repellent admixture to mortar mix as recommended by water repellent manufacturer for specific mortar mix used to achieve minimum water retention percentage of 80 for Type N and S mortar when tested as per ASTM C270.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of unit masonry. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

A. Build single-wythe walls to the actual thickness of the masonry units, using units of thickness indicated.

B. Build chases and recesses to accommodate items specified in this and other Sections of the Specifications.

C. Leave openings for equipment to be installed before completion of masonry. After installing equipment, complete masonry to match construction immediately adjacent to the opening.

D. Cut masonry units with motor-driven saws to provide clean, sharp, unchipped edges. Cut units as required to provide continuous pattern and to fit adjoining construction. Use full-size units without cutting, where possible. Allow units cut with water-cooled saws to dry before placing, unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.

E. Mix units for exposed unit masonry from several pallets or cubes as they are placed to produce uniform blend of colors and textures.

3.3 CONSTRUCTION TOLERANCES

A. Variation from Plumb: For vertical lines and surfaces of walls, do not exceed 1/4 inch in 10 feet, nor 3/8 inch in 20 feet, nor 1/2 inch in 40 feet or more. For external corners, expansion joints, control joints, and other conspicuous lines, do not exceed 1/4 inch in 20 feet, nor 1/2 inch in 40 feet or more. For vertical alignment of head joints, do not exceed plus or minus 1/4 inch in 10 feet, nor 1/2 inch maximum.

B. Variation from Level: For bed joints and lines of exposed lintels, sills, and other conspicuous lines, do not exceed 1/4 inch in 20 feet, nor 1/2 inch in 40 feet or more.

C. Variation in Cross-Sectional Dimensions: From dimensions shown, do not exceed minus 1/4 inch nor plus 1/2 inch.

D. Variation in Mortar-Joint Thickness: Do not vary from joint thickness indicated by more than plus or minus 1/8 inch, with a maximum thickness limited to 1/2 inch. Do not vary joint thickness from joint thickness of adjacent course by more than 1/8 inch.

3.4 LAYING MASONRY WALLS

A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint widths and for accurate locating of openings, movement-type joints, returns, and offsets. Avoid the use of less-than-half-size units at corners, jambs, and where possible at other locations.

B. Lay walls to comply with specified construction tolerances, with courses accurately spaced and coordinated with other construction.

C. Bond Pattern: Lay masonry in the following bond pattern; do not use units with less than nominal 4-inch horizontal face dimensions at corners or jambs.

1. One-half running bond with vertical joint in each course centered on units in courses above and below.

D. Stopping and Resuming Work: In each course, rack back 1/2-unit length; do not tooth. Clean exposed surfaces of set masonry, wet clay masonry units lightly if required, and remove loose masonry units and mortar prior to laying fresh masonry.

E. Built-in Work: As construction progresses, build-in items specified under this and other Sections of the Specifications. Fill in solidly with masonry around built-in items.

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

G. Fill cores in hollow concrete masonry units with grout full height under lintels and similar items, unless otherwise indicated. Jambs at all door and window openings shall be grouted full height.

3.5 MORTAR BEDDING AND JOINTING

A. Lay hollow concrete masonry units as follows:

1. With full mortar coverage on horizontal and vertical face shells.
2. Bed webs in mortar in starting course on footings and slabs and where adjacent to cells or cavities to be filled with grout.
3. Maintain joint widths indicated, except for minor variations required to maintain bond alignment. If not indicated, lay walls with 3/8-inch joints.

B. Lay solid brick-size masonry units with completely filled bed and head joints; butter ends with sufficient mortar to fill head joints and shove into place. Do not furrow bed joints or slush head joints.

C. Tool joints slightly concave when thumbprint hard, using a jointer larger than joint thickness, unless otherwise indicated.

1. For glazed masonry units, use a nonmetallic jointer 3/4 inch or more in width.

3.6 HORIZONTAL-JOINT REINFORCEMENT

A. General: Provide continuous horizontal-joint reinforcement as indicated. Install entire length of longitudinal side rods in mortar with a minimum cover of 5/8 inch. Lap reinforcing a minimum of 6 inches.

1. Space reinforcement not more than 16 inches o.c.

B. Cut or interrupt joint reinforcement at control and expansion joints, unless otherwise indicated.

C. Provide continuity at corners and wall intersections by using prefabricated "L" and "T" sections. Cut and bend reinforcement units as directed by manufacturer for continuity at returns, offsets, column fireproofing, pipe enclosures, and other special conditions.

3.7 PLACING REINFORCEMENT

A. General: Comply with ACI 530.

B. Clean reinforcement of loose rust and mill scale, earth, ice, and other materials that reduce or destroy bond with grout.

C. Accurately position, support, and secure reinforcement against displacement.

3.8 CONTROL AND EXPANSION JOINTS

A. General: Install control and expansion joints in unit masonry where indicated. Build-in related items as the masonry progresses. Do not form a continuous span through movement joints.

3.9 LINTELS

A. Provide precast concrete lintels where shown and where openings of more than 12 inches for brick size units and 24 inches for block size units are shown without other supporting lintels. Provide precast concrete lintels made with concrete that complies with requirements in Section 03 30 00, Cast-in-Place Concrete.

B. Where indicated on the Drawings, provide precast refractory concrete lintels per the following requirements.

1. Provide precast refractory concrete lintels made with refractory concrete, consisting of calcium aluminate cement and fired aggregates, with a minimum ultimate compressive strength of 4,000 psi and reinforcing bars placed as indicated on the drawings. Cure precast lintels before handling and installing. Lintels shall be warranty items that must not be damaged during the warranty period by repetitive live fire training, including exposures to temperatures up to 1,800 degrees F and thermal shock due to water application.

C. Provide minimum bearing of 8 inches at each jamb, unless otherwise indicated.

3.10 GROUTING

A. Do not place grout until entire height of masonry to be grouted has attained sufficient strength to resist grout pressure.

1. Do not exceed the following pour heights for fine grout:

a. For minimum widths of grout spaces of 3/4 inch or for minimum grout space of hollow unit cells of 1-1/2 by 2 inches, pour height of 12 inches.
b. For minimum widths of grout spaces of 2 inches or for minimum grout space of hollow unit cells of 2 by 3 inches, pour height of 60 inches.
c. For minimum widths of grout spaces of 2-1/2 inches or for minimum grout space of hollow unit cells of 2-1/2 by 3 inches, pour height of 12 feet.
d. For minimum widths of grout spaces of 3 inches or for minimum grout space of hollow unit cells of 3 by 3 inches, pour height of 24 feet.

2. Do not exceed the following pour heights for coarse grout:

a. For minimum widths of grout spaces of 1-1/2 inches or for minimum grout space of hollow unit cells of 1-1/2 by 3 inches, pour height of 12 inches.
b. For minimum widths of grout spaces of 2 inches or for minimum grout space of hollow unit cells of 2-1/2 by 3 inches, pour height of 60 inches.
c. For minimum widths of grout spaces of 2-1/2 inches or for minimum grout space of hollow unit cells of 3 by 3 inches, pour height of 12 feet.
d. For minimum widths of grout spaces of 3 inches or for minimum grout space of hollow unit cells of 3 by 4 inches, pour height of 24 feet.

3. Provide cleanout holes at least 3 inches in least dimension for grout pours over 60 inches in height.

3.11 REPAIRING, POINTING, AND CLEANING

A. Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or if units do not match adjoining units. Install new units to match adjoining units; install in fresh mortar or grout, pointed to eliminate evidence of replacement.

B. Pointing: During the tooling of joints, enlarge voids and holes, except weep holes, and completely fill with mortar. Point-up joints, including corners, openings, and adjacent construction, to provide a neat, uniform appearance. Prepare joints for application of sealants.

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

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

1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels. If necessary, use cleaner to remove stains.

E. Protection: Provide final protection and maintain conditions that ensure unit masonry is without damage and deterioration at time of Substantial Completion.

3.12 QUALITY CONTROL DURING CONSTRUCTION

A. General: The Owner will employ a testing agency to perform tests and inspections and to submit testing and inspection reports.

B. Perform visual inspections of at least 25% of masonry placement, checking for reinforcement placement, mortar placement, joint placement, anchorage placement, and grouting.

C. Testing Frequency: Tests listed in this Article will be performed during construction for each 2,000 sq. ft. of wall area or portion thereof, but no less than three of each test for the Project if there is less than 6,000 square feet of wall surface for the Project.

D. Compressive-Strength Tests for Grout: Test grout cylinders or cubes for compressive strength per ASTM C 1019 as follows:

1. Prepare 1 set of laboratory-cured specimens, cylinders or cubes, for testing as follows: one specimen tested at 7 days, two specimens tested at 28 days, and one spare specimen to be held in reserve for later testing if required.

E. Field Sampling and Testing of Mortar: Test mortar for consistency of materials and procedures per ASTM C 780.

F. Prism-Test Method: For each type of wall construction indicated, test one set of three masonry prisms for compressive strength per ASTM C 1314 and as follows:

1. Prepare 1 set of prisms for testing at 7 days and 1 set for testing at 28 days.

G. Test results shall be reported in writing to Engineer and Contractor within 24 hours after tests. Reports of strength tests shall contain the Project identification name and number, date of masonry placement, name of testing service, masonry type and class, location of masonry in structure, and compressive breaking strength for both 7-day tests and 28-day tests.

END OF SECTION 042000

SECTION 051200 - STRUCTURAL STEEL FRAMING

1.1 SUMMARY

A. Section Includes:

1. Structural steel.
2. Shrinkage-resistant grout.

B. Related Requirements:

1. Section 055000 "Metal Fabrications" for steel lintels and shelf angles not attached to structural-steel frame, miscellaneous steel fabrications and other steel items not defined as structural steel.

1.2 DEFINITIONS

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

1.3 COORDINATION

A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.

B. Coordinate installation of anchorage items to be embedded in or attached to other construction without delaying the Work. Provide setting diagrams, sheet metal templates, instructions, and directions for installation.

1.4 ACTION SUBMITTALS

A. Product Data:

1. Structural-steel materials.
2. High-strength, bolt-nut-washer assemblies.
3. Anchor rods.
4. Shop primer.
5. Shrinkage-resistant grout.

B. Shop Drawings: Show fabrication of structural-steel components.

1. Include details of cuts, connections, splices, camber, holes, and other pertinent data.
2. Include embedment Drawings.
3. Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length, and type of each weld. Show backing bars that are to be removed and supplemental fillet welds where backing bars are to remain.

4. Indicate type, size, and length of bolts, distinguishing between shop and field bolts. Identify pretensioned and slip-critical, high-strength bolted connections.
5. Identify members not to be shop primed.

C. Delegated-Design Submittal: For structural-steel connections indicated on Drawings to comply with design loads, include analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For fabricator.

B. Welding certificates.

C. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers, certifying that shop primers are compatible with topcoats.

D. Mill test reports for structural-steel materials, including chemical and physical properties.

E. Product Test Reports: For the following:

1. Bolts, nuts, and washers, including mechanical properties and chemical analysis.

F. Source quality-control reports.

1.6 QUALITY ASSURANCE

A. Fabricator Qualifications: A qualified fabricator that participates in the AISC Quality Certification Program and is designated an AISC-Certified Plant, Category BU or is accredited by the IAS Fabricator Inspection Program for Structural Steel (Acceptance Criteria 172).

B. Shop-Painting Applicators: Qualified in accordance with AISC's Sophisticated Paint Endorsement P1 or to SSPC-QP 3.

C. Welding Qualifications: Qualify procedures and personnel in accordance with AWS D1.1/D1.1M.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Store materials to permit easy access for inspection and identification. Keep steel members off ground and spaced by using pallets, dunnage, or other supports and spacers. Protect steel members and packaged materials from corrosion and deterioration.

1. Do not store materials on structure in a manner that might cause distortion, damage, or overload to members or supporting structures. Repair or replace damaged materials or structures as directed.

B. Store fasteners in a protected place in sealed containers with manufacturer's labels intact.

1. Fasteners may be repackaged provided Owner's testing and inspecting agency observes repackaging and seals containers.
2. Clean and relubricate bolts and nuts that become dry or rusty before use.
3. Comply with manufacturers' written recommendations for cleaning and lubricating ASTM F3125/F3125M, Grade F1852 bolt assemblies and for retesting bolt assemblies after lubrication.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Comply with applicable provisions of the following specifications and documents:

1. ANSI/AISC 303.

B. Connection Design Information:

1. Option 3 and 3B: Design connections and final configuration of member reinforcement at connections in accordance with ANSI/AISC 303 by fabricator's qualified professional engineer.

a. Use Allowable Stress Design; data are given at service-load level.

C. Moment Connections: Type FR, fully restrained.

2.2 STRUCTURAL-STEEL MATERIALS

A. W-Shapes: ASTM A992/A992M, Grade 50.

B. Channels, Angles, M, S-Shapes: ASTM A36/A36M.

C. Plate and Bar: ASTM A36/A36M.

D. Cold-Formed Hollow Structural Sections: ASTM A500/A500M, Grade B structural tubing.

E. Steel Pipe: ASTM A53/A53M, Type E or Type S, Grade B.

1. Weight Class: as indicated.
2. Finish: Black except where indicated to be galvanized.

F. Steel Castings: ASTM A216/A216M, Grade WCB, with supplementary requirement S11.

G. Steel Forgings: ASTM A668/A668M.

H. Welding Electrodes: Comply with AWS requirements.

2.3 BOLTS AND CONNECTORS

A. High-Strength A325 Bolts, Nuts, and Washers: ASTM F3125/F3125M, Grade A325, Type 1, heavy-hex steel structural bolts; ASTM A563, Grade DH, heavy-hex carbon-steel nuts; and ASTM F436/F436M, Type 1, hardened carbon-steel washers; all with plain finish.

B. Zinc-Coated High-Strength A325 Bolts, Nuts, and Washers: ASTM F3125/F3125M, Grade A325, Type 1, heavy-hex steel structural bolts; ASTM A563, Grade DH, heavy-hex carbon-steel nuts; and ASTM F436/F436M, Type 1, hardened carbon-steel washers.

1. Finish: Hot-dip zinc coating.

2.4 RODS

A. Unheaded Anchor Rods: ASTM F1554, Grade 36.

1. Configuration: Straight.
2. Nuts: ASTM A563 heavy-hex carbon steel.
3. Plate Washers: ASTM A36/A36M carbon steel.
4. Washers: ASTM F436, Type 1, hardened carbon steel.
5. Finish: Plain.

B. Headed Anchor Rods: ASTM F1554, Grade 36, straight.

1. Nuts: ASTM A563 heavy-hex carbon steel.
2. Plate Washers: ASTM A36/A36M carbon steel.
3. Washers: ASTM F436, Type 1, hardened carbon steel.
4. Finish: Plain.

C. Threaded Rods: ASTM A36/A36M.

1. Nuts: ASTM A 63 heavy-hex carbon steel.
2. Washers: ASTM F436 carbon steel.
3. Finish: Plain.

2.5 FORGED-STEEL STRUCTURAL HARDWARE

A. Clevises and Turnbuckles: Made from cold-finished carbon-steel bars, ASTM A108, AISI C-1035.

B. Eye Bolts and Nuts: Made from cold-finished carbon-steel bars, ASTM A108, AISI C-1030.

C. Sleeve Nuts: Made from cold-finished carbon-steel bars, ASTM A108, AISI C-1018.

2.6 PRIMER

A. Steel Primer:

1. Fabricator's standard lead- and chromate-free, nonasphaltic, rust-inhibiting primer complying with MPI#79 and compatible with topcoat.

2.7 SHRINKAGE-RESISTANT GROUT

A. Nonmetallic, Shrinkage-Resistant Grout: ASTM C1107/C1107M, factory-packaged, nonmetallic aggregate grout, noncorrosive and nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.

2.8 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.

1. Camber structural-steel members where indicated.
2. Fabricate beams with rolling camber up.
3. Identify high-strength structural steel in accordance with ASTM A6/A6M and maintain markings until structural-steel framing has been erected.
4. Mark and match-mark materials for field assembly.
5. Complete structural-steel assemblies, including welding of units, before starting shop-priming operations.

B. Thermal Cutting: Perform thermal cutting by machine to greatest extent possible.

1. Plane thermally cut edges to be welded to comply with requirements in AWS D1.1/D1.1M.

C. Bolt Holes: Cut, drill, mechanically thermal cut, or punch standard bolt holes perpendicular to metal surfaces.

D. Finishing: Accurately finish ends of columns and other members transmitting bearing loads.

E. Cleaning: Clean and prepare steel surfaces that are to remain unpainted in accordance with SSPC-SP 1.

F. Holes: Provide holes required for securing other work to structural steel and for other work to pass through steel members.

1. Cut, drill, or punch holes perpendicular to steel surfaces.
2. Baseplate Holes: Cut, drill, mechanically thermal cut, or punch holes perpendicular to steel surfaces.
3. Weld threaded nuts to framing and other specialty items indicated to receive other work.

2.9 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.

2.10 GALVANIZING

A. Hot-Dip Galvanized Finish: Apply zinc coating by the hot-dip process to structural steel in accordance with ASTM A123/A123M.

1. Fill vent and drain holes that are exposed in the finished Work unless they function as weep holes, by plugging with zinc solder and filing off smooth.
2. Galvanize lintels, shelf angles and members as indicated.

2.11 SHOP PRIMING

A. Shop prime steel surfaces, except the following:

1. Surfaces embedded in concrete or mortar. Extend priming of partially embedded members to a depth of 2 inches.
2. Surfaces to be field welded.
3. Surfaces of high-strength bolted, slip-critical connections.
4. Surfaces to receive sprayed fire-resistive materials (applied fireproofing).
5. Galvanized surfaces.
6. Surfaces enclosed in interior construction.

B. Surface Preparation of Steel: Clean surfaces to be painted. Remove loose rust and mill scale and spatter, slag, or flux deposits. Prepare surfaces in accordance with the following specifications and standards:

1. SSPC-SP 2.

C. Priming: Immediately after surface preparation, apply primer in accordance with manufacturer's written instructions and at rate recommended by SSPC to provide a minimum dry film thickness of 1.5 mils. Use priming methods that result in full coverage of joints, corners, edges, and exposed surfaces.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify, with 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 PREPARATION

A. Provide temporary shores, guys, braces, and other supports during erection to keep structural steel secure, plumb, and in alignment against temporary construction loads and loads equal in intensity to design loads. Remove temporary supports when permanent structural steel, connections, and bracing are in place unless otherwise indicated on Drawings.

3.3 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 and leveling 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 if indicated.
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. Comply with manufacturer's written installation instructions for grouting.

C. Maintain erection tolerances of structural steel within ANSI/AISC 303.

D. Align and adjust various members that form part of complete frame or structure before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that are in permanent contact with members. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.

1. Level and plumb individual members of structure. Slope roof framing members to slopes indicated on Drawings.

E. Splice members only where indicated.

F. Do not use thermal cutting during erection.

G. Do not enlarge unfair holes in members by burning or using drift pins. Ream holes that must be enlarged to admit bolts.

3.4 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.
2. Remove backing bars or runoff tabs, back gouge, and grind steel smooth.
3. Assemble and weld built-up sections by methods that maintain true alignment of axes without exceeding tolerances in ANSI/AISC 303 for mill material.

3.5 FIELD QUALITY CONTROL

A. Special Inspections: Owner will engage a special inspector to perform the following special inspections:

1. Verify structural-steel materials and inspect steel frame joint details.
2. Verify weld materials and inspect welds.
3. Verify connection materials and inspect high-strength bolted connections.

B. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.

1. Bolted Connections: Inspect 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.

3.6 PROTECTION

A. Galvanized Surfaces: Clean areas where galvanizing is damaged or missing, and repair galvanizing to comply with ASTM A780/A780M.

B. Touchup Painting: Immediately after erection, clean exposed areas where primer is damaged or missing, and paint with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.

1. Clean and prepare surfaces by SSPC-SP 2 hand-tool cleaning or SSPC-SP 3 power-tool cleaning.

C. Touchup Priming: Cleaning and touchup priming are specified in Section 099600 "High-Performance Coatings."

END OF SECTION 051200

SECTION 052100 - STEEL JOIST FRAMING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Special Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Long-span steel joists.
2. Joist accessories.

B. Related Requirements:

1. Section 042000 "Unit Masonry" for installing bearing plates in unit masonry.
2. Section 051200 "Structural Steel Framing" for furnishing steel bearing plates.

1.3 DEFINITIONS

A. SJI's "Specifications": Steel Joist Institute's "Standard Specifications, Load Tables and Weight Tables for Steel Joists and Joist Girders."

B. Special Joists: Steel joists or joist girders requiring modification by manufacturer to support nonuniform, unequal, or special loading conditions that invalidate load tables in SJI's "Specifications."

1.4 ACTION SUBMITTALS

A. Product Data: For each type of joist, accessory, and product.

B. Shop Drawings:

1. Include layout, designation, number, type, location, and spacing of joists.
2. Include joining and anchorage details, bracing, bridging, and joist accessories; splice and connection locations and details; and attachments to other construction.
3. Indicate locations and details of bearing plates to be embedded in other construction.
4. Show coordination of bridging, bracing and accessories with ductwork indicated to run between joists and where equipment (such as gymnasium backstop bracing) is to be mounted to joists or associated framing. Ensure particular coordination in areas where joists remain exposed to view.
5. Joist submittal shall be signed and sealed by the delegated design engineer responsible for its preparation.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For manufacturer and for professional delegated design engineer.

B. Welding certificates.

C. Manufacturer certificates signed by manufacturers certifying that joists for this specific project comply with requirements.

D. Mill Certificates: For each type of bolt signed by bolt manufacturers certifying that bolts for this specific project comply with requirements.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: A manufacturer certified by SJI to manufacture joists complying with applicable standard specifications and load tables in SJI's "Specifications."

1. Manufacturer’s responsibilities include providing professional engineering services for designing joists to comply with performance requirements and preparing joist shop drawings.

B. SJI Specifications: Comply with standard specifications in SJI’s “Specifications” that are applicable to types of joists indicated.

C. Welding Qualifications: Qualify field-welding procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

D. Ohio Revised Code Sections 153.011 and 153.99: All steel shall be fabricated and produced using only steel made in the United States.

E. Reference: American Institute of Steel Construction (AISC):

1. AISC 360: Specification for Structural Steel Buildings.
2. AISC 303: Code of Standard Practice for Steel Buildings and Bridges.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle joists as recommended in SJI's "Specifications."

B. Protect joists from corrosion, deformation, and other damage during delivery, storage, and handling.

1.8 SEQUENCING

A. Deliver steel bearing plates to be built into masonry construction.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Steel: Comply with SJI's "Specifications" for web and steel-angle chord members.

1. Yield Strength used as a basis for design stresses shall be as follows:

a. Chords: 50,000 psi.
b. Webs: 36,000 psi or 50,000 psi.

B. Carbon-Steel Bolts and Threaded Fasteners: ASTM A 307, Grade A, carbon-steel, hex-head bolts and threaded fasteners; carbon-steel nuts; and flat, unhardened steel washers.

1. Finish: Plain, uncoated.

C. High-Strength Bolts, Nuts, and Washers: ASTM A 325, Type 1, heavy hex steel structural bolts; ASTM A 563 heavy hex carbon-steel nuts; and ASTM F 436 hardened carbon-steel washers.

1. Finish: Plain, uncoated.

D. Welding Electrodes: Comply with AWS standards.

E. All steel permanently installed in the Work shall be domestically produced.

2.2 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide special joists and connections capable of withstanding design loads indicated on the drawings.

2.3 K-SERIES STEEL JOISTS

A. Manufacture steel joists of type indicated according to "Standard Specifications for Open Web Steel Joists, K-Series" in SJI's "Specifications," with steel-angle top- and bottom-chord members, underslung ends, and parallel top chord.

1. Joist Type: K-series steel joists and KCS-type K-series steel joists.

B. Steel Joist Substitutes: Manufacture according to "Standard Specifications for Open Web Steel Joists, K-Series" in SJI's "Specifications," with steel-angle or -channel members.

C. Provide holes in chord members for connecting and securing other construction to joists.

D. Comply with AWS requirements and procedures for shop welding, appearance, quality of welds, and methods used in correcting welding work.

E. Top-Chord Extensions: Extend top chords of joists with SJI's Type S top-chord extensions where indicated, complying with SJI's "Specifications."

F. Extended Ends: Extend bearing ends of joists with SJI's Type R extended ends where indicated, complying with SJI's "Specifications."

G. Camber joists according to SJI's "Specifications."

H. Equip bearing ends of joists with manufacturer's standard beveled ends or sloped shoes if joist slope exceeds 1/4 inch per 12 inches.

2.4 LONG-SPAN STEEL JOISTS

A. Manufacture steel joists according to "Standard Specifications for Longspan Steel Joists, LH- Series and Deep Longspan Steel Joists, DLH-Series" in SJI's "Specifications," with steel-angle top- and bottom-chord members; of joist type and end and top-chord arrangements as indicated.

1. Joist Type: LH-series steel joists and DLH-series steel joists.
2. End Arrangement: Underslung.
3. Top-Chord Arrangement: Parallel.

B. Comply with AWS requirements and procedures for shop welding, appearance, quality of welds, and methods used in correcting welding work.

C. Provide holes in chord members for connecting and securing other construction to joists.

D. Camber long-span steel joists according to SJI's "Specifications.".

E. Equip bearing ends of joists with manufacturer's standard beveled ends or sloped shoes if joist slope exceeds 1/4 inch per 12 inches.

2.5 PRIMERS

A. Clean and remove loose scale, heavy rust, and other foreign materials from fabricated joists and accessories by hand-tool cleaning, SSPC-SP 2 or power-tool cleaning, SSPC-SP 3.

B. Primer: SSPC-Paint 15, or manufacturer's standard shop primer complying with performance requirements in SSPC-Paint 15 and compatible with topcoat specified in Section 099112 “Painting”.

2.6 JOIST ACCESSORIES

A. Bridging: Schematically indicated on structural drawings by type intended. Detail and fabricate according to SJI's "Specifications."

1. Coordinate with all other work and trades when establishing final bridging types and locations; accommodate ducts, lighting, sound-control and light baffles, equipment, equipment anchorages and other work required between, through, or attached to joists.
2. Furnish additional erection bridging if required for stability.

B. Steel bearing plates with integral anchorages are specified in Division 05 Section "Structural Steel Framing."

C. Furnish miscellaneous accessories including splice plates and bolts required by joist manufacturer to complete joist assembly and installation.

D. Furnish extended bottom-chord elements for all joists in gymnasiums whether or not indicated on the structural drawings.

1. Extended bottom chord shall be capable of supporting such imposed loads by web member at end of extension or by supplemental angle bracket by joist manufacturer, secured to wall structure.
2. Extend ends to within 1/2 inch of finish wall surface unless otherwise indicated.

2.7 CLEANING AND SHOP PAINTING

A. Clean and remove loose scale, heavy rust, and other foreign materials from fabricated joists and accessories by hand-tool cleaning, SSPC-SP 2 or power-tool cleaning, SSPC-SP 3.

B. Do not prime paint joists and accessories to receive sprayed fire-resistive materials.

C. Apply one coat of shop primer to joists and joist accessories to be primed to provide a continuous, dry paint film not less than 1 mil thick.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine supporting substrates, embedded bearing plates, and abutting structural framing for compliance with requirements for installation tolerances and other conditions affecting performance.

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

3.2 INSTALLATION

A. Do not install joists until supporting construction is in place and secured.

B. Install joists and accessories plumb, square, and true to line; securely fasten to supporting construction according to SJI's "Specifications," joist manufacturer's written recommendations, and requirements in this Section.

1. Before installation, splice joists delivered to Project site in more than one piece.
2. Space, adjust, and align joists accurately in location before permanently fastening.
3. Install temporary bracing and erection bridging, connections, and anchors to ensure that joists are stabilized during construction.
4. Delay rigidly connecting bottom-chord extensions to columns or supports until dead loads are applied.

C. Field weld joists to supporting steel bearing plates and framework. Coordinate welding sequence and procedure with placement of joists. Comply with AWS requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.

D. Bolt joists to supporting steel framework using high-strength structural bolts. Comply with Research Council on Structural Connection's "Specification for Structural Joints Using ASTM A 325 or ASTM A 490 Bolts" for high-strength structural bolt installation and tightening requirements.

E. Install and connect bridging concurrently with joist erection, before construction loads are applied. Anchor ends of bridging lines at top and bottom chords if terminating at walls or beams.

F. Field cutting, drilling, and all other field modifications to joists shall not be permitted without advance written consent and instructions from the delegated design engineer responsible for the joist design and submittal. Consent letter shall be specific to each individual location and condition and shall be signed, dated and sealed by the delegated design engineer.

3.3 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to inspect field welds and bolted connections and to perform field tests and inspections and prepare test and inspection reports.

B. Visually inspect field welds according to AWS D1.1M.

1. In addition to visual inspection, test field welds according to AWS D1.1/D1.1M and the following procedures, as applicable:

a. Liquid Penetrant Inspection: ASTM E 165.
b. Magnetic Particle Inspection: ASTM E 709.
c. Ultrasonic Testing: ASTM E 164.
d. Radiographic Testing: ASTM E 94.

C. Visually inspect bolted connections.

1. High-strength, field-bolted connections will be tested and verified according to procedures in RCSC's "Specification for Structural Joints Using ASTM A 325 or ASTM A 490 Bolts."

D. Correct deficiencies in Work that test and inspection reports have indicated are not in compliance with specified requirements.

E. Additional testing, at Contractor’s expense, will be performed to determine compliance of corrected Work with specified requirements.

3.4 PROTECTION

A. Touchup Painting: After installation, promptly clean, prepare, and prime or reprime field connections, rust spots, and abraded surfaces of prime-painted joists, bearing plates, abutting structural steel, and accessories.

1. Clean and prepare surfaces by hand-tool cleaning according to SSPC-SP 2, or

power- tool cleaning according to SSPC-SP 3.

2. Apply a compatible primer of same type as primer used on adjacent surfaces.

B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, which ensure that joists and accessories are without damage or deterioration at time of Contract Completion.

3.5 WASTE DISPOSAL

A. Comply with Waste Management requirements of Section 017419 “Construction Waste Management and Disposal”.

END OF SECTION 052100

SECTION 053100- STEEL DECKING

PART 1 -GENERAL

1.1 SUMMARY

A. Section Includes:

1. Non-composite form deck.

B. Related Requirements:

1. Section 033000 "Cast-in-Place Concrete" for normal-weight and lightweight structural concrete fill over steel deck.
2. Section 051200 "Structural Steel Framing" for shop- and field-welded shear connectors.
3. Section 055000 "Metal Fabrications" for framing deck openings with miscellaneous steel shapes.
4. Section 099123 "Interior Painting" for repair painting of primed deck and finish painting of deck.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of deck, accessory, and product indicated.

B. Shop Drawings:

1. Include layout and types of deck panels, anchorage details, reinforcing channels, pans, cut deck openings, special jointing, accessories, and attachments to other construction.

1.3 INFORMATIONAL SUBMITTALS

A. Welding certificates.

B. Product Certificates: For each type of steel deck.

C. Product Test Reports: For tests performed by a qualified testing agency, indicating that each of the following complies with requirements:

1. Power-actuated mechanical fasteners.
2. Acoustical roof deck.

D. Evaluation Reports: For steel deck, from ICC-ES.

E. Field quality-control reports.

1.4 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel according to AWS D1.3/D1.3M, "Structural Welding Code - Sheet Steel."

B. FM Global Listing: Provide steel roof deck evaluated by FM Global and listed in its "Approval Guide, Building Materials" for Class 1 fire rating and Class 1-90 windstorm ratings.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Protect steel deck from corrosion, deformation, and other damage during delivery, storage, and handling.

B. Stack steel deck on platforms or pallets and slope to provide drainage. Protect with a waterproof covering and ventilate to avoid condensation.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

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

B. Fire-Resistance Ratings: Comply with ASTM E 119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Indicate design designations from UL's "Fire Resistance Directory" or from the listings of another qualified testing agency.

2.2 NONCOMPOSITE FORM DECK

A. Noncomposite Form Deck: Fabricate ribbed-steel sheet noncomposite form-deck panels to comply with "SDI Specifications and Commentary for Noncomposite Steel Form Deck," in SDI Publication No. 31, with the minimum section properties indicated, and with the following:

1. Galvanized-Steel Sheet: ASTM A 653/A 653M, Structural Steel (SS), Grade 33 (230) zinc coating.
2. Profile Depth: As Indicated
3. Design Uncoated-Steel Thickness: As Indicated
4. Span Condition: Triple span or more.
5. Side Laps: Overlapped.

2.3 ACCESSORIES

A. General: Provide manufacturer's standard accessory materials for deck that comply with requirements indicated.

B. Mechanical Fasteners: Corrosion-resistant, low-velocity, power-actuated or pneumatically driven carbon-steel fasteners; or self-drilling, self-threading screws.

C. Side-Lap Fasteners: Corrosion-resistant, hexagonal washer head; self-drilling, carbon-steel screws, No. 10 (4.8-mm) minimum diameter.

D. Flexible Closure Strips: Vulcanized, closed-cell, synthetic rubber.

E. Miscellaneous Sheet Metal Deck Accessories: Steel sheet, minimum yield strength of 33,000 psi (230 MPa), not less than 0.0359-inch (0.91-mm) design uncoated thickness, of same material and finish as deck; of profile indicated or required for application.

F. Pour Stops and Girder Fillers: Steel sheet, minimum yield strength of 33,000 psi (230 MPa), of same material and finish as deck, and of thickness and profile recommended by SDI Publication No. 31 for overhang and slab depth.

G. Column Closures, End Closures, Z-Closures, and Cover Plates: Steel sheet, of same material, finish, and thickness as deck unless otherwise indicated.

H. Piercing Hanger Tabs: Piercing steel sheet hanger attachment devices for use with floor deck.

I. Weld Washers: Uncoated steel sheet, shaped to fit deck rib, 0.0747 inch (1.90 mm) thick, with factory-punched hole of 3/8-inch (9.5-mm) minimum diameter.

J. Flat Sump Plates: Single-piece steel sheet, 0.0747 inch (1.90 mm) thick, of same material and finish as deck. For drains, cut holes in the field.

K. Galvanizing Repair Paint: ASTM A 780/A 780M.

L. Repair Paint: Manufacturer's standard rust-inhibitive primer of same color as primer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine supporting frame and field conditions for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

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

3.2 INSTALLATION, GENERAL

A. Install deck panels and accessories according to applicable specifications and commentary in SDI Publication No. 31, manufacturer's written instructions, and requirements in this Section.

B. Install temporary shoring before placing deck panels if required to meet deflection limitations.

C. Locate deck bundles to prevent overloading of supporting members.

D. Place deck panels on supporting frame and adjust to final position with ends accurately aligned and bearing on supporting frame before being permanently fastened. Do not stretch or contract side-lap interlocks.

E. Place deck panels flat and square and fasten to supporting frame without warp or deflection.

F. Cut and neatly fit deck panels and accessories around openings and other work projecting through or adjacent to deck.

G. Provide additional reinforcement and closure pieces at openings as required for strength, continuity of deck, and support of other work.

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

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

3.3 FLOOR-DECK INSTALLATION

A. Fasten floor-deck panels to steel supporting members by arc spot (puddle) welds of the surface diameter indicated and as follows:

1. Weld Diameter: 5/8 inch (16 mm), nominal.
2. Weld Spacing: Space and locate welds as indicated.

B. Side-Lap and Perimeter Edge Fastening: Fasten side laps and perimeter edges of panels between supports, at intervals not exceeding the lesser of one-half of the span or 36 inches (914 mm), and as follows:

1. Mechanically fasten with self-drilling, No. 10 (4.8-mm-) diameter or larger, carbon-steel screws.

C. End Bearing: Install deck ends over supporting frame with a minimum end bearing of 1-1/2 inches (38 mm), with end joints as follows:

1. End Joints: Lapped.

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

E. Floor-Deck Closures: Weld steel sheet column closures, cell closures, and Z-closures to deck, according to SDI recommendations, to provide tight-fitting closures at open ends of ribs and sides of deck.

3.4 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.

B. Field welds will be subject to inspection.

C. Prepare test and inspection reports.

3.5 PROTECTION

A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on both surfaces of deck with galvanized repair paint according to ASTM A 780/A 780M and manufacturer's written instructions.

B. Repair Painting: Wire brush and clean rust spots, welds, and abraded areas on both surfaces of prime-painted deck immediately after installation, and apply repair paint.

1. Apply repair paint, of same color as adjacent shop-primed deck, to bottom surfaces of deck exposed to view.

END OF SECTION 053100

SECTION 055000 – METAL FABRICATIONS

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. Steel framing and supports for applications where framing and supports are not specified in other Sections.
2. Loose steel lintels.
3. Metal ladders.
4. Pipe bollards.
5. Fasteners.

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

1. Loose steel lintels.
2. Anchor bolts, steel pipe sleeves, slotted-channel inserts, and wedge-type inserts indicated to be cast into concrete or built into unit masonry.
3. Steel weld plates and angles for casting into concrete for applications where they are not specified in other Sections.

1.3 PERFORMANCE REQUIREMENTS

A. Delegated Design: Design ladders, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

B. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on exterior metal fabrications by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects.

1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

1.4 ACTION SUBMITTALS

A. Shop Drawings: Show fabrication and installation details for metal fabrications.

1. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items.

B. Delegated-Design Submittal: For ladders indicated to comply with performance requirements and design criteria. Include analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified professional engineer.

B. Welding certificates.

1.6 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

1.7 PROJECT CONDITIONS

A. Field Measurements: Verify actual locations of walls and other construction contiguous with metal fabrications by field measurements before fabrication.

1.8 COORDINATION

A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.

B. Coordinate installation of anchorages and steel weld plates and angles for casting into concrete. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 “Quality Requirements”, to design ladders.

B. Structural Performance of Ladders: Design and provide ladders, including ladder landings, capable of withstanding the effects of loads and stresses within limits and under conditions specified in ANSI A14.3.

C. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on exterior metal fabrications by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects.

1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

2.2 METALS, GENERAL

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.

2.3 METALS

A. All steel permanently installed in the Work shall be domestically produced.

B. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.

C. Steel Pipe: ASTM A 53/A 53M, standard weight (Schedule 40) unless otherwise indicated.

2.4 FASTENERS

A. General: Unless otherwise indicated, provide Type 304 stainless-steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5, at exterior walls. Select fasteners for type, grade, and class required.

B. Steel Bolts and Nuts: Regular hexagon-head bolts, ASTM A 307, Grade A; with hex nuts, ASTM A 563; and, where indicated, flat washers.

C. Steel Bolts and Nuts: Regular hexagon-head bolts, ASTM A 325, Type 3; with hex nuts, ASTM A 563, Grade C3; and, where indicated, flat washers.

D. Stainless-Steel Bolts and Nuts: Regular hexagon-head annealed stainless-steel bolts, ASTM F 593; with hex nuts, ASTM F 594; and, where indicated, flat washers; Alloy.

E. Anchor Bolts: ASTM F 1554, Grade 36, of dimensions indicated; with nuts, ASTM A 563; and, where indicated, flat washers.

1. Hot-dip galvanize or provide mechanically deposited, zinc coating where item being fastened is indicated to be galvanized.

F. Eyebolts: ASTM A 489.

G. Machine Screws: ASME B18.6.3.

H. Plain Washers: Round, ASME B18.22.1.

I. Anchors, General: Anchors capable of sustaining, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing according to ASTM E 488, conducted by a qualified independent testing agency.

J. Post-Installed Anchors: Torque-controlled expansion anchors or chemical anchors.

1. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5, unless otherwise indicated.
2. Material for Exterior Locations and Where Stainless Steel is Indicated: Alloy Group 1 stainless-steel bolts, ASTM F 593, and nuts, ASTM F 594.

2.5 MISCELLANEOUS MATERIALS

A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.

B. 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.

C. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.

D. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.

E. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.

2.6 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 radius of approximately 1/32 inch 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. Where exposed fasteners are required, use Phillips flat-head (countersunk) fasteners unless otherwise indicated. Locate joints where least conspicuous.

G. Fabricate seams and other connections that will be exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.

H. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.

I. Provide for anchorage of type indicated; coordinate with supporting structure. Space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.

2.7 MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Provide steel framing and supports not specified in other Sections as needed to complete the Work.

B. Fabricate units from steel shapes, plates, and bars of welded construction unless otherwise indicated. Fabricate to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction.

1. Cut, drill and tap units to receive hardware, hangers and similar items.
2. Furnish inserts for units installed after concrete is placed.

C. Fabricate supports for operable partitions from continuous steel beams of sizes indicated with attached bearing plates, anchors, and braces as indicated. Drill or punch bottom flanges of beams to receive partition track hanger rods; locate holes where indicated on operable partition Shop Drawings.

D. Galvanize exterior miscellaneous framing and supports and elsewhere where indicated.

E. Prime miscellaneous framing and supports except where galvanized finish is indicated.

F. Provide welded stud anchors or bars where indicated for embedding miscellaneous steel shape anchorages into cast-in-place concrete. Space and size as indicated or as indicated in reviewed shop drawings.

2.8 METAL LADDERS

A. General:

1. Comply with ANSI A14.3 unless otherwise indicated.
2. For elevator pit ladders, comply with ASME A17.1.
3. Sizes and spacing shown on drawings or specified are minimums required; provide more stringent requirements, heavier members and lesser spacing if dictated by the delegated design engineer’s calculations.
4. Ladders shall be fully-welded construction.

2.9 METAL SHIPS' LADDERS

A. Provide metal ships' ladders where indicated. Fabricate of open-type construction with channel or plate stringers and pipe and tube railings unless otherwise indicated. Provide brackets and fittings for installation.

1. Treads shall be not less than 5 inches exclusive of nosing or less than 8-1/2 inches including the nosing, and riser height shall be not more than 9-1/2 inches.
2. Fabricate ships' ladders, including railings from steel.
3. Fabricate treads from welded or pressure-locked steel bar grating. Limit openings in gratings to no more than 1/2 inch in least dimension.
4. Fabricate treads and platforms from rolled-steel floor plate.
5. Comply with applicable railing requirements in Section 055100 "Metal Stairs."

B. Prime steel ships' ladders, including treads, railings, brackets, and fasteners, with zinc-rich primer.

2.10 LOOSE BEARING AND LEVELING PLATES

A. Provide loose bearing and leveling plates for steel items bearing on masonry or concrete construction. Drill plates to receive anchor bolts and for grouting.

B. Galvanize plates. ALL LOOSE BEARING PLATES IN EXTERIOR WALLS SHALL BE GALVANIZED, SHOP PRIMED AND PAINTED (IN THE FIELD) WHERE EXPOSED.

C. Prime plates. ALL LOOSE BEARING PLATES IN EXTERIOR WALLS SHALL BE GALVANIZED, SHOP PRIMED, AND PAINTED (IN THE FIELD) WHERE EXPOSED.

2.11 LOOSE STEEL LINTELS

A. Fabricate loose steel lintels from steel angles and shapes of size indicated for openings and recesses in masonry walls and partitions at locations indicated. Fabricate in single lengths for each opening unless otherwise indicated. Weld adjoining members together to form a single unit where indicated.

B. Size loose lintels to provide bearing length at each side of openings equal to 1/12 of clear span but not less than 8 inches unless otherwise indicated.

C. Galvanize loose steel lintels located in exterior walls. ALL LOOSE LINTELS IN EXTERIOR WALLS SHALL BE GALVANIZED, SHOP PRIMED, AND PAINTED (IN THE FIELD) WHERE EXPOSED.

D. Prime loose steel lintels located in exterior walls. ALL LOOSE LINTELS IN EXTERIOR WALLS SHALL BE GALVANIZED, SHOP PRIMED, AND PAINTED (IN THE FIELD) WHERE EXPOSED.

2.12 METAL BOLLARDS

A. Fabricate metal bollards from Schedule 40 steel pipe, hot-dip galvanized after fabrication and prime painted.

B. Size: Diameter as indicated on the drawings and not less than 6-inch.

C. Length: As indicated on the drawings and not less than 48-inches of embedment below finish grade or concrete and not less than 42-inch extension above grade or concrete surface.

D. Prime bollards with zinc-rich primer compatible with Division 09 Section “Painting”. Finish paint yellow.

2.13 FINISHES, GENERAL

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Finish metal fabrications after assembly.

C. Finish exposed surfaces to remove tool and die marks and stretch lines, and to blend into surrounding surface.

2.14 STEEL AND IRON FINISHES

A. Galvanizing: Hot-dip galvanize items as indicated to comply with ASTM A 153/A 153M for steel and iron hardware and with ASTM A 123/A 123M for other steel and iron products.

1. Do not quench or apply post galvanizing treatments that might interfere with paint adhesion.

B. Shop prime iron and steel items not indicated to be galvanized unless they are to be embedded in concrete, or masonry, or unless otherwise indicated.

C. Preparation for Shop Priming: Prepare surfaces to comply with SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."

1. Exterior Items: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
2. Interiors (SSPC Zone 1A): SSPC-SP 3 “Power Tool Cleaning.”

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.

1. Stripe paint corners, crevices, bolts, welds, and sharp edges.

PART 3 - EXECUTION

3.1 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.

3.2 INSTALLING MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Install framing and supports to comply with requirements of items being supported, including manufacturers' written instructions and requirements indicated on Shop Drawings.

B. Anchor supports for operable partitions securely to and rigidly brace from building structure.

3.3 INSTALLING METAL BOLLARDS

A. Excavate hole 4-inches deeper than indicated pipe depth and at least 8-inches greater in diameter than the outside diameter of the pipe. Slightly enlarge bottom of excavation and clean all loose material from bottom to produce flat bottom and sharp clean corners.

B. Fill metal-capped bollards solidly with concrete and allow concrete to cure seven days before installing.

1. Do not fill removable bollards with concrete.

C. Anchor internal sleeves for removable bollards in place with concrete footings. Center and align sleeves in holes 3 inches above bottom of excavation. Place concrete and vibrate or tamp for consolidation. Support and brace sleeves in position until concrete has cured.

D. Place removable bollards over internal sleeves and secure with 3/4-inch machine bolts and nuts. After tightening nuts, drill holes in bolts for inserting padlocks. Owner will furnish padlocks.

E. Fill bollards solidly with concrete, mounding top surface to shed water.

3.4 ADJUSTING AND CLEANING

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

1. Apply by brush or spray to provide a minimum 2.0-mil dry film thickness.

B. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Division 09 painting Sections.

C. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

END OF SECTION 055000

SECTION 26 05 05 – SELECTIVE DEMOLITION FOR ELECTRICAL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Division 01, “General Requirements.”

B. Section 26 05 00.35, “Special Procedures for Electrical.”

C. Section 26 05 00.78, “Closeout Submittals for Electrical.”

1.2 DESCRIPTION

A. Provide demolition and renovation work as shown on the Electrical Demolition Drawings.

B. Provide demolition needed in order to install the new Electrical Work.

C. Relocate existing equipment and wiring in order to accommodate installation of the Work. **THE DRAWINGS DO NOT SHOW EVERY ITEM OF DEMOLITION OR RENOVATION REQUIRED TO COMPLETE THE WORK.** Review the existing conditions and plan work accordingly.

D. Revise and update existing Panel Schedules.

E. Refer to Division 01 for protection of existing building during demolition work.

1.3 QUALITY ASSURANCE

A. Standards:
1. National Fire Protection Association (NFPA): 2023 NFPA 70, “National Electrical Code® (NEC).”
2. United States Environmental Protection Agency (EPA).
3. State EPA.

1.4 ENVIRONMENTAL HAZARDS

A. Asbestos Abatement: Refer to Section 26 05 00.35.

B. Materials Contaminated with Polychlorinated Biphenyls (PCBs): Refer to “Removal and Salvage” (later in this Specification Section).

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION

3.1 INSPECTION

A. At the beginning of construction, carefully inspect the entire Project and verify with the A/E and Owner all items designated to be removed or to remain.

B. Locate all existing utilities requiring removal and determine requirements for disconnecting and capping.

C. Locate all existing active utilities and circuits designated to remain. Protect and keep them in service.

3.2 PREPARATION

A. Notify the A/E and Owner at least (2) full working days in advance of commencing work in a particular area.

B. Schedule all work in a careful manner with full consideration for the Owner and its personnel, avoiding interference with the use of, and passage to and from, adjacent areas and facilities designated to remain in use during demolition.

C. Disconnect, or arrange for the disconnection of, all utilities or equipment designated to be removed or replaced. Perform all such work in accordance with the requirements of the Owner.

D. Coordinate all demolition, and any disconnection of existing utilities or equipment designated to be removed, with the A/E, Owner, Work of other Contractors, and Utility Company.

E. Coordinate disconnection of electrical service to existing luminaires and equipment to be removed and the removal of conduit, wireways, wiring, and other electrical devices with other Contractors.

F. Carefully disconnect existing luminaires, receptacles, and equipment. Many circuits may serve more than the renovated area.

G. Identify all circuits and reconnect existing loads to balance existing panels and to keep within existing panel, and feeder ampacity ratings.

H. Maintain, in operating condition, all active utilities designated to remain. Provide temporary caps as needed (not shown). Provide temporary connections and reconnections as needed (not shown).

I. Provide protection for the Owner's personnel and others.

J. Protect remaining property from damage during demolition and removal of debris.

3.3 DEMOLITION

A. Demolish and remove abandoned lines, conduit, equipment, equipment foundations and supports, and all other existing items either designated for removal or required for the renovation.

B. Disconnect and completely remove all existing electrical facilities that are not required to maintain service to other equipment or facilities.

C. Unless otherwise noted, completely remove existing surface-mounted equipment, wiring, and conduit back to point of origin.

D. Remove all existing wiring that is no longer used. Any exposed section of the raceway system that interferes with intended design or use of facility shall be cut flush at surface and plugged.

E. Unless otherwise noted, concealed conduits may be abandoned in place if they are cut beyond the wall/floor surface and plugged, and if they do not interfere with new construction.

F. Do not remove, cover up, or abandon existing operating electrical facilities. Maintain service to equipment that remains. Re-feed where necessary.

G. Existing outlets that are to be removed, and that have conduits rising from the floor slab, shall have the conduits cut below floor level. Rework to provide feed-through service to

other remaining outlets. Pull new wire between remaining outlets affected by the feed-through. Patch floor to original condition.

H. Close empty boxes with blank cover plates. If equipped with existing devices, remove the devices, and either remove the conductors to the adjacent outlet, or reconnect to provide feed-through service.

I. Abandoned outlet boxes shall have the cover plate and device removed, and conductors shall be pulled back to an adjacent outlet. Provide blank cover plate.

J. Disconnect and remove all existing devices and boxes on walls to be removed. Maintain circuits to devices that are to remain in use, if any. Revise and extend conduit and wiring.

K. Do not use equipment or methods that will cause damage to adjacent construction designated to remain.

L. Protect and maintain all active utilities and services. Repair or replace, at no expense to the Owner, all such items disturbed in the execution of Work.

M. Repair or replace surfaces and elements of structures **NOT** scheduled to be demolished, but damaged due to demolition or lack of protection.

N. Items that are completely concealed in existing structure and will not interfere with new work may remain. Cap and plug at ends.

O. Sprinkle rubbish and debris to keep dust laid.

P. Reroute and relocate any items to permit installation of new work.

3.4 RELOCATION OF EXISTING EQUIPMENT

A. The Contractor shall relocate existing luminaires and equipment in order to accomplish its work. Prior to handling equipment, report any existing damage to the Owner. Existing equipment may be stored on a short-term basis in spaces adjacent to each work area. Coordinate storage locations with the Lead Contractor, A/E, and Owner.

3.5 REMOVAL AND SALVAGE

A. Remove all items of equipment, copper wiring, and other material as shown on the Drawings and specified in these Specifications. Unless otherwise noted, all usable items shall be salvaged and reused where possible.

B. Reuse existing breakers, conduit, and wiring if in good condition, not defective, and in compliance with 2023 NEC. Report any deficiencies to the A/E.

C. Disposal of Fluorescent Luminaires:
   1. Assume that all existing fluorescent luminaires being removed do not have ballasts containing PCBs.
   2. Deliver all removed fluorescent lamps to a recycling facility and provide a Certificate of Disposal to the Owner.
   3. If, during demolition, any ballast is encountered that is **NOT** labeled “NO PCBs,” it shall be considered PCB-containing.

D. Disposal of PCB-Containing Materials:
   1. Hire a Certified PCB Contractor to dispose of all PCB-containing materials, including, but not limited to, ballasts, capacitors, transformers, etc.
   2. Materials shall be burned in an incinerator approved by EPA.
   3. Provide a Certificate of Disposal for the Owner.
   4. The cost of any PCB removal/disposal will be addressed by Change Order.

E. Items Being Removed That Are to Be Reused:
   1. Carefully remove and store usable items until reinstallation is to proceed.
   2. Coordinate locations of stored materials with the Lead Contractor, A/E, and Owner.

F. Items Being Removed That Are **NOT** to Be Reused:
   1. The Owner will have first right of refusal.
   2. Carefully remove any items that the Owner wishes to keep and deliver them in good condition to the permanent storage location on site designated by the Owner.

G. Dispose, off-site, of all items not wanted by the Owner.

3.6 ELECTRICAL RENOVATION WORK

A. Rework or relocate any existing panels, luminaires, outlets, equipment, conduit, and wiring that interfere with any new Work.

B. Relocate all existing electrical devices, luminaires, and equipment in a neat and workmanlike manner.

C. Provide new luminaires, devices, other electrical equipment and items, and wiring.

D. Provide all cutting required for installation of new branch circuit conduits from existing panelboards recessed in masonry, tile, concrete, plaster, or gypsum wall board wall construction.

E. Review nameplate data of all equipment being rewired and notify the A/E immediately if any changes are required to properly wire the equipment.

F. Review electrical data of all existing electrical distribution equipment being reused, such as circuit breakers, disconnect switches, fuses, motor starters, variable-frequency drives, wiring, etc. Notify the A/E immediately if any changes are required for proper reuse and suitability of equipment.

G. Note locations of any abandoned conduit and wiring, including exterior lines, on the As-Built Drawings. Refer to Section 26 05 00.78.

END OF SECTION 26 05 05

SECTION 061053 – MISCELLANEOUS ROUGH CARPENTRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Framing with dimension lumber.
2. Wood blocking and nailers.
3. Wood furring and grounds.
4. Plywood backing panels.

B. Related Requirements:

1. Section 062200 "Interior Finish Carpentry."

1.3 DEFINITIONS

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

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

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

1.4 ACTION SUBMITTALS

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

1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used and net amount of preservative retained.
2. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Include

physical properties of treated materials based on testing by a qualified independent testing agency.

3. 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 D 5664.
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.
5. Include copies of warranties from chemical treatment manufacturers for each type of treatment.

1.5 INFORMATIONAL SUBMITTALS

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

1. Preservative-treated wood.
2. Power-driven fasteners.
3. Powder-actuated fasteners.
4. Expansion anchors.
5. Metal framing anchors.

1.6 QUALITY ASSURANCE

A. Testing Agency Qualifications: For testing agency providing classification marking for fire-retardant treated material, an inspection agency acceptable to authorities having jurisdiction that periodically performs inspections to verify that the material bearing the classification marking is representative of the material tested.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Stack lumber flat with spacers beneath and between each bundle to provide air circulation. Protect lumber 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.

B. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, provide lumber that complies with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Provide lumber graded 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.

3. Where nominal sizes are indicated, provide actual sizes required by DOC PS 20 for moisture content specified. Where actual sizes are indicated, they are minimum dressed sizes for dry lumber.
4. Provide dressed lumber, S4S, unless otherwise indicated.

C. 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.

2.2 WOOD-PRESERVATIVE-TREATED MATERIALS

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

1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium. Do not use inorganic boron (SBX) for sill plates.
2. For exposed items indicated to receive a stained or natural finish, use chemical formulations that do not require incising, contain colorants, bleed through, or otherwise adversely affect finishes.

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

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

1. For exposed lumber indicated to receive a stained or natural finish.

D. Application: Treat miscellaneous carpentry as indicated.

1. Wood sills, sleepers, blocking, and similar concealed members in contact with masonry or concrete.

2.3 DIMENSION LUMBER FRAMING

A. Framing: No. 2 grade and the following species:

1. Hem-fir (north); NLGA.
2. Southern pine; SPIB.
3. Mixed southern pine; SPIB.
4. Spruce-pine-fir; NLGA.
5. Douglas fir-south; WWPA.

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. Nailers.

3. Rooftop equipment bases and support curbs.
4. Furring.
5. Grounds.

B. For items of dimension lumber size, provide Construction or No. 2 grade lumber.

1. Hem-fir (north); NLGA.
2. Mixed southern pine; SPIB.
3. Spruce-pine-fir; NLGA.
4. Hem-fir; WCLIB or WWPA.
5. Spruce-pine-fir (south); NeLMA, WCLIB, or WWPA.

C. For concealed boards, provide lumber with 19 percent maximum moisture content and the following species and grades:

1. Mixed southern pine, No. 2 grade; SPIB.
2. Hem-fir or hem-fir (north), Construction or No. 2 Common grade; NLGA, WCLIB, or WWPA.
3. Spruce-pine-fir (south) or spruce-pine-fir, Construction or No. 2 Common grade; NeLMA, NLGA, WCLIB, or WWPA.
4. Eastern softwoods, No. 2 Common grade; NELMA.
5. Northern species, No. 2 Common grade; NLGA.

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 FASTENERS

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

1. Where 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 A 153/A 153M.

B. Nails, Brads, and Staples: ASTM F 1667.

C. Power-Driven Fasteners: NES NER-272.

D. Wood Screws: ASME B18.6.1.

E. Screws for Fastening to Metal Framing: ASTM C 1002, length as recommended by screw manufacturer for material being fastened.

F. Lag Bolts: ASME B18.2.1.

G. Bolts: Steel bolts complying with ASTM A 307, Grade A; with ASTM A 563 hex nuts and, where indicated, flat washers.

H. Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to 6 times the load imposed when installed in unit masonry assemblies and equal to 4 times the load imposed when installed in concrete as determined by testing per ASTM E 488 conducted by a qualified independent testing and inspecting agency.

1. Material: Carbon-steel components, zinc plated to comply with ASTM B 633, Class Fe/Zn 5.
2. Material: Stainless steel with bolts and nuts complying with ASTM F 593 and ASTM F 594, Alloy Group 1 or 2.

2.6 MISCELLANEOUS MATERIALS

A. Adhesives for Gluing to Concrete or Masonry: Formulation complying with ASTM D 3498 that is approved for use indicated by adhesive manufacturer.

1. Adhesives shall have a VOC content or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
2. Adhesives shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

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

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Set carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit carpentry to other construction; scribe and cope as needed for accurate fit. Locate nailers, blocking, grounds, and similar supports to comply with requirements for attaching other construction.

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

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

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

E. Metal Framing Anchors: 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.

H. Provide fire blocking in furred spaces, stud spaces, and other concealed cavities.

I. Sort and select lumber so that natural characteristics will 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. Securely attach carpentry work to substrate by anchoring and fastening as indicated, complying with the following:

1. NES NER-272 for power-driven fasteners.
2. Table 2304.9.1, "Fastening Schedule," in ICC's International Building Code.

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

3.2 WOOD BLOCKING AND NAILER INSTALLATION

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

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

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

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

END OF SECTION 061053

SECTION 062200 – INTERIOR FINISH CARPENTRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the contract, including General Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Finishing items, including accessories as specified and indicated on drawings.
2. Interior trim and cabinet installation.

B. Related Requirements:

1. Section 061053 “Miscellaneous Rough Carpentry”.

1.3 SUBMITTALS

A. Submit product data for each type of product and process of millwork during fabrication, finishing, and installation.

1. Submit MSDS sheets for all adhesives and glues identifying VOC content in conformance with specification.

B. Submit shop drawings showing relationship and location of each millwork item, dimensioned plans and elevations, large scale details, attachment devices and other components.

C. Submit samples, for initial selection purposes, showing full range of colors, textures and patterns available.

D. Submit product data on core materials identifying materials containing no added urea formaldehyde.

1.4 QUALITY ASSURANCE

A. Manufactured qualifications; firm experienced in successfully producing millwork similar to that indicted for this project, with the sufficient production capacity to produce required take out units without causing delay in work.

B. Installer qualifications; arrange for installation of millwork by a firm demonstrating successful experience in installing millwork items similar type and quality to those required for this project.

C. AWI Quality Standard; Architectural Woodwork Institute (AWI) "Architectural Woodwork Quality Standards, latest edition except as otherwise indicated.

1. Unless otherwise indicated, AWI Custom Grade shall be the minimum quality millwork grade. When a higher quality grade standard is specified or indicated on the drawings, those requirements shall govern.

1.5 DELIVERY, STORAGE AND HANDLING

A. Protect millwork during transit, delivery, storage and handling to prevent damage, soilage and deterioration.

B. Do not deliver millwork until painting, wet work, grinding, and similar operations that could damage or deteriorate millwork have been completed in installation areas.

C. Comply with millwork manufacturer and installer recommendations for optimum temperature and humidity conditions for millwork during storage and installation. Do not install millwork until these conditions are reached.

D. Where millwork is indicated to be fitted to other construction, verify dimensions of other construction by accurate field measurements before manufacturing millwork; show recorded measurements on final shop drawings. Coordinate manufacturing schedule with construction progress to avoid delay of work.

PART 2 - PRODUCTS

2.1 FABRICATION

A. First quality workmanship is required with finish millwork free of defects.

B. Fabricate millwork items to dimensions, profiles, materials, and details indicated.

C. Complete fabrication, including assembly, finishing and accessing doors, before shipment to project site to maximum extent possible. Disassemble components only as necessary for shipment and installation. Where fitting at site is necessary, provide ample allowance for scribing, trimming, and fitting.

D. Cut openings to receive hardware, plumbing fixtures, electrical work, and similar items. Field cut only where necessary. Coordinate locations with Mechanical and Electrical Contractors. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Smooth edges of cutouts and when located in countertops and similar exposures.

E. Ease and cleanup edging to minimize exposure of core.

F. Back out of kerf backs of the following members except those with ends exposed in finished work.

G. 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. Field verify measurements and examine adjoining work upon which this work is dependent. Contractor is responsible for the proper fit of all items furnished and installed as part of the work of this section.

3.2 PREPARATION

A. Condition millwork to average prevailing humidity conditions in installation areas before installing.

B. Before installing millwork, examine shop fabricated work for completion and complete work as required, including back priming and removal of packing.

3.3 INSTALLATION

A. Scribe and fit millwork items to other finished surfaces in a careful manner. Other work damaged or distributed shall be repaired or replaced.

B. Millwork item shall be installed plumb or level, straight and true with no distortions. Shim as required with concealed shims. Install to a tolerance of 1/8” in 8’ for plumb level and with no variation in flushness of adjoining surfaces.

C. Secure millwork items to grounds, stripping, concealed blocking or ledgers with countersunk concealed fasteners.

D. Anchor securely to base units and other support systems as indicated.

3.4 ADJUSTMENT AND CLEANING

A. Repair damaged and defective millwork where possible to eliminate defects functionally and visually. Where not possible to satisfactorily repair damage and defects, provide new millwork items as specified. Adjust joinery for uniform appearance.

B. Clean millwork on exposed and semi-exposed surfaces. Touch up factory applied finishes to restore damaged or soiled areas.

3.6 PROTECTION

A. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and installer, to ensure millwork is protected from damage or deterioration at time of Substantial Completion.

END OF SECTION 062200

SECTION 072500 – VAPOR BARRIER

PART 1 - GENERAL

1. 1 DESCRIPTION

A. This Section includes vapor barrier under interior slab-on-grade concrete.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Vapor barrier; Use only materials that are resistant to deterioration when tested in accordance with ASTM E 154, as follows:

1. At concrete slab; polyethylene sheet not less than 10 mils thick.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and installation conditions. Do not proceed with vapor barrier installation until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install vapor barrier over gravel subbase before placing concrete slab-on-grade. Gravel surface shall be leveled before laying vapor barrier. Take care to not puncture or damage the membrane.

1. Repair punctures and tears by taping a 6 mil polyethylene patch over the penetration. Patch shall extend one (1) foot larger than penetration in all directions.
2. Place no concrete until vapor barrier is observed and approved by the Architect.

B. Apply vapor barrier sheets in the widest practical width parallel to direction of pour with joints overlapped 6 inches minimum and sealed. Turn up and seal sheets at walls, columns, and other vertical surfaces.

1. Seal with appropriate tape at seams.

END OF SECTION 072500

SECTION 076200 - SHEET METAL FLASHING AND TRIM

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following sheet metal flashing and trim:

1. Formed roof drainage system.
2. Formed fascia trim (behind gutters).
3. Formed drip edges.

B. This Section includes coordination of work in this Section with Work of Roof Membrane System.

C. Related Sections include the following:

1. Section 042000 "Unit Masonry" for rubberized-asphalt flashing specified as part of masonry work.
2. Section 061000 “Rough Carpentry” for wood blocking requirements.
3. Section 075419 "Thermoplastic Membrane Roofing” for installing roof accessories integral with roofing membrane.
4. Section 077100 "Roof Specialties" for thru-wall receivers, reglet receivers, surface- mounted receivers, and counterflashings.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Shop Drawings: Show layouts of sheet metal flashing and trim, including plans and elevations.

Distinguish between shop- and field-assembled work. Include the following:

1. Identify material, thickness, weight, and finish for each item and location in Project.
2. Details for forming sheet metal flashing and trim, including profiles, shapes, seams, and dimensions.
3. Details for fastening, joining, supporting, and anchoring sheet metal flashing and trim, including fasteners, clips, cleats, and attachments to adjoining work.
4. Details of expansion joint covers, including showing direction of expansion and contraction.

C. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below:

1. 8-inch square samples of specified sheet materials to be exposed as finished surfaces.
2. Sample of fully fabricated gutter expansion joint.

1.3 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified fabricator.

B. Warranty: Sample of special warranty.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance Data: For sheet metal flashing, trim, and accessories to include in maintenance manuals.

1.5 QUALITY ASSURANCE

A. Fabricator Qualifications: Shop that employs skilled workers who custom fabricate sheet metal flashing and trim similar to that required for this Project and whose products have a record of successful in-service performance.

B. Installer Qualifications: Engage an experience Installer who has completed sheet metal flashing and trim work similar in material, design, and extent to that indicated for this Project and with a record of successful in-service performance.

C. SMACNA and NRCA: Except as otherwise indicated, the workmanship of sheet metal work, method for forming joints, thickness requirements, anchoring, cleating, and provisions for expansion shall conform to the standard details and recommendation of the SMACNA - Architectural Sheet Metal Manual, Sixth Edition and NRCA – Roofing and Waterproofing Manual. If there is a discrepancy between these references and the project specifications and drawings, the more strict requirements shall govern.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Do not store sheet metal flashing and trim materials in contact with other materials that might cause staining, denting, or other surface damage. Store sheet metal flashing and trim materials away from uncured concrete and masonry.

B. Protect strippable protective covering on sheet metal flashing and trim from exposure to sunlight and high humidity, except to the extent necessary for the period of sheet metal flashing and trim installation.

1.7 WARRANTY

A. Special Warranty on Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace sheet metal flashing and trim that shows evidence of deterioration of factory-applied finishes within specified warranty period.

1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:

a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.

c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.

2. Finish Warranty Period: 20 years from date of Substantial Completion.

1.8 COORDINATION

A. Coordinate installation of sheet metal flashing and trim with interfacing and adjoining construction to provide a leakproof, secure, and noncorrosive installation.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. General: Sheet metal flashing and trim assemblies as indicated shall withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Completed sheet metal flashing and trim shall not rattle, leak, or loosen, and shall remain watertight.

B. Sheet Metal Standard for Flashing and Trim: Comply with NRCA's "The NRCA Roofing Manual" and SMACNA's "Architectural Sheet Metal Manual" requirements for dimensions and profiles shown unless more stringent requirements are indicated.

C. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes to prevent buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.

2.2 SHEET METALS

A. General: Protect mechanical and other finishes on exposed surfaces from damage by applying a strippable, temporary protective film before shipping.

B. Prepainted, Metallic-Coated Steel Sheet: Steel sheet metallic coated by the hot-dip process and prepainted by the coil-coating process to comply with ASTM A 755.

1. Aluminum-Zinc Alloy-Coated Steel Sheet: ASTM A 792, Class AZ50 coating designation, Grade 40; structural quality.
2. Surface: Smooth, flat.
3. Exposed Coil-Coated Finish:

a. Two-Coat Fluoropolymer: AAMA 621. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

b. Color: Custom color to match Dimensional Metals, Inc. “Putty”.

4. Concealed Finish: Pretreat with manufacturer's standard white or light-colored acrylic or polyester backer finish, consisting of prime coat and wash coat with a minimum total dry film thickness of 0.5 mil.

2.3 MISCELLANEOUS MATERIALS

A. General: Provide materials and types of fasteners, protective coatings, separators, sealants, and other miscellaneous items as required for complete sheet metal flashing and trim installation.

B. Fasteners: Same metal as sheet metal flashing or other noncorrosive metal as recommended by sheet metal manufacturer designed to withstand design loads.

1. Exposed Fasteners: Heads matching color of sheet metal by means of factory-applied coating.

C. Elastomeric Sealant: ASTM C 920, elastomeric silicone polymer sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.

D. Bituminous Coating: Cold-applied asphalt emulsion complying with ASTM D 1187.

2.4 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.

C. Sealed Joints: Form nonexpansion 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 deep, filled with elastomeric sealant concealed within joints.

E. Seams: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with elastomeric sealant unless otherwise recommended by sealant manufacturer for intended use. Blind rivet joints where necessary for strength.

F. Conceal fasteners and expansion provisions where possible on exposed-to-view sheet metal flashing and trim.

2.5 ROOF DRAINAGE SHEET METAL FABRICATIONS

A. Hanging Gutters: Shop fabricate to cross section indicated on Drawings, complete with corner miters, end pieces, outlet tubes, gutter spacers, gutter brackets and other accessory pieces as required for a complete installation.

1. Gutter Profile: Match Dimensional Metals, Inc. standard gutter profile. Fabricate in continuous lengths up to 50 feet.
2. Join sections with riveted and sealed joints.
3. Provide expansion joints where indicated on the Drawings.

    a. Gutter expansion joints shall be butt type joints fabricated in accordance with Figure 1-7 of SMACNA's "Architectural Sheet Metal Manual – 6th Edition.

4. Provide galvanized or stainless steel wire ball strainers at outlet tubes.
5. Fabricate gutters from Aluminum-Zinc Alloy-Coated Steel: 0.0336 inch (22 gage) thick minimum; provide thicker material if required by referenced standards for girth of gutters indicated.
6. Gutter Spacers: Fabricate from same material and finish as gutters. Size shall be 1/16-inch thick by 1-1/2-inches wide.
7. Gutter Brackets: Fabricate from same material and finish as gutter. Size shall be 3/16- inch thick by 1-1/2-inches wide.

B. Downspouts: Shop fabricated, shapes and sizes indicated on the Drawings.

1. Join sections with 1-1/2-inch telescoping joints.
2. Run downspouts plumb from gutter to grade without offsets or elbows except as indicated.
3. Provide semi-concealed hangers designed to hold downspouts securely 1-1/2 inches away from walls.
4. Vertical seams shall be exposed toward the exterior and located on side face.
5. Fabricate downspouts from Aluminum-Zinc Alloy-Coated Steel: 0.0336 inch (22 gage) thick.

C. Formed Fascia Trim and Drip Edges at Gutters: Shop fabricated to profile and sizes indicated on the Drawings. Fabricate from Aluminum-Zinc Alloy-Coated Steel: 0.0336 inch (22 gage) thick, color to match gutters.

D. Conductor Heads: Fabricate conductor heads with flanged back and stiffened top edge and of dimensions and shape required, complete with outlet tubes, exterior flange trim, and built-in overflows. Fabricate from the following materials:

1. Aluminum-Zinc Alloy-Coated Steel: 0.0336 inch (22 gage) thick.

E. Fabricate downspouts and trims/drip edges in the longest lengths practical and not less than 10- foot sections.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, to verify actual locations, dimensions and other conditions affecting performance of work.

1. Verify compliance with requirements for installation tolerances of substrates.
2. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.

B. Verify wood blocking is in-place, secure and in proper relationship to face of wall below.

C. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.

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

3.2 INSTALLATION, GENERAL

A. Coordinate installation fully with roof membrane and membrane flashings; do not install metal trims on irregular, missing, or improper membranes.

B. General: Anchor sheet metal flashing and trim and other components of the Work securely in place, with provisions for thermal and structural movement. Use fasteners, protective coatings, separators, sealants, and other miscellaneous items as required to complete sheet metal flashing and trim system.

1. Install sheet metal flashing and trim true to line and levels indicated. Provide uniform, neat seams with minimum exposure of solder, welds, and sealant.
2. Install sheet metal flashing and trim to fit substrates and to result in watertight performance. Verify shapes and dimensions of surfaces to be covered before fabricating
sheet metal.
3. Install exposed sheet metal flashing and trim without excessive oil canning, buckling, and tool marks.
4. Torch cutting of sheet metal flashing and trim is not permitted.
5. Do not use graphite pencils to mark metal surfaces.

C. Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with bituminous coating or by other permanent separation as recommended by fabricator or manufacturers of dissimilar metals.

1. Bed flanges in thick coat of asphalt roofing cement where required for waterproof performance.

D. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet with no joints allowed within 24 inches of corner or intersection. Where lapped expansion provisions cannot be used or would not be sufficiently watertight, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with sealant concealed within joints.

E. Fasteners: Use fasteners of sizes that will penetrate substrate not less than 1-1/4 inches for

nails and not less than 3/4 inch for wood screws.

1. Prepainted, Metallic-Coated Steel: Use stainless-steel fasteners.

F. Seal joints with elastomeric sealant as required for watertight construction.

1. Where sealant-filled joints are used, embed hooked flanges of joint members not less than 1 inch into sealant. Apply sealant manufacturer approved/recommended primer to both sides of metal joint prior to application of sealant. Form joints to completely conceal sealant. When ambient temperature at time of installation is moderate, between 40 and 70 deg F, set joint members for 50 percent movement each way. Adjust setting proportionately for installation at higher ambient temperatures. Do not install sealant-type joints at temperatures below 40 deg F.

3.3 ROOF DRAINAGE SYSTEM INSTALLATION

A. General: Install sheet metal roof drainage items to produce complete roof drainage system according to SMACNA recommendations and as indicated.

B. Hanging Gutters:

1. Join sections with lapped joints sealed with elastomeric sealant.
2. Provide for thermal expansion.
3. Provide gutter brackets 32-inches on center. Provide gutter spacers 32-inches on center and spaced midway between gutter brackets.
4. Anchor gutter brackets to substrate with two (2) anchors. Provide end closures and seal watertight with sealant.
5. Provide galvanized or stainless steel wire ball strainers at leader opening to all downspouts.

C. Downspouts: Locate bracket fasteners at top and bottom and at approximately 60 inches o.c. in between.

1. At low-sloped roofs, provide elbows at base of downspout.
2. At grade, connect downspouts to underground drainage system indicated.

D. Expansion-Joint Covers: Install expansion-joint covers at locations and of configuration indicated. Lap joints a minimum of 4 inches in direction of water flow.

E. Other drainage system devices and accessories: Comply with requirements of the roof membrane manufacturer and with SMACNA recommendations for the type of item involved.

3.4 ERECTION TOLERANCES

A. Installation Tolerances: Shim and align sheet metal flashing and trim within installed tolerance of 1/4 inch in 20 feet on slope and location lines as indicated and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.

3.5 CLEANING AND PROTECTION

A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.

B. Clean off excess sealants.

C. Remove temporary protective coverings and strippable films as sheet metal flashing and trim are installed. On completion of installation, clean finished surfaces, including removing unused fasteners, metal filings, pop rivet stems, and pieces of flashing. Maintain in a clean condition during construction.

D. Replace sheet metal flashing and trim that have been damaged or that have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 076200

SECTION 077100 - ROOF SPECIALTIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Special Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following manufactured roof specialties:

1. Thru-wall receiver.
2. Reglet receiver.
3. Surface mounted receiver.
4. Counterflashing.

B. Related Sections include the following:

1. Section 042000 "Unit Masonry" for installing thru-wall receiver.
2. Section 061000 "Rough Carpentry" for wood blocking.
3. Section 076200 "Sheet Metal Flashing and Trim" for metal gutters, downspouts, drip edges, and formed fascia's.
4. Section 079200 "Joint Sealants" for field-applied sealants between roof specialties and adjacent materials.

1.3 DEFINITIONS

A. Base Flashing: Plies or strips of roof membrane material used to close-off and/or seal a roof at the horizontal-to-vertical intersections, such as at a roof-to-wall juncture. Membrane base flashing covers the edge of the field membrane.

B. Flashing: components used to weatherproof or seal roof system edges at perimeters, penetrations, walls, expansion joints, valley, and other places where the roof covering is interrupted or terminated.

C. Thru-wall Receiver with Counterflashing (as intended for this project): Flashing system consisting of a concealed in-wall metal receiver for embedment in masonry construction and which supports the associated membrane flashing across the wall cavity and protrudes from the wall with a locking-slot to receive an exposed metal counterflashing.

1. Used for flashing to a cavity wall where membrane flashing interrupts the downward flow of moisture in the cavity.

D. Reglet Receiver with Counterflashing (as intended for this project): Flashing system consisting of a reglet-style receiver inserted into a horizontal masonry joint and protruding from the wall with a locking-slot to receive an exposed metal counterflashing.

1. Used for flashing to a composite masonry wall or to a cavity wall where the downward flow of moisture in the cavity is not interrupted.

E. Surface-Mounted Receiver with Counterflashing (as intended for this project): Flashing system consisting of a surface mounted receiver attached to exterior wall surface with a locking-slot to receive an exposed metal counterflashing

1. Used for flashing to a composite masonry wall or to a cavity wall where the downward flow of moisture in the cavity is not interrupted.

1.4 PERFORMANCE REQUIREMENTS

A. General Performance: Roof specialties shall withstand exposure to weather and resist thermally induced movement without failure, rattling, leaking, or fastener disengagement due to defective manufacture, fabrication, installation, or other defects in construction.

B. Thermal Movements: Provide manufactured roof specialties that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, hole elongation, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Provide clips that resist rotation and avoid shear stress as a result of thermal movements. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Samples for Initial Selection: For each type of manufactured roof specialty indicated with factory-applied color finishes.

1. Provide actual-material samples approximately 3-by 4-inches free of burrs and sharp edges, of the full range available and not less than 30 colors. Provide label on back surface identifying each color by name or number.

C. Samples for Verification: Counter flashings in color(s) selected. 12-inch lengths of full-size components including fasteners, cover joints, accessories, and attachments.

1.6 INFORMATIONAL SUBMITTALS

A. Warranty: Sample of special warranty.

1.7 CLOSEOUT SUBMITTALS

A. Maintenance Data: For roofing specialties to include in maintenance manuals.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Do not store roof specialties in contact with other materials that might cause staining, denting, or other surface damage. Store roof specialties away from uncured concrete and masonry.

B. Protect strippable protective covering on roof specialties from exposure to sunlight and high humidity, except to extent necessary for the period of roof specialties installation.

1.9 COORDINATION

A. Coordinate installation of manufactured roof specialties with interfacing and adjoining construction to provide a leakproof, secure, and noncorrosive installation.

B. Provide thru-wall receivers to masonry contractor for installation as masonry work progresses.

1.10 WARRANTY

A. Special Warranty on Painted Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace manufactured roof specialties that show evidence of deterioration of factory-applied finishes within specified warranty period.

1. Fluoropolymer Finish: Deterioration includes, but is not limited to, the following:

a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.

2. Finish Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 EXPOSED METALS

A. Aluminum-Zinc Alloy-Coated Steel Sheet: ASTM A 792, Class AZ50 coating designation, Grade 40; structural quality, 0.028-inch (24 gauge) thickness.

1. Surface: Smooth, flat finish.
2. Exposed Coil-Coated Finishes: Prepainted by the coil-coating process to comply with ASTM A 755. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

a. Two-Coat Fluoropolymer: AAMA 621. System consisting of primer and fluoropolymer color topcoat containing not less than 70 percent PVDF resin by weight.

3. Color: Custom color to match Dimensional Metals, Inc. “Beige” for counterflashing at metal roof panels.
4. Color: Custom color to match Dimensional Metals, Inc. “Putty” for counterflashing at thermoplastic membrane roofing.

2.2 CONCEALED METALS

A. Stainless-Steel Sheet: ASTM A 240 or ASTM A 666, Type 304; minimum thicknesses s indicated below.

2.3 MISCELLANEOUS MATERIALS

A. General: Provide materials and types of fasteners, protective coatings, separators, sealants, and other miscellaneous items required by manufacturer for a complete installation.

B. Fasteners: Manufacturer's recommended fasteners, suitable for application and designed to withstand design loads.

C. Elastomeric Sealants: Non-skinning, non-curing permanently flexible butyl sealant of type, grade, class, and use classifications required to seal overlap joints in thru-wall receivers and remain watertight.

D. Bituminous Coating: Cold-applied asphalt emulsion complying with ASTM D 1187.

2.4 MANUFACTURERS

A. Subject to compliance with requirements provide products from one of the following:

1. Cheney Flashing Company.
2. Hickman Company, W. P.
3. Metal-Era, Inc.
4. York Manufacturing, Inc.

2.5 RECEIVERS AND COUNTERFLASHING

A. Thru-Wall Receiver:

1. Manufactured through-wall sheet metal receiver for embedment in masonry (and other wall facing constructions) with turned-up edge dam minimum 2-inch high at rear of receiver against the backup wall for rigidity and to prevent sagging.

a. Single-piece construction formed with hook-slot protruding minimal distance outside of wall to engage separate counter flashing and flat metal flange with 2-inch high hooked end sized to rest on outer masonry wythe and extend to backup wythe (behind cavity wall insulation).

2. Material: Non-ribbed stainless steel as indicated in “Concealed Metals” article above, 0.025 inches thick minimum or thicker if required by manufacturer’s spring-lock design.

B. Reglet Receiver:

1. Manufactured channel-shaped sheet metal reglet units matching mortar joint height and at least 1-inch deep, formed with hook-slot protruding minimal distance from face of wall and designed to engage separate counter flashing.

2. Material: Non-ribbed stainless steel as indicated in “Concealed Metals” article above, 0.019 inches thick minimum or thicker if required by manufacturer’s spring-lock design.

C. Surface-Mounted Receiver:

1. Manufactured surface-mounted sheet metal receiver with slotted holes for fastening to substrate, with neoprene or other suitable weatherproofing washers, and with channel for sealant at top edge. Form with hook-slot extending minimal distance from face of wall and designed to engage separate counter flashing.
2. Where receiver is shown installed under aluminum storefront sill, trim off top edge of receiver so it is flat against wall substrate.
3. Material: Aluminum-Zinc Alloy-Coated Steel Sheet “Exposed Metals” specified above.

D. Counter Flashing:

1. Fabrication: Manufacturer’s standard (4-inch high minimum) sheet metal section designed to snap into and lock with hook-slot of receiver portion without additional fasteners.

a. Size to span over and conceal membrane termination bar if termination bar is detailed on the drawings.

2. Material: Aluminum-Zinc Alloy-Coated Steel Sheet “Exposed Metals” specified above.

2.6 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 COORDINATION IN ADVANCE OF MASONRY WORK

A. Review construction drawings and shop drawings of interfacing materials, particularly roofing and roof insulation types and installed thicknesses.

B. Determine highest elevation of roof membrane where it abuts the wall where receiver and counter flashing are to be installed.

1. REGARDLESS OF ELEVATION SHOWN ON DRAWINGS, Plan installation of in-wall elements at height indicated BUT NOT LOWER THAN the height above highpoint

of membrane required by the roofing manufacturer's warranty (typically at least 8-inches).

C. In discussion with architect and masonry subcontractor; resolve any discrepancies between construction drawings and shop drawing determination of masonry joint elevation to receive in-wall flashing components.

3.2 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, to verify actual locations, dimensions, and other conditions affecting performance of work.

B. Examine walls, roof edges, and parapets for suitable conditions for roof specialties.

C. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.

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

3.3 INSTALLATION, GENERAL

A. General: Install roof specialties according to manufacturer's written instructions. Anchor roof specialties securely in place, with provisions for thermal and structural movement. Use fasteners, protective coatings, separators, sealants, and other miscellaneous items as required to complete roof-specialty systems.

1. Install roof specialties level, plumb, true to line and elevation; with limited oil-canning and without warping, jogs in alignment, buckling, or tool marks.
2. Provide uniform, neat seams with minimum exposure of sealant.
3. Install roof specialties to fit substrates and to result in watertight performance. Verify shapes and dimensions of surfaces to be covered before manufacture.
4. Torch cutting of roof specialties is not permitted.
5. Do not use graphite pencils to mark metal surfaces.
6. Provide end dams on concealed metals where appropriate to prohibit off-flow of moisture inside the wall cavity. Provide preformed inside and outside corners that lap straight sections at least six inches along length and are sealant-coated this full distance.
7. Lap ends of sheet metal receivers not less than 1-1/2 inches and seal lap with elastomeric sealant.

B. Metal Protection: Protect metals against galvanic action by separating dissimilar metals from contact with each other or with corrosive substrates by painting contact surfaces with bituminous coating or by other permanent separation as recommended by manufacturer.

1. Coat concealed side of uncoated aluminum and stainless-steel roof specialties with bituminous coating where in contact with treated wood, ferrous metal, or cementitious construction.
2. Bed flanges in thick coat of asphalt roofing cement where required by manufacturers of roof specialties for waterproof performance.

C. Expansion Provisions: Allow for thermal expansion of exposed roof specialties.

1. Space movement joints at a maximum of 12 feet with no joints within 18 inches of corners or intersections unless otherwise shown on Drawings.

2. When ambient temperature at time of installation is between 40 and 70 deg F, set joint members for 50 percent movement each way. Adjust setting proportionately for installation at higher ambient temperatures.

D. Seal joints as required for watertight construction. Place sealant to be completely concealed in joint. Do not install sealants at temperatures below 40 deg F.

3.4 THRU-WALL RECEIVER WITH COUNTER FLASHING

A. Install so that hook-slot portion of receiver does not extend outside of face of wall beyond manufacturer's recommendations or such that the counter flashing does not exert spring- pressure against roof membrane or roof base flashing membrane.

B. Install receiver portion spanning cavity with a slight downward slope to the exterior and positioned to receive and support flexible membrane flashing across the cavity, cavity wall insulation, and cavity drainage material provided as part of "Unit Masonry". Fasten vertical leg of receiver

into back-up masonry as necessary to maintain a fixed position.

C. Keep receiver portion flat, free from bending and defect. Clean thoroughly before installation of flexible flashing and ensure full adhesion of the flexible flashing to the receiver in a manner that provides complete support and complete free drainage with no retained moisture.

D. Engage counter flashing firmly into the hook-slot of the receiver per manufacturer's instructions.

3.5 REGLET RECEIVER WITH COUNTER FLASHING

A. Install reglet as masonry is being laid or rake joint when mortar is still pliable and install to uniform depth necessary. Install so that hook-slot portion of reglet does not extend outside of face of wall beyond manufacturer's recommendations or such that the spring-cover does not exert spring-pressure against roof membrane or roof base flashing membrane.

B. Seal reglet joint in compliance with Section 079200 "Joint Sealants".

C. Engage counter flashing firmly into the hook-slot of the reglet per manufacturer's instructions.

3.6 SURFACE-MOUNTED RECEIVER WITH COUNTER FLASHING

A. Install surface-mounted receivers to exterior surfaces through slotted holes with anchors spaced as recommended by the manufacturer and to ensure tight, non-moving conditions.

B. Seal top edge of surface-mounted receiver in compliance with Section 079200 "Joint Sealants."

C. Engage counter flashing firmly into the hook-slot of the receiver per manufacturer's instructions.

3.7 CLEANING AND PROTECTION

A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and

weathering.

B. Remove temporary protective coverings and strippable films as roof specialties are installed. On completion of installation, clean finished surfaces, including removing unused fasteners, metal filings, and pieces of flashing. Maintain roof specialties in a clean condition during construction.

C. Replace roof specialties that have been damaged or that cannot be successfully repaired by finish touchup or similar minor repair procedures.

END OF SECTION 077100

SECTION 078413 – PENETRATION FIRESTOPPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Thru penetrations in fire-resistance-rated walls.
2. Membrane penetrations in fire-resistance-rated walls.
3. Penetrations in non-fire resistance rated horizontal assemblies.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Product Schedule: For each penetration firestopping system. Include location and design designation of qualified testing and inspecting agency.

1. Where Project conditions require modification to a qualified testing and inspecting agency's illustration for a particular penetration firestopping condition, submit illustration, with modifications marked, approved by penetration firestopping manufacturer's fire-protection engineer as an engineering judgment or equivalent fire-resistance-rated assembly.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified Installer.

B. Installer Certificates: From Installer indicating penetration firestopping has been installed in compliance with requirements and manufacturer's written recommendations.

C. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for penetration firestopping.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: A firm experienced in installing penetration firestopping similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful performance. Qualifications include having the necessary experience, staff, and training to install manufacturer's products per specified

requirements. Manufacturer's willingness to sell its penetration firestopping products to Contractor or to Installer engaged by Contractor does not in itself confer qualification on buyer.

B. Fire-Test-Response Characteristics: Penetration firestopping shall comply with the following requirements:

1. Penetration firestopping tests are performed by a qualified testing agency acceptable to authorities having jurisdiction.
2. Penetration firestopping is identical to those tested per testing standard referenced in "Penetration Firestopping" Article. Provide rated systems complying with the following requirements:

a. Penetration firestopping products bear classification marking of qualified testing and inspecting agency.
b. Classification markings on penetration firestopping correspond to designations listed by the following:

1) UL in its "Fire Resistance Directory."
2) Intertek ETL SEMKO in its "Directory of Listed Building Products."

1.6 PROJECT CONDITIONS

A. Environmental Limitations: Do not install penetration firestopping when ambient or substrate temperatures are outside limits permitted by penetration firestopping manufacturers or when substrates are wet because of rain, frost, condensation, or other causes.

B. Install and cure penetration firestopping per manufacturer's written instructions using natural means of ventilations or, where this is inadequate, forced-air circulation.

1.7 COORDINATION

A. Coordinate construction of openings and penetrating items to ensure that penetration firestopping is installed according to specified requirements.

B. Coordinate sizing of sleeves, openings, core-drilled holes, or cut openings to accommodate penetration firestopping.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

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

1. Hilti, Inc.
2. Specified Technologies Inc.
3. 3M Fire Protection Products.
4. Tremco, Inc.; Tremco Fire Protection Systems Group.

5. WR Grace & Co.
6. Isolatek International.
7. Rectorseal.

2.2 PENETRATION FIRESTOPPING

A. Provide penetration firestopping that is produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and other gases, and maintain original fire-resistance rating of construction penetrated. Penetration firestopping systems shall be compatible with one another, with the substrates forming openings, and with penetrating items if any.

B. Penetrations in Fire-Resistance-Rated Walls: Provide penetration firestopping with ratings determined per ASTM E 814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg.

1. Fire resistance rated walls include Fire Walls, Fire Barriers and Fire Partitions.

C. Penetrations in Non Fire Resistance Rated Horizontal Assemblies:
1. Non Combustible penetrating items that connect not more than three stories shall have their annular space at the horizontal assembly filled to resist the free passage of flame and products of combustion utilizing fill, void and cavity material classified for uses in through penetration firestop systems.
2. Ducts connecting not more than two stories shall have their annular space at the horizontal assembly filled to resist the free passage of flame and products of combustion utilizing fill, void and cavity material classified for uses in through penetration firestop systems

D. Membrane Penetrations in Fire Resistance Rated Framed Wall Assemblies:

1. Recessed electrical boxes, sanitary piping, supply piping and other devices or fixtures recessed in fire resistance rated framed wall assemblies or penetrating one side of a fire resistance rated framed wall assemblies shall be installed such that the required fire resistance of the assembly will not be reduced.
2. Membrane penetrations on opposite sides of fire resistance rated walls by listed electrical boxes shall be separated horizontally by 24” or through the use of listed putty pads.

E. Exposed Penetration Firestopping: Provide products with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, as determined per ASTM E 84.

F. VOC Content: Penetration firestopping sealants and sealant primers shall comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):

1. Sealants: 250 g/L.
2. Sealant Primers for Nonporous Substrates: 250 g/L.
3. Sealant Primers for Porous Substrates: 775 g/L.

G. Low-Emitting Materials: Penetration firestopping sealants and sealant primers shall comply with the testing and product requirements of the California Department of Health Services'

"Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

H. Accessories: Provide components for each penetration firestopping system that are needed to install fill materials and to maintain ratings required. Use only those components specified by penetration firestopping manufacturer and approved by qualified testing and inspecting agency for firestopping indicated.

1. Permanent forming/damming/backing materials, including the following:

   a. Slag-wool-fiber or rock-wool-fiber insulation.
   b. Sealants used in combination with other forming/damming/backing materials to prevent leakage of fill materials in liquid state.
   c. Fire-rated form board.
   d. Fillers for sealants.

2. Temporary forming materials.
3. Substrate primers.
4. Collars.
5. Steel sleeves.

2.3 FILL MATERIALS

A. Latex Sealants: Single-component latex formulations that do not re-emulsify after cure during exposure to moisture.

B. Firestop Devices: Factory-assembled collars formed from galvanized steel and lined with intumescent material sized to fit specific diameter of penetrant.

C. Intumescent Composite Sheets: Rigid panels consisting of aluminum-foil-faced elastomeric sheet bonded to galvanized-steel sheet.

D. Intumescent Putties: Nonhardening dielectric, water-resistant putties containing no solvents, inorganic fibers, or silicone compounds.

E. Intumescent Wrap Strips: Single-component intumescent elastomeric sheets with aluminum foil on one side.

F. Mortars: Prepackaged dry mixes consisting of a blend of inorganic binders, hydraulic cement, fillers, and lightweight aggregate formulated for mixing with water at Project site to form a nonshrinking, homogeneous mortar.

G. Pillows/Bags: Reusable heat-expanding pillows/bags consisting of glass-fiber cloth cases filled with a combination of mineral-fiber, water-insoluble expansion agents, and fire-retardant additives. Where exposed, cover openings with steel-reinforcing wire mesh to protect pillows/bags from being easily removed.

H. Silicone Foams: Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam.

I. Silicone Sealants: Single-component, silicone-based, neutral-curing elastomeric sealants of grade indicated below:

1. Grade: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces, and nonsag formulation for openings in vertical and sloped surfaces, unless indicated firestopping limits use of nonsag grade for both opening conditions.

2.4 MIXING

A. For those products requiring mixing before application, comply with penetration firestopping manufacturer's written instructions for accurate proportioning of materials, water (if required), type of mixing equipment, selection of mixer speeds, mixing containers, mixing time, and other items or procedures needed to produce products of uniform quality with optimum performance characteristics for application indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for opening configurations, penetrating items, substrates, and other conditions affecting performance of the Work.

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

3.2 PREPARATION

A. Surface Cleaning: Clean out openings immediately before installing penetration firestopping to comply with manufacturer's written instructions and with the following requirements:

1. Remove from surfaces of opening substrates and from penetrating items foreign materials that could interfere with adhesion of penetration firestopping.
2. Clean opening substrates and penetrating items to produce clean, sound surfaces capable of developing optimum bond with penetration firestopping. Remove loose particles remaining from cleaning operation.
3. Remove laitance and form-release agents from concrete.

B. Priming: Prime substrates where recommended in writing by manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.

C. Masking Tape: Use masking tape to prevent penetration firestopping from contacting adjoining surfaces that will remain exposed on completion of the Work and that would otherwise be permanently stained or damaged by such contact or by cleaning methods used to remove stains. Remove tape as soon as possible without disturbing firestopping's seal with substrates.

3.3 INSTALLATION

A. General: Install penetration firestopping to comply with manufacturer's written installation instructions and published drawings for products and applications indicated.

B. Install forming materials and other accessories of types required to support fill materials during their application and in the position needed to produce cross-sectional shapes and depths required to achieve fire ratings indicated.

1. After installing fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not indicated as permanent components of firestopping.

C. Install fill materials for firestopping by proven techniques to produce the following results:

1. Fill voids and cavities formed by openings, forming materials, accessories, and penetrating items as required to achieve fire-resistance ratings indicated.
2. Apply materials so they contact and adhere to substrates formed by openings and penetrating items.
3. For fill materials that will remain exposed after completing the Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.4 IDENTIFICATION

A. Identify penetration firestopping with preprinted metal or plastic labels. Attach labels permanently to surfaces adjacent to and within 6 inches of firestopping edge so labels will be visible to anyone seeking to remove penetrating items or firestopping. Use mechanical fasteners or self-adhering-type labels with adhesives capable of permanently bonding labels to surfaces on which labels are placed. Include the following information on labels:

1. The words "Warning - Penetration Firestopping - Do Not Disturb. Notify Building Management of Any Damage."
2. Contractor's name, address, and phone number.
3. Designation of applicable testing and inspecting agency.
4. Date of installation.
5. Manufacturer's name.
6. Installer's name.

3.5 FIELD QUALITY CONTROL

A. Where deficiencies are found or penetration firestopping is damaged or removed because of testing, repair or replace penetration firestopping to comply with requirements.

B. Proceed with enclosing penetration firestopping with other construction only after inspection reports are issued and installations comply with requirements.

3.6 CLEANING AND PROTECTION

A. Clean off excess fill materials adjacent to openings as the Work progresses by methods and with cleaning materials that are approved in writing by penetration firestopping manufacturers and that do not damage materials in which openings occur.

B. Provide final protection and maintain conditions during and after installation that ensure that penetration firestopping is without damage or deterioration at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, immediately cut out and remove damaged or deteriorated penetration firestopping and install new materials to produce systems complying with specified requirements.

3.7 PENETRATION FIRESTOPPING SCHEDULE

A. Where UL-classified systems are indicated, they refer to system numbers in UL's "Fire Resistance Directory" under product Category XHEZ. System ratings shall meet or exceed the wall rating identified in the Project drawings. System ratings identified in the respective scheduled system reflect the basis of design system rating

B. Firestopping for Metallic Pipes, Conduit, or Tubing in fire rated framed wall assemblies:

1. UL-Classified Systems: W-L 1091.
2. F-Rating: 1 hour or 2 hours based on wall assembly penetrated.
3. Type of Fill Materials: As required to achieve rating.
4. The following types and sizes of penetrations may be used:

    a. Steel Pipe — Nom 24 in diam (or smaller) Schedule 10 (or heavier) steel pipe.
    b. Iron Pipe — Nom 24 in. diam (or smaller) cast or ductile iron pipe.
    c. Conduit — Nom 4 in. diam (or smaller) steel electrical metallic tubing or 6 in. diam steel conduit.
    d. Copper Tubing — Nom 6 in. diam (or smaller) Type L (or heavier) copper tubing.
    e. Copper Pipe — Nom 6 in. diam (or smaller) Regular (or heavier) copper pipe.

C. Firestopping for Insulated Metallic Pipes or Tubing in fire rated framed wall assemblies:

1. UL-Classified Systems: W-L 5096.
2. F-Rating: 1 hour or 2 hours based on wall assembly penetrated.
3. Type of Fill Materials: As required to achieve rating.
4. The following types and sizes of penetrations may be used:

    a. Steel Pipe — Nom 12 in diam (or smaller) Schedule 10 (or heavier) steel pipe.
    b. Copper Tubing — Nom 6 in. diam (or smaller) Type L (or heavier) copper tubing.
    c. Copper Pipe — Nom 6 in. diam (or smaller) Regular (or heavier) copper pipe.

D. Firestopping for Metallic Pipes, Conduit, or Tubing in fire rated masonry wall assemblies:

1. UL-Classified Systems: W-J 1031.
2. F-Rating: 1 hour or 2 hours based on wall assembly penetrated.
3. Type of Fill Materials: As required to achieve rating.
4. The following types and sizes of penetrations may be used:

a. Steel Pipe — Nom 24 in diam (or smaller) Schedule 10 (or heavier) steel pipe.
b. Iron Pipe — Nom 24 in. diam (or smaller) cast or ductile iron pipe.
c. Conduit — Nom 4 in. diam (or smaller) steel electrical metallic tubing or 6 in. diam steel conduit.
d. Copper Tubing — Nom 6 in. diam (or smaller) Type L (or heavier) copper tubing.
e. Copper Pipe — Nom 6 in. diam (or smaller) Regular (or heavier) copper pipe.

E. Firestopping for Metallic Pipes, Tubing or Conduit in fire rated masonry wall assemblies:

1. UL-Classified Systems: C-AJ-1226.
2. F-Rating: 1 hour or 2 hours based on wall assembly penetrated. (System is 3 hour system.)
3. The following types and sizes of penetrations may be used:

a. Steel Pipe — Nom 30 in diam (or smaller) Schedule 10 (or heavier) steel pipe.
b. Iron Pipe — Nom 30 in. diam (or smaller) cast or ductile iron pipe.
c. Copper Pipe — Nom 6 in. diam (or smaller) Regular (or heavier) copper pipe.
d. Copper Tubing — Nom 6 in. diam (or smaller) Type L (or heavier) copper tubing.
e. Conduit — Nom 6 in. diam (or smaller) steel conduit or Nom 4 in. diam (or smaller) steel electrical metallic tubing (EMT).

F. Firestopping for Electrical Cables in fire rated masonry wall assemblies:

1. UL-Classified Systems: C-AJ-3180. (System is 3 hour system.)
2. F-Rating: 1 hour or 2 hours based on wall assembly penetrated.
3. Type of Fill Materials: As required to achieve rating.
4. The following types and sizes of penetrations may be used:

a. Cables — Aggregate cross-sectional area of cables in opening to be max 45 percent of the aggregate cross-sectional area of the opening. Cables to be rigidly supported on both sides of floor or wall assembly. Any combination of the following types and sizes of metallic conductor or fiber optic cable may be used:

1) Max 500 kcmil single copper connector power cable with thermoplastic insulation and polyvinyl chloride (PVC) jacket.
2) Max 300 pair No. 24 AWG copper conductor telecommunication cables with polyvinyl chloride (PVC) insulation and jacket material.
3) Max 7/C copper conductor No. 12 AWG multiconductor power and control cables with polyvinyl chloride (PVC) or cross-linked polyethylene (XLPE) insulation and PVC jacket.
4) Multiple fiber optical communication cables jacketed with PVC and having a max outside diam of 1/2 in. (13 mm).
5) Max 3/C copper conductor No. 12 AWG with bare aluminum ground, polyvinyl chloride (PVC) insulated steel, Metal-clad cable.
6) Max 3/C with ground 2/0 AWG copper conductor SER cable with cross-linked polyethylene (XLPE) insulation and polyvinyl chloride (PVC) jacket.
7) RG/U coaxial cable with polyethylene (PE) insulation and polyvinyl chloride (PVC) jacket having a max outside diameter of ½ in. (13 mm)

8) Fire Resistive Cables* - Max 1-1/4 in. (32 mm) diam single conductor or multi conductor Type MI cable. A min 1/8 in. (3 mm) separation shall be maintained between MI cables and any other types of cable.

G. Firestopping for Electrical Cables in fire rated framed wall assemblies:

1. UL-Classified Systems: W-L-3065.
2. F-Rating: 1 hour or 2 hours.
3. Type of Fill Materials: As required to achieve rating.
4. The following types and sizes of penetrations may be used:

a. Cables — Aggregate cross-sectional area of cable in opening to be max 45 percent of the cross-sectional area of the opening. The annular space between the cable bundle and the periphery of the opening to be min 0 in. (0 mm, point contact) to max 1 in. (25 mm) Cables to be rigidly supported on both sides of the wall assembly. Cable bundle, using cables described below, may penetrate the wall at an angle not greater than 45 degrees. Any combination of the following types and sizes of copper conductor cables may be used:

1) Max 7/C No. 12 AWG with polyvinyl chloride (PVC) insulation and jacket.
2) Max 25 pair No. 24 AWG telephone cable with PVC insulation and jacket.
3) Max 4 pr No. 22 AWG Cat 5 or Cat 6 computer cables.
4) Type RG/U coaxial cable with polyethylene (PE) insulation and PVC jacket having a max outside diameter of ½ in. (13 mm).
5) Max RG 6/U coaxial cable with fluorinated ethylene insulation and jacketing.
6) Multiple fiber optical communication cable jacketed with PVC and having a max OD of 5/8 in. (16 mm).
7) Through Penetrating Products*— Max three copper conductor No. 8 AWG .Metal-Clad Cable.
8) Max 3/C (with ground)(or smaller) No. 8 AWG copper conductor cable with PVC insulation and jacketing.
9) Max 3/4 in. (19 mm) diam copper ground cable with or without a PVC jacket.
10) Fire Resistive Cables* - Max 1-1/4 in. (32 mm) diam single conductor or multi conductor Type MI cable. A min 1/8 in. (3 mm) separation shall be maintained between MI cables and any other types of cable.
11) Max 4/C with ground 300 kcmil (or smaller) aluminum SER cable with PVC insulation and jacket.
12) Through Penetrating Product* - Any cables, Metal-Clad Cable+ or Armored Cable+ currently Classified under the Through Penetrating Products category.
13) Maximum 3/C No. 8 AWG metal-clad cable.
14) Maximum 5/8 diam fiber-optic cable with PVC jacket.

For cable bundle penetrating the wall assembly at an angle of 45 degrees, the T rating is ¾ hr for a 2 hr wall assembly.

H. Firestopping for Cable Trays with Electric Cables in fire rated masonry walls:

1. UL-Classified Systems: W-J-4030.
2. F-Rating: 1 hour or 2 hours based on wall assembly penetrated.
3. Type of Fill Materials: As required to achieve rating.
4. The following types and sizes of penetrations may be used:

a. Cable Tray — Max 24 in. (610 mm) wide by 4 in. (102 mm) deep open-ladder cable tray with channel-shaped side rails formed of 0.10 (2.54 mm) thick aluminum and 1-1/2 in. (38 mm) wide by 1 in. (25 mm) channel shaped rungs spaced on 9 in. (229 mm) OC. The annular space between cable tray and periphery of opening shall be min 0 in. (point contact) to max 5 in. (127 mm). Cable tray to be rigidly supported on both sides of wall assembly.
b. Cables — Aggregate cross-sectional area of cables in cable tray to be max 45 percent of the cross-sectional area of the cable tray. Any combination of the following types and sizes of copper conductor cables may be used:

1) Max 300 pair No. 24 AWG telephone cable with polyvinyl chloride (PVC) insulation and jacket.
2) Max 500 kcmil single conductor copper power cable with PVC jacket material.
3) Multiple fiber optical communication cable jacketed with PVC and having a max OD of 3/8 in. (9 mm).
4) Max 3/C No. 12 AWG copper conductor steel clad cable with PVC insulation material.

I. Firestopping for Cable Trays with Electric Cables in fire rated framed walls:

1. UL-Classified Systems: W-L-4011.
2. F-Rating: 1 hour or 2 hours based on wall assembly penetrated.
3. Type of Fill Materials: As required to achieve rating.
4. The following types and sizes of penetrations may be used:

a. Cable Tray — Max 24 in. (610 mm) wide by max 6 in. (152 mm) deep open-ladder or solid-back cable tray with channel-shaped side rails formed of 0.10 in. (2.54 mm) thick aluminum or 0.060 in. (1.54 mm) thick steel and with 1-1/2 in. (38 mm) wide by 1 in. (25 mm) channel shape rungs spaced 9 in. (229 mm) OC or a 0.029 in. (0.74 mm) thick steel solid back, respectively. The annular space between the cable tray and the periphery of the opening shall be min 0 in. (point contact) to max 4 in. (102 mm). Cable tray to be rigidly supported on both sides of floor or wall assembly.
b. Cables — Aggregate cross-sectional area of cables in cable tray to be max 45 percent of the cross-sectional area of the cable tray based on a max 5 in. (127 mm) cable loading depth. Any combination of the following types and sizes of copper conductor cables may be used:

1) 1/C, 750 kcmil (or smaller) power cable with EPR insulation and PVC jacket.
2) 300 pair — No. 24 AWG cable with PVC insulation and jacket
3) Twenty-four fiberoptic cable with PVC subunit and jacket.
4) Max three 1/C, No. 12 AWG wire, insulated with polyvinyl chloride, in a nom 3/4 in. (19 mm) Flexible Metal Conduit.

J. Firestopping for Electrical Metallic Tubing in fire rated framed wall assemblies:

1. UL-Classified Systems: W-L-2075.
2. F-Rating: 1 hour or 2 hours.
3. Type of Fill Materials: As required to achieve rating.
4. The following types and sizes of penetrations may be used:

a. Electrical Nonmetallic Tubing — Nom 2 in. diam (or smaller) corrugated wall electrical nonmetallic tubing (ENT) constructed of polyvinyl chloride (PVC). Tubing to be rigidly supported on both sides of wall assembly. A nom annular space of 3/4 in. is required within the firestop system

END OF SECTION 078413

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. Urethane joint sealants.
3. Latex joint sealants.

B. Related Sections:

1. Section 018113 “Sustainable Design Requirements” for general Project LEED requirements and for additional LEED requirements specifically applicable to this Section.
2. Section 042000 “Unit Masonry”.
3. Section 084113 “Aluminum Framed Entrances and Storefronts”.
4. Section 084413 “Glazed Aluminum Curtain Wall”.
5. Section 085113 “Aluminum Windows”.
6. Section 092900 “Gypsum Board”.
7. Section 123216 “Manufactured Plastic-Laminate Faced Casework”.

1.3 CONTRACTOR’S PRECONSTRUCTION TESTING

A. Preconstruction Compatibility and Adhesion Testing: Submit to joint-sealant manufacturers, for testing indicated below, samples of materials that will contact or affect joint sealants.

1. Use manufacturer’s standard test method to determine whether priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of joint sealants to joint substrates.
2. Submit pieces of each kind of material, including joint substrates, shims, joint-sealant backings, secondary seals, and miscellaneous materials.
3. Schedule sufficient time for testing and analyzing results to prevent delaying the Work.
4. For materials failing tests, obtain joint-sealant manufacturer's written instructions for corrective measures including use of specially formulated primers.
5. Testing will not be required if joint-sealant manufacturers submit joint preparation data that are based on previous testing, not older than 24 months, of sealant products for adhesion to, and compatibility with, joint substrates and other materials matching those submitted.

B. Preconstruction Field-Adhesion Testing: Before installing sealants, field test their adhesion to Project joint substrates as follows:

1. Locate test joints as directed by Architect.
2. Conduct field tests for each application indicated below:

    a. Each kind of sealant and joint substrate indicated.

3. Notify Architect seven days in advance of dates and times when test joints will be erected.
4. Arrange for tests to take place with joint-sealant manufacturer's technical representative present.

    a. Test Method: Test joint sealants according to Method A, Field-Applied Sealant Joint Hand Pull Tab, in Appendix X1 in ASTM C 1193 or Method A, Tail Procedure, in ASTM C 1521.

        1) For joints with dissimilar substrates, verify adhesion to each substrate separately; extend cut along one side, verifying adhesion to opposite side. Repeat procedure for opposite side.

5. Report whether sealant failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each kind of product and joint substrate. For sealants that fail adhesively, retest until satisfactory adhesion is obtained.
6. Evaluation of Preconstruction Field-Adhesion-Test Results: Sealants not evidencing adhesive failure from testing, in absence of other indications of noncompliance with requirements, will be considered satisfactory. Do not use sealants that fail to adhere to joint substrates during testing.

1.4 ACTION SUBMITTALS

A. Product Data: For each joint-sealant product indicated.

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. Samples for Verification: For each kind and color of joint sealant required, provide Samples with joint sealants in 1/2-inch- wide joints formed between two 6-inch- long strips of material matching the appearance of exposed surfaces adjacent to joint sealants.

D. Joint-Sealant Schedule: Include the following information:

1. Joint-sealant application, joint location, and designation.
2. Joint-sealant manufacturer and product name.
3. Joint-sealant formulation.
4. Joint-sealant color.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified installer.

B. Product Certificates: For each kind of joint sealant and accessory, from manufacturer.

C. Sealant, Waterproofing, and Restoration Institute (SWRI) Validation Certificate: For each sealant specified to be validated by SWRI's Sealant Validation Program.

D. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, indicating that sealants comply with requirements.

E. Preconstruction Compatibility and Adhesion Test Reports: From sealant manufacturer, indicating the following:

1. Materials forming joint substrates and joint-sealant backings have been tested for compatibility and adhesion with joint sealants.
2. Interpretation of test results and written recommendations for primers and substrate preparation needed for adhesion.

F. Preconstruction Field-Adhesion Test Reports: Indicate which sealants and joint preparation methods resulted in optimum adhesion to joint substrates based on testing specified in "Preconstruction Testing" Article.

G. Field-Adhesion Test Reports: For each sealant application tested.

H. Warranties: Sample of special warranties.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.

B. Source Limitations: Obtain each kind of joint sealant from single source from single manufacturer.

C. Product Testing: Test joint sealants using a qualified testing agency.

1. Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1021 to conduct the testing indicated.
2. Test according to SWRI's Sealant Validation Program for compliance with requirements specified by reference to ASTM C 920 for adhesion and cohesion under cyclic movement, adhesion-in-peel, and indentation hardness.

D. 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.

E. Pre-Installation Conference: Conduct conference at Project site.

1.7 PROJECT 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 or are below 40 deg F.
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.

1.8 WARRANTY

A. Special Installer's Warranty: Manufacturer's standard form in which Installer agrees to repair or replace joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.

1. Warranty Period: Two years from date of Substantial Completion.

B. Special Manufacturer's Warranty: Manufacturer's standard form in which joint-sealant manufacturer agrees to furnish joint sealants to repair or replace those that do not comply with performance and other requirements specified in this Section within specified warranty period.

1. Warranty Period: Five years from date of Substantial Completion.

C. Special warranties specified in this article exclude deterioration or failure of joint sealants from the following:

1. Movement of the structure caused by structural settlement or errors attributable to design or construction resulting in stresses on the sealant exceeding sealant manufacturer's written specifications for sealant elongation and compression.
2. Disintegration of joint substrates from natural 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 MATERIALS, 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. VOC Content of Interior Sealants: Provide sealants and sealant primers for use inside the weatherproofing system that comply with the following limits for VOC content when calculated according to 40 CFR 59, Part 59, Subpart D (EPA Method 24):

1. Architectural Sealants: 250 g/L.
2. Sealant Primers for Nonporous Substrates: 250 g/L.
3. Sealant Primers for Porous Substrates: 775 g/L.

C. Stain-Test-Response Characteristics: Where sealants are specified to be nonstaining to porous substrates, provide products that have undergone testing according to ASTM C 1248 and have not stained porous joint substrates indicated for Project.

D. Suitability for Contact with Food: Where sealants are indicated for joints that will come in repeated contact with food, provide products that comply with 21 CFR 177.2600.

E. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range.

2.2 SILICONE JOINT SEALANTS

A. Mildew-Resistant, Single-Component, Nonsag, Neutral- or Acid-Curing Silicone Joint Sealant: ASTM C 920, Type S, Grade NS, Class 25, for Use NT.

1. Applications: Interior joints of:

   a. Non-porous surfaces in area of moisture and high humidity including toilet rooms, showers and kitchens;
   b. Countertops that have sinks.

2. Products: Subject to compliance with requirements, provide one of the following:

   a. BASF Building Systems: Omniplus.
   b. Dow Corning Corporation; 786 Mildew Resistant.
   c. GE Advance Materials – Silicones; Sanitary SCS1700.
   d. May National Associates, Inc.; Bondaflex Sil 100 WF.
   e. Pecora Corporation; 898.
   f. Tremco Incorporated; Tremsil 200 sanitary.

2.3 URETHANE JOINT SEALANTS

A. Multicomponent, Nonsag, Urethane Joint Sealant: ASTM C 920, Type M, Grade NS, Class 50 for Use NT.

1. Applications:

   a. Interior joints in vertical and overhead surfaces including;

      1) Control joints on exposed interior surfaces of exterior walls;
      2) Perimeter joints of exterior openings;
      3) Control joints on exposed unit masonry walls.

   b. Exterior joints in vertical and overhead surfaces including:

      1) Control joints in unit masonry;

2) Window, door frame, storefront, curtainwall, and louver perimeter joints (both interior and exterior side of opening).
3) All other exterior non-traffic joints not include otherwise.

2. Products: Subject to compliance with requirements, provide one of the following:

a. Pecora Corporation; Dynatrol II.
b. Polymeric Systems, Inc.; PSI-270.
c. Tremco Incorporated; Dymeric 240 FC.

3. Color Selection Range: Standard or custom colors providing minimum wide-range selection from at least 50 choices.

2.4 LATEX JOINT SEALANTS

A. Latex Joint Sealant: Acrylic latex or siliconized acrylic latex, ASTM C 834, Type OP, Grade NF.

1. Applications:

a. Interior vertical and overhead surfaces at perimeter of wall surfaces and frames of interior doors and borrowed lights.
b. Perimeter of gypsum board surfaces where they abut another material.
c. All other interior nontraffic joints not included otherwise.

2. Products: Subject to compliance with requirements, provide one of the following:

a. BASF Building Systems; Sonolac.
b. Bostik, Inc.; Chem-Calk 600.
c. Pecora Corporation; AC-20+.
d. Tremco Incorporated; Tremflex 834.

2.5 SOLVENT-RELEASE-CURING JOINT SEALANTS

A. Butyl-Rubber-Based Joint Sealant: ASTM C 1311.

1. Applications:

a. Bedding thresholds to concrete at exterior door locations.

2. Products: Subject to compliance with requirements, provide one of the following:

a. Bostik, Inc.; Chem-Calk 300.
b. Pecora Corporation; BC-158.
c. Tremco Incorporation; Tremco Butyl Sealant.

2.6 ACOUSTICAL JOINT SEALANTS

A. Acoustical Joint Sealant: Manufacturer's standard nonsag, paintable, nonstaining latex sealant complying with ASTM C 834. Product effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.

B. Applications:

1. Perimeter joints of gypsum board partitions indicated to have sound-reduction properties or containing sound attenuation blankets.
2. Electric boxes and other penetrations of gypsum board in partitions indicated to have sound-reduction properties or containing sound attenuations blankets.

C. Products: Subject to compliance with requirements, provide one of the following:

1. Auralex Acoustics; Auralex StopGap Acoustical Sealant.
2. Pecora Corporation; AIS-919.
3. USG Corporation; SHEETROCK Acoustical Sealant.

2.7 JOINT SEALANT BACKING

A. General: Provide sealant backings of material that are nonstaining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.

B. Cylindrical Sealant Backings: ASTM C 1330, as approved in writing by joint-sealant manufacturer for joint application indicated], and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.

C. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint. Provide self-adhesive tape where applicable.

2.8 MISCELLANEOUS MATERIALS

A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.

B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.

C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

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 joint-sealant performance.

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

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

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 Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified in subparagraphs below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.

1. Remove excess sealant from surfaces adjacent to joints.
2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
3. Provide concave joint profile per Figure 8A in ASTM C 1193, unless otherwise indicated.

G. Acoustical Sealant Installation: At sound-rated assemblies and elsewhere as indicated, seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C 919 and with manufacturer's written recommendations.

3.4 FIELD QUALITY CONTROL

A. Field-Adhesion Testing: Field test joint-sealant adhesion to joint substrates as follows:

1. Test Method: Test joint sealants according to Method A, Field-Applied Sealant Joint Hand Pull Tab, in Appendix X1 in ASTM C 1193 or Method A, Tail Procedure, in ASTM C 1521.

    a. For joints with dissimilar substrates, verify adhesion to each substrate separately; extend cut along one side, verifying adhesion to opposite side. Repeat procedure for opposite side.

2. Inspect tested joints and report on the following:

    a. Whether sealants filled joint cavities and are free of voids.
    b. Whether sealant dimensions and configurations comply with specified requirements.
    c. Whether sealants in joints connected to pulled-out portion failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each kind of product and joint substrate. Compare these results to determine if adhesion passes sealant manufacturer's field-adhesion hand-pull test criteria.

3. Record test results in a field-adhesion-test log. Include dates when sealants were installed, names of persons who installed sealants, test dates, test locations, whether joints were primed, adhesion results and percent elongations, sealant fill, sealant configuration, and sealant dimensions.
4. Repair sealants pulled from test area by applying new sealants following same procedures used originally to seal joints. Ensure that original sealant surfaces are clean and that new sealant contacts original sealant.

B. Evaluation of Field-Adhesion Test Results: Sealants not evidencing adhesive failure from testing or noncompliance with other indicated requirements will be considered satisfactory. Remove sealants that fail to adhere to joint substrates during testing or to comply with other requirements. Retest failed applications until test results prove sealants comply with indicated requirements.

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 Contract Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from original work.

END OF SECTION 079200

SECTION 079500 - EXPANSION CONTROL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Special Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Interior expansion control systems.

1.3 DEFINITIONS

A. Maximum Joint Width: Widest linear gap a joint system tolerates and in which it performs its designed function without damaging its functional capabilities.

B. Minimum Joint Width: Narrowest linear gap a joint system tolerates and in which it performs its designed function without damaging its functional capabilities.

C. Movement Capability: Value obtained from the difference between widest and narrowest widths of a joint opening typically expressed in numerical values (mm or inches) or a percentage (plus or minus) of nominal value of joint width.

D. Nominal Joint Width: The width of the linear opening specified in practice and in which the joint system is installed.

1.4 ACTION SUBMITTALS

A. Product Literature: For all products included in this Section.

B. Shop Drawings: For each expansion control system specified. Include plans, elevations, sections, details, splices, blockout requirement, attachments to other work, and line diagrams showing entire route of each expansion control system. Where expansion control systems change planes, provide isometric or clearly detailed drawing depicting how components interconnect.

C. Product Schedule: Prepared by or under the supervision of the supplier. Include the following information in tabular form:

1. Manufacturer and model number for each expansion control system.
2. Expansion control system location cross-referenced to Drawings.
3. Nominal joint width.
4. Movement capability.
5. Materials, colors, and finishes.

6. Product options.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: An employer of workers trained and approved by manufacturer.

B. Source Limitations: Obtain interior architectural joint systems through one source from a single manufacturer.

C. Accessibility Requirements: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA), Accessibility Guidelines (ADAAG)".

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

A. General: Provide architectural joint systems of design, basic profile, materials, and operation indicated. Provide units with capability to accommodate variations in adjacent surfaces.

1. Furnish units in longest practicable lengths to minimize field splicing. Install with hairline mitered corners where joint changes direction or abuts other materials.
2. Include factory-fabricated closure materials and transition pieces, tee-joints, corners, curbs, cross-connections, and other accessories as required to provide continuous joint systems.

B. Design architectural joint systems for the following size and movement characteristics:

1. Nominal Joint Width: As indicated on Drawings.
2. Movement Capability: Plus or minus 50 percent minimum.

2.2 MATERIALS

A. Aluminum: ASTM B 221, Alloy 6063-T5 for extrusions; ASTM B 209, Alloy 6061-T6 for sheet and plate.

1. Apply manufacturer's standard protective coating on aluminum surfaces to be placed in contact with cementitious materials.
2. Class I, Clear Anodic Finish: AA-M12C22A41 (Mechanical Finish: nonspecular as fabricated; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class I, clear coating 0.018 mm or thicker) complying with AAMA 611.

B. Elastomeric Seals: Preformed elastomeric membranes or extrusions to be installed in metal frames.

C. Cellular Foam Seals: Extruded, compressible foam designed to function under compression.

D. Compression Seals: ASTM E 1612; preformed rectangular elastomeric extrusions having

internal baffle system and designed to function under compression.

E. Strip Seals: ASTM E 1783; preformed elastomeric membrane or tubular extrusions having an internal baffle system and secured in or over a joint by a metal locking rail.

F. Moisture Barrier: Flexible elastomeric material, EPDM, minimum 45 mils thick.

G. Accessories: Manufacturer's standard anchors, clips, fasteners, set screws, spacers, and other accessories compatible with material in contact, as indicated or required for complete installations.

2.3 ARCHITECTURAL JOINT SYSTEMS FOR BUILDING INTERIORS

A. Manufactures: Subject to compliance with requirements provide the products one of the following:

1. Balco, Inc.
2. JointMaster/InPro Corporation.
3. MM Systems Corporation.

B. Types of covers required: Details on the drawings are intended as diagrammatic representations and may not include every condition of expansion joint / joint cover necessary. Provide joint system with appropriate accessories where insulation (thermal envelope maintenance), water-stopping, or firestopping is required in the joint assembly.

C. Floor-to-Floor Joint System :

1. Balco, Inc.; NBR-2X18 with moisture barrier.
2. JointMaster/InPro Corporation; 222/223-A01-050 with moisture barrier.
3. MM Systems Corporation; FDT-200 with moisture barrier.
4. *Watson Bowman Acme; NBS-200 with moisture barrier (Addendum #2, Item #A-1).*

D. Wall Corner Joint System :

1. Balco, Inc.; 6TWC-2.
2. JointMaster/InPro Corporation; 300-A09-050.
3. MM Systems Corporation; FX-L 2-.5.

E. Floor-to-Wall Joint Systems

1. Balco, Inc.; NBRL-2x18 with moisture barrier.
2. JointMaster/InPro Corporation; 222/223-A02-050 with moisture barrier.
3. MM Systems Corporation; FDTE-200 with moisture barrier.

2.4 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.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine surfaces and blockouts where architectural joint systems will be installed for installation tolerances and other conditions affecting performance of work. Proceed with installation only after unsatisfactory conditions have been corrected.

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

3.2 PREPARATION

A. Prepare substrates according to architectural joint system manufacturer's written instructions.

B. Coordinate and furnish anchorages, setting drawings, and instructions for installing joint systems. Provide fasteners of metal, type, and size to suit type of construction indicated and to provide for secure attachment of joint systems.

3.3 ADVANCE COORDINATION

A. Provide block-out in floor slabs of size necessary for later installation of frames and anchors of floor expansion joints. When installing, coat concrete surfaces with bonding agent and fill with non-shrink epoxy grout or cement

3.4 INSTALLATION

A. Comply with manufacturer's written instructions for storing, handling, and installing architectural joint assemblies and materials unless more stringent requirements are indicated.

B. Metal Frames: Perform cutting, drilling, and fitting required to install expansion control systems.

1. Install in true alignment and proper relationship to joints and adjoining finished surfaces measured from established lines and levels.
2. Adjust for differences between actual structural gap and nominal design gap due to ambient temperature at time of installation. Notify Architect where discrepancies occur that will affect proper expansion control system installation and performance.
3. Cut and fit ends to accommodate thermal expansion and contraction of metal without buckling of frames.
4. Install frames in continuous contact with adjacent surfaces.

    a. Spot shimming is not permitted. If shimming is necessary to adjust top of frame

and plate with top plane of finished flooring, use continuous strips of hard plastic or fiberglass shims designed for shimming purposes.

5. Coat concrete surfaces of blockout, and frame, with bonding agent and fill with non-shrink epoxy grout or cement.

   a. Vibrate or force grout under any remaining gaps between the expansion joint frame and its bearing surface.

6. Locate anchors at interval recommended by manufacturer, but not less than 3 inches from each end and not more than 24 inches o.c.

C. Seals in Metal Frames: Install elastomeric seals and membranes in frames to comply with manufacturer's written instructions. Install with minimum number of end joints.

1. Provide in continuous lengths for straight sections.
2. Seal transitions according to manufacturer's written instructions. Vulcanize or heat-weld field-spliced joints as recommended by manufacturer.
3. Installation: Mechanically lock seals into frames or adhere to frames with adhesive or pressure-sensitive tape as recommended by manufacturer.

D. Terminate exposed ends of joint assemblies with field- or factory-fabricated termination devices.

E. Water Barrier: Provide water barrier at interior floor joints. Provide drainage fittings at a maximum of 50 feet or where indicated.

3.5 PROTECTION

A. Do not remove protective covering until finish work in adjacent areas is complete. When protective covering is removed, clean exposed metal surfaces to comply with manufacturer's written instructions.

B. Protect the installation from damage by work of other Sections. Where necessary due to heavy construction traffic, remove and properly store cover plates or seals and install temporary protection over joints. Reinstall cover plates or seals prior to Substantial Completion of the Work.

END OF SECTION 079500

SECTION 081113 – HOLLOW METAL FRAMES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Standard hollow metal frames.
2. Standard hollow metal borrowed lights.
3. Standard hollow metal door frames with integral electric conduit/wiring pathways (E-frames).

B. Related Sections:

1. Section 042000 "Unit Masonry" for embedding anchors for hollow metal work into masonry construction.
2. Section 081415 “Flush Wood Doors” for wood doors installed in hollow metal frames.
3. Section 088000 “Glazing” for glass in borrow lights.
4. Section 087100 "Door Hardware".

1.3 DEFINITIONS

A. Minimum Thickness: Minimum thickness of base metal without coatings.

B. Standard Hollow Metal Work: Hollow metal work fabricated according to ANSI/SDI A250.8.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, core descriptions, fire-resistance rating, and finishes.

B. Shop Drawings: Include the following:

1. Elevations of each frame design.
2. Individual details of each differing E-Frame configuration.

    a. Include details of conduit, boxes, and preparations for power, signal, and control systems.

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 anchorages, joints, field splices, and connections.
7. Details of accessories.
8. Details of moldings, removable stops, and glazing.
9. Schedule: Provide a schedule of hollow metal work prepared by or under the supervision of supplier, using same reference numbers for details and openings as those on Drawings. Coordinate with door hardware schedule.

1.5 QUALITY ASSURANCE

A. Source Limitations: Obtain hollow metal work from single source from single manufacturer.

B. Fire-Rated Door Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at positive pressure according to NFPA 252.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver hollow metal work palletized, wrapped, or crated to provide protection during transit and Project-site storage. Do not use nonvented plastic.

B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.

C. Store hollow metal work under cover at Project site. Place in stacks of five units maximum in a vertical position with heads up, spaced by blocking, on minimum 4-inch- high wood blocking. Do not store in a manner that traps excess humidity.

1. Provide minimum 1/4-inch space between each stacked door to permit air circulation.

1.7 COORDINATION

A. Coordinate installation of anchorages for hollow metal frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors. Deliver such items to Project site in time for installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

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

1. Black Mountain Door
2. Ceco Door Products; an Assa Abloy Group company.
3. Curries Company; an Assa Abloy Group company.
4. Daybar Industries, Inc.
5. Republic Door and Frames.
6. Steelcraft; an Ingersoll-Rand company.

7. Pioneer Industries, Inc.
8. Metal Products, Inc.

2.2 REGULATORY REQUIREMENTS

A. Fire-Rated 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 at positive pressure according to UL 10C.

2.3 MATERIALS

A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

B. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B; suitable for exposed applications.

C. Frame Anchors: ASTM A 591/A 591M, Commercial Steel (CS), 40Z coating designation; mill phosphatized.

1. For anchors built into exterior walls, steel sheet complying with ASTM A 1008/A 1008M or ASTM A 1011/A 1011M, hot-dip galvanized according to ASTM A 153/A 153M, Class B.

D. Inserts, Bolts, and Fasteners: Hot-dip galvanized according to ASTM A 153/A 153M.

E. Powder-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. Grout: ASTM C 476, except with a maximum slump of 4 inches, as measured according to ASTM C 143/C 143M.

G. Mineral-Fiber Insulation: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers manufactured from slag or rock wool with 6- to 12-lb/cu. ft. density; with maximum flame-spread and smoke-development indexes of 25 and 50, respectively; passing ASTM E 136 for combustion characteristics.

H. Bituminous Coating: Cold-applied asphalt mastic, SSPC-Paint 12, compounded for 15-mil dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.

2.4 E-FRAME REQUIREMENTS

A. Special shop-performed frame preparation is required for openings that have electric hardware, technology devices or security devices. These frames are defined as “E-Frames”. Reference door hardware schedule for doors that require power.

B. E-Frames: Fabricate all hollow metal frames, and designated interior hollow metal frames, with integrated electrical junction boxes, conduit / wiring pathways.

1. Conduit shall be ½" diameter conduit to connect between junction boxes. PVC conduit may be used if desired to assist in tight-bend conditions. Provide nylon pull string through all conduit between all junction boxes.
2. Fabricate all electrical junction boxes with knockouts on each face of each junction box cover plate for field connection of electrical conduit by electrician.
3. All components shall be securely fastened to the frame and placed to not inhibit correct placement and installation of the frame. Provide specialty jamb anchors if necessary.
4. Provide frame opening access to all junction boxes and provide flush cover plate and screws at each.

C. Coordination with Hardware and Equipment: Back-box sizes and locations indicated in the drawing E-frame details are developed from individual manufacturer product information and may not conform to space and location requirements of the specific products to be used in this Project. Frame fabricator shall:

1. Obtain specific product information for all electric door hardware and devices to be used at each opening. This includes but is not limited to electric strikes, power transfers, door operators, magnetic locks, and door position switches.

    a. Verify that information gives specific frame-location requirements.
    b. Verify that information gives specific mounting screw locations and requirements, cover-plate information and other provisions needed for attachment.
    c. Verify that information includes specific physical dimensions.

2. Prepare shop drawings that show frames with back-boxes of appropriate length, width and depth and proper location, connecting conduit of appropriate size, and lead-out conduit of appropriate location, size and length.

    a. Boxes must accommodate space required to make wiring connections.
    b. Prepare a separate frame detail and designation for each differing configuration of E-Frame components.

3. Fabricate frames after satisfactory review of shop drawings. For devices where a physical sample was received, perform a trial-test installation in the first-completed frame to ensure devices fit and can be properly installed.

2.5 STANDARD HOLLOW METAL FRAMES

A. General: Comply with ANSI/SDI A250.8 and with details indicated for type and profile.

B. Interior Frames: Fabricated from cold-rolled steel sheet.

1. Fabricate frames with mitered or coped corners.
2. Fabricate frames as full profile welded unless otherwise indicated.
3. Frames: 0.053-inch- thick steel sheet.
4. Provide extra stops to receive 5/8" operable integral horizontal blinds at all interior borrowed lights, where indicated..

C. Hardware Reinforcement: Fabricate according to ANSI/SDI A250.6 with reinforcement plates from same material as frames.

2.6 FRAME ANCHORS

A. Jamb Anchors:

1. Masonry Type: Adjustable strap-and-stirrup or T-shaped anchors to suit frame size, not less than 0.042 inch thick, with corrugated or perforated straps not less than 2 inches wide by 10 inches long; or wire anchors not less than 0.177 inch thick.
2. Stud-Wall Type: Designed to engage stud, welded to back of frames; not less than 0.042 inch thick.

B. Floor Anchors: Formed from same material as frames, not less than 0.042 inch thick, and as follows:

1. Monolithic Concrete Slabs: Clip-type anchors, with two holes to receive fasteners.
2. Separate Topping Concrete Slabs: Adjustable-type anchors with extension clips, allowing not less than 2-inch height adjustment. Terminate bottom of frames at finish floor surface.

2.7 STOPS AND MOLDINGS

A. Fixed Frame Moldings: Formed integral with hollow metal frames, a minimum of 5/8 inch high unless otherwise indicated.

B. Loose Stops for Glazed Lights in Frames: Minimum 0.032 inch thick, fabricated from same material as frames in which they are installed.

C. Terminated Stops: Where indicated on interior door frames, terminate stops 6 inches above finish floor 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.

2.8 ACCESSORIES

A. Mullions and Transom Bars: Join to adjacent members by welding or rigid mechanical anchors.

B. Grout Guards: Formed from same material as frames, not less than 0.016 inch thick.

2.9 FABRICATION

A. Fabricate hollow metal work to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for thickness of metal. Where practical, fit and assemble units in manufacturer's plant. To ensure proper assembly at Project site, clearly identify work that cannot be permanently factory assembled before shipment.

B. Hollow Metal Frames: Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of same thickness metal as frames.

1. Welded Frames: Weld flush face joints continuously; grind, fill, dress, and make smooth, flush, and invisible.
2. Provide closed tubular members with no visible face seams or joints, fabricated from same material as door frame. Fasten members at crossings and to jambs by butt welding.
3. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.
4. Grout Guards: Weld guards to frame at back of hardware mortises in frames to be grouted.
5. Floor Anchors: Weld anchors to bottom of jambs and mullions with at least four spot welds per anchor.
6. Jamb Anchors: Provide number and spacing of anchors as follows:

    a. Masonry Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:

        1) Two anchors per jamb up to 60 inches high.
        2) Three anchors per jamb from 60 to 90 inches high.
        3) Four anchors per jamb from 90 to 120 inches high.
        4) Four anchors per jamb plus 1 additional anchor per jamb for each 24 inches or fraction thereof above 120 inches high.

    b. Stud-Wall Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:

        1) Three anchors per jamb up to 60 inches high.
        2) Four anchors per jamb from 60 to 90 inches high.
        3) Five anchors per jamb from 90 to 96 inches high.
        4) Five anchors per jamb plus 1 additional anchor per jamb for each 24 inches or fraction thereof above 96 inches high.
        5) Two anchors per head for frames above 42 inches wide and mounted in metal-stud partitions.

7. Door Silencers: Except on weather-stripped doors, 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.

8. Integrated electrical junction boxes, conduit / wiring pathways for hollow metal E-frames shall be fully assembled in the factory and provided with nylon pull string through all conduit between all junction boxes.

C. Fabricate concealed stiffeners, edge channels, and hardware reinforcement from either cold- or hot-rolled steel sheet.

D. Hardware Preparation: Factory prepare hollow metal work to receive templated mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping according to the Door Hardware Schedule and templates furnished as specified in Division 08 Section "Door Hardware."

1. Locate hardware as indicated, or if not indicated, according to ANSI/SDI A250.8.

2. Reinforce doors and frames to receive nontemplated, mortised and surface-mounted door hardware.
3. Comply with applicable requirements in ANSI/SDI A250.6 and ANSI/DHI A115 Series specifications for preparation of hollow metal work for hardware.
4. For all E-frames, shop-fit frames with conduit system providing internal boxes for wiring installation to all current or potential future electric hardware and door monitoring positions and include 'pigtail' conduit with the system of adequate length to extend 2-feet above the nearest accessible ceiling space.

    a. Note this is required whether or not the door is currently indicated to have electric hardware or security monitoring devices.

5. Coordinate locations of conduit and wiring boxes for electrical connections with Division 26 Sections.

E. Stops and Moldings: Provide stops and moldings around glazed lights where indicated. Form corners of stops and moldings with butted or mitered hairline joints.

1. Single Glazed Lights: Provide fixed stops and moldings welded on secure side of hollow metal work.
2. Provide fixed frame moldings on outside of exterior and on secure side of interior doors and frames.
3. Provide loose stops and moldings on inside of hollow metal work.
4. Coordinate rabbet width between fixed and removable stops with type of glazing and type of installation indicated.

2.10 STEEL FINISHES

A. Prime Finish: Apply manufacturer's standard primer immediately after cleaning and pretreating.

1. Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying with ANSI/SDI A250.10 acceptance criteria; recommended by primer manufacturer for substrate; compatible with substrate and field-applied coatings despite prolonged exposure.

PART 3 - EXECUTION

3.1 EXAMINATION

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

B. Examine roughing-in for embedded and built-in anchors to verify actual locations before frame installation.

C. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.

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

3.2 INSTALLATION

A. General: Install hollow metal work plumb, rigid, properly aligned, and securely fastened in place; comply with Drawings and manufacturer's written instructions.

B. Hollow Metal Frames: Install hollow metal frames of size and profile indicated. Comply with ANSI/SDI A250.11.

1. Set frames accurately in position, plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces, leaving surfaces smooth and undamaged.

    a. Coordinate frame installation with electrical and technologies contractors for connection of conduit to electrical junction boxes of all frames with integrated electrical conduit/wiring pathways.
    b. Place frames before construction of enclosing walls and ceilings.
    c. At fire-protection-rated openings, install frames according to NFPA 80.
    d. Install frames with removable glazing stops located on secure side of opening.
    e. Install door silencers in frames before grouting.
    f. Remove temporary braces necessary for installation only after frames have been properly set and secured.
    g. Check plumbness, squareness, and twist of frames as walls are constructed. Shim as necessary to comply with installation tolerances.
    h. Field apply bituminous coating to backs of frames that are filled with grout containing antifreezing agents.

2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and secure with postinstalled expansion anchors.

    a. Floor anchors may be set with powder-actuated fasteners instead of postinstalled expansion anchors if so indicated and approved on Shop Drawings.

3. Metal-Stud Partitions: Solidly pack mineral-fiber insulation behind frames.
4. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with grout.
5. Installation Tolerances: Adjust hollow metal door frames for squareness, alignment, twist, and plumb to the following tolerances:

    a. Squareness: Plus or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
    b. Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.
    c. Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
    d. Plumbness: Plus or minus 1/16 inch, measured at jambs at floor.

C. Glazing: Comply with installation requirements in Division 08 Section "Glazing" and with hollow metal manufacturer's written instructions.

1. Secure stops 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.

3.3 ADJUSTING AND CLEANING

A. Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including hollow metal work that is warped, bowed, or otherwise unacceptable.

B. Remove grout and other bonding material from hollow metal work immediately after installation.

C. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying, rust-inhibitive primer.

END OF SECTION 081113

SECTION 081416 – INTERIOR WOOD DOORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Solid-core doors with wood-veneer faces.
2. Factory finishing wood doors.
3. Factory fitting wood doors to frames and factory machining for hardware.

B. Related Sections:

1. Section 087100 “Door Hardware” for door hardware in flush wood doors.
2. Section 088000 “Glazing” for glass view panels in flush wood doors.

1.3 DEFINITIONS

A. Composite Wood: A product consisting of wood or plant particles or fibers bonded together by a synthetic resin or binder. Examples: plywood, particle-board, OSB, and MDF.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of door indicated. Include details of core and edge construction, louvers, and trim for openings. Include factory-finishing specifications.

B. Shop Drawings: Indicate location, size, and hand of each door; elevation of each kind of door; construction details not covered in Product Data; and other pertinent data.

1. Dimensions and locations of blocking.
2. Indicate dimensions and locations of mortises and holes for hardware.
3. Indicate dimensions and locations of cutouts.
4. Indicate requirements for veneer matching.
5. Indicate doors to be factory finished and finish requirements.
6. Indicate fire-protection ratings for fire-rated doors.
7. Undercuts.

C. Samples for Initial Selection: For factory-finished doors. Provide set of three samples showing typical range of color and grain to be expected in the finished work.

D. Samples for Verification:

1. Factory finishes applied to actual door face materials, approximately 8 by 10 inches, for each material and finish.
2. Corner sections of doors, approximately 8 by 10 inches, with door faces and edges representing actual materials to be used.

    a. Finish veneer-faced door samples with same materials proposed for factory-finished doors.

3. Frames for light openings, 6 inches long.

E. Warranty: Sample of special warranty.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: A qualified manufacturer that is certified for chain of custody by an FSC-accredited certification body.

B. Source Limitations: Obtain wood doors from single manufacturer.

C. Quality Standard: In addition to requirements specified, comply with AWI's "Architectural Woodwork Quality Standards Illustrated."

1. Provide AWI Quality Certification Labels or an AWI letter of licensing for Project indicating that doors comply with requirements of grades specified.
2. Provide WI-Certified Compliance Certificate indicating that doors comply with requirements of grades specified.
3. Provide WI-Certified Compliance Certificate for installation.

D. Fire-Rated Wood Doors: Doors complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at positive pressure according to 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.
2. Temperature-Rise Limit: At vertical exit enclosures and exit passageways, provide doors that have a maximum transmitted temperature end point of not more than 450 deg F above ambient after 30 minutes of standard fire-test exposure.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Comply with requirements of referenced standard and manufacturer's written instructions.

B. Package doors individually in plastic bags or cardboard cartons.

C. Mark each door with opening number used on Shop Drawings.

1.7 PROJECT 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 between 60 and 90 deg F and relative humidity between 43 and 70 percent during the remainder of the construction period.

1.8 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace doors that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Warping (bow, cup, or twist) more than 1/4 inch in a 42-by-84-inch section.
b. 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. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Algoma Hardwoods, Inc.
2. Eggers Industries.
3. Graham; an Assa Abloy Group company.
4. Marshfield Door Systems, Inc.
5. Mohawk Flush Doors, Inc.; a Masonite company.
6. VT Industries Inc.
7. Oshkosh Door Company.

2.2 DOOR CONSTRUCTION, GENERAL

A. Quality Standard: In addition to requirements specified, comply with WDMA I.S.1-A, “Architectural Wood Flush Doors.”

B. Low-Emitting Materials: Fabricate doors with adhesives and composite wood products that do not contain urea formaldehyde.

C. WDMA I.S.1-A Performance Grade: Extra Heavy Duty.

D. Particleboard-Core Doors:

1. Particleboard: ANSI A208.1, Grade LD-1, made with binder containing no urea-formaldehyde resin.
2. Blocking: Provide wood blocking in particleboard-core doors as needed to eliminate through-bolting hardware. as follows:

    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.

E. Fire-Protection-Rated Doors: Provide core specified or mineral core as needed to provide fire-protection rating indicated.

1. Edge Construction: Provide edge construction with intumescent seals concealed by outer stile. Comply with specified requirements for exposed edges.
2. Pairs: Provide fire-retardant stiles that are listed and labeled for applications indicated without formed-steel edges and astragals. Comply with specified requirements for exposed edges.
3. Pairs: Provide formed-steel edges and astragals.

    a. Finish steel edges and astragals with baked enamel.
    b. Finish steel edges and astragals to match door hardware (locksets or exit devices).

2.3 VENEERED-FACED DOORS

A. Interior Doors:

1. Grade: Premium, with Grade A faces.
2. Species: White oak.
3. Cut: Rotary cut.
4. Match between Veneer Leaves: Book or slip match.
5. Assembly of Veneer Leaves on Door Faces: Running match.
6. Exposed Vertical and Top Edges: Same species as faces.
7. Core: Particleboard, except half and full-glazed doors: structural composite lumber core.
8. Construction: Five plies. Stiles and rails are bonded to core, then entire unit abrasive planed before veneering. Faces are bonded to core using a hot press.
9. Construction: Five plies, either bonded or nonbonded construction.
10. WDMA I.S.1-A Performance Grade: Extra Heavy Duty.

B. Wood doors associated with electric hardware must be pre-wired or include conduit for field wiring of door by door hardware supplier.

2.4 FABRICATION

A. Factory fit doors to suit frame-opening sizes indicated. Comply with clearance requirements of referenced quality standard for fitting unless otherwise indicated.

1. Comply with requirements in NFPA 80 for fire-rated doors.

B. Factory machine doors for hardware that is not surface applied. Locate hardware to comply with DHI-WDHS-3. Comply with final hardware schedules, door frame Shop Drawings, DHI A115-W series standards, and hardware templates.

1. Coordinate with hardware mortises in metal frames to verify dimensions and alignment before factory machining.
2. Metal Astragals: Factory machine astragals and formed-steel edges for hardware for pairs of fire-rated doors.

C. Openings: Cut and trim openings through doors in factory.

1. Light Openings: Trim openings with moldings of material and profile indicated.
2. Glazing: Factory install glazing in doors indicated to be factory finished. Comply with applicable requirements in Division 08 Section "Glazing."

2.5 FACTORY FINISHING

A. General: Comply with referenced quality standard for factory finishing. Complete fabrication, including fitting doors for openings and machining for hardware that is not surface applied, before finishing.

1. Finish faces, all four edges, edges of cutouts, and mortises. Stains and fillers may be omitted on edges of cutouts, and mortises.

B. Site finish doors.

C. Finish:

1. Finish: To match C3 Armstrong Wood Veneer Ceiling Finish.
2. Staining: As selected by Architect from industry full range and custom finishes.
3. Effect: Filled finish.
4. Sheen: Satin.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine doors and installed door frames before hanging doors.

1. Verify that 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. Installation Instructions: Install doors to comply with manufacturer's written instructions and the referenced quality standard, and as indicated.

1. Install fire-rated doors in corresponding fire-rated frames according to NFPA 80.

C. Job-Fitted Doors: Align and fit doors in frames with uniform clearances and bevels as indicated below; do not trim stiles and rails in excess of limits set by manufacturer or permitted for fire-rated doors. Machine doors for hardware. Seal edges of doors, edges of cutouts, and mortises after fitting and machining.

1. Clearances: Provide 1/8 inch at heads, jambs, and between pairs of doors. Provide 1/8 inch from bottom of door to top of decorative floor finish or covering unless otherwise indicated. Where threshold is shown or scheduled, provide 1/4 inch from bottom of door to top of threshold unless otherwise indicated.

a. Comply with NFPA 80 for fire-rated doors.

2. Bevel non-fire-rated doors 1/8 inch in 2 inches at lock and hinge edges.
3. Bevel fire-rated doors 1/8 inch in 2 inches at lock edge; trim stiles and rails only to extent permitted by labeling agency.

D. 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 087100 - DOOR HARDWARE

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Commercial door hardware.
2. Cylinders for doors specified in other Sections.
3. Electrified door hardware.

1.2 SUBMITTALS

A. Product Data: For each product indicated.

B. Shop Drawings: Include details of electrified door hardware and wiring diagrams.

C. Samples: For each exposed finish.

D. Door Hardware Schedule: Organized into door hardware sets indicating type, style, function, size, label, hand, manufacturer, fasteners, location, and finish of each door hardware item. Include description of each electrified door hardware function, including sequence of operation.

E. Keying Schedule: Detail Owner's final keying instructions for locks.

F. Product certificates.

1.3 QUALITY ASSURANCE

A. Supplier Qualifications: Person who is or employs a qualified DHI Architectural Hardware Consultant.

B. Source Limitations: Obtain electrified door hardware from same manufacturer as mechanical door hardware, unless otherwise indicated. Manufacturers that are listed to perform electrical modifications, by a testing and inspecting agency acceptable to authorities having jurisdiction, are acceptable.

C. Keying Conference: Conduct conference at Project site. Incorporate keying conference decisions into final keying schedule.

D. Pre-Installation Conference: Conduct conference at Project site.

E. Keys: Deliver keys to Owner by registered mail.

F. Templates: Obtain and distribute templates for doors, frames, and other work specified to be factory prepared for installing door hardware.

G. Standards: Comply with BHMA A156 series standards, Grade 1.

H. Certified Products: Provide door hardware that is listed in BHMA directory of certified products.

1.4 STORM SHELTER REQUIREMENTS

A. Means of egress doors shall be operable from the inside without the use of keys, or special knowledge of effort.

B. Latching mechanisms shall be permanently mounted on the assembly. Such mechanisms shall require no tools to be engaged in the latched position. Devices such as pins shall be permanently secured to the assembly through the use of chains or wires which must be of corrosion resistant materials.

C. Multi-latching systems that are not categorized as means of egress/escape and are provided with more than one single-action latching mechanism shall be provided with permanently posted instructions on latching.

D. Door latching hardware necessary for the door assembly to perform as designed for the storm shelter shall either automatically engage when the door is in a closed position and shall not be capable of being disables, or be capable of being engaged by an occupant. Signage shall be provided with instructions for latching the door for emergency shelter use.

1.5 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of door hardware that fails in materials or workmanship within warranty period from date of Substantial Completion.

1. Warranty Period for Manual Closers: 10 years.
2. Warranty Period for Exit Devices: 3 years.
3. Warranty Period for Locks: 7 years.
4. All other hardware one year.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Product: Subject to compliance with requirements, provide the product named for each door hardware item indicated in Door Hardware Sets.

B. Basis-of-Design Product: Product named for each door hardware item indicated in Door Hardware Sets establishes the basis of design. Provide either the named product or a comparable product by one of the manufacturers specified for each type of hardware item.

C. Manufacturers Used in the specification:

Products	Manufacture Specified	Acceptable Equals
Hinges	Ives	Hager, Stanley
Continuous Hinges	Ives	Roton, Select
Locksets	Schlage	No substitutions
Card Readers/Keypads	Schlage Electronics	No substitutions
Exit Devices	Von Duprin 99 Series	No substitutions
Closers	LCN 4041XP MC	No substitutions
Overhead Stops	Glynn Johnson	Rixson, ABH
Push/Pulls, Stops	Ives	Hager, Rockwood
Flushbolts	Ives	Hager, Rockwood
Thresholds/Seals	National Guard	Hager, Pemko, Zero
Power Transfers/Supplies	Von Duprin	No substitutions
Auto. Operators	LCN	No substitutions
Wall Magnets	LCN	Rixson
Cylinders	Schlage	No substitutions
Flush Pulls	Rockwood	Hager, Ives

2.2 DOOR HARDWARE

A. Scheduled Door Hardware: Provide door hardware according to Door Hardware Sets . Manufacturers' names are abbreviated.

2.3 HINGES

A. General: Except for hinges and pivots to be installed entirely (both leaves) into wood doors and frames, provide only template-produced units.

B. Hinge Base Metal: Unless otherwise indicated, provide the following:

1. Interior Hinges: Steel, with steel pin.
2. Hinges for Fire-Rated Assemblies: Steel, with steel pin.

C. Non-removable Pins: Provide set screw in hinge barrel that prevents removal of pin while door is closed; for out-swinging exterior doors.

D. Screws: Phillips flat-head screws; screw heads finished to match surface of hinges.

E. Metal Doors and Frames: Machine screws (drilled and tapped holes).

2.4 MECHANICAL LOCKS

A. Cylindrical Locks:

1. Locks shall be ANSI A156.2, Series 4000 Grade 1 UL Listed for 3-hour doors. Manufactured from heavy gauge cold rolled steel mechanisms that are corrosion treated for normal conditions.
2. Locks to have standard 2-3/4” backset with a full 1/2" reversible dead latch. Thru-bolted mounting post for positive interlock to the door with concealed mounting screws.
3. Lever trim shall be pressure cast zinc to match finishes. The design specified, with 3-7/16” diameter roses. Trim shall be applied by “no exposed screws”.

2.5 BOLTS

A. Shall have forged bronze faceplate with extruded brass lever wrought brass guide and strike. Flush bolts for hollow metal doors shall be extension rod type door up to 7’6” in height shall have 12” steel or brass rods, manual flush bolts for doors over 7’6” in height shall be increased by 6” for each additional 6” of door height. Wood doors shall have corner-wrap type. Provide dust proof strikes for all bottom bolts.

2.6 EXIT DEVICES

A. Panic Exit Devices: Listed and labeled for panic protection, based on testing according to UL 305.

B. Fire Exit Devices: Complying with NFPA 80 that are listed and labeled for fire and panic protection, based on testing according to UL 305 and NFPA 252.

C. All lever design shall match mortise or cylindrical lock lever designs.

D. All devices to incorporate a security dead-latching feature. Provide roller strikes for all rim and surface mounted vertical rod devices, ASA strikes for mortise devices, and manufacturer’s standard strikes for concealed vertical rod devices.

2.7 CLOSERS

A. Surface-Mounted Closers:

B. Spring power shall be continuously adjustable over the full range of closer sizes, and allow for reduced opening force for the physically handicapped. Hydraulic regulation shall be by tamper-proof, non-critical valves. Closers shall have separate adjustment for latch speed, general speed, and back check.

C. All closers will not be seen on the public side or hallway side of the door. The appropriate drop plate or mounting plates will be used as conditions dictate.

2.8 PROTECTIVE TRIM UNITS

A. Protective Trim Units: Sized 2” inches less than door width on push side and 1” inch less than door width on pull side, by height scheduled or indicated. Fasten with exposed machine or self-tapping screws.

2.9 STOPS AND HOLDERS

A. Stops and Holders: Provide floor stops for doors, unless wall or other type stops are scheduled or indicated. Do not mount floor stops where they will impede traffic. Where floor or wall stops are not appropriate, provide overhead holders.

B. Silencers for Door Frames: Neoprene or rubber; fabricated for drilled-in application to frame.

2.10 DOOR GASKETING AND THRESHOLDS

A. Door Gasketing: Provide continuous weather-strip gasketing on exterior doors and provide smoke, light, or sound gasketing on interior doors where indicated or scheduled. Provide non-corrosive fasteners for exterior applications and elsewhere as indicated.

2.11 CYLINDERS, KEYING, AND STRIKES

A. Cylinders: Tumbler type, constructed from brass or bronze, stainless steel, or nickel silver.

B. Keying System: To owners existing Schlage ‘Primus’ key system as directed by owner at later date

2.12 FABRICATION

A. Base Metals: Furnish metals of a quality equal to or greater than that of specified door hardware units and BHMA A156.18 for finishes. Do not furnish manufacturer's standard materials if different from specified standard.

B. Fasteners: Phillips flat-head screws with finished heads to match surface of door hardware, unless otherwise indicated. Provide steel machine or wood screws or steel through bolts for fire-rated applications.

C. Spacers or Sex Bolts: For through bolting of hollow metal doors.

D. Fasteners for Wood Doors: Comply with requirements of DHI WDHS.2, "Recommended Fasteners for Wood Doors."

E. Finishes: Comply with BHMA A156.18.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Examine doors and frames for compliance with requirements for installation tolerances, labeled fire door assembly construction, wall and floor construction, and other conditions affecting performance. Examine roughing-in for electrical power systems to verify actual locations of wiring connections before electrified door hardware installation.

B. Steel Door and Frame Preparation: Comply with DHI A115 series. Drill and tap doors and frames for surface-applied hardware according to SDI 107.

C. Wood Door Preparation: Comply with DHI A115-W series.

D. Mounting Heights: Comply with the following requirements, unless otherwise indicated:

1. Standard Steel Doors and Frames: DHI's "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames."
2. Custom Steel Doors and Frames: DHI's "Recommended Locations for Builders' Hardware for Custom Steel Doors and Frames."
3. Wood Doors: DHI WDHS.3, "Recommended Locations for Architectural Hardware for Wood Flush Doors."

E. Adjust and reinforce attachment substrates as necessary for proper installation and operation. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors according to industry standards.

1. Thresholds: Set thresholds for exterior and acoustical doors in full bed of sealant complying with requirements specified in Division 7 Section "Joint Sealants."

F. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with accessibility requirements.

1. Door Closers: Adjust sweep period so that from an open position of 70 degrees, the door will take at least three seconds to move to a point 3 inches (75 mm) from the latch, measured to the leading edge of the door.

3.2 FIELD QUALITY CONTROL

A. Inspections: Owner will engage a qualified independent Architectural Hardware Consultant to perform inspections and to prepare inspection reports.

3.3 DOOR HARDWARE SETS

Hardware Group A

3	EA	HINGE	5BB1HW 4.5 X 4.5	652	IVE
1	EA	VANDL CLASSROOM SEC W/INSIDE INDICATOR	ND98TD RHO IS-CRS	626	SCH
2	EA	FSIC CORE	23-030 EV29 T	626	SCH
1	EA	WALL STOP/HOLDER	WS40	626	IVE
1	EA	SILENCER	SR64	GRY	IVE

Hardware Group B

3	EA	HINGE	5BB1HW 4.5 X 4.5	652	IVE
1	EA	PASSAGE LOCK	ND10S	626	SCH
1	EA	WALL STOP	WS406/407CCV	630	IVE

Hardware Group C

2	EA	HINGE	5BB1HW 4.5 X 4.5	652	IVE
1	EA	CYL X TURN DEAD LOCK	L460T L583-363	626	SCH
1	EA	FSIC CORE	23-030 EV C	626	SCH
1	EA	WALL STOP	WS406/407CCV	630	IVE

Hardware Group D

3	EA	HINGE	5BB1HW 4.5 X 4.5	652	IVE
1	EA	RIM CYLINDER	20-057 ICX	626	SCH
1	EA	FSIC CORE	23-030 EV29 T	626	SCH
1	EA	OH STOP	100S	630	GLY
1	EA	SURFACE CLOSER	4040XP REG OR PA AS REQ	689	LCN
1	EA	KICK PLATE	8400 8"X 2" LDW B-CS	630	IVE
3	EA	SILENCER	SR64	GRY	IVE

Hardware Group E

3	EA	HINGE	5BB1HW 4.5 X 4.5	652	IVE
1	EA	PULL PLATE	8305 4" X 16"	630	IVE
1	EA	PUSH PLATE	8200 4" X 16"	630	IVE
1	EA	SURFACE CLOSER	4040XP REG OR PA AS REQ MC	689	LCN
1	EA	KICK PLATE	8400 8" X 2" LDW B-CS	630	IVE
1	EA	MOP PLATE	8400 4" X 1½" LDW B-CS	630	IVE
1	EA	WALL STOP	WS406/407CCV	630	IVE

Hardware Group F

6	EA	HINGE	5BB1HW 4.5 X 4.5	652	IVE
1	EA	MANUAL FLUSH BOLT	FB458	626	IVE
1	EA	STOREROOM LOCK	ND80TD RHO	626	SCH
1	EA	FSIC CORE	23-030 EV C (0-BITTED)	626	SCH
2	EA	WALL STOP/HOLDER	WS40	626	IVE

Hardware Group G

3	EA	HINGE	5BB1HW 4.5 X 4.5	652	IVE
1	EA	PRIVACY LOCK	ND40S RHO	626	SCH
1	EA	SURFACE CLOSER	4040XP REG	689	LCN
1	EA	WALL STOP	WS406/407CCV	630	IVE

Hardware Group H

3	EA	HINGE	5BB1HW 4.5 X 4.5	652	IVE
1	EA	RIM HOUSING	20-079	626	SCH
1	EA	FSIC CORE	23-030 EV C	626	SCH
1	EA	KICK PLATE	8400 8" X 1" LDW B-CS	630	IVE
1	EA	WALL STOP/HOLDER	WS40	626	IVE

Hardware Group I

3	EA	HINGE	5BB1HW 4.5 X 4.5	652	IVE
1	EA	VANDL CLASSROOM SEC	ND98TD RHO IS-CRS	626	SCH
2	EA	FSIC CORE	23-030 EV29 T	626	SCH
1	EA	SURFACE CLOSER	4040XP REG OR PA AS REQ	689	LCN
1	EA	WALL STOP	WS406/407CCV	630	IVE
3	EA	SILENCER	SR64	GRY	IVE

Hardware Group J

3	EA	HINGE	5BB1HW 4.5 X 4.5	652	IVE
1	EA	STOREROOM LOCK	ND80TD RHO	626	SCH
1	EA	FSIC CORE	23-030 EV C	626	SCH
1	EA	MOP PLATE	8400 4" X 1" LDW B-CS	630	IVE
1	EA	WALL STOP	WS406/407CCV	630	IVE

Note! Key all Locksets into Owners existing system.

END OF SECTION 087100

SECTION 092216 - NON-STRUCTURAL METAL FRAMING

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. 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 092900 "Gypsum Board" for interior gypsum board.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

1.4 INFORMATIONAL SUBMITTALS

A. Product Certificates: For each type of code-compliance certification for studs and tracks.

B. Evaluation Reports: For embossed steel studs and tracks from ICC-ES or other qualified testing agency acceptable to authorities having jurisdiction.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Test-Response Characteristics: For fire-resistance-rated assemblies that incorporate non-load-bearing steel framing, provide materials and construction identical to those tested in assembly indicated, according to ASTM E 119 by an independent testing agency.

B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated on Drawings, according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.

C. Horizontal Deflection: For wall assemblies, limited to 1/360 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 metal unless otherwise indicated.
2. Protective Coating: G40 hot dip galvanized unless otherwise indicated.

B. Studs and Tracks: ASTM C 645. Use either steel studs and tracks or embossed steel studs and tracks.

1. Steel Studs and Tracks:

a. Minimum Base-Metal Thickness: (20 Gauge)
b. Depth: As indicated on Drawings.

2. Embossed Steel Studs and Tracks: Roll-formed and embossed with surface deformations to stiffen the framing members so that they are structurally equivalent to conventional ASTM C 645 steel studs and tracks.

a. Minimum Base-Metal Thickness: As required by horizontal deflection performance requirements
b. Depth: As indicated on Drawings.

C. Slip-Type Head Joints: Where indicated, provide the following:

1. Single Long-Leg Track System: ASTM C 645 top track with 2-inch- (51-mm-) deep flanges in thickness not less than indicated for studs, installed with studs' friction fit into top track and with continuous bridging located within 12 inches (305 mm) of the top of studs to provide lateral bracing.

D. Firestop Tracks: Top track manufactured to allow partition heads to expand and contract with movement of 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.

E. Cold-Rolled Channel Bridging: Steel, 0.0538-inch (1.367-mm) minimum base-metal thickness, with minimum 1/2-inch- (13-mm-) wide flanges.

1. Depth: 1-1/2 inches (38 mm)
2. Clip Angle: Not less than 1-1/2 by 1-1/2 inches (38 by 38 mm), 0.068-inch- (1.72-mm-) thick, galvanized steel.

F. Hat-Shaped, Rigid Furring Channels: ASTM C 645.

1. Minimum Base-Metal Thickness: 0.0329 inch (0.836 mm)]
2. Depth: As indicated on Drawings.

2.3 SUSPENSION SYSTEMS

A. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.062-inch- (1.59-mm-) diameter wire, or double strand of 0.048-inch- (1.21-mm-) diameter wire.

B. Wire Hangers: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.16 inch (4.12 mm) in diameter.

C. Grid Suspension System for Gypsum Board Ceilings: ASTM C 645, direct-hung system composed of main beams and cross-furring members that interlock.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Armstrong World Industries, Inc.; Drywall Grid Systems.
b. Chicago Metallic Corporation; Drywall Ceiling Suspension.
c. USG Corporation; Drywall Suspension System.

2.4 AUXILIARY MATERIALS

A. General: Provide auxiliary materials that comply with referenced installation standards.

1. Fasteners for Steel Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.

B. Isolation Strip at Exterior Walls: Provide one of the following:

1. Asphalt-Saturated Organic Felt: ASTM D 226/D 226M, Type I (No. 15 asphalt felt), nonperforated.
2. Foam Gasket: Adhesive-backed, closed-cell vinyl foam strips that allow fastener penetration without foam displacement, 1/8 inch (3.2 mm) thick, in width to suit steel stud size.

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.

1. Furnish concrete inserts and other devices indicated to other trades for installation in advance of time needed for coordination and construction.

B. Coordination with Sprayed Fire-Resistive Materials:

1. Before sprayed fire-resistive materials are applied, attach offset anchor plates or ceiling tracks to surfaces indicated to receive sprayed fire-resistive materials. Where offset anchor plates are required, provide continuous plates fastened to building structure not more than 24 inches (610 mm) o.c.
2. After sprayed fire-resistive materials are applied, remove them only to extent necessary for installation of non-load-bearing steel framing. Do not reduce thickness of fire-resistive materials below that are required for fire-resistance ratings indicated. Protect adjacent fire-resistive materials from damage.

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. Extend bracing to structure or solid walls

1. This requirement applies both to wingwall ends and to walls terminating above ceilings where framing does not extend to building structure above whether or not so detailed on the drawings.
2. Spacing for wall bracing: 48-inches on center maximum; stagger direction; avoid piping and ductwork.

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: 16 inches (406 mm) o.c. unless otherwise indicated.
2. Multilayer Application: 16 inches (406 mm) o.c. unless otherwise indicated.
3. Space framing for soffits and bulkheads 16-inches o.c. unless closer in indicated or required for conditions and loads.
4. Coordinate additional stud locations and wood blocking required for wall mounted items.

B. Where studs are installed directly against exterior masonry walls or dissimilar metals at exterior walls, install isolation strip between studs and exterior wall.

C. Install studs so flanges within framing system point in same direction.

D. Install tracks at floors and overhead supports. Extend framing full height to structural supports or substrates above suspended ceilings except where partitions are indicated to terminate at suspended ceilings. Continue framing around ducts that penetrate partitions above ceiling.

1. Slip-Type Head Joints: Where framing extends to overhead structural supports, install to produce joints at tops of framing systems that prevent axial loading of finished assemblies.
2. Door Openings: Screw vertical studs at jambs to jamb anchor clips on door frames; install track section (for cripple studs) at head and secure to jamb studs.

    a. Install two studs at each jamb unless otherwise indicated.
    b. Coordinate stud placement with conduit and electric components for doors with electric or security system hardware; do not permit cutting of jamb-stud flanges.
    c. Install cripple studs at head adjacent to each jamb stud, with a minimum 1/2-inch clearance from jamb stud to allow for installation of control joint in finished assembly.
    d. Extend jamb studs through suspended ceilings and attach to underside of overhead structure whether or not the contiguous wall extends to structure above.

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.

5. Sound-Rated Partitions: Install framing to comply with sound-rated assembly indicated.
6. Curved Partitions:

    a. Bend track to uniform curve and locate straight lengths so they are tangent to arcs.
    b. Begin and end each arc with a stud, and space intermediate studs equally along arcs. On straight lengths of no fewer than two studs at ends of arcs, place studs 6 inches (150 mm) o.c.

E. Direct Furring:

1. Attach hat channel furring vertically (unless otherwise indicated) spaced 16-inches on center anchored to concrete or masonry with stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches o.c.
2. Provide horizontal hat channel or matching size Cee channel around all sides of wall openings through furred walls.
3. Coordinate wood blocking location and thickness where required for wall mounted items.

F. Installation Tolerance: Install each framing member so fastening surfaces vary not more than 1/8 inch (3 mm) 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 (1219 mm)] 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. Do not attach hangers to steel roof deck.
5. Do not attach hangers to permanent metal forms. Furnish cast-in-place hanger inserts that extend through forms.
6. Do not attach hangers to rolled-in hanger tabs of composite steel floor deck.
7. Do not connect or suspend steel framing from ducts, pipes, or conduit.

D. Fire-Resistance-Rated Assemblies: Wire tie furring channels to supports.

E. Seismic Bracing: Sway-brace suspension systems with hangers used for support.

F. 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.

G. Installation Tolerances: Install suspension systems that are level to within 1/8 inch in 12 feet (3 mm in 3.6 m) measured lengthwise on each member that will receive finishes and transversely between parallel members that will receive finishes.

END OF SECTION 092216

SECTION 092900 - GYPSUM BOARD

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Interior gypsum board.

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 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Samples: For the following products:

1. Trim Accessories: Full-size Sample in 12-inch- long length for each trim accessory indicated.

1.4 QUALITY ASSURANCE

A. Mockups: Build mockups of at least 100 sq. ft. in surface area to demonstrate aesthetic effects and to set quality standards for materials and execution.

1. Build mockups for the following:

a. Each level of gypsum board finish indicated for use in exposed locations.
b. Each texture finish indicated.

2. Apply or install final decoration indicated, including painting and wallcoverings, on exposed surfaces for review of mockups.
3. Simulate finished lighting conditions for review of mockups.

4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.5 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.

1.6 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.

B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.

2.2 GYPSUM BOARD, GENERAL

A. Size: Provide maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.

B. Products: Subject to compliance with requirements, provide one of the following:

1. American Gypsum.
2. CertainTeed Corp.
3. Continental Building Products.
4. Georgia-Pacific Gypsum LLC.
5. National Gypsum Company.
6. PABCO Gypsum.
7. USG Corporation.

2.3 INTERIOR GYPSUM BOARD

A. Gypsum Wallboard: ASTM C 1396/C 1396M.

1. Thickness: 5/8 inch.
2. Long Edges: Tapered

B. Gypsum Board, Type X: ASTM C 1396/C 1396M.

1. Thickness: 5/8 inch.
2. Long Edges: Tapered

C. Flexible Gypsum Board: ASTM C 1396/C 1396M. Manufactured to bend to fit radii and to be more flexible than standard regular-type gypsum board of same thickness.

1. Thickness: 1/4 inch.
2. Long Edges: Tapered.

D. Gypsum Ceiling Board: ASTM C 1396/C 1396M.

1. Thickness: 1/2 inch.
2. Long Edges: Tapered.

E. Abuse-Resistant Gypsum Board: ASTM C 1396/C 1396M gypsum board, tested according to ASTM C 1629/C 1629M.

1. Core: 5/8 inch (15.9 mm), Type X.
2. Surface Abrasion: ASTM C 1629/C 1629M, meets or exceeds Level 2 requirements.
3. Indentation: ASTM C 1629/C 1629M, meets or exceeds Level 2 requirements.
4. Soft-Body Impact: ASTM C 1629/C 1629M, meets or exceeds Level 2 requirements.
5. Long Edges: Tapered.
6. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.
7. Locations: All walls up to 8 feet minimum above finished floor; stagger horizontal joints to utilize full sheets and to eliminate a continuous transition line at 8 feet. Not required at bulkheads and soffits unless noted otherwise.

F. Glass-Mat Interior Gypsum Board: ASTM C 1658/C 1658M. With fiberglass mat laminated to both sides. Specifically designed for interior use.

1. Core: 1/2 inch (12.7 mm), Type C OR 5/8 inch (15.9 mm), Type X as indicated on drawings
2. Long Edges: Tapered.
3. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.

2.4 SPECIALTY GYPSUM BOARD

A. Gypsum Board, Type C: ASTM C 1396/C 1396M. Manufactured to have increased fire-resistive capability.

1. Thickness: As required by fire-resistance-rated assembly indicated on Drawings.
2. Long Edges: Tapered.

2.5 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: not permitted
    d. U-Bead: not permitted
    e. Expansion (control) joint.

3. Option for INTERIOR TRIM: No-Coat Structural Laminate trims by Structus Building Technologies may be used as a contractor option. Installation shall be in compliance with manufacturer’s requirements using manufacturer’s recommended tools and equipment.

2.5 JOINT TREATMENT MATERIALS

A. General: Comply with ASTM C 475/C 475M.

B. Joint Tape:

1. Interior Gypsum Board: Paper.
2. Exterior Gypsum Soffit Board: Paper.
3. Glass-Mat Gypsum Sheathing Board: 10-by-10 glass mesh.

C. Joint Compound for Interior Gypsum Board: For each coat, use formulation that is compatible with other compounds applied on previous or for successive coats.

1. Prefilling: At open joints, rounded or beveled panel edges, and damaged surface areas, use setting-type taping compound.
2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use drying-type, all-purpose compound.

    a. Use setting-type compound for installing paper-faced metal trim accessories.

3. Fill Coat: For second coat, use drying-type, all-purpose compound.
4. Finish Coat: For third coat, use drying-type, all-purpose compound.
5. Skim Coat: For final coat of Level 5 finish, use drying-type, all-purpose compound.

2.6 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: ASTM C 665, Type I (blankets without membrane facing) produced by combining thermosetting resins with mineral fibers manufactured from glass, slag wool, or rock wool.

1. Fire-Resistance-Rated Assemblies: Comply with mineral-fiber requirements of assembly.

D. Acoustical Sealant: Manufacturer's standard nonsag, paintable, nonstaining latex sealant complying with ASTM C 834. Product effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.

E. Thermal Insulation: As specified in Section 072100 "Insulation."

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. (0.7 sq. m) in area.
2. Fit gypsum panels around ducts, pipes, and conduits.
3. Where partitions intersect structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by structural members; allow 1/4- to 3/8-inch- 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. Wood Framing: Install gypsum panels over wood framing, with floating internal corner construction. Do not attach gypsum panels across the flat grain of wide-dimension lumber, including floor joists and headers. Float gypsum panels over these members or provide control joints to counteract wood shrinkage.

J. STC-Rated Assemblies: Seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Note that this requires placement of sealant bead PRIOR to gypsum board being placed against metal framing. Comply with ASTM C 919 and with manufacturer's written instructions for locating edge trim and closing off sound-flanking paths around or through assemblies, including sealing partitions above acoustical ceilings.

K. 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. 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 vertically (parallel 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 high walls, install panels horizontally unless otherwise indicated or required by fire-resistance-rated assembly.

3. Fastening Methods: Apply gypsum panels to supports with steel drill screws.

B. 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 (400 mm) 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 and face layers separately to supports with screws.

C. Curved Surfaces:

1. Install panels horizontally (perpendicular to supports) and unbroken, to extent possible, across curved surface plus 12-inch- long straight sections at ends of curves and tangent to them.
2. For double-layer construction, fasten base layer to studs with screws 16 inches o.c. Center gypsum board face layer over joints in base layer, and fasten to studs with screws spaced 12 inches o.c.

3.4 APPLYING EXTERIOR GYPSUM PANELS FOR CEILINGS AND SOFFITS

A. Apply panels perpendicular to supports, with end joints staggered and located over supports.

1. Install with 1/4-inch open space where panels abut other construction or structural penetrations.
2. Fasten with corrosion-resistant screws.

3.5 INSTALLING TRIM ACCESSORIES

A. General: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.

B. Control Joints: Install control joints at locations indicated on Drawings and 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 unless otherwise indicated.
2. LC-Bead: Use at exposed panel edges

3.6 FINISHING GYPSUM BOARD

A. General: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.

B. Prefill open joints, rounded or beveled edges, and damaged surface areas.

C. Apply joint tape over gypsum board joints, except for trim products specifically indicated as not intended to receive tape.

D. Gypsum Board Finish Levels: Finish panels to levels indicated below and according to ASTM C 840:

1. Level 1: Ceiling plenum areas, concealed areas, and where indicated.

2. Level 5: All exposed gypsum board surfaces

    a. Primer and its application to surfaces are specified in Section 099123 "Interior Painting."
    b. Embed tape and apply separate first, fill, and finish coats of joint compound to tape, fasteners, and trim flanges, and apply skim coat of joint compound over entire surface.
    c. If imperfections or irregularities are observed in level 5 finishes after installation of paint primer, gypsum board installer is responsible for re-working gypsum finish to remove such defects and for having the surface re-prime painted and re-inspected, at no additional cost to Owner.

E. Glass-Mat Gypsum Sheathing Board: Finish according to manufacturer's written instructions for use as exposed soffit board.

F. Glass-Mat Faced Panels: Finish according to manufacturer's written instructions.

G. Cementitious Backer Units: Finish according to manufacturer's written instructions.

3.7 FIELD QUALITY CONTROL

A. Above-Ceiling Observation: Before Contractor installs gypsum board ceilings, Architect will conduct an above-ceiling observation and report deficiencies in the Work observed. Do not proceed with installation of gypsum board to ceiling support framing until deficiencies have been corrected.

1. Notify Architect seven days in advance of date and time when Project, or part of Project, will be ready for above ceiling inspections.

3.8 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 - 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 wall tile.
2. Waterproof membrane
3. Crack isolation membrane.
4. Metal edge strips.
5. Tile backing panels

B. Related Sections:

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.

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site

1. Review requirements in ANSI A108.01 for substrates and for preparation by other trades.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

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 Initial Selection: For tile, grout, and accessories involving color selection.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Master Grade Certificates: For each shipment, type, and composition of tile, signed by tile manufacturer and Installer.

C. Product Certificates: For each type of product.

D. Product Test Reports: For tile-setting and -grouting products

1.6 MAINTENANCE MATERIAL SUBMITTALS (Attic Stock)

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 5 percent of amount installed for each type, composition, color, pattern, and size indicated.

2. Grout: Furnish quantity of grout equal to 5 percent of amount installed for each type, composition, and color indicated.

1.7 QUALITY ASSURANCE

A. Installer Qualifications:

1. Installer employs Ceramic Tile Education Foundation Certified Installers or installers recognized by the U.S. Department of Labor as Journeyman Tile Layers.

1.8 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.

1.9 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 tile of each type 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.

C. Source Limitations for Other Products: Obtain each of the following products specified in this Section from a single manufacturer:

1. Waterproof membrane.
2. Crack isolation membrane.
3. Metal edge strips.
4. Uncoupling membranes

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 tiles 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. Basis of design styles and colors are listed on the drawings.

B. Subject to compliance with requirements, provide products from one of the following manufacturers:

1. Daltile (Basis of Design).
2. American Olean.
3. Anatolia.
4. Florida Tile.
5. Stonepeak.

C. Ceramic Wall Tile, Type TW-1: ANSI A137.1 standard grade.

1. Size: 6 inch by 18 inch, nominal.
2. Surface Finish: Matte.
3. Color(s): As indicated on drawings.
4. Trim Units: Matching bead, bullnose, cove, and base shapes in sizes coordinated with field tile.

2.4 WATERPROOF MEMBRANE

A. General: Manufacturer's standard product that complies with ANSI A118.10 and is recommended by the manufacturer for the application indicated. Include reinforcement and accessories recommended by manufacturer.

B. At Contractor’s option, provide either of the products listed in paragraphs 1 or 2 below:

1. Fabric-Reinforced, Fluid-Applied Product: System consisting of liquid-latex rubber, with a VOC content of 65 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24), and fabric reinforcement.

a. Products:

1) Custom Building Products; 9240 Waterproofing and Anti-Fracture Membrane.
2) Laticrete International Inc.; Laticrete 9235 Waterproof Membrane.
3) MAPEI Corporation; Mapelastic AquaDefense.
4) Summitville Tiles, Inc.; S-9000.

2. Unreinforced, Fluid-Applied Product: Liquid-latex rubber, with a VOC content of 65 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24), in a consistency suitable for trowel application and intended for use as waterproofing.

a. Products:

1) LATICRETE International Inc.; Hydro Ban.

2.5 UNCOUPLING MEMBRANES

A. General: Manufacturer's standard product, selected from the following, which complies with ANSI A118.12 for high performance and is recommended by the manufacturer for the application indicated. Include reinforcement and accessories recommended by manufacturer.

B. Corrugated Polyethylene: Corrugated polyethylene with a grid structure of square or circular cavities and with anchoring webbing on the underside; 3/16-inch nominal thickness.

1. Products: Subject to compliance with requirements, provide the following:

a. Custom Building Products; SpiderWeb II Uncoupling Mat.
b. Laticrete International, Inc.; Strata Mat.
c. Schluter Systems L.P.; DITRA.

2.6 CRACK-ISOLATION MEMBRANES

A. General: Manufacturer's standard product, which complies with ANSI A118.12 for high performance and is recommended by the manufacturer for the application indicated. Include reinforcement and accessories recommended by manufacturer.

B. Fabric-Reinforced, Modified-Bituminous Sheet: Self-adhering, modified-bituminous sheet with fabric reinforcement facing; 0.040-inch nominal thickness.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Custom Building Products.
b. MAPEI Corporation.
c. National Applied Construction Products, Inc.

2.7 SETTING MATERIALS

A. Latex-Portland Cement Mortar (Thinset) Installation Materials: ANSI A118.4.

1. Provide prepackaged, dry-mortar mix combined with styrene-butadiene-rubber liquid-latex additive.
2. Products: Subject to compliance with requirements, provide one of the following:

a. Custom Building Products; equivalent product.
b. Laticrete International Inc.; Laticrete 254 Platinum.
c. MAPEI Corporation; KeraBond T/ Keralastic System.
d. TEC; a subsidiary of H. B. Fuller Company; equivalent product.

B. Water-Cleanable Epoxy Grout: ANSI A118.3, with a VOC content of 65 g/L or less when calculated according to 40 CFR 59, Subpart D.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Custom Building Products: 100% Solids Epoxy Grout mixed with cement grout.
b. Laticrete International, Inc.; SpectraLOCK PRO Grout.
c. MAPEI Corporation; Kerapoxy CQ.
d. TEC; a subsidiary of H. B. Fuller Company; AccuColor EFX Epoxy Special Effects Grout.

2. Provide product capable of withstanding continuous and intermittent exposure to temperatures of up to 140 deg F and 212 deg F, respectively, and certified by manufacturer for intended use.

2.8 ELASTOMERIC SEALANTS

A. General: Provide manufacturer's standard chemically curing, elastomeric sealants of base polymer and characteristics indicated that comply with applicable requirements in Section 07 92 00 "Joint Sealants."

1. Use sealants that have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
2. Use primers, backer rods, and sealant accessories recommended by sealant manufacturer.

B. Colors: Provide colors of exposed sealants to match colors of grout in tile adjoining sealed joints, unless otherwise indicated.

2.9 MISCELLANEOUS MATERIALS

A. Trowelable Underlayments and Patching Compounds: Latex-modified, portland cement-based formulation provided or approved by manufacturer of tile-setting materials for installations indicated.

B. Metal Edge Strips: 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; white zinc alloy exposed-edge material.

C. 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.

D. Cementitious Backer Units: ANSI A118.9 or ASTM C 1325, Type A, in maximum lengths available to minimize end-to-end butt joints.

1. Thickness: 1/2 inch (12.7 mm)

2.10 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 installation of grounds, anchors, recessed frames, electrical and mechanical units of work, and similar items located in or behind tile has been completed.
3. 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. Remove coatings, including curing compounds and other substances that contain soap, wax, oil, or silicone, that are incompatible with tile-setting materials.

B. Blending: For tile exhibiting color variations within ranges, 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 CERAMIC TILE INSTALLATION

A. Comply with TCNA's "Handbook for Ceramic, Glass, and Stone Tile Installation" for TCNA installation methods specified in tile installation schedules. Comply with parts of the ANSI A108 series "Specifications for Installation of Ceramic Tile" that are referenced in TCNA installation methods, specified in tile installation schedules, and apply to types of setting and grouting materials used.

1. For the following installations, follow procedures in the ANSI A108 series of tile installation standards for providing 95 percent mortar coverage:

    a. Tile floors in wet areas.
    b. Tile floors consisting of tiles 8 by 8 inches (200 by 200 mm) or larger.
    c. 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 Wall Tile: 1/16 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. Metal Edge Strips: Install at locations indicated and where exposed edge of tile flooring meets carpet, wood, or other flooring that finishes flush with top of tile

3.4 WATERPROOFING INSTALLATION

A. Install waterproofing to comply with ANSI A108.13 and manufacturer's written instructions to produce waterproof membrane of uniform thickness that is bonded securely to substrate.

B. Allow waterproofing to cure and verify by testing that it is watertight before installing tile or setting materials over it.

3.5 UNCOUPLING MEMBRANE INSTALLATION

A. Install uncoupling membrane to comply with ANSI A108.17 and manufacturer's written instructions to produce membrane of uniform thickness and bonded securely to substrate.

B. Do not install tile or setting materials over uncoupling membrane until membrane has cured.

3.6 CRACK ISOLATION MEMBRANE INSTALLATION

A. Install crack isolation membrane to comply with ANSI A108.17 and manufacturer's written instructions to produce membrane of uniform thickness that is bonded securely to substrate.

B. Allow crack isolation membrane to cure before installing tile or setting materials over it.

3.7 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.

3.8 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.

END OF SECTION 093013

SECTION 095100 - ACOUSTICAL CEILINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SECTION INCLUDES

A. Suspended metal grid ceiling system.

B. Acoustical units.

1.3 RELATED REQUIREMENTS

A. Section 033000 - Cast-in-Place Concrete: Placement of special anchors or inserts for suspension system.

B. Section 053100 - Steel Decking: Placement of special anchors or inserts for suspension system.

1.4 REFERENCE STANDARDS

A. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process 2020.

B. ASTM C635/C635M - Standard Specification for the Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings 2017.

C. ASTM C636/C636M - Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels 2019.

D. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials 2020.

E. ASTM E580/E580M - Standard Practice for Installation of Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels in Areas Subject to Earthquake Ground Motions 2020.

F. ASTM E1264 - Standard Classification for Acoustical Ceiling Products 2019.

1.5 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on suspension system components and acoustical units.

C. Shop Drawings: Indicate grid layout and related dimensioning.

D. Samples: Submit two samples 6 by 6 inch in size illustrating material and finish of acoustical units.

E. Samples: Submit two samples each, 6 inches long, of suspension system main runner, cross runner, and perimeter molding.

F. Manufacturer's Qualification Statement.

G. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.

1. See Section 016000 - Product Requirements, for additional provisions.
2. Extra Acoustical Units: Quantity equal to 5 percent of total installed.

1.6 QUALITY ASSURANCE

A. Suspension System Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

B. Acoustical Unit Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

1.7 FIELD CONDITIONS

A. Maintain uniform temperature of minimum 60 degrees F (16 degrees C), and maximum humidity of 40 percent prior to, during, and after acoustical unit installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Acoustic Tiles/Panels:

1. Armstrong World Industries, Inc. (Basis of Design).
2. CertainTeed Corporation.
3. USG Corporation.

B. Suspension Systems:

1. Same as for acoustical units.

2.2 PERFORMANCE REQUIREMENTS

A. Fire-Resistance Rating: Determined in accordance with test procedures in ASTM E119 and complying with the following:

2.3 ACOUSTICAL UNITS

A. Acoustical Units - General: ASTM E1264, Class A.

B. Acoustic Ceiling Tile ACT-1: Painted mineral fiber, with the following characteristics:

1. Basis of Design: Armstrong School Zone Fine Fissured.

2. Classification: ASTM E1264 Type III.

    a. Form: 2, water felted.
    b. Pattern: "C" - perforated, small holes.

3. Size: 24 inch by 48 inch.
4. Thickness: 15/16 inch.
5. Light Reflectance: 0.84 percent, determined in accordance with ASTM E1264.
6. NRC Range: Not less than 0.70., determined in accordance with ASTM E1264.
7. Ceiling Attenuation Class (CAC): Not less than 40, determined in accordance with ASTM E1264.
8. Panel Edge: Square
9. Tile Edge: Square

    a. Joint: Kerfed and rabbeted.

10. Color: White.
11. Suspension System: Exposed grid.
12. Locations: As indicated on drawings.

C. Acoustic Ceiling Tile ACT-2: Painted mineral fiber, with the following characteristics:

1. Basis of Design: Armstrong Ultima Lay-in.
2. Classification: ASTM E1264 Type III.

    a. Form: 2, water felted.
    b. Pattern: "C" - perforated, small holes.

3. Size: 24 inch by 24 inch.
4. Thickness: 15/16 inch.
5. Light Reflectance: 0.84 percent, determined in accordance with ASTM E1264.
6. NRC Range: Not less than 0.75., determined in accordance with ASTM E1264.
7. Ceiling Attenuation Class (CAC): Not less than 35, determined in accordance with ASTM E1264.
8. Panel Edge: Square.
9. Tile Edge: Square.

    a. Joint: Kerfed and rabbeted.

10. Color: White.
11. Suspension System: Exposed grid.
12. Locations: As indicated on drawings.

2.4 SUSPENSION SYSTEM(S)

A. Metal Suspension Systems - General: Complying with ASTM C635/C635M; die cut and interlocking components, with perimeter moldings, hold down clips, stabilizer bars, clips, and splices as required.

1. Materials:

    a. Steel Grid: ASTM A653/A653M, G30 coating, unless otherwise indicated.

B. Exposed Suspension System, Type: Hot-dipped galvanized steel grid with aluminum cap.

1. Structural Classification: Intermediate duty, when tested in accordance with ASTM C635/C635M.
2. Profile: Tee; 15/16-inch (24 mm) face width.
3. Finish: Baked enamel.
4. Color: White.

2.5 ACCESSORIES

A. Support Channels and Hangers: Galvanized steel; size and type to suit application, seismic requirements, and ceiling system flatness requirement specified.

B. Hanger Wire: 12-gauge, 0.08 inch (2 mm) galvanized steel wire.

C. Hold-Down Clips: Manufacturer's standard clips to suit application.

D. Security Clips: Manufacturer’s standard clips to suit application.

1. Locations: Toilet Rooms.

E. Perimeter Moldings: Same metal and finish as grid.

1. Size: As required for installation conditions and specified Seismic Design Category.
2. Angle Molding: L-shaped, for mounting at same elevation as face of grid.

F. Metal Edge Trim for "Cloud" Suspension Systems: Steel or extruded aluminum; provide attachment clips, splice plates, and preformed corner pieces for complete trim system.

1. Trim Height: 8 inch (203 mm).
2. Finish: Baked enamel.
3. Color: White.
4. Products:

    a. USG Corporation; Compasso Suspension Trim: www.usg.com/ceilings
    b. Armstrong; Axiom Trim

G. Touch-up Paint: Type and color to match acoustical and grid units.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that layout of hangers will not interfere with other work.

3.2 PREPARATION

A. Install after major above-ceiling work is complete.

B. Coordinate the location of hangers with other work.

C. Provide hanger clips during steel deck erection. Provide additional hangers and inserts as required.

3.3 INSTALLATION - SUSPENSION SYSTEM

A. Install suspension system in accordance with ASTM C636/C636M, ASTM E580/E580M, and manufacturer's instructions and as supplemented in this section.

B. Rigidly secure system, including integral mechanical and electrical components, for maximum deflection of 1:360.

C. Locate system on room axis according to reflected plan.

D. Perimeter Molding: Install at intersection of ceiling and vertical surfaces and at junctions with other interruptions.

1. Install in bed of acoustical sealant.
2. Use longest practical lengths.
3. Overlap and rivet corners.

E. Suspension System, Non-Seismic: Hang suspension system independent of walls, columns, ducts, pipes and conduit. Where carrying members are spliced, avoid visible displacement of face plane of adjacent members.

F. Where ducts or other equipment prevent the regular spacing of hangers, reinforce the nearest affected hangers and related carrying channels to span the extra distance.

G. Do not support components on main runners or cross runners if weight causes total dead load to exceed deflection capability.

H. Support fixture loads using supplementary hangers located within 6 inches (152 mm) of each corner, or support components independently.

I. Do not eccentrically load system or induce rotation of runners.

3.4 INSTALLATION - ACOUSTICAL UNITS

A. Install acoustical units in accordance with manufacturer's instructions.

B. Fit acoustical units in place, free from damaged edges or other defects detrimental to appearance and function.

C. Lay directional patterned units with pattern parallel to longest room axis.

D. Fit border trim neatly against abutting surfaces.

E. Install acoustical units’ level, in uniform plane, and free from twist, warp, and dents.

F. Cutting Acoustical Units:

1. Cut to fit irregular grid and perimeter edge trim.
2. Make field cut edges of same profile as factory edges.
3. Double cut and field paint exposed reveal edges.

G. Where round obstructions occur, provide preformed closures to match perimeter molding.

H. Lay acoustical insulation for a distance of 48 inches (1219 mm) either side of acoustical partitions as indicated.

I. Install hold-down clips on each panel to retain panels tight to grid system; comply with fire rating requirements.

J. Install hold-down clips on panels within 20 ft (6 m) of an exterior door, and at Vestibule 300A and 300B.

3.5 TOLERANCES

A. Maximum Variation from Flat and Level Surface: 1/8 inch in 10 feet (3 mm in 3 m).

B. Maximum Variation from Plumb of Grid Members Caused by Eccentric Loads: 2 degrees.

END OF SECTION 095100

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. Resilient base.
2. Resilient stair accessories.
3. Resilient molding accessories.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Samples: For each exposed product and for each color and texture specified, not less than 12 inches (300 mm) long.

C. Samples for Initial Selection: For each type of product indicated.

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 (3 linear m) for every 500 linear feet (150 linear m) or fraction thereof, of each type, color, pattern, and size of resilient product installed.

1.5 QUALITY ASSURANCE

A. Fire-Test-Response Characteristics: 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. ASTM E 662 (Smoke Generation) Maximum Specific Optical Density of 450 or less.

B. Provide testing of concrete substrate moisture content and relative humidity testing and comply with manufacturers requirements for these conditions before starting installation.

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 (10 deg C) or more than 90 deg F (32 deg C).

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. 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. Install resilient products after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis of design styles and colors are listed on the drawings.

B. Subject to compliance with requirements, provide products from one of the following manufacturers:

1. Tarkett Johnsonite (Basis of Design).
2. Flexco.
3. Mohawk Group.
4. Roppe.

2.2 RESILIENT BASE (RB)

A. Resilient Base Standard: ASTM F 1861.

1. Material Requirement: Type TS (rubber, vulcanized thermoset).
2. Manufacturing Method: Group I (solid, homogeneous).
3. Style: Cove (base with toe).

B. Properties:

1. Minimum Thickness: 0.125 inch (3.18mm).
2. Height: As indicated on drawings.
3. Lengths: Coils in manufacturer's standard length.

4. Outside Corners: Job formed.
5. Inside Corners: Job formed.
6. Finish: As selected by Architect from manufacturer's full range.
7. Colors and Patterns: As indicated by manufacturer's designations on Drawings.

2.3 RESILIENT STAIR ACCESSORIES (STR)

A. One-Piece Integral Tread and Riser with Overlap Nosing:

1. One-piece design, solid rubber stair riser/tread/nosing, with integral overlap nosing, and with visual impairment contrasting solid rubber insert.
2. Application: all tread / risers except first riser of a run and top tread of a run.
3. Material shall comply with ASTM F 2169, Type TS, rubber, vulcanized thermoset, Group I solid, homogeneous
4. Cut to length and width to fit stair configuration.
5. Products: Basis of design indicated on Drawings.
6. 9-foot lengths.
7. Tread/Riser Color as selected by Architect.
8. Visually Impaired Solid Rubber Color Insert Strip: As recommended by manufacturer for compliant visual contrast and approved by Architect. Abrasive strip or grit tape inserts are not acceptable.

B. Resilient Stair Accessory Standard: ASTM F 2169.

1. Material Requirement: Type TS (rubber, vulcanized thermoset) or Type TP (rubber, thermoplastic).
2. Manufacturing Method: Group II (tread with contrasting color).

C. Stringers:

1. Smooth, flat, 10 inches high by 6-foot lengths.

    a. Cut stringers to fit stair substrate treads and risers before installing resilient treads and risers.
    b. Top edge factory finish at height indicated, parallel with line of nosings (stair pitch).

2. Application: All stair stringers.
3. Products: Subject to compliance with requirements, provide products by same manufacturer as treads / risers.
4. Thickness: 0.125 inch.
5. Color as selected by Architect.

2.4 RESILIENT MOLDING ACCESSORIES

A. Resilient Molding Accessory

1. Manufacturers: Subject to compliance with requirements, provide products by same manufacturer as resilient base.

B. Description: Transition strips, ADA compliant.

C. Material: Rubber.

D. Profile and Dimensions: As selected by Architect from manufacturer's full range of profiles.

E. Colors and Patterns: As selected by Architect from full range of industry colors.

2.5 INSTALLATION MATERIALS

A. Trowelable Leveling and Patching Compounds: Latex-modified, portland-cement-based or blended hydraulic-cement-based formulation provided or approved by resilient-product manufacturer for applications indicated.

B. Adhesives: Water-resistant type recommended by resilient-product manufacturer for resilient products and substrate conditions indicated.

1. Use adhesives that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):

a. Cove Base Adhesives: Not more than 50 g/L.
b. Rubber Floor Adhesives: Not more than 60 g/L.

C. Stair-Tread Nose Filler: Two-part epoxy compound recommended by resilient stair-tread manufacturer to fill nosing substrates that do not conform to tread contours.

PART 3 - EXECUTION

3.1 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. Concrete Substrates for Resilient Stair Treads and Accessories: 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 manufacturer. Do not use solvents.
3. Alkalinity and Adhesion Testing: Perform tests recommended by manufacturer.
4. Moisture Testing: Perform tests recommended by manufacturer and as follows. Proceed with installation only after substrates pass testing.

    a. Perform 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. Perform relative humidity test using in situ probes, ASTM F 2170. Proceed with installation only after substrates have a maximum 75% relative humidity level measurement.

C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound and remove bumps and ridges to produce a uniform and smooth substrate.

D. Do not install resilient products until they are same temperature as the space where they are to be installed.

1. Move resilient products and installation materials into spaces where they will be installed at least 48 hours in advance of installation.

E. Sweep and vacuum clean substrates to be covered by resilient products immediately before installation.

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 practicable 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. Job-Formed Corners:

1. Outside Corners: Use straight pieces of maximum lengths possible. Form without producing discoloration (whitening) at bends.
2. Inside Corners: Use straight pieces of maximum lengths possible. Form by cutting an inverted V- shaped notch in toe of wall base at the point where corner is formed; do not

overlap toe sections. Shave back of base where necessary to produce a snug fit to substrate.

3.4 RESILIENT ACCESSORY INSTALLATION

A. Comply with manufacturer's written instructions for installing resilient accessories.

B. Resilient Stair Accessories:

1. Use stair-tread-nose filler to fill nosing substrates that do not conform to tread contours.
2. Tightly adhere to substrates throughout length of each piece.
3. Stringer to slope at pitch of stair. Cut at top and bottom to blend into wall base.

C. Resilient Molding Accessories: Butt to adjacent materials and tightly adhere to substrates throughout length of each piece. Install reducer strips at edges of carpet and resilient 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 096513

SECTION 096519 - RESILIENT TILE FLOORING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Luxury vinyl floor tile. (LVT)

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Samples: Full-size units of each color, texture, and pattern of floor tile required.

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 50 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 (10 deg C) or more than 90 deg F (32 deg C). 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 (21 deg C) or more than 95 deg F (35 deg C) 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 (13 deg C) or more than 95 deg F (35 deg C)

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 MANUFACTURERS AND PRODUCTS

A. Basis of design products are listed on the drawings.

2.3 LUXURY VINYL TILE (LVT)

A. Manufacturers and Products: Basis of design products are indicated on Drawings. Other manufacturers to comply with specifications and provide style & color match as approved by the Architect.

1. Patcraft (Basis of Design).
2. Interface.
3. Mohawk.
4. Shaw.

5. Tarkett

B. Tile Standard: ASTM F 1700.

1. Class: Class III, printed film vinyl tile.
2. Type: B, embossed surface.
3. Wear layer: 20 mil.
4. Overall thickness: min. 2.5mm.
5. Finish: As indicated on drawings.
6. Installation method: glue down.
7. Tile size: As indicated on drawings.
8. Warranty: 20 years.

2.4 INSTALLATION MATERIALS

A. Trowelable Leveling and Patching Compounds: Latex-modified, portland-cement-based or blended hydraulic-cement-based formulation provided or approved by floor tile manufacturer for applications indicated.

B. Adhesives: Water-resistant type recommended by floor tile and adhesive manufacturers to suit floor tile and substrate conditions indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of floor tile.

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

3.2 PREPARATION

A. Prepare substrates according to floor tile manufacturer's written instructions to ensure adhesion of resilient products.

B. Concrete Substrates: Prepare according to ASTM F 710.

1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.
3. Alkalinity and Adhesion Testing: Perform tests recommended by manufacturer. Proceed with installation only after substrates pass testing.

4. Moisture Testing: Perform tests recommended by manufacturer and as follows. Proceed with installation only after substrates pass testing.

    a. Perform 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. Perform 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 and remove bumps and ridges to produce a uniform and smooth substrate.

D. Do not install floor tiles until they are same temperature as space where they are to be installed.

1. Move resilient products and installation materials into spaces where they will be installed at least 48 hours in advance of installation.

E. Sweep and vacuum clean substrates to be covered by resilient products immediately before installation.

3.3 FLOOR TILE INSTALLATION

A. Comply with manufacturer's written instructions for installing floor tile.

B. Lay out decorative patterns accurately, aligned and located as indicated on the drawings. Obtain any necessary clarifications from architect before starting layout or custom cutting work.

C. 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 in pattern indicated. Resolve any uncertainty regarding pattern in pre-installation conference with interior designer.

D. 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 pattern of colors and sizes indicated or directed by the interior designer.

E. 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.

F. Extend floor tiles into toe spaces, door reveals, closets, and similar openings. Extend floor tiles to center of doors.

G. 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, non-staining marking device.

H. Install floor tiles on covers for telephone and electrical ducts, building expansion-joint covers, and similar items in finished floor 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.

I. Adhere floor tiles to flooring substrates using a full spread of adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.

3.4 CLEANING AND PROTECTION

A. Comply with manufacturer's written instructions for cleaning and protecting floor tile.

B. Perform the following operations immediately after completing floor tile installation:

1. Remove adhesive and other blemishes from surfaces.
2. Sweep and vacuum surfaces thoroughly.
3. Damp-mop surfaces to remove marks and soil.

C. Protect floor tile from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.

D. Cover floor tile until Substantial Completion.

END OF SECTION 096519

SECTION 096713 - RESINOUS FLOORING

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 resinous flooring systems with urethane body coat(s).

1. Application Method: Self-leveling slurry with broadcast aggregates.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated. Include manufacturer's technical data, application instructions, and recommendations for each resinous flooring component required.

B. Samples for Initial Selection: For each type of exposed finish required.

C. Samples for Verification: For each resinous flooring system required, 6 inches square, applied to a rigid backing by Installer for this Project.

D. Installer Certificates: Signed by manufacturer certifying that installers comply with specified requirements.

E. Material Test Reports: For each resinous flooring component.

F. Material Certificates: For each resinous flooring component, signed by manufacturer.

G. Maintenance Data: For resinous flooring to include in maintenance manuals.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced installer (applicator) who is experienced in applying resinous flooring systems similar in material, design, and extent to those indicated for this Project, whose work has resulted in applications with a record of successful in-service performance, and who is acceptable to resinous flooring manufacturer.

1. Engage an installer who employs only persons trained and approved by resinous flooring manufacturer for applying resinous flooring systems indicated.
2. Engage an installer who is certified in writing by resinous flooring manufacturer as qualified to apply resinous flooring systems indicated.

B. Source Limitations: Obtain primary resinous flooring materials, including primers, resins, hardening agents, grouting coats, and topcoats, through one source from a single manufacturer.

Provide secondary materials, including patching and fill material, joint sealant, and repair materials, of type and from source recommended by manufacturer of primary materials.

C. Federal Agency Approvals: Where indicated, provide resinous flooring systems approved by the USDA and FDA for use indicated.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in original packages and containers, with seals unbroken, bearing manufacturer's labels indicating brand name and directions for storage and mixing with other components.

B. Store materials to prevent deterioration from moisture, heat, cold, direct sunlight, or other detrimental effects.

1.6 PROJECT CONDITIONS

A. Environmental Limitations: Comply with resinous flooring manufacturer's written instructions for substrate temperature, ambient temperature, moisture, ventilation, and other conditions affecting resinous flooring application.

B. Lighting: Provide permanent lighting or, if permanent lighting is not in place, simulate permanent lighting conditions during resinous flooring application.

C. Close spaces to traffic during resinous flooring application and for not less than 24 hours after application, unless manufacturer recommends a longer period.

PART 2 - PRODUCTS

2.1 RESINOUS FLOORING (RES)

A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:

B. Products: Subject to compliance with requirements, provide one of the following:

1. Key Resin Company; Key Quartz B-125 (Basis of Design).
2. Arizona Polymer Flooring, Inc.;
3. Atlas Minerals & Chemicals, Inc., Polymer Flooring Division
4. Dur-A-Flex Inc.
5. General Polymers Corporation, a division of the Sherwin-Williams Company
6. Micor Company, Inc.
7. Pacific Polymers, Inc.
8. Polymerica Incorporated
9. Silikal Resin Systems
10. Tamms Industries, Inc.

C. System Characteristics:

1. Color and Pattern: As selected by Architect from manufacturer's full range.
2. Wearing Surface: Textured for slip resistance.
3. Integral Cove Base: 4 inches high.
4. Overall System Thickness: 1/8 inch.
5. Federal Agency Approvals: USDA and FDA approved for food-processing environments.

D. System Components: Manufacturer's standard components that are compatible with each other and as follows:

1. Waterproofing Membrane: Type recommended by manufacturer for substrate and primer and body coat(s) indicated.

    a. Formulation Description: High solids.

2. Reinforcing Membrane: Flexible resin formulation that is recommended by manufacturer for substrate and primer and body coat(s) indicated and that prevents substrate cracks from reflecting through resinous flooring.

    a. Formulation Description: High solids.
    b. Provide fiberglass scrim embedded in reinforcing membrane.

3. Primer Coat: Type recommended by manufacturer for substrate and body coat(s) indicated.

    a. Formulation Description: High solids.

4. Body Coat(s):

    a. Resin: Urethane.
    b. Formulation Description: High solids.
    c. Application Method: Self-leveling slurry with broadcast flakes.

        1) Thickness of Coats: 1/8 inch.
        2) Number of Coats: One.

    d. Aggregates: Colored quartz (ceramic-coated silica).

5. Topcoat: Chemical-resistant or finish coat(s).

    a. Resin: Urethane.
    b. Formulation Description: High solids.
    c. Type: Clear.
    d. Finish: Matte.
    e. Number of Coats: Two.

E. System Physical Properties: Provide resinous flooring system with the following minimum physical property requirements when tested according to test methods indicated:

1. Compressive Strength: per ASTM C 579.
2. Tensile Strength: per ASTM D 412.
3. Flexural Modulus of Elasticity: per ASTM C 580.
4. Water Absorption: per ASTM C 413.

5. Coefficient of Thermal Expansion: per ASTM C 531.
6. Indentation: percent maximum per MIL-D-3134.
7. Impact Resistance: No chipping, cracking, or delamination and not more than 1/16-inch permanent indentation per MIL-D-3134.
8. Resistance to Elevated Temperature: No slip or flow of more than 1/16 inch per MIL-D-3134.
9. Abrasion Resistance: maximum weight loss per ASTM D 4060.
10. Flammability: Self-extinguishing per ASTM D 635.
11. Hardness: Shore D per ASTM D 2240.
12. Bond Strength: 100 percent concrete failure per ACI 503R.

2.2 ACCESSORY MATERIALS

A. Patching and Fill Material: Resinous product of or approved by resinous flooring manufacturer and recommended by manufacturer for application indicated.

B. Joint Sealant: Type recommended or produced by resinous flooring manufacturer for type of service and joint condition indicated.

PART 3 - EXECUTION

3.1 PREPARATION

A. General: Prepare and clean substrates according to resinous flooring manufacturer's written instructions for substrate indicated. Provide clean, dry, and neutral Ph substrate for resinous flooring application.

B. Concrete Substrates: Provide sound concrete surfaces free of laitance, glaze, efflorescence, curing compounds, form-release agents, dust, dirt, grease, oil, and other contaminants incompatible with resinous flooring.

1. Roughen concrete substrates as follows:

    a. Shot-blast surfaces with an apparatus that abrades the concrete surface, contains the dispensed shot within the apparatus, and recirculates the shot by vacuum pickup.
    b. Comply with ASTM C 811 requirements, unless manufacturer's written instructions are more stringent.

2. Repair damaged and deteriorated concrete according to resinous flooring manufacturer's written recommendations.
3. Verify that concrete substrates are dry.

    a. Perform anhydrous calcium chloride test, ASTM F 1869. Proceed with application only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. of slab in 24 hours.
    b. Perform plastic sheet test, ASTM D 4263. Proceed with application only after testing indicates absence of moisture in substrates.
    c. Perform additional moisture tests recommended by manufacturer. Proceed with application only after substrates pass testing.

4. Verify that concrete substrates have neutral Ph and that resinous flooring will adhere to them. Perform tests recommended by manufacturer. Proceed with application only after substrates pass testing.

C. Resinous Materials: Mix components and prepare materials according to resinous flooring manufacturer's written instructions.

D. Use patching and fill material to fill holes and depressions in substrates according to manufacturer's written instructions.

E. Treat control joints and other nonmoving substrate cracks to prevent cracks from reflecting through resinous flooring according to manufacturer's written recommendations.

3.2 APPLICATION

A. General: Apply components of resinous flooring system according to manufacturer's written instructions to produce a uniform, monolithic wearing surface of thickness indicated.

1. Coordinate application of components to provide optimum adhesion of resinous flooring system to substrate, and optimum intercoat adhesion.
2. Cure resinous flooring components according to manufacturer's written instructions. Prevent contamination during application and curing processes.
3. At substrate expansion and isolation joints, provide joint in resinous flooring to comply with resinous flooring manufacturer's written recommendations.

    a. Apply joint sealant to comply with manufacturer's written recommendations.

B. Apply primer over prepared substrate at manufacturer's recommended spreading rate.

C. Apply waterproofing membrane, where indicated, in manufacturer's recommended thickness.

1. Apply waterproofing membrane to integral cove base substrates.

D. Apply reinforcing membrane to entire substrate surface.

E. Integral Cove Base: Apply cove base mix to wall surfaces before applying flooring. Apply according to manufacturer's written instructions and details including those for taping, mixing, priming, troweling, sanding, and topcoating of cove base. Round internal and external corners.

F. Apply self-leveling slurry body coat(s) in thickness indicated for flooring system.

1. Broadcast aggregates and, after resin is cured, remove excess aggregates to provide surface texture indicated.

G. Apply troweled or screeded body coat(s) in thickness indicated for flooring system. Hand or power trowel and grout to fill voids. When cured, sand to remove trowel marks and roughness.

H. Apply grout coat, of type recommended by resinous flooring manufacturer to fill voids in surface of final body coat and to produce wearing surface indicated.

I. Apply topcoat(s) in number of coats indicated for flooring system and at spreading rates recommended in writing by manufacturer.

3.3 FIELD QUALITY CONTROL

A. Core Sampling: At the direction of Owner and at locations designated by Owner, take 1 core sample per 1000 sq. ft. of resinous flooring, or portion of, to verify thickness. For each sample that fails to comply with requirements, take two additional samples. Repair damage caused by coring and correct deficiencies.

B. Material Sampling: Owner may at any time and any number of times during resinous flooring application require material samples for testing for compliance with requirements.

1. Owner will engage an independent testing agency to take samples of materials being used. Material samples will be taken, identified, sealed, and certified in presence of Contractor.
2. Testing agency will test samples for compliance with requirements, using applicable referenced testing procedures or, if not referenced, using testing procedures listed in manufacturer's product data.
3. If test results show applied materials do not comply with specified requirements, pay for testing, remove noncomplying materials, prepare surfaces coated with unacceptable materials, and reapply flooring materials to comply with requirements.

3.4 CLEANING AND PROTECTING

A. Protect resinous flooring from damage and wear during the remainder of construction period. Use protective methods and materials, including temporary covering, recommended in writing by resinous flooring manufacturer.

END OF SECTION 096713

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 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes

1. Modular carpet tile.

B. Related Sections:

1. Section 096513 Resilient Base and Accessories for resilient wall base and accessories installed with carpet tile.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site

1. Review methods and procedures related to carpet tile installation including, but not limited to, the following:

a. Review delivery, storage, and handling procedures.
b. Review ambient conditions and ventilation procedures.
c. Review subfloor preparation procedures.
d. Review transition strip requirements between LVT and carpet tile.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include manufacturer's written data on physical characteristics, durability, and fade resistance.
2. Include manufacturer's written installation recommendations for each type of substrate.

B. Samples: For each of the following products and for each color and texture required. Label each Sample with manufacturer's name, material description, color, pattern, and designation indicated on Drawings and in schedules.

1. Carpet Tile: Full-size Sample for each type & color
2. Exposed Edge, Transition, and Other Accessory Stripping: 12-inch- (300-mm-) long Samples.

C. Product Schedule: For carpet tile. Use same designations indicated on Drawings.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Product Test Reports: For carpet tile, for tests performed by a qualified testing agency.

C. Sample Warranty: For special warranty.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For carpet tiles to include in maintenance manuals. Include the following:

1. Methods for maintaining carpet tile, including cleaning and stain-removal products and procedures and manufacturer's recommended maintenance schedule.
2. Precautions for cleaning materials and methods that could be detrimental to carpet tile.

1.7 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. Carpet Tile: Full-size units equal to 5 percent of amount installed for each type indicated, but not less than 10 sq. yd. (8.3 sq. m).

1.8 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who is certified by the International Certified Floorcovering Installers Association at the Commercial II certification level.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Comply with CRI's "CRI Carpet Installation Standard."

1.10 FIELD CONDITIONS

A. Comply with CRI's "CRI Carpet Installation Standard" for temperature, humidity, and ventilation limitations.

B. Environmental Limitations: Do not deliver or install carpet tiles until spaces are enclosed and weathertight, wet-work in spaces is complete and dry, and ambient temperature and humidity conditions are maintained at levels planned for building occupants during the remainder of the construction period.

C. Do not install carpet tiles over concrete slabs until slabs have cured and are sufficiently dry to bond with adhesive and concrete slabs have pH range recommended by carpet tile manufacturer.

D. Where demountable partitions or other items are indicated for installation on top of carpet tiles, install carpet tiles before installing these items.

1.11 WARRANTY

A. Special Warranty for Carpet Tiles: Manufacturer agrees to repair or replace components of carpet tile installation that fail in materials or workmanship within specified warranty period.

1. Warranty does not include deterioration or failure of carpet tile due to unusual traffic, failure of substrate, vandalism, or abuse.
2. Failures include, but are not limited to, the following:

a. More than 10 percent edge raveling, snags, and runs.
b. Dimensional instability.
c. Excess static discharge.
d. Loss of tuft-bind strength.
e. Loss of face fiber.
f. Delamination.

3. Warranty Period: Lifetime Limited Carpet Tile Warranty.

PART 2 - PRODUCTS

2.1 CARPET TILE (CPT)

A. Manufacturers and Products: Basis of design products are indicated on Drawings.

1. Subject to compliance with custom requirements provide products by the following manufacturers:

a. Patcraft (Basis of Design).
b. Interface.
c. Mohawk.
d. Shaw.
e. Tarkett.

2. Manufacturer shall have no less than fifteen years of production experience with modular carpet, maintain registration to the ISO 9001 QMS and ISO 14001 EMS Standards, and demonstrate environmental responsibility through programs of source reduction, recycling, reuse, and conservation.
3. Manufacturer must have an operational reclamation program for each of the product types produced in its manufacturing history, including nylon face, and backing; and must have an operational program for recycling reclaimed carpet face fiber into new carpet face fiber and reclaimed carpet backing into new carpet backing.
4. Manufacturer must state amount of anticipated trim and installation waste with bid.
5. Carpet tile must be capable of being installed without wet adhesives. In the event a resealable glue method of installation is required, adhesive shall be water-based and allow for removal of carpet tile at any time without damage to carpet or substrate. Adhesive shall contain antimicrobial preservative and have “zero” calculated VOCs.

B. Performance Characteristics: As follows:

1. Critical Radiant Flux Classification: Not less than 0.45 W/sq. cm.
2. Emissions: Provide carpet tile that complies with testing and product requirements of CRI's "Green Label Plus" program.
3. Yarn System: Duracolor Tricor Premium Nylon.
4. Dye Method: 100% Solution Dyed.
5. Preservative: EcoSentry Soil Protection.
6. Backing: Non-woven synthetic EcoWorx.
7. Gauge: 1/12th.
8. Yarn Weight: 17 oz. per yd.
9. Pile Height: 0109” (2.77mm).
10. Stitches: 11.5 per inch.
11. Pile Density: 5,614 oz/yd.
12. Size: As indicated on drawings.
13. Sustainable Carpet Assessment Standard: (NSF-140) Sustainable Choice Gold/Platinum.
14. Indoor Air Quality: Green Label Plus Certified # GLP1171 and CHPS Section 01350.

C. Warranty

1. Mold: Lifetime protection against mold in product for life of carpet (Limited Lifetime).
2. Wear: No more than 10% by weight in 20 years (chair pads not required).
3. Static Generation: Less than 3.0 kV at 70° and 20% R.H. for Lifetime.
4. Delamination: None for 15 years.

D. Minimum Anti-microbial standards

1. Antimicrobial preservative, registered by the EPA for use in carpeting, with broad spectrum efficacy against the growth of bacteria and fungi for a minimum of 20 years, assuming proper maintenance and meet the following standards:
2. Antimicrobial preservative shall be incorporated into the primary backing and contain no arsenic, formaldehyde or heavy metals (tin, lead, mercury, silver, copper or zinc), be non-halogenated (no fluorine, chlorine, bromine or iodine), non-phenolic and shall have low water solubility.
3. The antimicrobial treated carpet when new shall pass GSA parameters for treated carpets via AATCC method 174 parts II and III. ASTM E 2471-05 may be used in lieu of AATCC method 174 parts II and III.
4. The preservative shall be biodegradable and not toxic to non-target species.

2.2 INSTALLATION ACCESSORIES

A. Trowelable Leveling and Patching Compounds: Latex-modified, hydraulic-cement-based formulation provided or recommended by carpet tile manufacturer.

B. Adhesives: Water-resistant, mildew-resistant, non-staining, pressure-sensitive type to suit products and subfloor conditions indicated, that complies with flammability requirements for installed carpet tile and is recommended by carpet tile manufacturer for releasable installation. 1. VOC Limits: Provide adhesives with VOC content not more than 50 g/L when calculated according to 40 CFR 59, Subpart D (EPA method 24).

C. Tapered Transitions: Tapered flexible vinyl transitions, not less than 2 inches (50 mm) (38 mm) wide with mitered corners:

1. Provide Johnsonite CTA-XX-K (or equal) at transitions between carpet-type mats and adjacent resilient tile flooring.
2. Vinyl Color: As selected by Architect from full range of industry colors.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for maximum moisture content, alkalinity range, installation tolerances, and other conditions affecting carpet tile performance.

B. Examine carpet tile for type, color, pattern, and potential defects.

C. Concrete Subfloors: Verify that concrete slabs comply with ASTM F 710 and the following:

1. Slab substrates are dry and free of curing compounds, sealers, hardeners, and other materials that may interfere with adhesive bond.
2. Alkalinity and Adhesion Testing: Perform tests recommended by manufacturer. Proceed with installation only after substrates pass testing.
3. Moisture Testing: Perform tests recommended by manufacturer and as follows. Proceed with installation only after substrates pass testing.

    a. Perform 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. (1.36 kg of water/92.9 sq. m) in 24 hours.
    b. Perform 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.

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

3.2 PREPARATION

A. General: Comply with CRI's "Carpet Installation Standards" and with carpet tile manufacturer's written installation instructions for preparing substrates indicated to receive carpet tile.

B. Use trowelable leveling and patching compounds, according to manufacturer's written instructions, to fill cracks, holes, depressions, and protrusions in substrates. Fill or level cracks, holes and depressions 1/8 inch (3 mm) wide or wider, and protrusions more than 1/32 inch (0.8 mm) unless more stringent requirements are required by manufacturer's written instructions.

C. Concrete Substrates: Remove coatings, including curing compounds, and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, without using solvents. Use mechanical methods recommended in writing by adhesive and carpet tile manufacturers.

D. Metal Substrates: Clean grease, oil, soil and rust, and prime if recommended in writing by adhesive manufacturer. Rough sand painted metal surfaces and remove loose paint. Sand aluminum surfaces, to remove metal oxides, immediately before applying adhesive.

E. Broom and vacuum clean substrates to be covered immediately before installing carpet tile.

3.3 INSTALLATION

A. General: Comply with CRI's "CRI Carpet Installation Standard," Section 18, "Modular Carpet" and with carpet tile manufacturer's written installation instructions.

B. Installation Method:

1. Full Room Installation: Glue down; install every tile with full-spread, releasable, pressure-sensitive adhesive per manufacturer’s recommendations
2. Classroom (small area installation): pressure sensitive adhesive peel off corner strips per manufacturer’s recommendations

C. Maintain dye-lot integrity. Do not mix dye lots in same area.

D. Cut and fit carpet tile to butt tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, edgings, thresholds, and nosings. Bind or seal cut edges as recommended by carpet tile manufacturer.

E. Extend carpet tile into toe spaces, door reveals, closets, open-bottomed obstructions, removable flanges, alcoves, and similar openings.

F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on carpet tile as marked on subfloor. Use nonpermanent, non-staining marking device.

G. Lay tiles square with room axis in pattern indicated. Resolve any uncertainty regarding pattern in pre- installation conference with architect.

3.4 CLEANING AND PROTECTION

A. Perform the following operations immediately after installing carpet tile:

1. Remove excess adhesive and other surface blemishes using cleaner recommended by carpet tile manufacturer.
2. Remove yarns that protrude from carpet tile surface.
3. Vacuum carpet tile using commercial machine with face-beater element.

B. Protect installed carpet tile to comply with CRI's "Carpet Installation Standard," Section 20, "Protecting Indoor Installations."

C. Protect carpet tile against damage from construction operations and placement of equipment and fixtures during the remainder of construction period. Use protection methods indicated or recommended in writing by carpet tile manufacturer.

END OF SECTION 096813

SECTION 099112 - 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 exterior and interior substrates for painting designated IPS – Integrated Paint System.

1. Concrete.
2. Concrete masonry units (CMUs).
3. Steel and iron.
4. Galvanized metal.
5. Wood.
6. Portland cement plaster (stucco).
7. Gypsum board.
8. Cotton or canvas insulation covering.

1.3 DEFINITIONS

A. MPI Gloss Level 1: Not more than five units at 60 degrees and 10 units at 85 degrees, according to ASTM D 523.

B. MPI Gloss Level 3: 10 to 25 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523.

C. MPI Gloss Level 4: 20 to 35 units at 60 degrees and not less than 35 units at 85 degrees, according to ASTM D 523.

D. MPI Gloss Level 5: 35 to 70 units at 60 degrees, according to ASTM D 523.

E. MPI Gloss Level 6: 70 to 85 units at 60 degrees, according to ASTM D 523.

F. MPI Gloss Level 7: More than 85 units at 60 degrees, according to ASTM D 523.

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. Samples for Verification: For each type of paint system and each color and gloss of topcoat.

1. Submit Samples on rigid backing, 8 inches (200 mm) square.
2. Apply coats on Samples in steps to show each coat required for system.
3. Label each coat of each Sample.
4. Label each Sample for location and application area.

D. 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, 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. Paint: 5 percent, but not less than 1 gal. (3.8 L) of each material and color applied.

1.6 QUALITY ASSURANCE

A. Mockups: Apply benchmark samples of each paint system indicated and each color and finish selected to verify preliminary selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Architect will select one surface to represent surfaces and conditions for application of each paint system specified in Part 4.

a. Vertical and Horizontal Surfaces: Provide samples of at least 100 sq. ft.
b. Other Items: Architect will designate items or areas required.

2. Apply benchmark samples after permanent lighting and other environmental services have been activated and the area is under lighting and other visual-impacting conditions that match the completed-construction.
3. Final approval of color selections will be based on mockups.

a. If architect’s review of colors on actual-conditions mockup indicates that the color is not acceptable, regardless of tentative color approval of verification samples, architect reserves the right to select different colors and the contractor shall then provide a new mockup for review at no additional cost to the owner.

4. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
5. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Contract Completion.

1.7 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 (7 deg C).

1. Maintain containers in clean condition, free of foreign materials and residue.
2. Remove rags and waste from storage areas daily.

1.8 FIELD CONDITIONS

A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F (10 and 35 deg C).

B. Do not apply paints in snow, rain, fog, or mist; when relative humidity exceeds 85 percent; at temperatures less than 5 deg F (3 deg C) above the dew point; or to damp or wet surfaces.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

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

1. Benjamin Moore & Co.
2. PPG Architectural Coatings.
3. Sherwin-Williams Company (Basis of Design).

2.2 PAINT MATERIALS, GENERAL

A. Material Compatibility: Provide block fillers, primers, and finish-coat materials that are compatible with one another and with the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.

B. Material Quality: Provide manufacturer's best-quality paint material of the various coating types specified that are factory formulated and recommended by manufacturer for application indicated. Paint-material containers not displaying manufacturer's product identification will not be acceptable.

C. VOC Content: Products shall comply with VOC limits of authorities having jurisdiction and, for interior paints and coatings applied at Project site, the following VOC limits, exclusive of colorants added to a tint base, when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

1. Flat Paints and Coatings: 50 g/L.
2. Non-flat Paints and Coatings: 150 g/L.
3. Anti-Corrosive Coatings: 250 g/L.
4. Clear Wood Finishes, Varnishes: 350 g/L.
5. Clear Wood Finishes, Lacquers: 550 g/L.
6. Floor Coatings: g/L.

7. Waterproofing Sealers: 250 g/L.
8. Sanding Sealers: 275 g/L.
9. All other Sealers: 200 g/L.
10. Clear Shellac: 730 g/L.
11. Pigmented Shellac: 550 g/L.
12. Stains: 250 g/L.

D. Locations: Provide where designated IPS – Integrated Paint System.

E. Colors: Match Architect's samples. Provide color selections made by the Architect and accepted after review of in-place mock-ups.

2.3 CONCRETE UNIT MASONRY BLOCK FILLERS

A. Concrete Unit Masonry Block Filler: Factory-formulated high-performance latex block fillers.

1. Benjamin Moore; M88 Latex Block Filler.
2. PPG; 6-15 Speedhide, Int/Ext Acrylic Masonry Block Filler.
3. Sherwin-Williams; PrepRite Block Filler, B25W25 Series.

2.4 EXTERIOR PRIMERS

A. Exterior Ferrous-Metal Primer: Factory-formulated rust-inhibitive metal primer for exterior application.

1. Benjamin Moore; Moore's IMC Alkyd Metal Primer No. M06.
2. PPG; 90-712 Series Pitt-Tech Int/Ext Industrial DTM Primer/Finish Enamel.
3. Sherwin-Williams; Pro-Industrial Pro-Cryl Universal Primer B66-310 Series.

B. Exterior Galvanized Metal Primer: Factory-formulated galvanized metal primer for exterior application.

1. Benjamin Moore; Moore's IMC Acrylic Metal Primer No. M04.
2. PPG; 90-712 Series Pitt-Tech Int/Ext Industrial DTM Primer/Finish Enamel.
3. Sherwin-Williams; Pro-Industrial Pro-Cryl Universal Primer B66-310 Series.

2.5 INTERIOR PRIMERS

A. Interior Gypsum Board Primer: Factory-formulated latex-based primer for interior application.

1. Benjamin Moore; Eco Spec Interior Latex Primer Sealer 231.
2. PPG; 6-2 Speedhide Interior Primer Sealer.
3. Sherwin-Williams; ProMar 200 Zero VOC Interior Latex Primer B28W2600.

B. Interior Wood Primer for Acrylic-Enamel Finishes: Factory-formulated acrylic-latex-based interior wood primer.

1. Benjamin Moore; Eco Spec Interior Latex Primer Sealer 231.
2. PPG; 17-955 SealGrip Acrylic Undercoat.
3. Sherwin-Williams; ProMar 200 Zero VOC Interior Latex Primer B28W2600.

C. Interior Zinc-Coated Metal Primer: Factory-formulated galvanized metal primer.

1. Benjamin Moore; Moore's IMC Acrylic Metal Primer No. M04.
2. PPG; 90-712 Series Pitt-Tech Int/Ext Industrial DTM Primer/Finish Enamel.
3. Sherwin-Williams; Pro-Industrial Pro-Cryl Universal Primer B66-310 Series.

2.6 EXTERIOR FINISH COATS

A. Exterior Semigloss Acrylic Enamel: Factory-formulated semigloss acrylic-modified alkyd enamel for exterior application.

1. Benjamin Moore; M29 D.T.M. Acrylic Semi-Gloss.
2. PPG; 90-374 Series Pitt-Tech One Pack Interior/Exterior High Performance Waterborne High Gloss DTM Industrial Enamel.
3. Sherwin-Williams; Pro Industrial Zero VOC Semi-Gloss, B66-600 Series.

B. Interior Semigloss Waterbased Alkyd Urethane Enamel: Factory-formulated semigloss waterbased alkyd urethane enamel for interior application.

1. Benjamin Moore; Approved Equal meeting specification requirements.
2. PPG; Approved Equal meeting specification requirements.
3. Sherwin-Williams; Pro Industrial Waterbased Alkyd Urethane Enamel Semi-Gloss, B53-1150/2150 Series.

2.7 INTERIOR FINISH COATS (IPS)

A. Interior Flat or Eggshell Acrylic Paint (Dryfall): Factory-formulated flat or eggshell acrylic latex paint for interior application.

1. Benjamin Moore; M53 Sweep-Up Latex Flat.
2. PPG; 6-715 xi Speedhide Interior Dry-Fog Spray Paint Flat Latex.
3. Sherwin-Williams; Pro Industrial Waterborne Acrylic Dry Fall Eg-Shel B42W00082.

B. Interior Flat Acrylic Paint: Factory-formulated flat acrylic-emulsion latex paint for interior application.

1. Benjamin Moore; Eco Spec Interior Latex Flat 219.
2. PPG; 6-70 Series SpeedHide Interior Wall Flat-Latex.
3. Sherwin-Williams; ProMar 200 Zero VOC Latex Flat B30-2600 Series.

C. Interior Flat Latex-Emulsion Size: Factory-formulated flat latex-based interior paint.

1. Benjamin Moore; Eco Spec Interior Latex Flat 219.
2. PPG; 6-70 Series SpeedHide Interior Wall Flat-Latex.
3. Sherwin-Williams; ProMar 200 Zero VOC Latex Flat B30-2600 Series.

D. Interior Low-Luster Acrylic Enamel: Factory-formulated eggshell acrylic-latex interior enamel.

1. Benjamin Moore; Moorcraft Super Spec Latex Eggshell Enamel 274.
2. PPG; 6-411 Series SpeedHide Interior Enamel Eggshell Latex.

3. Sherwin-Williams; ProMar 200 Zero VOC Latex Eg-Shel B20-2600 Series.

E. Interior Semigloss Acrylic Enamel: Factory-formulated semigloss acrylic-latex enamel for interior application.

1. Benjamin Moore; Moorcraft Super Spec Latex Semi-Gloss Enamel 276.
2. PPG; 6-500 Series SpeedHide Interior Semi-Gloss Latex.
3. Sherwin-Williams; ProMar 200 Zero VOC Latex Semi-Gloss B31-2600 Series.

F. Interior Semigloss Acrylic-Modified Alkyd Enamel: Factory-formulated semigloss acrylic-modified alkyd enamel for interior application.

1. Benjamin Moore; M29 D.T.M. Acrylic Semi-Gloss.
2. PPG; Speedhide WR Alkyd Finish.
3. Sherwin-Williams; Pro Industrial Zero VOC Semi-Gloss, B66-600 Series.

G. Interior Semigloss Waterbased Alkyd Urethane Enamel: Factory-formulated semigloss waterbased alkyd urethane enamel for interior application.

1. Benjamin Moore; Approved Equal meeting specification requirements.
2. PPG; Approved Equal meeting specification requirements.
3. Sherwin-Williams; Pro Industrial Waterbased Alkyd Urethane Enamel Semi-Gloss, B53-1150/2150 Series.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Coordination of Work: Review other Sections in which primers are provided to ensure compatibility of the total system for various substrates. On request, furnish information on characteristics of finish materials to ensure use of compatible primers.

1. Notify Architect about anticipated problems when using the materials specified over substrates primed by others.

B. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

C. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:

1. Concrete: 12 percent.
2. Masonry (Clay and CMU): 12 percent.
3. Wood: 15 percent.
4. Gypsum Board: 12 percent.

D. Gypsum Board Substrates: Verify that finishing compound is sanded smooth.

E. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.

F. 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. 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.

B. 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.

C. 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.

D. Masonry Substrates: Remove efflorescence and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces or mortar joints exceed that permitted in manufacturer's written instructions.

E. Steel Substrates: Remove rust, loose mill scale, and shop primer, if any. Clean using methods recommended in writing by paint manufacturer.

F. Shop-Primed Steel Substrates: Clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material as used for shop priming to comply with SSPC-PA 1 for touching up shop-primed surfaces.

G. Galvanized-Metal Substrates: Remove grease and oil residue from galvanized sheet metal fabricated from coil stock by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints.

H. Wood Substrates:

1. Scrape and clean knots and apply coat of knot sealer before applying primer.
2. Sand surfaces that will be exposed to view and dust off.
3. Prime edges, ends, faces, undersides, and backsides of wood.
4. After priming, fill holes and imperfections in the finish surfaces with putty or plastic wood filler. Sand smooth when dried.

I. Cotton or Canvas Insulation Covering Substrates: Remove dust, dirt, and other foreign material that might impair bond of paints to substrates.

3.3 APPLICATION

A. General: Apply paint according to manufacturer's written instructions. Use applicators and techniques best suited for substrate and type of material being applied.

1. Paint colors, surface treatments, and finishes are indicated in the paint schedules.
2. Do not paint over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions detrimental to formation of a durable paint film.
3. Provide finish coats that are compatible with primers used.
4. The term "exposed surfaces" includes areas visible when permanent or built-in fixtures, grilles, convector covers, covers for finned-tube radiation, and similar components are in place. Extend coatings in these areas, as required, to maintain system integrity and provide desired protection.
5. Paint surfaces behind movable equipment and furniture the same as similar exposed surfaces. Before final installation of equipment, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
6. Paint interior surfaces of ducts with a flat, non-specular black paint where visible through registers or grilles.
7. Paint front and backsides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.
8. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
9. Finish exterior doors on tops, bottoms, and side edges the same as exterior faces.
10. Sand lightly between each succeeding enamel or varnish coat.

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. 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.

D. Scheduling Painting: Apply first coat to surfaces that have been cleaned, pretreated, or otherwise prepared for painting as soon as practicable after preparation and before subsequent surface deterioration.

1. The number of coats and film thickness required are the same regardless of application method. Do not apply succeeding coats until previous coat has cured as recommended by manufacturer. If sanding is required to produce a smooth, even surface according to manufacturer's written instructions, sand between applications.
2. Omit primer over metal surfaces that have been shop primed and touchup painted.
3. If undercoats, stains, or other conditions show through final coat of paint, apply additional coats until paint film is of uniform finish, color, and appearance. Give special attention to ensure that edges, corners, crevices, welds, and exposed fasteners receive a dry film thickness equivalent to that of flat surfaces.
4. Allow sufficient time between successive coats to permit proper drying. Do not recoat surfaces until paint has dried to where it feels firm and does not deform or feel sticky under moderate thumb pressure, and until application of another coat of paint does not cause undercoat to lift or lose adhesion. Allow finished coats to cure a minimum of 24 hours before applying another coat.

E. Application Procedures: Apply paints and coatings by brush, roller, spray, or other applicators according to manufacturer's written instructions.

1. Brushes: Use brushes best suited for type of material applied. Use brush of appropriate size for surface or item being painted.
2. Rollers: Use rollers of carpet, velvet-back, or high-pile sheep's wool as recommended by manufacturer for material and texture required.
3. Spray Equipment: Use airless spray equipment with orifice size as recommended by manufacturer for material and texture required.
4. Touch-up: Touch-up damaged areas of painting using only the same type of application equipment as was used for the original application. If differences of appearance – including sheen and light reflectance – appear in the repaired area due to different application methods, sand the defective work area and repaint the entire surface (not just the original damage area) between normal surface breaks (E.G.: between wall corners, control joints, frames).

F. Minimum Coating Thickness: Apply paint materials in coats no thinner (and not excessively thicker) than manufacturer's recommended spreading rate to achieve dry film thickness indicated. Provide total dry film thickness of the entire system as recommended by manufacturer.

G. Mechanical and Electrical Work: Painting of mechanical and electrical work is limited to items exposed in equipment rooms and occupied spaces.

H. Mechanical items to be painted include, but are not limited to, the following:

1. Uninsulated metal piping.
2. Uninsulated plastic piping.
3. Pipe hangers and supports.
4. Tanks that do not have factory-applied final finishes.
5. Visible portions of internal surfaces of metal ducts, without liner, behind air inlets and outlets.
6. Duct, equipment, and pipe insulation having "all-service jacket" or other paintable jacket material.
7. Mechanical equipment that is indicated to have a factory-primed finish for field painting.

I. Electrical items to be painted include, but are not limited to, the following:

1. Panelboards.
2. Electrical equipment that is indicated to have a factory-primed finish for field painting.
3. Conduit and fittings.

J. Block Fillers: Apply block fillers to concrete masonry block at a rate to ensure complete coverage with pores filled.

K. Prime Coats: Before applying finish coats, apply a prime coat, as recommended by manufacturer, to material that is required to be painted or finished and that has not been prime coated by others. Recoat primed and sealed surfaces where evidence of suction spots or unsealed areas in first coat appears, to ensure a finish coat with no burn-through or other defects due to insufficient sealing.

L. Pigmented (Opaque) Finishes: Completely cover surfaces as necessary to provide a smooth, opaque surface of uniform finish, color, appearance, and coverage. Cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections will not be acceptable.

M. Transparent (Clear) Finishes: Use multiple coats to produce a glass-smooth surface film of even luster. Provide a finish free of laps, runs, cloudiness, color irregularity, brush marks, orange peel, nail holes, or other surface imperfections.

1. Apply stains if indicated.
2. Provide satin finish for final coats.

N. Completed Work: Match approved samples for color, texture, and coverage. Remove, refinish, or repaint work not complying with requirements.

3.4 FIELD QUALITY CONTROL

A. Owner reserves the right to invoke the following test procedure at any time and as often as Owner deems necessary during the period when paint is being applied:

1. Owner will engage a qualified independent testing agency to sample paint material being used. Samples of material delivered to Project will be taken, identified, sealed, and certified in the presence of Contractor
2. Testing agency will perform appropriate tests for the following characteristics as required by Owner:

a. Alkali and mildew resistance.
b. Quantitative material analysis.
c. Abrasion resistance.
d. Apparent reflectivity.
e. Flexibility.
f. Washability.
g. Absorption.
h. Accelerated weathering.
i. Dry opacity.
j. Accelerated yellowness.
k. Recoating.
l. Skinning.
m. Color retention.

3. Owner may direct Contractor to stop painting if test results show any material being used does not comply with specified requirements.

a. Contractor shall remove noncomplying paint from Project site, pay for testing, and properly re-prepare, and repaint surfaces previously coated with the noncomplying paint.
b. If necessary, Contractor may be required to remove noncomplying paint from previously painted surfaces if, on repainting with specified paint, the two coatings are incompatible.

3.5 CLEANING AND PROTECTION

A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site. Do not allow accumulation of used rags on site even if placed in air-tight containers.

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.

PART 4 - SCHEDULES

4.1 GENERAL

A. Verify painting schedule and requirements for each surface and each area.

4.2 EXTERIOR PAINT SCHEDULE

A. Ferrous Metal: Provide the following finish systems over exterior ferrous metal. Primer is not required on shop-primed items.

1. Semigloss Waterbased Alkyd Urethane Enamel Finish: Two finish coats over a rust-inhibitive primer.

a. Primer: Exterior ferrous-metal primer.
b. Finish Coats: Exterior semigloss waterbased alkyd urethane enamel.

B. Zinc-Coated Metal: Provide the following finish systems over exterior zinc-coated metal surfaces:

1. Semigloss Waterbased Alkyd Urethane Enamel Finish: Two finish coats over a galvanized metal primer.

a. Primer: Exterior galvanized metal primer.
b. Finish Coats: Exterior semigloss waterbased alkyd urethane enamel.

4.3 INTERIOR PAINT SCHEDULE

A. Concrete Unit Masonry: Provide the following finish systems over interior concrete masonry:

1. Semigloss Acrylic Enamel Finish: Two finish coats over a block filler.

a. Block Filler: Concrete unit masonry block filler.

b. Finish Coats: Interior semigloss acrylic enamel.

B. Gypsum Board: Provide the following finish systems over interior gypsum board surfaces:

1. Flat Acrylic Finish at ceilings, bulkheads and soffits: Two finish coats over a primer.

a. Primer: Interior gypsum board primer.
b. Finish Coats: Interior flat acrylic paint.

2. Low-Luster Acrylic Enamel Finish at wall surfaces: Two finish coats over a primer.

a. Primer: Interior gypsum board primer.
b. Finish Coats: Interior low-luster acrylic enamel.

C. Ferrous Metal: Provide the following finish systems over ferrous metal:

1. Flat or Eggshell Acrylic Finish (Dryfall) at exposed roof structure only at Contractor's option: One finish coat over factory-primed surfaces.

a. Finish Coat: Interior flat or eggshell acrylic (dryfall) paint.

2. Semigloss Waterbased Alkyd Urethane Enamel Finish: Two finish coats over factory-primed surfaces.

a. Finish Coats: Interior semigloss waterbased alkyd urethane enamel.

D. Zinc-Coated Metal: Provide the following finish systems over interior zinc-coated metal surfaces:

1. Semigloss Waterbased Alkyd Urethane Enamel Finish: Two finish coats over a primer.

a. Primer: Interior zinc-coated metal primer.
b. Finish Coats: Interior semigloss waterbased alkyd urethane enamel.

E. All-Service Jacket over Insulation: Provide the following finish system on cotton or canvas insulation covering:

1. Flat Acrylic Finish: Two finish coats. Add fungicidal agent to render fabric mildew proof.

a. Finish Coats: Interior flat latex-emulsion size.

END OF SECTION 099112

SECTION 101100 - VISUAL DISPLAY 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. Visual display board assemblies.

1.3 DEFINITIONS

A. Tackboard: Framed or unframed, tackable, visual display board assembly.

B. Visual Display Board Assembly: Visual display surface that is factory fabricated into composite panel form, either with or without a perimeter frame; includes markerboards and tackboards.

C. Visual Display Surface: Surfaces that are used to convey information visually, including surfaces of markerboards, tackboards, and surfacing materials that are not fabricated into composite panel form but are applied directly to walls.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

1. Show location of panel joints.
2. Show location of special-purpose graphics for visual display surfaces.
3. Include sections of typical trim members including head tack strips bottom trays.
4. Details of installation.

C. Samples for Initial Selection: For each type of visual display surface indicated and as follows:

1. Actual-material sections of tackable surface material showing the full range of colors available. Printed or photographic representations of color will be returned without review.

D. Samples for Verification: For each type of visual display surface indicated and as follows:

1. Visual Display Surface: Not less than 8 by 10 inches, mounted on substrate indicated for final work.

a. Actual sections of porcelain-enamel face sheet and tackable surface material.
b. Cork tackboards: actual material samples of full range.

2. Trim: 6-inch- long sections of each trim and accessory profile.
3. Accessories: one of each type.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Warranties: Special warranties specified in this Section.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For visual display surfaces to include in maintenance manuals.

1.7 MATERIALS MAINTENANCE SUBMITTALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Map Rail Hardware: Provide 2 dozen map hooks. Deliver to the school site.

1.8 QUALITY ASSURANCE

A. Installer Qualifications: An authorized representative of visual display unit manufacturer for installation and maintenance of units required for this Project.

B. Source Limitations: Obtain each type of visual display surface through one source from a single manufacturer. Obtain tack and markerboard visual display units from the same manufacturer and with matching trim style and size.

C. Surface-Burning Characteristics: As determined by testing identical products according to ASTM E 84 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.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Deliver factory-built visual display boards, including factory-applied trim completely assembled in one piece without joints, where possible. If dimensions exceed maximum manufactured panel size, provide two or more pieces of equal length as acceptable to Architect. When overall dimensions require delivery in separate units, pre-fit components at the factory, disassemble for delivery, and make final joints at the site.

B. Store visual display units vertically with packing materials between each unit.

1.10 FIELD CONDITIONS

A. Field Measurements: Verify dimensions by field measurements before fabrication and indicate measurements on Shop Drawings.

1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating visual display surfaces without field measurements. Coordinate wall construction to ensure that actual dimensions correspond to established dimensions.
2. Allow for trimming and fitting where taking field measurements before fabrication might delay the Work.

1.11 WARRANTY

A. Special Warranty for Porcelain-Enamel Face Sheets: Manufacturer's standard form in which manufacturer agrees to repair or replace porcelain-enamel face sheets that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Surfaces lose original writing and erasing qualities.
b. Surfaces become slick or shiny.
c. Surfaces exhibit crazing, cracking, or flaking.

2. Warranty Period: 50 years.

PART 2 - PRODUCTS

2.1 MANUFACTURERS COMPONENT MATERIALS, GENERAL

A. Porcelain-Enamel Face Sheet: Per Visual Display Board manufacturer’s standard materials provide either ASTM A 424, enameling-grade steel, uncoated thickness indicated; with exposed face and edges coated with primer, 1.7-to-2.5-mil- thick ground coat, and color cover coat, and concealed face coated with primer and 1.7-to-2.5-mil- ground coat; or ASTM A 463/A 463M, Type 1, stretcher-leveled aluminized steel, with 0.0236-inch uncoated thickness; with porcelain-enamel coating fused to steel at approximately 1000 deg F. Provide color as selected by Architect from manufacturer’s full range of colors.

1. Matte-Finish Cover Coat: Low reflective / low gloss; chalk wipes clean with dry cloth or standard eraser.
2. Products:

a. Claridge Products & Equipment, Inc.; LCS Markerboard.
b. K-Pro Specialty Products; Prosteel.
c. PolyVision Corporation; P3 Ceramicsteel Markerboard.

B. Hardboard: AHA A135.4, tempered.

C. Particleboard: ANSI A208.1, Grade M-1, made with binder containing no urea formaldehyde.

D. Plastic-Impregnated Cork Sheet: MS MIL-C-15116-C, Type I, seamless, homogeneous, self-sealing sheet consisting of granulated cork, linseed oil, resin binders, and dry pigments that are mixed and calendared onto fabric backing; with washable vinyl finish and integral color throughout and with surface-burning characteristics indicated.

E. Extruded Aluminum: ASTM B 221, Alloy 6063.

2.2 FRAMED MARKERBOARD ASSEMBLIES

A. Porcelain-Enamel Markerboard Assembly: Balanced, high-pressure, factory-laminated markerboard assembly of 3-ply construction consisting of backing sheet, core material, and 0.021-inch- thick, porcelain- enamel face sheet.

1. Manufacturers:

    a. AARCO Products, Inc.
    b. ADP/Lemco, Inc.
    c. AJW.
    d. Best-Rite Manufacturing.
    e. Claridge Products & Equipment, Inc.
    f. Ghent Manufacturing Inc.
    g. K-Pro Specialty Products.
    h. Marsh Industries, Inc.
    i. Platinum Visual Systems; a division of ABC School Equipment, Inc.

2. Particleboard Core: 3/8 inch thick; with 0.005-inch- thick, aluminum foil backing.
3. Laminating Adhesive: Manufacturer's standard moisture-resistant thermoplastic type.
4. Map-rail: continuous full length at frame head.

2.3 FRAMED TACKBOARD ASSEMBLIES

A. Manufacturers:

1. AARCO Products, Inc.
2. ADP/Lemco, Inc.
3. AJW.
4. Best-Rite Manufacturing.
5. Claridge Products & Equipment, Inc.
6. Ghent Manufacturing Inc.
7. K-Pro Specialty Products.
8. Marsh Industries, Inc.
9. Platinum Visual Systems; a division of ABC School Equipment, Inc.

B. Plastic-Impregnated-Cork Tack Assembly: 1/4-inch- thick, plastic-impregnated cork sheet factory laminated to 1/4-inch- thick hardboard or particleboard.

1. Laminating Adhesive: Manufacturer's standard low VOC moisture-resistant thermoplastic type.

2.4 MARKERBOARD AND TACKBOARD ACCESSORIES

A. Aluminum Frames and Trim: Fabricated from not less than 0.062-inch-thick extruded aluminum.

1. Factory-Applied Trim: Manufacturer's standard; matching trim on framed tack and marker boards. Field assembly from stock extrusions is not allowed.

B. Marker Tray: Manufacturer's standard, continuous.

1. Solid Type: Extruded aluminum with ribbed section and smoothly curved exposed ends.
2. Omit marker tray at gymnasium markerboards.

C. Magnetic Marker and Eraser Holders: Provide for each gymnasium markerboards.

D. Map Rail: Provide the following accessories:

1. Display Rail: Continuous and integral with map rail; fabricated from cork approximately 1 to 2 inches wide.
2. End Stops: Located at each end of map rail.
3. Map Hooks: Two map hooks for every 48 inches of map rail or fraction thereof.
4. Flag Holder: One for each room, flag holders must point upward. Provide sample for Owner approval.
5. Omit map rail and tack strip at gymnasium markerboards.

2.5 FABRICATION

A. Porcelain-Enamel Visual Display Assemblies: Laminate porcelain-enamel face sheet and backing sheet to core material under heat and pressure with manufacturer's standard flexible, waterproof adhesive.

B. Visual Display Boards: Factory assemble visual display boards, unless otherwise indicated.

1. For framed units trim shall be assembled and attached to visual display boards at manufacturer's factory before shipment.

C. Factory-Assembled Visual Display Units: Coordinate factory-assembled units with trim and accessories indicated. Join parts with a neat, precision fit.

1. Make joints only where total length exceeds maximum manufactured length. Fabricate with minimum number of joints, as indicated on approved Shop Drawings.
2. Provide manufacturer's standard vertical-joint spline system between abutting sections of markerboards, but only where overall length shown exceeds industry manufacturing capabilities.
3. Where size of visual display boards or other conditions require support in addition to normal trim, provide structural supports or modify trim as indicated or as selected by Architect from manufacturer's standard structural support accessories to suit conditions indicated.

D. Aluminum Frames and Trim: Fabricate units straight and of single lengths, keeping joints to a minimum. Miter corners to neat, hairline closure.

1. Where factory-applied trim is indicated, trim shall be assembled and attached to visual display units at manufacturer's factory before shipment.

2.6 ALUMINUM 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. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.

D. Clear Anodic Finish: AAMA 611, AA-M12C22A31, Class II, 0.010 mm or thicker.

1. All frames and trim.

PART 3 - EXECUTION

3.1 EXAMINATION

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

B. Examine walls and partitions for proper preparation, blocking, and backing for visual display surfaces.

C. Walls shall be (at least) prime and one finish coat painted before visual display boards are installed.

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

3.2 PREPARATION

A. Comply with manufacturer's written instructions for surface preparation.

B. Clean substrates of substances that could impair the performance of and affect the smooth, finished surfaces of visual display boards, including dirt, mold, and mildew.

C. Prepare surfaces to achieve a smooth, dry, clean surface free of flaking, unsound coatings, cracks, defects, projections, depressions, and substances that will impair bond between visual display surfaces and wall surfaces.

1. Prepare substrates indicated to receive visual display wall covering as required by manufacturer's written instructions to achieve a smooth, dry, clean, structurally sound surface that is uniform in color.
2. Moisture Content: Maximum of 4 percent when tested with an electronic moisture meter.

3.3 INSTALLATION, GENERAL

A. General: Install visual display surfaces in locations and at mounting heights indicated on Drawings. Keep perimeter lines straight, level, and plumb. Provide grounds, clips, backing materials, adhesives, brackets, anchors, trim, and accessories for complete installation.

3.4 INSTALLATION OF FACTORY-FABRICATED VISUAL DISPLAY UNITS

A. Visual Display Boards: Attach concealed clips, hangers, and grounds to wall surfaces and to visual display boards with mechanical fasteners at not more than 16 inches o.c. Secure both top and bottom of boards to walls.

3.5 INSTALLATION OF UNFRAMED TACKBOARDS

A. Verify that mounting surface is flat and without protruding objects or device plates.

B. Fit tackboards snug (1/16-inch approximate maximum clearance) between vertical and horizontal abutting surfaces.

C. Install by one of the methods indicated above and brace in place until set.

3.6 CLEANING AND PROTECTION

A. Clean visual display surfaces according to manufacturer's written instructions. Attach one cleaning label to visual display surface in each room.

B. Touch up factory-applied finishes to restore damaged or soiled areas.

C. Cover and protect visual display surfaces after installation and cleaning.

END OF SECTION 101100

SECTION 101419 - DIMENSIONAL LETTER SIGNAGE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Fabricated dimensional characters.

1.3 COORDINATION

A. Furnish templates for placement of electrical service embedded in permanent construction by other installers.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For signs.

1. Include fabrication and installation details and attachments to other work.
2. Show sign mounting heights, locations of supplementary supports to be provided by other installers, and accessories.
3. Show message list, typestyles, graphic elements, and layout for each sign at least half size.

C. Samples for Initial Selection: For each type of sign assembly, exposed component, and exposed finish.

1. Include representative Samples of available typestyles and graphic symbols.

D. Product Schedule: For dimensional letter signs. Use same designations indicated on Drawings or specified.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Sample Warranty: For special warranty.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For signs to include in maintenance manuals.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

1.8 FIELD CONDITIONS

A. Field Measurements: Verify locations of electrical service embedded in permanent construction by other installers by field measurements before fabrication, and indicate measurements on Shop Drawings.

1.9 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of signs that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Deterioration of finishes beyond normal weathering.
b. Separation or delamination of sheet materials and components.

2. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 DIMENSIONAL CHARACTERS

A. Precision Cut Solid Acrylic Letters

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

a. ACE Sign Systems, Inc.
b. ASI Sign Systems, Inc.
c. Gemini Incorporated.

2. Character Material: Solid acrylic.
3. Material Thickness: As indicated on drawings.
4. Finishes: As indicated on drawings.
5. Mounting: VHB tape.
6. Typeface: As indicated on drawings.
7. Size: As indicated on drawings.
8. Copy: As indicated on drawings.

B. Fasteners and Anchors: Manufacturer's standard as required for secure anchorage of signs, noncorrosive and compatible with each material joined, and complying with the following:

1. Use concealed fasteners and anchors unless indicated to be exposed.
2. Sign Mounting Fasteners:

a. Concealed Studs: Concealed (blind), threaded studs welded or brazed to back of sign material, screwed into back of sign assembly, or screwed into tapped lugs cast integrally into back of cast sign material, unless otherwise indicated.

2.2 FABRICATION

A. General: Provide manufacturer's standard sign assemblies according to requirements indicated.

1. Preassemble signs and assemblies in the shop to greatest extent possible. Disassemble signs and assemblies only as necessary for shipping and handling limitations. Clearly mark units for reassembly and installation; apply markings in locations concealed from view after final assembly.
2. Mill joints to a tight, hairline fit. Form assemblies and joints exposed to weather to resist water penetration and retention.
3. Comply with AWS for recommended practices in welding and brazing. Provide welds and brazes behind finished surfaces without distorting or discoloring exposed side. Clean exposed welded and brazed connections of flux, and dress exposed and contact surfaces.
4. Conceal connections if possible; otherwise, locate connections where they are inconspicuous.
5. Internally brace dimensional characters for stability, to meet structural performance loading without oil-canning or other surface deformation, and for securing fasteners.
6. Provide rabbets, lugs, and tabs necessary to assemble components and to attach to existing work. Drill and tap for required fasteners. Use concealed fasteners where possible; use exposed fasteners that match sign finish.
7. Castings: Fabricate castings free of warp, cracks, blowholes, pits, scale, sand holes, and other defects that impair appearance or strength. Grind, wire brush, sandblast, and buff castings to remove seams, gate marks, casting flash, and other casting marks before finishing.

2.3 GENERAL FINISH REQUIREMENTS

A. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

B. 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.

C. Directional Finishes: Run grain with long dimension of each piece and perpendicular to long dimension of finished trim or border surface unless otherwise indicated.

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.

B. Verify that sign-support surfaces are within tolerances to accommodate signs without gaps or irregularities between backs of signs and support surfaces unless otherwise indicated.

C. Verify that electrical service is correctly sized and located to accommodate signs.

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

3.2 INSTALLATION

A. General: Install signs using mounting methods indicated and according to manufacturer's written instructions.

1. Install signs level, plumb, true to line, and at locations and heights indicated, with sign surfaces free of distortion and other defects in appearance.
2. Before installation, verify that sign surfaces are clean and free of materials or debris that would impair installation.

B. Mounting Methods:

1. Concealed Studs: Using a template, drill holes in substrate aligning with studs on back of sign. Remove loose debris from hole and substrate surface.

    a. Masonry Substrates: Fill holes with adhesive. Leave recess space in hole for displaced adhesive. Place sign in position and push until flush to surface, embedding studs in holes. Temporarily support sign in position until adhesive fully sets.
    b. Thin or Hollow Surfaces: Place sign in position and flush to surface, install washers and nuts on studs projecting through opposite side of surface, and tighten.

3.3 ADJUSTING AND CLEANING

A. Remove and replace damaged or deformed characters and signs that do not comply with specified requirements. Replace characters with damaged or deteriorated finishes or components that cannot be successfully repaired by finish touchup or similar minor repair procedures.

B. Remove temporary protective coverings and strippable films as signs are installed.

C. On completion of installation, clean exposed surfaces of signs according to manufacturer's written instructions, and touch up minor nicks and abrasions in finish. Maintain signs in a clean condition during construction and protect from damage until acceptance by Owner.

D. Repair scratches and other damage which might have occurred during installation. Replace components where repairs were made but are still visible to the unaided eye from a distance of 10 feet.

END OF SECTION 101419

SECTION 101423 - PANEL SIGNAGE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Special Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Interior panel signs.

1.3 DEFINITIONS

A. Accessible: In accordance with the accessibility standard.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For panel signs.

1. Include fabrication and installation details and attachments to other work.
2. Show sign mounting heights, locations of supplementary supports to be provided by others, and accessories.
3. Show message list, typestyles, graphic elements, including raised characters and Braille, and layout for each sign at least half size.

C. Samples for Initial Selection: Manufacturer's color sets consisting of actual-material units or sections of units showing the full range of colors available.

D. Samples for Verification: For each type of sign assembly showing all components and with the required finish(es), in manufacturer's standard size unless otherwise indicated and as follows:

1. Panel Signs: Provide a sample panel not less than 6 inches by 6 inches for each material, color, texture, and pattern required. On each panel include a representative sample of the graphic image process required, showing graphic style, and colors and finishes of letters, numbers, and other graphic devices.

E. Sign Schedule: Use same designations indicated on Drawings.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Sample Warranty: For special warranty.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For signs to include in maintenance manuals.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: Manufacturer of products.

B. Design Concept: The bidding documents are based upon a general design intent and signage quantity. The signage contractor is required to meet with the Owner to determine final location, quantity, size and copy for all signs. A maximum of 3 visits will be required. Submit Owner approved sign copy to Architect for final approval.

1.8 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of signs that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Deterioration of finishes beyond normal weathering.
b. Deterioration of embedded graphic image.
c. Separation or delamination of sheet materials and components.

2. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Accessibility Standard: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines for Buildings and Facilities for signs.

2.2 SIGNS

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

1. Ace Sign Systems.
2. APCO Signs.
3. ASE, Inc.
4. ASI Sign Systems.
5. Best Sign Systems, Inc.
6. Takeform.

B. Panel Sign: Provide smooth sign panel surfaces constructed to remain flat under installed conditions within a tolerance of plus or minus 1/16 inch measured diagonally from corner to corner, complying with one of the following sign construction types in the first two following paragraphs. Applied letters, engraved characters and Braille plates are NOT acceptable.

1. Melamine Surface Laminate and Phenolic Core: 0.125-inch melamine surface laminate and phenolic core with a carved background to produce the raised graphics with Braille 1/32 inch above surface with contrasting colors as selected by Architect from manufacturer's full range.
2. Laminated, Etched Photopolymer: Raised graphics with Braille 1/32 inch above surface with contrasting colors as selected by Architect from manufacturer's full range and laminated to 0.125-inch acrylic back.
3. Edge Condition: Square cut.
4. Corner Condition: Square.
5. Mounting: Unframed.
6. Custom Paint Colors: As selected by Architect.
7. Tactile Characters: Characters and Grade 2 Braille raised 1/32 inch above surface with contrasting colors. Font styles to be selected by architect from manufacturers' complete line of ADA compliant styles.
8. Sign Schedule: Indicated on Drawings.

C. Brackets: Fabricate brackets and fittings for bracket-mounted signs from extruded aluminum to suit panel sign construction and mounting conditions indicated. Factory paint brackets in color matching background color of panel sign.

D. Changeable Message Inserts: Fabricate signs to allow insertion of changeable messages in the form of transparent covers with paper inserts printed by Owner.

1. Furnish insert material and software for creating text and symbols for PC-Windows or Apple computers for Owner production of paper inserts.

2.3 PANEL-SIGN MATERIALS

A. Acrylic Sheet: ASTM D 4802, category as standard with manufacturer for each sign, Type UVF (UV filtering).

2.4 ACCESSORIES

A. Adhesives: As recommended by sign manufacturer and with a VOC content of 70 g/L or less for adhesives used inside the weatherproofing system and applied on-site when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

B. Two-Face Tape: Manufacturer's standard high-bond, foam-core tape, 0.045 inch thick, with adhesive on both sides.

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 signage work.

B. Verify that sign-support surfaces are within tolerances to accommodate signs without gaps or irregularities between backs of signs and support surfaces unless otherwise indicated.

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

3.2 INSTALLATION

A. General: Install signs using mounting methods indicated and according to manufacturer's written instructions.

1. Install signs level, plumb, true to line, and at locations and heights indicated, with sign surfaces free of distortion and other defects in appearance.
2. Interior Wall Signs: Install signs on walls adjacent to latch side of door, 5’-0” above floor to top of sign. Where not indicated or possible, such as double doors, install signs on nearest adjacent walls. Locate to allow approach within 3 inches of sign without encountering protruding objects or standing within swing of door.

B. Wall-Mounted Signs: Comply with sign manufacturer's written instructions except where more stringent requirements apply.

1. Adhesive and Two-Face Tape: Clean bond-breaking materials from substrate surface and remove loose debris. Apply tape strips symmetrically to back of sign and of suitable quantity to support weight of sign without slippage. Keep strips away from edges to prevent visibility at sign edges. Apply linear beads or spots of adhesive symmetrically to back of sign and of suitable quantity to support weight of sign after cure without slippage. Keep adhesive away from edges to prevent adhesive extrusion as sign is applied and to prevent visibility of cured adhesive at sign edges. Place sign in position and push to engage adhesive.
2. Signs Mounted on Glass: Provide matching, blank, opaque plate on opposite side of glass to conceal mounting materials.

C. Bracket-Mounted Signs: Provide manufacturer's standard brackets, fittings, and hardware for mounting signs that project at right angles from walls and ceilings. Attach brackets and fittings securely to walls and ceilings with concealed fasteners and anchoring devices to comply with manufacturer's written instructions.

3.3 ADJUSTING AND CLEANING

A. Remove and replace damaged or deformed signs and signs that do not comply with specified requirements. Replace signs with damaged or deteriorated finishes or components that cannot be successfully repaired by finish touchup or similar minor repair procedures.

B. Remove temporary protective coverings and strippable films as signs are installed.

C. On completion of installation, clean exposed surfaces of signs according to manufacturer's written instructions and touch up minor nicks and abrasions in finish. Maintain signs in a clean condition during construction and protect from damage until acceptance by Owner.

END OF SECTION 101423

SECTION 102800 - TOILET ACCESSORIES

PART 1 - GENERAL

1.1 DESCRIPTION

A. Provide toilet accessories, including mounting and anchorage devices and templates necessary for their installation. Work includes:

1. Commercial quality recessed and surface mounted toilet accessories.
2. Framed mirrors.
3. Janitor accessories.

1.2 SUBMITTALS

A. Submit product data for each toilet accessory item specified, including details of construction relative to materials, dimensions, gauges, profiles, method of mounting, specified options, and finishes.

B. Submit full-size samples of each toilet accessory item for verification of design, operation, and finish requirements. Acceptable samples will be returned and may be used in the work.

C. Submit setting drawings where cutouts are required in other work, include templates, substrate preparation instructions, and directions for preparing cutouts and installation of anchorage devices.

1.3 PROJECT CONDITIONS

A. Coordinate accessory locations, installation, and sequencing with other work to avoid interference and to assure proper installation, operation, adjustment, cleaning, and servicing of toilet accessory items.

1.4 WARRANTY

A. Submit manufacturer’s written 10-year warranty against silver spoilage of mirrors, agreeing to replace mirrors that develop visible defects within warranty period.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Subject to compliance with requirements, provide toilet accessories by one of the

following:

1. Bobrick Washroom Equipment, Inc.
2. Bradley Corporation
3. Gamco Co.

2.2 MATERIALS, GENERAL

A. Stainless steel; AISI Type 302/304, with polished No. 4 finish, 0.034-inch (22 gauge) minimum thickness.

B. Brass; Leaded and unleaded, flat products, ASTM B19; rods, shapes, forgings, and flat products with finished edges, ASTM B16; Castings, ASTM B30.

C. Sheet Steel; Cold-rolled, commercial quality ASTM A 366, 0.04-inch (20 gauge) minimum. Surface preparation and metal pretreatment as required for applied finish.

D. Galvanized Steel Sheet; ASTM A527, G60.

E. Chromium Plating; Nickel and chromium electro-deposited on base metal, ASTM B456, Type SC2.

F. Baked Enamel Finish; Factory-applied, gloss white, baked acrylic enamel coating.

G. Mirror Glass; Nominal 6.0-mm (0.23-inch) thick, conforming to ASTM C1036, Type I, Class 1, Quality q2, and with silvering, electro-plated copper coating, and protective organic coating.

H. Galvanized Steel Mounting Devices; ASTM A153, hot-dip galvanized after fabrication.

I. Fasteners; Screws, bolts, and other devices of same material as accessory unit, or of galvanized steel where concealed.

2.3 GRAB BARS

A. Stainless Steel Type: Provide grab bars with wall thickness not less than 0.05 inch (18 gauge) and as follows:

B. Mounting: Exposed fasteners, manufacturer’s standard flanges and anchorages.

C. Clearance: 1-1/2-inch clearance between wall surface and inside face of bar.

D. Gripping Surfaces: Smooth, satin finish.

E. Gripping Surfaces: Manufacturer’s standard non-slip texture.

F. Heavy-Duty Size: Outside diameter of 1-1/2 inches.

2.4 MISCELLANEOUS ACCESSORIES

A. Mop and Broom Holder/Utility Shelf: Combination unit with 0.05-inch (18 gauge), Type 304, stainless steel shelf with ½-inch returns, 0.062-inch (16 gauge) support brackets for wall mounting. Provide 0.062-inch (16 gauge) stainless steel hooks for wiping rags on front of shelf, together with spring-loaded, rubber hat, cam-type mop/broom holders; ¼-inch-diameter stainless steel drying rod suspended beneath shelf. Provide unit 36 inches long and complete with four mop/broom holders and three hooks.

2.5 MIRROR UNITS

A. Standard Stainless-Steel Framed Mirror Units: Fabricate frame with channel shapes not less than 0.04 inch (20 gauge), with square corners carefully mitered to hairline joints and mechanically interlocked. Provide in Type 430 bright polished finish.

B. Shelves: Fabricate steel in same gauge and finish as mirror frame, approximately 5 inches deep by width of mirror. Turn down and return edges for additional rigidity. Weld shelves securely to bottom of mirror frame; provide concealed, rigid bracket supports for widths exceeding 36 inches.

2.6 TOILET ACCESSORY TYPES

A. Furnish accessories with mounting and anchorage devices as recommended by the manufacturer for the type of surface on which to be mounted.

B. Toilet accessory types:

1. T-1; Toilet Paper Holder
    a. Bobrick #B-2892
2. T-2; Soap Dispenser
    a. Bobrick #B-2111
3. T-3; Paper Towel Dispenser
    a. Bobrick # B262
4. T-4; Grab Bar - 42
    a. Bobrick #B-6806 Series
5. T-5; Mirror 18x36
    a. Bobrick #B-2900 Series
6. T-6; Sanitary Napkin
    a. Bobrick #B-6806 Series

7. T-7; Grab Bar-36

    a. Bobrick #B6806 Series

8. T-8; Changing Station

    a. Foundations #100SSE-SM

9. T-9; Mop/Broom Holder

    a. Bobrick #B239

10. T-10; Grab Bar – 18”

    a. Bobrick #B6806 Series

C. Similar products as manufactured by Gamco and Bradley as considered equivalent.

2.7 FABRICATION

A. 1-1/2-inch diameter, unobtrusive logo of manufacturer, as approved by Architect, is permitted on exposed face of toilet accessory units. On either interior surface not exposed view or back surface, provide additional identification by means of either a printed, waterproof label or a stamped nameplate, indicating manufacturer’s name and product model number.

B. Surface-mounted toilet accessories; except where otherwise indicated, fabricate units with tight seams and joints, exposed edges rolled. Hang doors or access panels with continuous stainless-steel piano hinge. Provide concealed anchorage wherever possible.

C. Recessed toilet accessories; except where otherwise indicated, fabricate units of all welded construction, without mitered corners.

D. Framed mirror units; fabricate frames for glass mirror units to accommodate wood, felt, plastic, or other glass edge protection material. Provide mirror backing and support system that will permit rigid, tamper-proof glass installation and prevent accumulation of moisture, as follows:

1. Provide galvanized steel backing sheet, not less than 22 gauge (0.034 inch) and full mirror size, with non-absorptive filler material. Corrugated cardboard is not acceptable filler material.
2. Mirror unit hangers; one-piece galvanized steel wall hanger device with spring action locking mechanism to hold mirror unit in position with no exposed screws or bolts to provide rigid, tamper proof and theft proof installation.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install toilet accessory units in accordance with manufacturer's instructions, using fasteners appropriate to substrate and recommended by manufacturer of unit. Install units plumb and level, firmly anchored in locations and at heights indicated.

B. Secure mirrors to walls in concealed, tamper proof manner with special hangers, toggle bolts, or screws. Set units plumb, level, and square at locations indicated, in accordance with manufacturer's instructions for type of substrate involved.

C. Installation of toilet accessories must use torx-head (star design with center pin) security fasteners in all exposed locations unless otherwise approved by Architect.

3.2 ADJUSTING AND CLEANING

A. Adjust toilet accessories for proper operation and verify that mechanisms function smoothly. Replace damaged or defective items.

B. Clean and polish all exposed surfaces in strict accordance with manufacturer's recommendations after removing temporary labels and protective coatings.

END OF SECTION 102800

SECTION 104300 - EMERGENCY AID SPECIALTIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Special Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SECTION INCLUDES

A. Automated external defibrillators (AEDs).

B. Automated external defibrillator (AED) cabinets.

C. Accessories.

1.3 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide AED operational features, color and finish, anchorage details, and installation instructions.

C. Manufacturer's Installation Instructions: Indicate special criteria and wall opening coordination requirements.

D. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

E. Maintenance Data: Include test schedules and recertification requirements.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Automated External Defibrillators (AEDs):

1. Philips Medical Systems; www.usa.philips.com.
2. Stryker Corporation; HeartSine Samaritan PAD 350P Defibrillator - PAD 350p: www.stryker.com.
3. ZOLL Medical Corporation; www.zoll.com.

B. Emergency Aid Cabinets and Accessories:

1. Activar Construction Products Group, Inc. - JL Industries; LifeStart 1400 Series AED Cabinet: www.activarcpg.com.
2. Modern Metal Products, a division of Technico, Inc; www.modern-metal.com.

2.2 ACCESSORIES

A. Alarm Contacts: Contact devices.

B. Cabinet Door Signage: 'AED" decal, or vinyl self-adhering, prespaced black lettering and identifying graphic in accordance with authorities having jurisdiction (AHJ).

C. Plastic Wall Signage: Flat style.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify rough openings for cabinet are correctly sized and located.

3.2 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install cabinets plumb and level in wall openings.

C. Secure rigidly in place.

D. Place AEDs in cabinets.

E. Wall Signs:

1. Location: Where shown.
2. Apply on walls after field painting is completed and has been accepted.

F. Cabinet Lettering:

1. Location: Face of door framing.
2. Apply lettering on factory-finished cabinets either at the factory or just prior to Substantial Completion.

3.3 ADJUSTING AND CLEANING

A. Remove temporary protective coverings and strippable films, if any, as cabinets are installed unless otherwise indicated in manufacturer's written installation instructions.

B. Adjust cabinet doors to operate smoothly without binding. Verify that alarms and integral locking devices operate properly.

C. On completion of cabinet installation, clean interior and exterior surfaces as recommended by manufacturer.

D. Touch up marred finishes. Replace cabinets that cannot be restored to factory-finished appearance. Use materials and procedures recommended by cabinet manufacturer.

END OF SECTION 104300

SECTION 104413 - FIRE PROTECTION CABINETS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Special Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Fire protection cabinets for the following:

a. Portable fire extinguishers.

B. Related Sections:

1. Section 104416 "Fire Extinguishers."

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for fire protection cabinets.

1. Fire Protection Cabinets: Include roughing-in dimensions, details showing mounting methods, relationships of box and trim to surrounding construction, door hardware, cabinet type, trim style, and panel style.

B. Samples for Initial Selection: For each type of fire protection cabinet indicated.

C. Product Schedule: For fire protection cabinets. Coordinate final fire protection cabinet schedule with fire extinguisher schedule to ensure proper fit and function.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance Data: For fire protection cabinets to include in maintenance manuals.

1.5 QUALITY ASSURANCE

A. Source Limitations: Obtain fire extinguishers and cabinets through one source from a single manufacturer.

B. Fire-Rated, Fire Protection Cabinets: Listed and labeled to comply with requirements in ASTM E 814 for fire-resistance rating of walls where they are installed.

1.6 COORDINATION

A. Coordinate size of fire protection cabinets to ensure that type and capacity of fire extinguishers indicated are accommodated.

B. Coordinate sizes and locations of fire protection cabinets with wall depths.

C. Ensure that mounting methods, heights, and cabinet design does not create an ADA 'overhanging objects' violation. No element (including handle) projecting from the wall plane more than 4-inches when above 27-inches above floor line.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Cold-Rolled Steel Sheet: ASTM A 1008, Commercial Steel (CS), Type B.

B. Tempered Float Glass: ASTM C 1048, Kind FT, Condition A, Type I, Quality q3, 3 mm thick, Class 1 (clear).

2.2 FIRE PROTECTION CABINET

A. Manufacturer: Subject to compliance with requirements, provide one of the following:

1. Fire End & Croker Corporation.
2. Guardian Fire Equipment, Inc.
3. J. L. Industries, Inc., a division of Activar Construction Products Group.
4. Larsen's Manufacturing Company.
5. Nystrom Building Products.
6. Potter Roemer LLC.
7. Strike First Corporation of America.

B. Cabinet Size: Suitable for fire extinguisher specified in other sections.

C. Cabinet Material: Steel sheet.

D. Recessed Cabinet: Cabinet box recessed in walls of sufficient depth to suit style of trim indicated.

1. Exposed Flat Trim, typical: One-piece combination trim and perimeter door frame overlapping surrounding wall surface with exposed trim face and wall return at outer edge (backbend).

E. Cabinet Trim Material: Steel sheet.

F. Door Material: Steel sheet.

G. Door Style: Vertical duo panel with frame.

H. Door Glazing, typical: Tempered float glass (clear).

I. Door Hardware: Manufacturer's standard door-operating hardware of proper type for cabinet type, trim style, and door material and style indicated.

1. Typical cabinets: Provide projecting lever handle with cam-action latch or projecting door pull.

a. Projecting Handles more than 27-inches above floor line may not protrude more than 4-inches in front of the wall plane; provide recessed pulls if standard pulls do not comply with this ADA requirement.

2. Provide concealed type or continuous hinge, of same material and finish as trim, permitting door to open 180 degrees.

J. Accessories:

1. Mounting Bracket: Manufacturer's standard steel, designed to secure fire extinguisher to fire protection cabinet, of sizes required for types and capacities of fire extinguishers indicated, with plated or baked-enamel finish.

a. Provide brackets for all extinguishers, whether in cabinets or not.

2. Door Lock: Cam lock that allows door to be opened during emergency by pulling sharply on door handle.
3. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location. Locate as directed by Architect.

a. Identify fire extinguisher in fire protection cabinet with the words "FIRE EXTINGUISHER."

1) Location: Applied to cabinet door.
2) Application Process: Pressure-sensitive vinyl letters.
3) Lettering Color: Red.
4) Orientation: Vertical.

b. Identify bracket-mounted extinguishers outside of cabinets with the words "FIRE EXTINGUISHER" in red letter decals applied to wall surface.

K. Finishes:

1. Manufacturer's standard baked-enamel paint for the following:

a. Exterior of cabinet, door and trim, except for those surfaces indicated to receive another finish.
b. Interior of cabinet and door.

2. Steel: Baked enamel or powder coat.

2.3 FABRICATION

A. Fire Protection Cabinets: Provide manufacturer's standard box (tub) with trim, frame, door, and hardware to suit cabinet type, trim style, and door style indicated.

1. Weld joints and grind smooth.
2. Provide factory-drilled mounting holes.

B. Cabinet Doors: Fabricate doors according to manufacturer's standards, from materials indicated and coordinated with cabinet types and trim styles selected.

1. Fabricate door frames with tubular stiles and rails and hollow-metal design, minimum 1/2 inch thick.
2. Miter and weld perimeter door frames.

C. Cabinet Trim: Fabricate cabinet trim in one piece with corners mitered, welded, and ground smooth.

2.4 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces of fire protection cabinets from damage by applying a strippable, temporary protective covering before shipping.

C. Finish fire protection cabinets after assembly.

D. Appearance of Finished Work: Noticeable variations in same piece are 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.

2.5 STEEL FINISHES

A. Surface Preparation: Remove mill scale and rust, if present, from uncoated steel, complying with SSPC-SP 8, "Pickling." After cleaning, apply a conversion coating suited to the organic coating to be applied over it.

B. Baked-Enamel or Powder-Coat Finish: Immediately after cleaning and pretreating, apply manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat. Comply with coating manufacturer's written instructions for applying and baking to achieve a minimum dry film thickness of 2 mils.

1. Color and Gloss: White.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine walls and partitions for suitable framing depth and blocking where recessed cabinets will be installed.

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

3.2 PREPARATION

A. Prepare recesses for recessed fire protection cabinets as required by type and size of cabinet and trim style.

3.3 INSTALLATION

A. General: Install fire protection cabinets in locations indicated with top of cabinet opening 4'-8" above floor. Where extinguishers occur without cabinet, mount top of extinguisher 4'-4" above floor.

B. Fire Protection Cabinets: Fasten cabinets to structure, square and plumb.

1. Unless otherwise indicated, provide recessed fire protection cabinets. If wall thickness is not adequate for recessed cabinets, provide semi-recessed fire protection cabinets.
2. Fasten mounting brackets to inside surface of fire protection cabinets, square and plumb.

C. Identification: Apply vinyl lettering at locations indicated.

3.4 ADJUSTING AND CLEANING

A. Remove temporary protective coverings and strippable films, if any, as fire protection cabinets are installed unless otherwise indicated in manufacturer's written installation instructions.

B. Adjust fire protection cabinet doors to operate easily without binding. Verify that integral locking devices operate properly.

C. On completion of fire protection cabinet installation, clean interior and exterior surfaces as recommended by manufacturer.

D. Touch up marred finishes or replace fire protection cabinets that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by fire protection cabinet and mounting bracket manufacturers.

E. Replace fire protection cabinets that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 104413

SECTION 104416 - FIRE EXTINGUISHERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes portable, fire extinguishers for installation in fire extinguisher cabinets and for exposed (bracket-mounted) locations.

B. Related Sections:

1. Section 104413 "Fire Extinguisher Cabinets" for cabinets, mounting brackets inside cabinets, and mounting brackets for exposed wall-mounted extinguishers.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include rating and classification, material descriptions, dimensions of individual components and profiles, and finishes for fire extinguisher.

B. Product Schedule: For fire extinguishers. Coordinate final fire extinguisher schedule with fire protection cabinet schedule to ensure proper fit and function.

C. Warranty: Sample of special warranty.

1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain fire extinguishers and cabinets through one source from a single manufacturer.

B. NFPA Compliance: Fabricate and label fire extinguishers to comply with NFPA 10, "Portable Fire Extinguishers."

C. Fire Extinguishers: Listed and labeled for type, rating, and classification by an independent testing agency acceptable to authorities having jurisdiction.

1.5 WARRANTY

A. Special Warranty: 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.
b. Faulty operation of valves or release levers.

2. Warranty Period: Six years from date of Contract Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. NFPA Compliance: Fabricate and label fire extinguishers to comply with NFPA 10, "Portable Fire Extinguishers."

B. Fire Extinguishers: Listed and labeled for type, rating, and classification by an independent testing agency acceptable to authorities having jurisdiction.

1. Provide fire extinguishers approved, listed, and labeled by FM Global.

2.2 PORTABLE, HAND-CARRIED FIRE EXTINGUISHERS

A. Fire Extinguishers: Type, size, and capacity for each fire protection cabinet and mounting bracket indicated.

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

a. Fire End & Croker Corporation.
b. Guardian Fire Equipment, Inc.
c. J. L. Industries, Inc., a division of Activar Construction Products Group.
d. Larsen's Manufacturing Company.
e. Nystrom Building Products.
f. Potter Roemer LLC.
g. Strike First Corporation of America.

2. Valves: Manufacturer's standard.
3. Handles and Levers: Manufacturer's standard.
4. Instruction Labels: Include pictorial marking system complying with NFPA 10, Appendix B.

B. Multipurpose Dry-Chemical Type in Steel Container: UL-rated 4-A:60-B:C, 10-lb nominal capacity, with monoammonium phosphate-based dry chemical in enameled-steel container.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine fire extinguishers for proper charging and tagging.

1. 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.

B. Install extinguisher in fire extinguisher cabinet in all public areas and where fire extinguisher cabinets are indicated on the drawings.

C. Install extinguisher on wall-surface mounting brackets in non-public service areas unless a cabinet is specifically indicated.

D. Install for extinguisher access in compliance with ADA accessibility guidelines, including clear floor space and reach limits.

END OF SECTION 104416

SECTION 102113.19 - PLASTIC TOILET COMPARTMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Solid-plastic toilet compartments configured as toilet enclosures and urinal screens.

B. Related Sections:

1. Section 102800 "Toilet, Bath, and Laundry Accessories" for toilet tissue dispensers, grab bars, purse shelves, and similar accessories mounted on toilet compartments.

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 toilet compartments.

B. Shop Drawings: For 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: For each type of toilet compartment material indicated.

1. Include Samples of hardware and accessories involving material and color selection.

D. Samples for Verification: For the following products, in manufacturer's standard sizes unless otherwise indicated:

1. Each type of material, color, and finish required for toilet compartments, prepared on 6-inch- (152-mm-) square Samples of same thickness and material indicated for Work.
2. Each type of hardware and accessory.

E. Product Schedule: For toilet compartments, prepared by or under the supervision of supplier, detailing location and selected colors for toilet compartment material.

1.4 INFORMATIONAL SUBMITTALS

A. Product Certificates: For each type of toilet compartment.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For toilet compartments to include in maintenance manuals.

1.6 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents and source.

1. Door Hinges: One hinge(s) with associated fasteners.
2. Latch and Keeper: One latch(es) and keeper(s) with associated fasteners.
3. Door Bumper: One bumper(s) with associated fasteners.
4. Door Pull: One door pull(s) with associated fasteners.
5. Fasteners: Ten fasteners of each size and type.

1.7 PROJECT CONDITIONS

A. Field Measurements: Verify actual locations of toilet fixtures, walls, columns, ceilings, and other construction contiguous with toilet compartments by field measurements before fabrication.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Flame-Spread Index: 25 or less.
2. Smoke-Developed Index: 450 or less.

B. Regulatory Requirements: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines for Buildings and Facilities 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:

1. Accurate Partitions Corporation.
2. Global Steel Products Corp.
3. Scranton Products.
4. Hadrian Inc.

B. Door, Panel, and Pilaster Construction: Solid, high-density polyethylene (HDPE) or polypropylene (PP) panel material, not less than 1 inch thick, seamless, with eased edges, and with homogenous color and pattern throughout thickness of material.

1. Color and Pattern: To match architect’s sample.

C. Pilaster Shoes and Sleeves (Caps): Manufacturer's standard design; polymer or stainless steel.

1. Polymer Color and Pattern: Matching pilaster.

D. Brackets (Fittings):

1. Full-Height (Continuous) Type: Manufacturer's standard design; extruded-aluminum at toilet compartments and stainless steel at urinal screens.

E. Heat-Sink Strip: Manufacturer's standard continuous, extruded-aluminum strip fastened to exposed bottom edges of solid-polymer components to prevent burning.

2.3 ACCESSORIES

A. Hardware and Accessories: Manufacturer's standard design, heavy-duty operating hardware and accessories.

1. Material: Clear anodized aluminum.

B. Overhead Bracing: Manufacturer's standard continuous, extruded-aluminum head rail with anti-grip profile and in manufacturer's standard finish.

1. At toilet stalls all overhead bracing shall be positioned above panels (not across open area of stalls).

C. Anchorages and Fasteners: Manufacturer's standard exposed fasteners of stainless steel finished to match hardware, with theft-resistant-type heads. Provide sex-type bolts for through-bolt applications. For concealed anchors, use hot-dip galvanized or other rust-resistant, protective-coated steel.

2.4 FABRICATION

A. Overhead-Braced and Floor-Anchored Units: Provide manufacturer's standard corrosion-resistant supports, leveling mechanism, fasteners, and anchors at pilasters to suit floor conditions. Make provisions for setting continuous head rail above panels and securing at top of each pilaster. Provide shoes at pilasters to conceal supports and leveling mechanism.

B. Wall-Hung Screens: Provide units in 18” wide by 42” high of same construction and finish as compartment panels. Provide screens with full-height brackets for attachment to wall. Provide screens with pilaster at opposite, unbraced end not anchored to wall.

C. Doors: Unless otherwise indicated, provide 24-inch-wide in-swinging doors for standard toilet compartments and 36-inch- wide out-swinging doors with a minimum 32-inch- wide clear opening for compartments indicated to be accessible to people with disabilities.

1. Hinges: Manufacturer's standard adjustable 54” self-closing type continuous aluminum hinge that can be adjusted to hold doors open at any angle up to 90 degrees.
2. Latch and Keeper: Manufacturer's standard surface-mounted latch unit designed for emergency access and with combination rubber-faced door strike and keeper. Provide units that comply with accessibility requirements of authorities having jurisdiction at compartments indicated to be accessible to people with disabilities.
3. Coat Hook: Manufacturer's standard combination hook and rubber-tipped bumper, sized to prevent door from hitting compartment-mounted accessories.
4. Door Bumper: Manufacturer's standard rubber-tipped bumper at out-swinging doors.
5. Door Pull: Manufacturer's standard unit at out-swinging doors that complies with accessibility requirements of authorities having jurisdiction. Provide units on both sides of doors at compartments indicated to be accessible to people with disabilities.

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

A. General: Comply with manufacturer's written installation instructions. Install unit’s 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.

B. Overhead-Braced and Floor-Anchored Units: Secure pilasters to floor and level, plumb, and tighten. Secure continuous head rail to each pilaster with not less 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. Urinal Screens: Attach with anchoring devices to suit supporting structure. Set units level and plumb and to resist lateral impact. Secure pilasters to floor and level, plumb, and tighten.

3.3 ADJUSTING

A. Hardware Adjustment: Adjust and lubricate hardware according to manufacturer's written instructions for proper operation. Set hinges on in-swinging doors to hold doors open

approximately 30 degrees from closed position when unlatched. Set hinges on out-swinging doors to return doors to fully closed position.

END OF SECTION 102113.19

SECTION 113013 – APPLIANCES

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. Provide residential appliances.

1.3 SUBMITTALS

A. Product Data: Submit manufacturer's product data and installation instructions for each material and product used.

B. Shop Drawings: Submit shop drawings indicating material characteristics, details of construction, connections, and relationship with adjacent construction.

C. Warranty: Submit manufacturer’s standard warranty. Include labor and materials to repair or replace defective materials.

D. Operation and Maintenance Data: Submit manufacturer's operation and maintenance data, including operating instructions, list of spare parts and maintenance schedule.

1.4 QUALITY ASSURANCE

A. Comply with governing codes and regulations. Provide products of acceptable manufacturers which have been in satisfactory use in similar service for three years. Use experienced installers. Deliver, handle, and store materials in accordance with manufacturer's instructions.

1. Provide products compliant with NFPA 70, UL, NEMA, AGA, ANSI requirements.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Kitchen Appliances:

1. Manufacturers:

a. Electrolux Major Appliances.
b. Frigidaire Co.
c. GE Appliances.

d. KitchenAid, Inc.
e. Maytag Co.
f. Whirlpool Corp.
g. Approved Equal.

2. Locations: As indicated on drawings.
3. Appliance: Refrigerators.
4. Appliance: Microwave ovens.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install materials and systems in accordance with manufacturer's instructions and approved submittals. Install materials and systems in proper relation with adjacent construction and with uniform appearance. Coordinate with work of other sections.

B. Restore damaged finishes and test for proper operation. Clean and protect work from damage.

END OF SECTION 113013

SECTION 122400 - WINDOW SHADES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Interior manual roller shades.

B. Related Requirements:

1. Section 061000 - Rough Carpentry: Concealed wood blocking for attachment of headrail brackets.

1.3 REFERENCE STANDARDS

A. ASTM G21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi 2015 (Reapproved 2021) e1.

B. C2C (DIR) - C2C Certified Products Registry; Cradle to Cradle Products Innovation Institute Current Edition.

C. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

D. NFPA 701 - Standard Methods of Fire Tests for Flame Propagation of Textiles and Films 2019.

E. UL (GGG) - GREENGUARD Gold Certified Products Current Edition.

F. UL 325 - Standard for Door, Drapery, Gate, Louver, and Window Operators and Systems Current Edition, Including All Revisions.

G. WCMA A100.1 - Safety of Window Covering Products 2018.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene one week prior to commencing work related to products of this section; require attendance of affected installers.

B. Sequencing:

1. Do not fabricate shades until field dimensions for each opening have been taken with field conditions in place.
2. Do not install shades until final surface finishes and painting are complete.

1.5 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets, including materials, finishes, fabrication details, dimensions, profiles, mounting requirements, and accessories.

C. Shop Drawings: Include shade schedule indicating size, location and keys to details, head, jamb and sill details, mounting dimension requirements for each product and condition, and operation direction.

D. Certificates: Manufacturer's documentation that line voltage components are UL listed or UL recognized.

E. Source Quality Control Submittals: Provide test reports indicating compliance with specified fabric properties.

F. Selection Samples: Include fabric samples in full range of available colors and patterns.

G. Verification Samples: Minimum size 6 inches (150 mm) square, representing actual materials, color and pattern.

H. Manufacturer's Instructions: Include instructions for storage, handling, protection, examination, preparation, and installation of product.

I. Operation and Maintenance Data: List of all components with part numbers, sources of supply, and operation and maintenance instructions; include copy of shop drawings.

J. Warranty: Submit sample of manufacturer's warranty and documentation of final executed warranty completed in Owner's name and registered with manufacturer.

K. Maintenance Contracts.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than five years of documented experience.

B. Installer Qualifications: Company specializing in performing work of this type with minimum five years of documented experience with shading systems of similar size and type.

1. Manufacturer's authorized representative.
2. Factory training and demonstrated experience.

C. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver shades in manufacturer's unopened packaging, labeled to identify each shade for each opening.

B. Handle and store shades in accordance with manufacturer's recommendations.

1.8 FIELD CONDITIONS

A. Do not install products under environmental conditions outside manufacturer's absolute limits.

1.9 WARRANTY

A. See Section 017800 - Closeout Submittals, for additional warranty requirements.

B. Provide manufacturer's warranty from Date of Substantial Completion, covering the following:

1. Shade Hardware: One year.
2. Fabric: One year.
3. Aluminum and Steel Coatings: One year.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Interior Manually Operated Roller Shades:

1. Draper, Inc.; Cordless FlexShade Elevate (Basis of Design).
2. Hunter Douglas Architectural.
3. Lutron Electronics Co., Inc.
4. MechoShade Systems LLC.

B. Source Limitations: Furnish products produced by a single manufacturer and obtained from a single supplier.

2.2 ROLLER SHADES

A. General:

1. Provide shade system components that are easy to remove or adjust without removal of mounted shade brackets.
2. Provide shade system that operates smoothly when shades are raised or lowered.
3. Provide shade system that is Cradle-to-Cradle certified and listed in C2C (DIR).

B. Manual Roller Shades:

1. Description: Single roller, manually operated fabric window shade system complete with mounting brackets, roller tubes, hembars, hardware, and accessories.

a. Drop Position: Regular roll.
b. Roll Direction: Roll down, closed position is at window sill.
c. Size: As indicated on drawings.
d. Fabric: As indicated under Shade Fabric article.

2. Brackets and Mounting Hardware: As recommended by manufacturer for mounting indicated and to accommodate shade fabric roll-up size and weight.
3. Roller Tubes: As required for type of shade operation.

    a. Material: Extruded aluminum, clear anodized finish.
    b. Size: As recommended by manufacturer; selected for suitability for installation conditions, span, and weight of shades.
    c. Fabric Attachment: Utilize extruded channel in tube to accept vinyl spline welded to fabric edge.
    d. Take-Up Roller: Manufacturer's standard roller tube pretensioned for winding lift cable in bottom-up type shades.

4. Hembars: Designed to maintain bottom of shade straight and flat.

    a. Style: Full wrap fabric covered bottom bar, flat profile with heat sealed closed ends.

5. Manual Operation for Interior Shades: Spring tension mechanism.

2.3 SHADE FABRIC

A. Fabric: Nonflammable, color-fast, impervious to heat and moisture, and able to retain its shape under normal operation.

1. Manufacturers:

    a. MechoShade Systems LLC; Ecoveil Shade 1550 Series.
    b. Lutron Electronics Co., Inc; E Screen THEIA.

2. Material: Vinyl coated polyester.
3. Material Certificates and Product Disclosures:

    a. Low-Emitting Material Certification: Greenguard Gold certified and listed in UL (GGG).
    b. Cradle to Cradle Material Health Certificate: Achievement level of Bronze.
    c. Health Product Declaration (HPD): Complete, published declaration with full disclosure of known hazards.
    d. Declare label.

4. Performance Requirements:

    a. Flammability: Pass NFPA 701 large and small tests.
    b. Fungal Resistance: No growth when tested according to ASTM G21.

5. Openness Factor: 3%.
6. Color: As selected by Architect from manufacturer’s full range of colors.

2.4 ROLLER SHADE FABRICATION

A. Field measure finished openings prior to ordering or fabrication.

B. Dimensional Tolerances: Fabricate shades to fit openings within specified tolerances.

1. Vertical Dimensions: Fill openings from head to sill with 1/2-inch (13 mm) space between bottom bar and window stool.
2. Horizontal Dimensions - Inside Mounting: Fill openings from jamb to jamb.

C. At openings requiring continuous multiple shade units with separate rollers, locate roller joints at window mullion centers, butt rollers end-to-end.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine finished openings for deficiencies that may preclude satisfactory installation.

B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

C. Start of installation shall be considered acceptance of substrates.

3.2 PREPARATION

A. Prepare surfaces using methods recommended by manufacturer for achieving best result for substrate under the project conditions.

B. Coordinate with window installation and placement of concealed blocking to support shades.

3.3 INSTALLATION

A. Install in accordance with manufacturer's instructions and approved shop drawings, using mounting devices as indicated.

B. Replace shades that exceed specified dimensional tolerances at no extra cost to Owner.

C. Adjust level, projection, and shade centering from mounting bracket. Verify there is no telescoping of shade fabric. Ensure smooth shade operation.

3.4 CLEANING

A. Clean soiled shades and exposed components as recommended by manufacturer.

B. Replace shades that cannot be cleaned to "like new" condition.

C. See Section 017419 - Construction Waste Management and Disposal for additional requirements.

3.5 CLOSEOUT ACTIVITIES

A. See Section 017800 - Closeout Submittals, for closeout submittals.

B. See Section 017900 - Demonstration and Training, for additional requirements.

C. Demonstration: Demonstrate operation and maintenance of window shade system to Owner's personnel.

D. Training: Train Owner's personnel on operation and maintenance of system.

1. Use operation and maintenance manual as training reference, supplemented with additional training materials as required.
2. Provide minimum of two hours training by manufacturer's authorized personnel at location designated by the Owner.

3.6 PROTECTION

A. Protect installed products from subsequent construction operations.

B. Touch-up, repair, or replace damaged products before Substantial Completion.

3.7 MAINTENANCE

A. See Section 017000 - Execution and Closeout Requirements, for additional requirements relating to maintenance service.

END OF SECTION 122400

SECTION 123216 - MANUFACTURED PLASTIC-LAMINATE-CLAD CASEWORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Special Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Plastic-laminate-faced cabinets of stock design.

B. Related Sections:

1. Section 061000 "Rough Carpentry" for wood blocking for anchoring manufactured wood casework.
2. Section 096513 "Resilient Base and Accessories" for resilient base applied to plastic-laminate-faced casework.
3. Section 123623.13 "Plastic-Laminate-Clad Countertops."

1.3 DEFINITIONS

A. Definitions in the AWI's, AWMAC's, and WI's "Architectural Woodwork Standards" apply to the work of this Section.

B. MDF: Medium-density fiberboard.

C. Exposed Portions of Cabinets: Surfaces visible when doors and drawers are closed, including bottoms of cabinets 48 inches above floor, and surfaces visible in open cabinets.

D. Semi exposed Portions of Cabinets: Surfaces behind opaque doors, such as interiors of cabinets, shelves, dividers, interiors and sides of drawers, and interior faces of doors. Tops of cabinets 78 inches or more above floor and bottoms of wall cabinets lower than 48-inches above floor are defined as semi exposed.

E. Concealed Portions of Cabinets: Surfaces not usually visible after installation, including sleepers, web frames, dust panels, and ends and backs that are placed directly against walls or other cabinets.

1.4 COORDINATION

A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other

related units of Work specified in other Sections to ensure that casework can be supported and installed as indicated.

B. Confirm sizes of all appliances prior to fabrication of casework.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work. Show fabrication details, including types and locations of hardware. Show installation details, including field joints and filler panels. Indicate manufacturer's catalog numbers for casework.

1. Field measure all walls and locations to receive casework prior to developing shop drawings. Notify Architect of any locations where casework illustrated in construction documents does not work with actual field measured wall dimensions on which the casework is to be located.

C. Samples for Initial Selection: For cabinet finishes.

D. Samples for Verification: 8-by-10-inch Samples for each type of finish.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Quality Standard Compliance Certificates: AWI Quality Certification Program certificates.

C. Sample Warranty: For special warranty.

1.7 MATERIALS MAINTENANCE SUBMITTALS

A. Furnish complete touchup kit for each type and finish of manufactured wood casework provided. Include scratch fillers, stains, finishes, and other materials necessary to perform permanent repairs to damaged casework finish. Provide one kit for each school.

1.8 QUALITY ASSURANCE

A. Installer Qualifications: An authorized representative who is trained and approved by manufacturer for installation of units required for this Project and who is a certified participant in AWI's Quality Certification Program.

B. Quality Standard: Unless otherwise indicated, comply with requirements for modular cabinets in AWIs "Architectural Woodwork Standards." Custom manufactured products shall meet AWI ‘custom grade’ requirements as a minimum, unless higher grade is specified.

C. Hanger rods/hooks to support minimum vertical load of 200 lbs. applied anywhere, full height

door to support minimum vertical load of 200 lbs. applied at outer edge compliance not identified.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Deliver casework only after painting, utility roughing-in, and similar operations that could damage, soil, or deteriorate casework have been completed in installation areas. If casework must be stored in other than installation areas, store only in areas where environmental conditions meet requirements specified in "Field Conditions" Article.

B. Keep finished surfaces covered with polyethylene film or other protective covering during handling and installation.

1.10 FIELD CONDITIONS

A. Environmental Limitations: Do not deliver or install casework until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period. Maintain temperature and relative humidity during the remainder of the construction period in range recommended for Project location by the AWI's, AWMAC's, and WI's "Architectural Woodwork Standards."

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

C. Locate concealed framing, blocking, and reinforcements that support casework by field measurements before being enclosed, and indicate measurements on Shop Drawings.

1.11 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of casework that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Delamination of components or other failures of glue bond.
b. Warping of components.
c. Failure of operating hardware.

2. Warranty Period: Five 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. Cabinets By Design (Duluth, GA).
2. Case Systems.
3. Creative Cabinet Systems, Inc.
4. LSI Corporation of America; a Sagas International company.
5. Southern Cabinetry.
6. Stevens Industries, Inc.
7. TMI Systems Design Corporation.

B. Source Limitations: Obtain plastic-laminate-faced cabinets from single manufacturer.

2.2 CASEWORK, GENERAL

A. Quality Standard: Unless otherwise indicated, comply with the AWI's, AWMAC's, and WI's "Architectural Woodwork Standards" for grades of casework indicated for construction, finishes, installation, and other requirements.

1. Grade: Custom.
2. Provide labels and certificates from AWI certification program indicating that casework, including installation, complies with requirements of grades specified.

B. Dimensional Sizes: Dimensions, sizes, and counter heights indicated on drawings are intended to reference standard-sized manufactured casework units. These dimensions may vary to the manufacturer’s nearest standard size and are not intended to indicate custom-sized units.

2.3 CASEWORK

A. Design:

1. Reveal overlay.

B. Grain Direction for Wood Grain Plastic Laminate:

1. Vertical on both doors and drawer fronts, with continuous vertical matching.
2. Lengthwise on face frame members.
3. Vertical on end panels.
4. Side to side on bottoms and tops of units.
5. Vertical on knee-space panels.
6. Horizontal on aprons.

C. Exposed Materials:

1. Plastic Laminate: Grade VGS.

a. Colors and Patterns: As indicated by manufacturer's full range.
b. Subject to compliance with requirements, provide from the following:

1. Wilsonart International (Basis of Design PL-1).
2. Formica Corporation (Basis of Design PL-2).
3. Nevamar Decorative Surfaces.

2. Unless otherwise indicated, provide specified edgebanding on all exposed edges.

D. Semi exposed Materials:

1. Thermoset Decorative Panels: Provide thermoset decorative panels for semi exposed surfaces unless otherwise indicated.

a. Provide plastic laminate of same grade as exposed surfaces for interior faces of doors and drawer fronts and other locations where opposite side of component is exposed.

2. Unless otherwise indicated, provide specified edge banding on all semi exposed edges.

E. Concealed Materials:

1. Plastic Laminate: Grade BKL. Balanced construction of all laminated panels is mandatory. Unfinished core stock surfaces, even on concealed surfaces (excluding edges), are not permitted.

2.4 MATERIALS

A. Low-Emitting Materials: Fabricate casework, including countertops, with adhesives and composite wood products containing no urea formaldehyde.

B. Maximum Moisture Content for Lumber: 7 percent for hardwood and 12 percent for softwood.

C. Softwood Plywood: DOC PS 1.

D. Particleboard: ANSI A208.1, Grade M-2; made with binder containing no urea formaldehyde.

E. MDF: ANSI A208.2; made with binder containing no urea formaldehyde.

F. Hardboard: ANSI A135.4, Class 1 Tempered.

G. Plastic Laminate: High-pressure decorative laminate complying with NEMA LD 3. Finishes to be laminate manufacturer’s matte, suede or equivalent finish as approved by Architect.

1. For laminates indicated on the drawings ‘to be selected’, interior designer will select from full range of colors and patterns for any of the manufacturers listed below.
2. Advise interior designer of any incompatible product selections and resolve any problems as part of the work.

3. Manufacturers: Subject to compliance with requirements, provide products by one of the following as selected by Architect:

    a. Wilsonart International (Basis of Design PL-1).
    b. Formica Corporation (Basis of Design PL-2).
    c. Nevamar Decorative Surfaces.

H. Edgebanding for Plastic Laminate: Rigid PVC extrusions, through color with satin finish, 3 mm thick at doors and drawer fronts, 1 mm thick at all other exposed edges of cabinet members and shelves (including wall cabinet top and bottom edges and at front and back edges of shelves).

I. Thermoset Decorative Panels: Particleboard or medium-density fiberboard finished with thermally fused, melamine-impregnated decorative paper and complying with requirements of NEMA LD 3, Grade VGL, for Test Methods 3.3, 3.4, 3.6, 3.8, and 3.10.

J. Edgebanding for Thermoset Decorative Panels: PVC or polyester edge banding matching thermoset decorative panels.

2.5 COLORS AND FINISHES

A. Wood Colors and Finishes: As selected by architect from full range of colors/finishes.

B. Thermoset Decorative Panel Colors, Patterns, and Finishes: As selected by architect from full range of colors/finishes.

C. Plastic-Laminate Colors, Patterns, and Finishes: As selected by architect from full range of colors/finishes.

D. PVC Edgebanding Color: As selected by architect from full range of colors/finishes.

2.6 FABRICATION

A. Plastic-Laminate-Faced Cabinet Construction: As required by referenced quality standard, but not less than the following:

1. Bottoms and Tops of Wall Cabinets: 3/4-inch particleboard, plastic-laminate faced on exposed surfaces, thermoset decorative panels on semi exposed surfaces, laminate backing sheet on concealed surfaces.
2. Bottoms and Tops of Base Cabinets and Tall Cabinets: 3/4-inch particleboard, plastic-laminate faced on exposed surfaces, thermoset decorative panels on semi exposed surfaces, laminate backing sheet on concealed surfaces. Base cabinets shall have a full sub top.
3. Ends of Cabinets: 3/4-inch particleboard, plastic-laminate faced on exposed surfaces, thermoset decorative panels on semi exposed surfaces, laminate backing sheet on concealed surfaces.
4. Toe Base: Individual applied base, each constructed of four (4) ¾-inch plywood panels (2 sides, front and back), factory attached to base and tall cabinets, 4-inch high and

inset from cabinet front and back edges.

5. Shelves: 3/4-inch particleboard shelves up to 36 inches wide, 1-inch particleboard, shelves over 36-inches wide, plastic-laminate faced on exposed surfaces, thermoset decorative panels on semi-exposed surfaces.
6. Backs of Cabinets: 1/2-inch- thick particleboard or MDF, plastic-laminate faced where exposed, thermoset decorative panels on semi exposed surfaces, laminate backing sheet on concealed surfaces.
7. Drawer Fronts: 3/4-inch particleboard, plastic-laminate faced.
8. Drawer Sides, Backs and Sub Fronts: 1/2-inch thermoset decorative panels, with glued dovetail or multiple-dowel joints.
9. Drawer Bottoms: 1/2-inch thermoset decorative panels glued and dadoed into front, back, and sides of drawers.
10. Doors: 3/4-inch particleboard or MDF plastic-laminate faced.

B. Filler and Closure Panels: Provide as needed to close spaces between cabinets and walls, ceilings, and indicated equipment. Fabricate from same material and with same finish as cabinets.

1. Filler panels shall be 3 inch minimum unless noted otherwise on drawings.
2. When a run of casework has filler panels at both ends, those filler panels shall be equal to each other in size unless noted otherwise on drawings.
3. Provide closure panels at top and bottom of wall cabinets where a gap exists at wall-corners and between cabinet end and walls where a filler panel is used at the face.
4. Match face material of adjacent surface; provide balancing ply on concealed face.
5. Scribe fit to irregular adjacent surfaces where normal bead of sealant would vary in size.

2.7 CASEWORK HARDWARE AND ACCESSORIES

A. Hardware, General: Unless otherwise indicated, provide manufacturer's standard satin-finish, commercial-quality, heavy-duty hardware.

1. Use threaded metal or plastic inserts with machine screws for fastening to particleboard except where hardware is through-bolted from back side.

B. Butt Hinges: Chrome-plated, semi concealed, 5-knuckle hinges complying with BHMA A156.9, Grade 1, with antifriction bearings and rounded tips. Provide two hinges for doors less than 48 inches high, three hinges for doors 48 inches – 63 inches high, and four hinges for doors more than 63 inches.

C. Pulls: Solid chrome-plated brass wire pulls, fastened from back with two screws. For sliding doors, provide recessed chrome-plated flush pulls. Provide two pulls for drawers more than 24 inches wide.

D. Door Catches: Nylon-roller spring catch. Provide two catches on doors more than 48 inches high.

E. Drawer Slides: BHMA A156.9, Type B05091.

1. Standard Duty (Grade 1): Side mounted and extending under bottom edge of

drawer; partial-extension type; epoxy-coated steel with polymer rollers.

2. Heavy Duty (Grade 1HD-100 and Grade 1HD-200): Side mounted; full-extension type; zinc-plated, steel ball-bearing slides.
3. Box Drawer Slides: Grade 1HD-100, for drawers not more than 6 inches high and 24 inches wide.
4. File Drawer Slides: Grade 1HD-200, for drawers more than 6 inches high or 24 inches wide.
5. Pencil Drawer Slides: Grade 1, for drawers not more than 3 inches high and 24 inches wide.

F. Drawer and Hinged Door Locks: Cam Lock cores shall be CompX # M4-7054-010-B-N90-D-P. Keyed in range RD700 thru RD800. No substitutions. CompX Cam Lock Cylinder assembly may vary based on application.

1. Provide a minimum of two keys per lock and six master keys. Each room shall be keyed differently. Provide master keying for all locks.
2. Provide locks on all doors and drawers.
3. Chain bolts shall be provided on inactive door of locking cabinets 72” or greater in height.
4. Coordinate Owner specific master key number and range of key code.

G. Sliding-Door Hardware Sets: Manufacturer's standard, to suit type and size of sliding-door units.

H. Adjustable Shelf Clip: Clear-polycarbonate; 2-pin locking plastic shelf rests complying with BHMA A156.9, Type B04013.

I. Grommets for Cable Passage through Countertops: 3-inch OD, molded-plastic grommets and matching plastic caps with slot for wire passage.

J. Coat Hanger Rods: 1-inch diameter, 14-gauge, chrome plated tubular steel supported in undershelf captive mounting hardware.

K. File Suspension Rails: All file drawers shall be provided with an integral file suspension rail system. File drawers shall be capable of accepting legal size file hangers in a lateral attitude if so desired.

L. Mirrors: 1/4” thick polished mirror plate.

M. Chain stops: Provide chain stop at each cabinet door where adjacent construction prohibits door from swinging the full 270 degrees.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas, with Installer present, for compliance with requirements for installation tolerances, location of framing and reinforcements, and other conditions affecting

performance of manufactured wood casework.

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

3.2 CASEWORK INSTALLATION

A. Install casework level, plumb, and true; shim as required, using concealed shims. Where casework abuts other finished work, apply filler strips and scribe for accurate fit, with fasteners concealed where practical.

B. Base Cabinets: Set cabinets straight, level, and plumb. Adjust sub tops within 1/16 inch of a single plane. Fasten cabinets to masonry or framing, wood blocking, or reinforcements in walls and partitions with fasteners spaced 24 inches o.c. Align similar adjoining doors and drawers to a tolerance of 1/16 inch. Bolt adjacent cabinets together with joints flush, tight, and uniform.

1. Where base cabinets are not installed adjacent to walls, fasten to floor at toe space with fasteners spaced 24 inches o.c. Secure sides of cabinets to floor, where they do not adjoin other cabinets, with not less than two fasteners.

C. Wall Cabinets: Hang cabinets straight, level, plumb, and with top of wall cabinets 7 feet above finished floor unless noted otherwise. Adjust fronts and bottoms within 1/16 inch of a single plane. Fasten to hanging strips, masonry, framing, blocking, or reinforcements in walls or partitions. Align similar adjoining doors to a tolerance of 1/16 inch.

1. Fasten through back, near top and bottom, at ends, and not more than 16 inches o.c.
2. Use toggle bolts at hollow masonry.
3. Use expansion anchors at solid masonry.
4. Use No. 10 wafer-head screws sized for 1-inch penetration at wood hanging strips.
5. Use toggle bolts through metal backing or metal framing behind wall finish at metal-framed partitions.

D. Install hardware uniformly and precisely. Set hinges snug and flat in mortises unless otherwise indicated. Adjust and align hardware so moving parts operate freely and contact points meet accurately. Allow for final adjustment after installation.

E. Adjust casework and hardware so doors and drawers operate smoothly without warp or bind. Lubricate operating hardware as recommended by manufacturer.

3.3 CLEANING AND PROTECTING

A. Repair or remove and replace defective work as directed on completion of installation.

B. Clean finished surfaces, touch up as required, and remove or refinish damaged or soiled areas to match original factory finish, as approved by Architect.

C. Protection: Provide 6-mil plastic or other suitable water-resistant covering over countertop surfaces. Tape to underside of countertop at a minimum of 48 inches o.c. Remove protection

at Contract Completion.

END OF SECTION 123216

SECTION 123623.13 - PLASTIC-LAMINATE-CLAD COUNTERTOPS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Special Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes plastic-laminate countertops.

B. Related Sections:

1. Section 123216 "Manufactured Plastic-Laminate-Clad Casework."

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

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 cutouts and holes for plumbing fixtures and other items installed in plastic-laminate countertops.
2. Apply AWI Quality Certification Program label to Shop Drawings.

C. Samples for Verification:

1. Plastic laminates, 8 by 10 inches, for each type, color, pattern, and surface finish, with one sample applied to core material and specified edge material applied to one edge.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Fabricator and Installer.

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

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.

B. Installer Qualifications: Fabricator of products.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Do not deliver countertops until painting and similar operations that could damage countertops have been completed in installation areas. If countertops 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 countertops until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.

B. Field Measurements: Where countertops 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.

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

PART 2 - PRODUCTS

2.1 PLASTIC-LAMINATE COUNTERTOPS

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

1. Provide labels and certificates from AWI certification program indicating that countertops, including installation, comply with requirements of grades specified.
2. The Contract Documents contain selections chosen from options in the quality standard and additional requirements beyond those of the quality standard. Comply with those selections and requirements in addition to the quality standard.

B. Grade: Custom.

C. Dimensional Sizes: Casework dimensions, sizes, and counter heights indicated on drawings are intended to reference standard-sized manufactured casework units. These dimensions may vary to the manufacturer’s nearest standard size and are not intended to indicate custom-sized units.

D. High-Pressure Decorative Laminate: NEMA LD 3, Grade HGP for formed tops. Finishes to be laminate manufacturer’s matte, suede or equivalent finish as approved by Architect.

1. All exposed to view surfaces shall receive high pressure plastic laminate unless noted otherwise. Ease all edges.
2. Use various manufacturers and colors as indicated on the room finish schedule sheet in the drawings by various required color schemes. For laminates indicated on the drawings 'to be selected,' interior designer will select from full range of colors and patterns for any of the manufacturers listed below.
3. Advise interior designer of any incompatible product selections and resolve any problems as part of the work.
4. Manufacturers: Subject to compliance with requirements, provide products by one of the following as selected by Architect:

    a. Wilsonart International (Basis of Design PL-1).
    b. Formica Corporation (Basis of Design PL-2).
    c. Nevamar Decorative Surfaces.

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

1. As indicated by manufacturer's designations.
2. Grain Direction: Parallel to cabinet fronts.

F. Edge Treatment: Same as laminate cladding on horizontal surfaces.

G. Core Material: Particleboard ANSI A208.1, Grade M-2; with no added urea-formaldehyde resin.

H. Core Material at Sinks: Moisture Resistant (MR) particleboard.

I. Core Thickness: 1-1/8 inch.

1. Where indicated on drawings to provide 1-1/2-inch-thick tops, provide a full double layer of 3/4-inch thick particleboard with plastic-laminate sheet shop bonded to both sides of particleboard. Built-up countertop edges are not acceptable. Sand surfaces to which plastic laminate is to be bonded.

J. Backer Sheet: Provide plastic-laminate backer sheet, NEMA LD 3, Grade BKL, on underside of countertop substrate.

2.2 ACCESSORIES

A. Grommets for Cable Passage through Countertops: 3-inch OD, molded-plastic grommets and matching plastic caps with slot for wire passage.

2.3 MISCELLANEOUS MATERIALS

A. VOC Limits for Installation Adhesives and Sealants: Use products that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):

1. Wood Glues: 30 g/L.
2. Multipurpose Construction Adhesives: 70 g/L.

3. Structural Wood Member Adhesive: 140 g/L.
4. Architectural Sealants: 250 g/L.

2.4 FABRICATION

A. Fabricate countertops to dimensions, profiles, and details indicated. Provide front and end overhang of 1 inch over base cabinets.

1. Provide all countertops and work surfaces with 180 degree bullnosed, post-formed edge.
2. Where backsplash is indicated, fabricate in one piece with countertop with 90 degree rolled top edge.
3. Where end splash is indicated, fabricate with 90 degree rolled top edge.
4. Provide side splash at adjacent walls and cabinets.
5. Provide all countertops and worksurfaces with raised (no drip) front edge.

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.

1. Trial fit assemblies at fabrication shop that cannot be shipped completely assembled. Install dowels, screws, bolted connectors, and other fastening devices that can be removed after trial fitting. Verify that various parts fit as intended and check measurements of assemblies against field measurements before disassembling for shipment.

C. Shop cut openings to maximum extent possible to receive 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.

1. Seal edges of openings in countertops with a coat of varnish.

PART 3 - EXECUTION

3.1 PREPARATION

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

B. Before installing countertops, examine shop-fabricated work for completion and complete work as required, including removal of packing and back priming.

3.2 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.
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 plastic-laminate 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. Install countertops 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.

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

F. Countertops: Secure tops to cabinets with Z- or L-type fasteners or equivalent, using two or more fasteners at each front, end, and back.

1. Install countertops with no more than 1/8 inch in 96-inch sag, bow, or other variation from a straight line.
2. Secure end splashes to tops with concealed metal brackets at 16 inches o.c. and to walls with adhesive.
3. Seal junctures of tops, splashes, and walls with mildew-resistant silicone sealant or another permanently elastic sealing compound recommended by countertop material manufacturer.

3.3 ADJUSTING AND CLEANING

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

B. Clean countertops on exposed and semi exposed surfaces. Touch up shop-applied finishes to restore damaged or soiled areas.

END OF SECTION 123623.13

SECTION 123661.16 - SOLID SURFACING COUNTERTOPS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Special Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes solid-surface-material countertops.

B. Related Sections:

1. Section 102800 “Toilet, Bath, and Laundry Accessories.”
2. Section 123216 "Manufactured Plastic-Laminate-Clad Casework."
3. Section 123623.13 "Plastic-Laminate-Clad Countertops."

1.3 ACTION SUBMITTALS

A. Product Data: For countertop and knee wall cap materials.

B. Shop Drawings: For countertops and knee wall caps. Show materials, finishes, edge profiles, and methods of joining.

C. Samples for Verification: For the following products:

1. Countertop material, 6 inches square.

1.4 PROJECT CONDITIONS

A. Field Measurements: Verify dimensions of countertops and knee wall caps by field measurements after base cabinets and knee walls are installed but before countertop and knee wall cap fabrication is complete.

PART 2 - PRODUCTS

2.1 SOLID-SURFACE-MATERIAL COUNTERTOPS

A. Configuration: Provide countertops and knee wall caps with the following front and side style:

1. Front: Straight, slightly eased at top.
2. Sides: Straight, slightly eased at top on exposed surfaces

B. Countertops: 1/2-inch-thick, solid-surfacing material laminated to 1-inch-thick

particleboard core with front edge built up with 3/4-inch- thick, solid-surfacing material. Countertop to be 1-1/2-inch-thick full extent of countertop (not just edge thickening).

C. Fabrication: Fabricate tops in one piece with shop-applied edges unless otherwise indicated. Comply with solid-surface-material manufacturer's written instructions for adhesives, sealers, fabrication, and finishing.

2.2 COUNTERTOP MATERIALS

A. Particleboard: ANSI A208.1, Grade M-2, made with binder containing no urea formaldehyde.

B. Adhesives: Adhesives shall not contain urea formaldehyde.

C. Solid Surface Material: Homogeneous solid sheets of filled plastic resin complying with ANSI SS1.

1. Use various manufacturers and colors as indicated on the room finish schedule sheet in the drawings by various required color schemes.
2. Advise interior designer of any incompatible product selections and resolve any problems as part of the work.
3. Manufacturers: Subject to compliance with requirements, provide products by one of the following as selected by Architect:

    a. Wilsonart (Basis of Design).
    b. Corian.
    c. Hanex Solid Surfaces.
    d. LG Chemical, Ltd.

4. Type: Provide Standard Type unless Special Purpose Type is indicated.
5. Colors and Patterns: As indicated by manufacturer's designations.

PART 3 - EXECUTION

3.1 INSTALLATION

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

B. 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 plastic-laminate 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.

C. Install countertops 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 countertops to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.

E. Countertops: Secure tops to cabinets with Z- or L-type fasteners or equivalent, using two or more fasteners at each front, end, and back.

1. Seal junctures of tops, splashes, and walls with mildew-resistant silicone sealant or another permanently elastic sealing compound recommended by countertop material manufacturer.

3.2 ADJUSTING AND CLEANING

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

B. Clean countertops and knee wall caps on exposed and semi-exposed surfaces. Touch up shop-applied finishes to restore damaged or soiled areas.

END OF SECTION 123661.16

SECTION 142100 – ELECTRIC TRACTION ELEVATORS

PART 1 – GENERAL

1.1 SUMMARY

A. Section includes: Electric Traction Gearless Elevators

B. Work Supplied Under Other Sections:

1. Temporary lighting, including temporary lighting in hoistway for machine space with switch located in hoistway on the strike jamb side of top landing door.
2. Hoistway ventilation shall be in accordance with local and national building code requirements.
3. Guide Rail Support shall be structurally adequate to extend from pit floor to top of hoistway, with spans in accordance with requirements of authority having jurisdiction and final layouts.
4. Removable barricades at all hoistway openings, in compliance with OSHA 29 CFR 1926.502 in addition to any local code requirements.
5. Lifeline attachments capable of withstanding 5000 lb load in accordance with OSHA 29 CFR 1926.502. Provide a minimum of 2 at the top, front of each hoistway.
6. Pit lighting: Fixture with switch and guards. Provide illumination level equal to or greater than that required by ASME A 17.1/CSA B44 2000, or applicable version.
7. Control space lighting with switch. Coordinate switch with lighting for machine space as allowable by code.
8. Access Doors: As required for access to governor. Access doors shall be self-closing, self-locking if necessary and operable from the inside without a key.
9. Sump pit and cover.

C. Related Sections:

1. Section 01 50 00 – Temporary Facilities and Controls
2. Section 03 30 00 – Cast-in-Place Concrete.
3. Section 04 20 00 – Unit Masonry.
4. Section 05 50 00 – Metal Fabrications
5. Section 23 00 00 – Heating, Ventilating, and Air Conditioning.
6. Section 26 00 00 – Electrical.
7. Section 31 00 00 – Earthwork.

D. Industry and government standards:

1. ICC/ANSI A117.1 Accessible and Usable Buildings and Facilities
2. ADAAG – Accessibility Guidelines for Buildings and Facilities
3. ANSI/NFPA 70, National Electrical Code.
4. ANSI/NFPA 80, Standard for Fire Doors and Fire Windows.
5. ASME/ANSI A17.1, Safety Code for Elevators and Escalators.

1.2 DESCRIPTION OF ELEVATOR

A. Drive: Non-Regenerative.

B. Quantity of Elevators: 1.

C. Landings: 4.

D. Opening: 2 Front Openings; 2 Back Openings.

E. Travel: As indicated on drawings.

F. Rated Capacity: 3500 lbs.

G. Rated Speed: 150 fpm.

H. Clear Inside Dimensions (W x D): 6’8” x 4’x3”.

I. Cab Height: 8’.

J. Clear height under suspended ceiling: 7’-7”.

K. Entrance Width & Type: 3’-6”.

L. Entrance Height: 7’.

M. Machine Location: Inside the hoistway mounted on car guide rail.

N. Control Space Location: Door

1.3 PERFORMANCE REQUIREMENTS

A. Car Performance:

1. Car Speed ± 5% of contract speed under any loading condition or direction of travel.
2. Car Capacity: Safely lower, stop and hold (per code) up to 125% of rated load.

B. System Performance.

1. Vertical Vibration (maximum): 25 mg.
2. Horizontal Vibration (maximum): 25mg.
3. Jerk Rate (maximum): 1.3 ft/sec3.
4. Acceleration (maximum): 1.3ft/sec2.
5. In Car Noise: = 55 dB(A).
6. Leveling Accuracy: ± 2 inches.
7. Starts per hour (maximum): 120.

1.4 SUBMITTALS

A. Product Data: Submit manufacturer’s product literature for each proposed system.

1. Cab design, dimensions and layout.

2. Layout, finishes, and accessories and available options.
3. Controls, signals and operating system.
4. Color selection charts for cab and entrances.

B. Shop Drawings:

1. Clearances and travel of car.
2. Clear inside hoistway and pit dimensions.
3. Location and layout of equipment and signals.
4. Car, guide rails, buffers and other components in hoistway.
5. Maximum rail bracket spacing.
6. Maximum loads imposed on building structure.
7. Hoist beam requirements.
8. Location and sizes of access doors.
9. Location and details of hoistway door and frames.
10. Electrical characteristics and connection requirements.

C. Operation and maintenance data:

1. Provide manufacturers' standard maintenance and operation manual.

D. Diagnostic Tools:

1. Prior to seeking final acceptance for the completed project as specified by the Contract Documents, the Elevator Contractor shall deliver to the Owner any specialized tool(s) that may be required to perform diagnostic evaluations, adjustments, and/or parametric software changes and/or test and inspections on any piece of control or monitoring equipment installed. This shall include any specialized tool(s) required for monitoring, inspection and/or maintenance where the means of suspension other than conventional wire ropes are furnished and installed by the Elevator Contractor. Any and all such tool(s) shall become property of the Owner. Any diagnostic tool provided to the Owner by the Elevator Contractor shall be configured to perform all levels of diagnostics, systems adjustment and parametric software changes which are available to the Elevator Contractor. In cases where diagnostic tools provided to the Owner require periodic recalibration/or re-initiation, the Elevator Contractor shall perform such tasks at no additional cost to the Owner for a period equal to the term of the maintenance agreement from the date of final acceptance of the completed project. During those intervals in which the Owner might find it necessary to surrender a diagnostic tool for re-calibration, re-initiation, or repair, the Elevator Contractor shall provide a temporary replacement for the tool at no additional cost to the Owner. The Elevator Contractor shall deliver to the Owner, printed instructions for the proper use of any tool that may be necessary to perform diagnostic evaluations, system adjustment, and /or parametric software changes on any unit of microprocessor-based elevator control equipment and means of suspension other than standard elevator steel cables furnished and installed by the Elevator Contractor. Accompanying the printed instructions shall be any and all access codes, password, or other proprietary information that is necessary to interface with the microprocessor-control equipment.

1.5 QUALITY ASSURANCE

A. Manufacturer: Minimum of fifteen years experience in the fabrication, installation and service of elevators of the type and performance of the specified. The manufacturer shall have a documented quality assurance program.

B. Installer: The equipment manufacturer shall install the elevator.

C. Inspection and Testing: In accordance with requirements of local jurisdiction, obtain required permits, inspections and tests.

1.6 DELIVERY, STORAGE AND HANDLING

A. If the construction site is not prepared to receive the elevator equipment at the agreed ship date, the General Contractor shall be responsible to provide a safe, dry, and easily accessible storage area on or off the premises. Additional labor costs for double handling will be the responsibility of the General Contractor.

B. Delivered elevator materials shall be stored in a protected environment in accordance with manufacturer recommendations. A minimum storage area of 10 feet by 20 feet is required adjacent to the hoistway.

1.7 WARRANTY

A. Provide manufacturer warranty for a period of one year. The warranty period is to begin upon Substantial Completion of the Contract. Warranty covers defects in materials and workmanship. Damage due to ordinary use, vandalism, improper or insufficient maintenance, misuse, or neglect do not constitute defective material or workmanship.

1.8 MAINTENANCE SERVICE

A. The elevator manufacturer shall provide maintenance service consisting of regular examinations and adjustments of the elevator equipment for a period of 12 months after date of Substantial Completion. Replacement parts shall be produced by the original equipment manufacturer.

B. The elevator subcontractor shall provide evidence that a service office is located within 45 miles of the installation and warehouse of parts is maintained within 100 miles. Service must be performed within 12 hours of the initial report.

C. Maximum 45-minute response time is required on all callbacks. Failure to meet this requirement, the University will call another maintenance company, and the expense will be passed to the contractor. If the contractor fails twice on arriving to the site, the University will hire another contractor to fulfill the agreement for the balance of the contract and pass the cost to the contractor.

PART 2 – PRODUCTS

2.1 MANUFACTURER

A. Provide AC gearless machine room-less elevator systems subject to compliance with the design and performance requirements of this specification.

1. Basis-of-Design: MonoSpace 300™ traction elevators by KONE, Inc.

Contact: Jim Cook (614) 769-5560, jim.cook@kone.com

B. Subject to compliance with requirements, provide equivalent product as manufactured by one of the following:

1. Otis Elevator Co
2. TK Elevator

2.2 EQUIPMENT: CONTROL COMPONENTS AND CONTROL SPACE

A. Controller: Provide microcomputer-based control system to perform all of the functions.

1. All high voltage contact points inside the controller cabinet shall be protected from accidental contact in a situation where the controller doors are open.
2. Controller shall be separated into two distinct halves: Motor Drive side and Control side. High voltage motor power conductors shall be routed and physically segregated from the rest of the controller.
3. Provide a serial card rack and main CPU board containing a non-erasable EPROM and operating system firmware.
4. Variable field parameters and adjustments shall be contained in a non-volatile memory module.

B. Drive: Provide Variable Voltage Variable Frequency AC drive system to develop high starting torque with low starting current.

C. Control Space: Locate controller(s) in a room adjacent to the hoistway at the top landing on the machine side of the elevator.

2.3 EQUIPMENT: HOISTWAY COMPONENTS

A. Machine: AC gearless machine, with permanent magnet synchronous motor, direct current electro-mechanical disc brakes and integral traction drive sheave, mounted to the car guide rail at the top of the hoistway.

B. Governor: Friction type over-speed governor rated for the duty of the elevator specified.

C. Buffers, Car and Counterweight: Polyurethane buffer.

D. Hoistway Operating Devices:

1. Emergency stop switch in the pit.
2. Terminal stopping switches.
3. Emergency stop switch on the machine.

E. Positioning System: System consisting of magnets and proximity switches.

F. Guide Rails and Attachments: Steel rails with brackets and fasteners.

2.4 EQUIPMENT: HOISTWAY ENTRANCES

A. Hoistway Entrances:

1. Sills: Extruded.
2. Doors: Hollow metal construction with vertical internal channel reinforcements.
3. Fire Rating: Entrance and doors shall be UL fire-rated for 1-1/2 hours.
4. Entrance Finish: Brushed stainless steel.
5. Entrance Markings Jamb Plates: Provide standard entrance jamb tactile markings on both jambs, at all floors. Plate Mountings: Refer to manufacturer drawings.

2.5 EQUIPMENT: CAR COMPONENTS

A. Car Frame: Provide car frame with adequate bracing to support the platform and car enclosure.

B. Platform: Platform shall be all steel construction.

C. Car Guides: Provide guide-shoes mounted to top and bottom of cars and counterweight frame. Each guide-shoe assembly should be arranged to maintain constant contact on the rail surfaces. Provide retainers in areas with Seismic design requirements.

D. Steel Cab:

1. Walls: Cab reinforced cold-rolled steel with two coats factory applied baked enamel finish, with applied vertical wood core panels covered on both sides with high pressure plastic laminate.
2. Canopy: Cold-rolled steel with hinged exit.
3. Front Door, Controls, Trims: Stainless steel, satin finish.
4. Ceiling:

    a. Stainless steel three panel suspended ceiling with satin finish and six round LED lights.

5. Handrail:

    a. Round tube brushed Stainless Steel – 1.25 in. Rails are to be located on back and side walls of car enclosure.

6. Flooring: LVT
7. Threshold: Aluminum.

E. Emergency Car Signals:

1. Emergency Siren: Siren mounted on top of cab that is activated when the alarm button in the car operating panel is engaged. Siren shall have rated sound pressure level of 80 dB(A) at a distance of three feet from device. Siren shall respond with a delay of not more than one second after activation of alarm button.

2. Emergency Car Lighting: Provide emergency power unit employing a 12-volt sealed rechargeable battery and totally static circuits shall illuminate the elevator car and provide current to the alarm bell in the event of building power failure.
3. Emergency Exit Contact: An electrical contract shall be provided on the car-top exit.

F. Ventilation: Manufacturer's standard, mounted on car top.

2.6 EQUIPMENT: SIGNAL DEVICES AND FIXTURES

A. Car Operating Panel: Provide car operating panel with all push buttons, key switches, and message indicators for elevator operation.

1. Car operating panels contain a bank of round, mechanical, illuminated buttons marked to correspond to landings served, emergency call button, door open button, door close button, and key switches for lights, inspection, and exhaust fan. Buttons shall have amber illumination (halo). All buttons to have raised text and Braille marking on left hand side. The car operating display panel shall be a 7-segment amber display. All texts, when illuminated, shall be amber. The car operating panel shall have a brushed stainless-steel finish.

2. Additional features of car operating panel shall include:

a. Car Position Indicator within operating panel.
b. Elevator Data Plate marked with elevator capacity and car number on car top.
c. Help Buttons with raised markings.
d. In-Car Stop Switch per local code.
e. Firefighter's hat.
f. Firefighter's Phase II Key-Switch.
g. Call Cancel Button.
h. Pre-programmed integrated ADA phone (complete description of krms features included as standard.)
i. Help Button/Communicator. Activation of help button will initiate two-way communication between car and a location inside the building, switching over to alternate location if call is unanswered, where personnel are available to take the appropriate action. Visual indicators are provided for call initiation and call acknowledgement.
j. Firefighter's Phase II emergency in-car operating instructions.

B. Hall Fixtures: Wall mounted hall fixtures shall be provided with necessary push buttons and key switches for elevator operation. Wall mounted hall fixtures shall have a brushed stainless steel finish.

1. Hall fixtures shall feature round, mechanical, illuminated buttons in raised fixture housings. Hall fixtures shall correspond to options available from that landing. Buttons shall be flat flush in vertically mounted fixture. Hall fixtures should be jamb-mounted. Hall lanterns shall feature illumination.

C. Car Lantern and Chime: A directional lantern visible from the corridor shall be provided in the car entrance. When the car stops and the doors are opening, the lantern shall indicate the

direction in which the car is to travel and a chime will sound. The chime will sound once for up and twice for down.

2.7 EQUIPMENT: ELEVATOR OPERATION AND CONTROLLER

A. Elevator Operation.

1. Operation: Using a microprocessor-based controller, operation shall be automatic by means of the car and hall buttons. If all calls in the system have been answered, the car shall park at the last landing served.
2. Zoned Car Parking.
3. Relative System Response Dispatching.

B. Standard Operating Features to include:

1. Full Collective Operation.
2. Fan and Light Control.
3. Load Weighing Bypass.
4. Ascending Car Uncontrolled Movement Protection.
5. Top of Car Inspection Station.
6. Battery Lowering.
7. Card Reader.
8. Cell Phone capabilities.

C. Additional Operating Features to include:

1. Independent Service.

D. Elevator Control System for Inspections and Emergency

1. Provide devices within controller to run the elevator in inspection operation.
2. Provide devices on car top to run the elevator in inspection operation.
3. Provide within controller an emergency stop switches to disconnect power from the brake and prevent motor from running.
4. Provide the means from the controller to mechanically lift and control the elevator brake to safely bring car to nearest available landing when power is interrupted.
5. Provide the means from the controller to reset the governor over speed switch and also trip the governor.
6. Provide the means from the controller to reset the emergency brake when set because of an unintended car movement or ascending car over speed.
7. Provide the means for the control to reset elevator earthquake operation.

2.8 EQUIPMENT: DOOR OPERATOR AND CONTROL

A. Door Operator: A closed loop permanent magnet VVVF high-performance door operator shall be provided to open and close the car and hoistway doors simultaneously. Door movement shall be cushioned at both limits of travel. Electro-mechanical interlocks shall be provided at each hoistway entrance to prevent operation of the elevator unless all doors are closed and locked.

Electric contact shall be provided on the car at each car entrance to prevent the operation of the elevator unless the car door is closed.

B. The door operator shall be arranged so that, in case of interruption or failure of electric power, the doors can be readily opened by hand from within the car, in accordance with applicable code. Emergency devices and keys for opening doors from the landing shall be provided as required by local code.

C. Doors shall open automatically when the car has arrived at or is leveling at the respective landings. Doors shall close after a predetermined time interval or immediately upon pressing of a car button. A door open button shall be provided in the car. Momentary pressing of this button shall reopen the doors and reset the time interval.

D. Door hangers and tracks shall be provided for each car and hoistway door. Tracks shall be contoured to match the hanger sheaves. The hangers shall be designed for power operation with provisions for vertical and lateral adjustment. Hanger sheaves shall have polyurethane tires and pre-lubricated sealed-for-life bearings.

E. Electronic Door Safety Device. The Elevator shall be equipped with an electronic protective device extending the full height of the car. When activated, this sensor shall prevent the doors from closing or cause them to stop and reopen if they are in the process of closing. The doors shall remain open as long as the flow of traffic continues and shall close shortly after the last person passes through the door opening.

2.9 ACCESSIBILITY

A. Comply with all ADAAG accessibility guidelines based upon current ADA Standard for Accessible Design.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Field measure and examine substrates, supports, and other conditions under which elevator work is to be performed.

B. Do not proceed with work until unsatisfactory conditions are corrected.

C. Prior to start of Work, verify hoistway is in accordance with shop drawings. Dimensional tolerance of hoistway from shop drawings: -0 inches +2 inches. Do not begin work of this section until dimensions are within tolerances.

D. Prior to start of Work, verify projections greater than 2 inches (4 inches if ASME A17.1/CSA B44 2000 applies) must be beveled not less than 75 degrees from horizontal.

E. Prior to start of Work, verify landings have been prepared for entrance sill installation. Traditional sill angle or concrete sill support shall not be required.

F. Prior to start of Work, verify elevator pit has been constructed in accordance with requirements, is dry and reinforced to sustain vertical forces, as indicated in approved submittal. Verify that sumps or sump pumps located within pit will not interfere with installed elevator equipment.

G. Prior to start of Work, verify control space has been constructed in accordance with requirements, with access coordinated with elevator shop drawings, including Sleeves and penetrations.

H. Verify installation of GFCI protected 20-amp in pit and adjacent to each signal control cabinet in control space.

3.2 PREPARATION

A. Coordinate installation of anchors, bearing plates, brackets and other related accessories.

3.3 INSTALLATION

A. Install equipment, guides, controls, car and accessories in accordance with manufacturer installation methods and recommended practices.

B. Properly locate guide rails and related supports at locations in accordance with manufacturer's recommendations and approved shop drawings. Anchor to building structure using isolation system to minimize transmission of vibrations to structure.

C. All hoistway frames shall be securely fastened to fixing angles mounted in the hoistway. Coordinate installation of sills and frames with other trades.

D. Lubricate operating system components in accordance with manufacturer recommendations.

E. Perform final adjustments and necessary service prior to substantial completion.

3.4 CONSTRUCTION

A. Interface with Other Work:

1. Guide rail brackets attached to steel shall be installed prior to application of fireproofing.
2. Coordinate construction of entrance walls with installation of door frames and sills. Maintain front wall opening until elevator equipment has been installed.

    a. Ensure adequate support for entrance attachment points at all landings.
    b. Coordinate wall openings for hall push buttons, signal fixtures and sleeves. Each elevator requires sleeves within the hoistway wall.
    c. Coordinate emergency power transfer switch and power change pending signals as required for termination at the primary elevator signal control cabinet in each group.
    d. Coordinate interface of elevators and fire alarm system.
    e. Coordinate interface of dedicated telephone line.

3.6 TESTING AND INSPECTIONS

A. Perform recommended and required testing in accordance with authority having jurisdiction.

B. Obtain required permits and provide originals to Owner's Representative.

3.6 DEMONSTRATION

A. Prior to substantial completion, instruct Owner's Representative on the proper function and required daily maintenance of elevators. Instruct personnel on emergency procedures.

END OF SECTION 142100

SECTION 21 05 00

COMMON WORK RESULTS FOR FIRE SUPPRESSION

PART 1 - GENERAL

1.1 PREFACE

A. The Work shall be performed using the General Contracting (GC) / Single-Prime Contractor project delivery method and the Design-Bid-Build process. References to Work to be performed by different Trades Contractors or Subcontractors are all subject to the Scope of Work by the Prime Contractor. Any conflicts regarding Scope of Work shall be directed to the Prime Contractor for resolution. **THE PRIME CONTRACTOR FOR THIS PROJECT SHALL ALSO BE KNOWN AS THE LEAD CONTRACTOR.**

B. **Terminology:** The terms below will be used throughout Division 21, in accordance with Division 00 and Division 01.
   1. Owner: Mt. Gilead Exempted Village Schools.
   2. Architect/Engineer (A/E): Schorr Architects, Inc. / Roger D. Fields Associates, Inc.
   3. Contractors:
      a. All Trade Contractors listed below, other than the Lead Contractor, are Subcontractors.
      b. General Trades: Refer to Divisions 02 through 14.
      c. Fire Suppression: Refer to Division 21.
      d. Plumbing: Refer to Division 22.
      e. HVAC: Refer to Division 23.
      f. Electrical: Refer to Division 26.
      g. Communications: Refer to Division 27.
      h. Electronic Safety and Security: Refer to Division 28.
      i. Site: Refer to Divisions 31 through 35.
   4. Authority Having Jurisdiction (AHJ) mentioned in Division 21:
      a. Morrow County Health District.
      b. City of Mt. Gilead Fire Department.
      c. State of Ohio Department of Commerce, Division of Industrial Compliance.
      d. State of Ohio Department of Commerce, Division of State Fire Marshal.
      e. State of Ohio Department of Health.

C. Scope of Work Summary for the Contractor Performing Fire Suppression Work on this Project:
   1. Provide limited area sprinkler system serving new elevator hoistway.

1.2 RELATED DOCUMENTS

A. Refer to the additional Divisions below for specific requirements, responsibilities, and methods relating to Division 21 Work. If there is a conflict, comply with the more restrictive requirements.
   1. Division 00, “Procurement and Contracting Requirements”: All sections.
      a. The “General Conditions” will provide additional information on the Contractor’s Scope of Work responsibilities.
   2. Division 01, “General Requirements”: All sections.

B. Read the entire Specification covering other branches of the Work. Contractor shall be held responsible for the coordination of its work with the work performed by other Trades.

1.3 DESCRIPTION

A. Fire Suppression Work includes the Work described in Division 21, "Fire Suppression," Sections 21 00 00 through 21 99 99 (as included), unless otherwise noted.

B. In the Sections listed above, the term "Contractor" shall mean the Contractor performing Fire Suppression Work on this Project, unless otherwise noted.

C. Fire Suppression Work includes, but is not limited to, the following:
   1. Unit Prices, Allowances, or Alternates, as shown, if any.
   2. Selective demolition.
   3. Water-based fire-suppression systems:
      a. Hydraulic design and pipe sizing.
      b. Specialties
      c. Limited area wet-pipe sprinkler system for the indicated areas.

D. Contractor is responsible for the more restrictive requirement between these general provisions and other requirements contained elsewhere in the Contract Documents.

E. Furnish material, labor, tools, accessories, and equipment to complete and leave ready for operation all fire-suppression systems of this Project as described in these Specifications and as shown on the Drawings.

F. Use sufficient skilled workers and competent supervisors in the execution of this portion of the Work to ensure proper and adequate installation throughout.

G. Refer to Section 21 05 00.31, "Project Coordination for Fire Suppression," regarding final electrical connections.

H. Maintain existing facilities in operation whenever possible. Occupied sections of the building will remain in use throughout construction. Coordinate with the A/E and Owner.

I. Work Sequence:
   1. The Work shall be conducted in one phase.

J. All fire-suppression systems shall be provided as complete and operational, and shall not be considered complete unless, and until, at a minimum, all Code and Governing Agency requirements are satisfied.

1.4 COORDINATION MEETINGS AND COORDINATION DRAWINGS

A. Terminology:
   1. Coordination Meetings: Coordination Meetings shall be held to identify Coordination Areas and the need for a Coordination Drawing for any Coordination Area. The Lead Contractor shall schedule and conduct the Coordination Meetings.
   2. Coordination Areas: Areas of the project that require special attention, i.e., where there are potential conflicts between Trades.
   3. Coordination Drawings: Drawings and electronic files prepared by the Coordination Participants to demonstrate how multiple-system and interdisciplinary work shall be coordinated.
   4. Coordination Participants: All Contractors shall participate in the process of developing the Coordination drawings, including, at a minimum, the following Trades:
      a. General Trades.
      b. Fire Suppression.

c. Plumbing.
d. HVAC.
e. Electrical.
f. Communications.
g. Electronic Safety and Security.

B. Refer to Section 23 05 00, "Common Work Results for HVAC," for additional requirements.

1.5 ADDITIONAL WORK CONSIDERATIONS

A. Available water flow:
1. Contractor shall certify that test results are correct and acceptable before performing pipe-sizing calculations, shall independently verify water flow data, and shall conduct its own testing if required.

B. Sprinkler Layout Drawings and Hydraulic Calculations:
1. Before any work is started, prepare dimensioned sprinkler layout drawings showing new pipe runs and sizes, sprinkler locations, valves, and accessories. Show luminaires, smoke detectors, speakers, diffusers/grilles, heating equipment, and structural elements in light background on the reflected ceiling plans, with sprinklers and piping shown in dark/heavy lines or symbols. Verify the final hazard classification for each area even though the documents may call for certain hazard classifications.
2. Submit (2) copies of sprinkler layout drawings and hydraulic calculations for review by the A/E.
3. Resubmit layout drawings if changes are made as a result of the A/E's review of the layout drawings.
4. After receiving initial review by the A/E, submit (2) copies of sprinkler layout drawings and hydraulic calculations, signed by a State-Certified Fire Suppression Designer, for final approval by the AHJ.
5. Submit sprinkler layout drawings to affected Contractors for their review and coordination before fabricating or installing system.
6. Coordinate all changes in sprinkler layout with all other Contractors.
7. Submit a final copy of the approved sprinkler layout drawings and calculations to the A/E for record purposes.

1.6 QUALITY ASSURANCE

A. Standards: Refer to individual Specification Sections for additional referenced standards. If a standard is undated, the referenced edition or most recent version of the standard applies.

B. Standards: The following is a list of referenced standards. Not all of these standards necessarily apply to this Project. Refer to individual Specification Sections. If a standard is undated, the referenced edition or most recent version of the standard applies.
1. American Institute of Architects Committee on Architecture for Health (AIA/CAH), Health Guidelines Revision Committee (HGRC): 2014 Guidelines for Design and Construction of Hospitals and Outpatient Facilities.
2. American Concrete Institute (ACI).
3. American National Standards Institute (ANSI).
4. American Society for Testing and Materials (ASTM).

5. American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE):
   a. Standard 62.1, Current Enforced Edition, "Ventilation for Acceptable Indoor Air Quality."
   b. Standard 90.1, Current Enforced Edition, "Energy Standard for Buildings Except Low-Rise Residential Buildings."
6. American Society of Mechanical Engineers (ASME):
   a. Boiler and Pressure Vessel Code (BPVC), Section IX, "Welding and Brazing Qualifications."
7. Americans with Disabilities Act (ADA), 2010, Accessibility Guidelines, Code of Federal Regulations (CFR), 36 CFR 1191.
8. Leadership in Energy and Environmental Design (LEED).
9. National Electrical Manufacturers Association (NEMA):
10. National Fire Protection Association (NFPA):
    a. 2023 NFPA 70, "National Electrical Code® (NEC)."
11. The Joint Commission.
12. Underwriters Laboratories, Inc. (UL).
13. WELL Building Standard™, International WELL Building Institute™ (IWBI).
14. United States Department of Labor, 29 CFR 1910.7, Occupational Safety and Health Administration (OSHA), Part 1926, "Safety and Health Regulations for Construction."
15. United States Environmental Protection Agency (EPA).
16. United States Green Building Council (USGBC).
17. State of Ohio:
    a. Ohio Administrative Code (OAC):
       1) OAC 1301:7-7: 2025 Ohio Fire Code.
       2) OAC 3701: Health Code, Current Edition.
       3) OAC 4101:1: 2024 Ohio Building Code.
       4) OAC 4101:5: 2024 Elevator Code.
    b. Ohio Revised Code 153.011.
    c. Ohio Environmental Protection Agency (EPA).

END OF SECTION 21 05 00

SECTION 21 05 17

SLEEVES AND SLEEVE SEALS FOR FIRE-SUPPRESSION PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Division 01, “General Requirements.”

B. Division 07, “Thermal and Moisture Protection.”

1.2 DESCRIPTION

A. Provide sleeves and sleeve seals, including all accessories required for a complete installation, at penetrations of exterior floor and wall assemblies. Sleeve where piping:
   1. Passes through equipment room walls.
   2. Passes exposed through non-fire-rated construction walls.
   3. Passes exposed through non-fire-rated construction above-grade floors.
   4. Passes through smoke-rated or fire-rated separations. Apply firestopping to fire-suppression penetrations of fire-rated floor and wall assemblies to maintain or restore original fire-resistance rating of assembly according to Division 07.

1.3 TERMINOLOGY

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.

1.4 QUALITY ASSURANCE

A. Standards:
   1. American Society for Testing & Materials (ASTM):
      a. ASTM E 84, Standard Test Method for Surface Burning Characteristics of Building Materials.”
      b. ASTM E 814, “Standard Method of Fire Tests of Through Penetration Fire Stops.”
   2. Factory Mutual Global (FMG).
   3. National Fire Protection Association (NFPA):
      a. 2023 NFPA 70, “National Electrical Code® (NEC)” (latest edition).
      b. 2021 NFPA 101, “Life Safety Code” (latest edition).
   4. Underwriters Laboratories, Inc. (UL) 1479, “Fire Tests of Through-Penetration Firestops.”

1.5 SUBMITTALS

A. Submit Manufacturer’s product data, installation instructions, and details for each required product.

PART 2 - PRODUCTS

2.1 SLEEVE SEALS — NON-FIRE-RATED FIRE-SUPPRESSION PENETRATIONS

A. Piping Sleeve Material:
   1. Up to 8 in. diameter: Machine-cut Schedule 40 black steel pipe.
   2. 8 in. and larger: Schedule 30 black steel pipe.

3. Bare copper piping: Copper sleeves.
4. **Option:** Schedule 40 plastic pipe may be used for piping sleeves, where adjacent ceiling space is not used for return air plenum. Refer to the Drawings.
5. Sleeves may be split, where used on existing piping through non-bearing walls.

B. Sizing: Sleeves shall be large enough for sleeve seals to be installed. Size to allow 1/2 in. minimum clearance all around piping.

2.2 SLEEVE SEALS — FIRE-RATED FIRE-SUPPRESSION PENETRATIONS

A. Acceptable Manufacturers: Either provide sleeves and sleeve seals from the Manufacturers listed in Division 07 or provide sleeves and sleeve seals from the following Manufacturers: 3M Fire Barrier caulking or putty, BP Fyre Putty, Carborundum Fibersil, Chase Foam, CSD Sealing Systems "FSP," Dow Corning 3-6548, Hilti Fire Stop, International Protective Coatings Corporation "Flame-Safe," Johns-Manville Cerafiber, KBS Mortar Seal, or Nelson Fire Stop.

B. ASTM E119 and E814 Silicone RTV foam, UL-approved.

C. Sleeves shall be large enough for fire-rated sleeve seals to be installed. Size to allow 1/2 in. minimum clearance all around.

2.3 FIRESTOP PILLOWS

A. Acceptable Manufacturers: KBS or approved equal by 3M or Specified Technologies Inc.

B. KBS SEALBAG™: UL-listed, FMG-approved.

2.4 SLEEVE SEALS — WATERTIGHT FIRE-SUPPRESSION PENETRATIONS

A. Provide sleeves with waterstop anchor flange at midpoint where penetrating structure at or below grade.
1. Acceptable Manufacturers: 3M, Calpico, or Hilti.

B. **Option:** Compression Seals: GPT Industries Link-Seal. Stainless steel bolts and nuts. Provide correct size seal and coordinate with sleeve size.
1. Acceptable Manufacturers: GPT Industries or approved equal by Calpico, Metraflex, Michigan, or Wayne.

C. Sleeves shall be large enough for watertight sleeve seals to be installed. Size to allow 1/2 in. minimum clearance all around.

PART 3 - EXECUTION

3.1 COORDINATION

A. Coordinate location of sleeves, core-drilled holes, and other holes required with the Lead Contractor, Structural Engineer, equipment, and other Trades.

3.2 INSTALLATION — GENERAL

A. Indicated sizes and locations are based on early Project information and should be verified by the Contractor.

B. Chases and constructed openings that are not indicated on the Drawings shall be provided at the expense of the Contractor requiring the chase or constructed opening.

C. If it becomes necessary to cut into the work because of the failure of the Contractor to notify the Lead Contractor, then the Lead Contractor shall do any cutting and patching required later, at the Contractor's expense.

D. Provide dimensions and locations of openings required in walls for sleeves, piping, and similar items, and deliver sleeves, to the Lead Contractor, so as not to delay construction.

E. **BEFORE CONSTRUCTION OF MASONRY OR CONCRETE WALLS IS STARTED**, give the Lead Contractor locations and sizes of all openings required for the installation of equipment or sleeves.

F. If sleeves are not installed due to the fault of the Contractor, the Lead Contractor shall core-drill holes through masonry or concrete construction at the expense of the Contractor.

G. In New Drywall, Masonry, or Concrete Wall Construction, as used in this Project:
   1. Provide sleeves for fire suppression items.
   2. Carefully coordinate and check locations of sleeves immediately before and after each concrete pour and/or masonry installation.
   3. **Option** for above ceiling only: Lead Contractor shall omit concrete block(s) where required for penetrations and shall provide square-finished opening. Do not omit concrete blocks in sound barrier walls, under bearing points, or in fire-rated or smoke-rated walls.
   4. In precast concrete work: In lieu of sleeves, cut holes after erection of concrete.
   5. Coordinate with other Contractors, Structural Engineer, and A/E.

H. In Existing Walls: Contractor shall provide sleeves for its own Work, unless specifically shown otherwise. Perform one of the following for piping penetrations and other openings through masonry or concrete walls:
   1. Knock out concrete block(s). Do not knock out concrete blocks under bearing points. Install sleeve. Repair wall. Coordinate with the A/E.
   2. Knock out concrete block(s). Do not knock out concrete blocks under bearing points. No sleeve needed if no fire rating required. Coordinate with the A/E.
   3. Core-drill through walls where required. No sleeve needed if smooth opening and no fire rating required.
   4. Provide own sleeves and all required cutting, drilling, and patching for openings required through below-grade walls, or under interior bearing walls. Install sleeve such that the wall does not bear on the fire suppression work.

I. Sleeves are not required in floor slabs on grade or in core-drilled openings not requiring firestopping or watertightness.
   1. **Exception:** Sleeves are required at core-drilling through hollow-core pre-cast concrete slabs and through concrete block walls to facilitate containment of required firestopping material.

J. Provide all piping sleeves and caulking for openings in new walls.

K. Piping shall not bear on sleeves. Install sleeves plumb and true to line, grade, and position.

L. Cutting:
   1. Cut off sleeves through walls flush with each surface.
   2. Cut off sleeves 1/8 in. above finished floors and 3 in. above floors in kitchens, utility rooms, equipment rooms, and shafts. Cut off bottom of sleeve flush with surface.
   3. Refer to Division 01 for specific requirements regarding approved cutting methods.

M. All piping sleeves and escutcheons shall have ample clearance for pipe and covering and shall have chrome-plated wall and floor escutcheons over the pipe in finished areas. Provide chrome-plated or prime-coated escutcheons in other rooms.

N. Unused sleeves shall be plugged and fire-packed. Provide finish that matches finish of adjacent surface.

3.3 INSTALLATION — FIRE-RATED FIRE-SUPPRESSION PENETRATIONS

A. Verify which walls, ceilings, or floors are fire-rated, if any, and provide approved fire-blocking or fire-protective devices.

B. Use approved, UL-listed, fire-retardant sealants, backing, and packing to maintain fire rating of the structure penetrated.

C. Spray UL-listed foam sealant around exposed piping entering and leaving fire-rated wall or floor structures.

D. To ensure fire blocking, close space around piping and other fire suppression items passing through walls and floors. Seal space up to a 1/2 in. gap with sealant or caulking. Close off space greater than a 1/2 in. gap with sheet metal and seal airtight.

E. For larger openings, provide firestop pillows.

F. Pack all fire-rated or sound-rated separation sleeves with glass fiber, high-temperature mineral wool, aluminum-silica fiber, fire-retardant rope, calcium silicate, or other noncombustible material to maintain fire rating of structure, and finish with fire-rated sleeve seals.

G. Fill space around all sleeves extending into exposed areas with material compatible with adjacent construction and finish.

H. All openings shall have been UL-tested utilizing the proper rated penetrations to be equal to, or greater than, the barrier assembly in which the penetration occurs.

I. Install all penetrations and openings in accordance with the Manufacturers' instructions.

J. The fire-blocking assembly shall maintain the required fire-resistance rating of the wall or floor in which it is placed. Apply a further sealant, if necessary, to attain a smoke-tight condition. Close openings without sleeves in the same manner.

K. Refer to Division 07 for additional requirements.

3.4 INSTALLATION — WATERTIGHT FIRE-SUPPRESSION PENETRATIONS

A. Sleeving with absolutely watertight seal is required for fire suppression work passing through exterior walls above grade

B. Piping sleeves penetrating outside wall or slabs on grade shall have welded intermediate flange imbedded in masonry. Space around piping shall be clamped, packed, and caulked to make an absolutely watertight seal within sleeve. Caulk around outside of sleeve.
   1. **Option:** Install compression seals.

END OF SECTION 21 05 17

SECTION 21 05 23

GENERAL-DUTY VALVES FOR WATER-BASED FIRE-SUPPRESSION PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Section 21 05 53, “Identification for Fire-Suppression Piping and Equipment.”

1.2 DESCRIPTION

A. Provide valves and accessories for fire-suppression piping system(s):
   1. To facilitate the maintenance, operation, isolation, and servicing of all water-based fire-suppression piping systems.
   2. In locations accessible to qualified personnel for operation, removal, maintenance, or servicing.
   3. As shown on the Drawings and as discussed in other Sections of these Specifications.
   4. In accordance with 2022 NFPA 13.

1.3 QUALITY ASSURANCE

A. Standards:
   1. American National Standards Institute (ANSI).
   2. American Water Works Association (AWWA).
   3. Manufacturer’s Standardization Society of the Valve and Fittings Industry (MSS).
   4. National Fire Protection Association (NFPA):
      a. 2022 NFPA 13, “Standard for the Installation of Sprinkler Systems.”

PART 2 - PRODUCTS

2.1 MANUFACTURERS AND MODEL NUMBERS

A. Manufacturer and Model Number listed below shall be considered to be the Design Base Manufacturer and Model Number. Other Acceptable Manufacturers will be permitted, unless specifically excluded.

B. All valves of the same type used on the Project shall be by the same Manufacturer.

2.2 BALL VALVES (BRONZE BODY, UP TO 2 IN.)

A. Acceptable Manufacturers: Nibco or approved equal by American-Darling, Automatic Sprinkler, Crane, Hammond, Kennedy Valve Division of McWane Inc., Milwaukee, Mueller, Powell, Reliable Automatic Sprinkler Co., Tyco Fire Products, United Brass Works, Victaulic, or Watts.

B. 1/4 in. to 1 in. (full port): Nibco Model KT-585-70-UL. MSS SP 110-conforming, 175 lb. WWP, threaded 2-piece, chrome-plated ball, blow-out-proof stem, and reinforced TFE seats.

2.3 CHECK VALVES

A. Acceptable Manufacturers: Kennedy Valve Division of McWane Inc. or approved equal by American-Darling, Automatic Sprinkler, Crane, Hammond, Milwaukee, Mueller, Nibco, Powell, Reliable Automatic Sprinkler Co., Tyco Fire Products, United Brass Works, Victaulic, or Watts.

B. 2 in. and Smaller (bronze body swing): Kennedy Valve Division Figure 440-SD. MSS SP 80, 200 PSI (WOG) bronze cap, threaded ends, Buna-N disc, and bronze hinge, pin, and disc assembly.

2.4 DRAIN VALVES

A. Acceptable Manufacturers: Milwaukee or approved equal by HCI, Nibco, or Walworth.

B. Milwaukee BA-100H. 3/4 in. bronze hose-end ball valve, with cap and chain (where concealed). Provide 3/4 in. garden hose thread adapter on outlet of drain valve, with cap.

2.5 SEALANT TAPE

A. Polytetrafluoroethylene (PTFE) tape.

PART 3 - EXECUTION

3.1 COORDINATION

A. Coordinate valves and accessories with structure and with mechanical and electrical equipment.

B. Coordinate the exact location of valves, etc., and the proper number, size, and type threads required, with the Local Fire Department.

C. Coordinate all access panel locations, if required, with the Lead Contractor.

3.2 INSTALLATION

A. Install valves:
1. At service connections to equipment not provided with valves.
2. At branch lines from main lines.
3. At low points for draining.

B. Install valves with handwheel at or above centerline of pipe.

C. Install supervisory switches on:
1. Ball valves.

D. Drain Valves: Install at low points in piping to provide complete drainage of the fire-suppression system if other means of draining are not provided.

E. To facilitate replacement of devices, install isolation valves upstream of pressure alarm switch, automatic drain device, and flow control valves.

F. Open up valves fully before soldering to piping.

G. During soldering or brazing, remove valve internals and protect the remaining element of sweat end valves against heat damage.

H. Do not make welded connections to valves.

I. Do **NOT** install any valves where the fluid operating pressure exceeds 80% of the valve's pressure rating.

J. Do **NOT** use bronze valves on iron fittings or pipe without dielectric unions.

K. Tighten packing glands before placing valves in service.

L. Tag all valves. Refer to Section 21 05 53.

M. Chain all fire water supply valves open. Provide locks. Give keys to the Owner.

3.3 TESTS

A. Test all valves for tightness.

B. Test-operate all valves at least once from closed-to-open-to-closed positions while valve is under pressure.

END OF SECTION 21 05 23

SECTION 21 05 29

HANGERS AND SUPPORTS FOR FIRE-SUPPRESSION PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Section 21 05 16, “Expansion Fittings and Loops for Fire-Suppression Piping.”

B. Section 21 05 48, “Vibration and Seismic Controls for Fire-Suppression Piping and Equipment.”

1.2 DESCRIPTION

A. Hangers and Supports for Fire-Suppression Equipment and Systems: Provide for piping installed under the Fire-Suppression Work.

B. Support Steel: Attach to building structure to support piping and smaller fire-suppression equipment items. Provide supports between structural members, except where specifically called out to be provided as part of the General Trades Work. Obtain prior written approval of the A/E.

C. Hangers for Piping: Install all necessary pipe hangers, supports, clamps, wall brackets, and attachments in order to:
   1. Properly support piping from building structure.
   2. Allow controlled thermal movement of piping systems.
   3. Facilitate action of expansion joints, loops, and bends, where used.
   4. Provide slope where indicated.

D. Provide all necessary inserts, expansion shields, beam clamps, piping floor supports, auxiliary steel, angles, clips, mechanical fasteners, reinforcement steel, structure drilling, welding to structure, etc.

E. Components shall be selected and matched to the load imposed on them.

F. Refer to Structural and Architectural Drawings and Specifications to determine what supports are provided as part of the General Trades Work.

1.3 QUALITY ASSURANCE

A. Standards:
   1. American National Standards Institute (ANSI)
   2. American Society for Testing and Materials (ASTM).
   3. American Society of Mechanical Engineers (ASME), including:
      a. ASME B31.1, “Code for Power Piping.”
      b. ASME B31.9, “Building Services Piping.”
   4. Factory Mutual Global (FMG).
   5. Manufacturers Standardization Society of the Valve and Fittings Industry (MSS).
      a. Standard Practice 58.
      b. Standard Practice 69.
      c. Standard Practice 89.
   6. National Fire Protection Association (NFPA):
      a. 2022 NFPA 13, “Standard for the Installation of Sprinkler Systems.”
   7. Underwriters Laboratories, Inc. (UL).

PART 2 - PRODUCTS

2.1 STRUCTURAL STEEL

A. Steel plates, shapes, and bars; steel beams; strut channels; standard-weight black steel pipe; or steel angle. ASTM A36 / ASTM A36M, black and galvanized, of adequate size and strength to safely carry the weight of equipment item.

2.2 HANGERS FOR PIPING

A. Acceptable Manufacturers: Anvil International, B-Line Systems Inc., Carpenter & Patterson Inc., ERICO, Globe Pipe Hanger Products Inc., National Pipe Hanger Corp., or PHD Manufacturing Inc.

B. Uninsulated Piping:
1. Steel, cast iron, or plastic; 1/2 in. to 8 in.: Anvil International Fig. 69. Galvanized carbon steel, adjustable swivel ring.
2. Steel, cast iron, or plastic; 10 in. and larger: Anvil International Fig. 260. Adjustable clevis, carbon steel yoke, U-strap, rod, and hex nuts.
3. Copper, 1/2 in. to 4 in.: Anvil International Fig. CT-99. Copper-plated hangers, adjustable tubing ring, carbon steel ring, and malleable iron adjusting nut.

C. For Piping Indicated to be Installed “Tight to Ceiling or Wall” (uninsulated, 1/2 in. to 4 in.): Anvil International Fig. 262. Carbon steel.
1. **Option:** PowerStrut channels with PowerStrut Model PS 3126 hold-down clamp. Use with rubber cushion for copper pipe.

D. Vertical Piping:
1. Anvil International Fig. 261. Friction riser clamp with 2-point bearing.
2. Use Anvil International Fig. CT-121 copper-plated riser clamp for copper pipe.

2.3 HANGER RODS, CLAMPS, AND BRACKETS FOR PIPING

A. Acceptable Manufacturers: Anvil International, B-Line Systems Inc., Carpenter & Patterson Inc., Globe Pipe Hanger Products Inc., ERICO, Miro, National Pipe Hanger Corp., or PHD Manufacturing Inc.

B. Hanger Rods: Solid steel, threaded ends or all-thread rods of diameter listed below, with double-nut attachment to the hanger and at the hanger attachment. Sizes are as follows:

PIPE SIZES	ROD DIAMETER
Up to and including 4 in.	3/8 in.

C. Hanger Clamps:
1. Beam clamps (up to 8 in. diameter pipe): Anvil International Fig. 218, Fig. 228, or Fig. 292. Top beam clamp, steel jaw, hook rod with nut, and spring washer steel eye-bolt, with Anvil International Fig. 157 or Fig. 290 extension piece for appropriate rod diameter.
a. **Option:** Anvil International Fig. 86, Fig. 93, or Fig. 94. Malleable iron clamp, hardened steel cup point set screw with Anvil International Fig. 89 steel retaining clip.

D. Hanger Brackets:
1. Acceptable Manufacturers: ABB (Thomas & Betts) Superstrut®, Anvil International, B-Line Systems Inc., Carpenter & Patterson Inc., ERICO, Globe Pipe Hanger Products Inc., National Pipe Hanger Corp., PHD Manufacturing Inc., or Unistrut Corp.

2. Wall brackets: Carbon steel, back plates, and bolts.
   a. Anvil International Fig. 194. Lightweight 750 lb. load.
   b. Anvil International Fig. 195. Medium-weight 1,500 lb. load.
   c. **Option:** Unistrut or ABB Superstrut® A1200.

2.4 HANGER COVERS FOR PIPING

A. Acceptable Manufacturers: Buckaroos Inc. or approved equal by Pipe Shields Inc. or PHS Industries.

B. Buckaroos Wraparoos. 2-piece PVC cover. Snap-on design, adhesive seals, to 205 degrees F. temperature. Includes 18 in. long PVC hanger rod cover. Available in multiple colors. The A/E shall approve all color selections for fire suppression equipment.

2.5 FINISH

A. Unless otherwise noted, all steel hangers and supports shall be standard black.
   1. **Exception:** Hangers and supports for exposed exterior applications shall be galvanized.

2.6 INSERTS

A. In Masonry with Voids: Master-Carr #94255A100. Steel plated with yellow chromated zinc, female threaded toggle.
   1. Acceptable Manufacturers: Master-Carr or approved equal by Vertical Solutions or Hohmann & Barnard.

B. In Precast Concrete: Hilti Fig. KH-EZ1. Malleable iron, expansion case, interior standard pipe threads, external helical wedge.
   1. Acceptable Manufacturers: Hilti or approved equal by Anvil International or Phillips.

C. In Poured Concrete: Anvil International Fig. 282. Malleable iron, universal mounting, lateral adjusting.
   1. Acceptable Manufacturers: Anvil International Inc. or approved equal by B-Line Systems Inc., Carpenter & Patterson Inc., Globe Pipe Hanger Products Inc., ERICO, Klo-Shure, National Pipe Hanger Corp., PHD Manufacturing Inc., or Unistrut.

PART 3 - EXECUTION

3.1 INSTALLATION

A. All piping supports, parts, and installation shall conform to the latest requirements of 2022 NFPA 13, ASME B31.1, and MSS SP-58, SP-69, and SP-89, and shall not exceed the maximum pipe deflections allowed by ASME B31.9, except as supplemented or modified by the requirements of this Specification.

B. Install all piping systems with adequate provisions made for expansion and to prevent stresses on valves and equipment. Provide adequate pipe anchors, guides, and supports from building structure to properly control pipe movement. Method shall suit job conditions.

C. Provide proper steel angles and channel systems, etc., between structural members for hanger supports where necessary. Weld to steel structural members where noted. Consult with the A/E regarding this procedure.

D. All hangers installed shall be appropriate for type of building structure indicated.

E. Do not support hangers from roof deck or floor above. Span from structural members with supplementary steel where direct attachment to structural members is not practical.

F. Install hangers and supports with all necessary inserts, bolts, rods, nuts, washers, and other accessories, according to the Manufacturer's recommendations. Hangers shall be double-nutted.

G. Use a separate hanger for each pipe. Do not hang one pipe from another.

H. Provide additional supports required to maintain piping alignment.

I. Spacing of Piping Supports: Locate and space piping supports according to NFPA requirements. Maximum spacing of piping supports shall be as follows:

STEEL PIPE SIZE	THREADED LIGHT WALL	STANDARD WEIGHT
1 in. to 3 in.	12 ft.	_____
1 in. to 1-1/4 in.	_____	12 ft.
Exception: Locate hangers on exposed horizontal piping, mounted at less than 12 ft. above floor, at 8 ft. on center.		

J. Securely support all piping from structure with all necessary hangers, rods, brackets, and accessories of approved type and size in accordance with 2022 NFPA 13.

K. Securely fasten pipe and hang with NFPA-approved hangers spaced not less than 12 in. or more than 18 in. from a sprinkler. (1) hanger is required on each length of pipe and on cross mains between each branch line.

L. All hangers shall support (5) times the total load of the water-filled pipe in addition to a minimum of 250 lb. load applied at the hanger per 2022 NFPA 13.

M. Support piping near elbows, such that the total cantilevered length for both sides of the elbow does not exceed 3 ft.

N. Structural Steel: Verify size required with the Structural Engineer.

O. **Option:** Trapeze hangers may be used where parallel runs of pipe occur.

P. Vertical Piping Hangers:
1. Support vertical risers at the floor with friction riser pipe clamps.
2. Shorten legs to conceal riser clamp within pipe chase and still provide adequate support.

Q. Hanger Clamps:
1. **DO NOT USE C-CLAMPS WITHOUT RETAINING CLIPS ON PIPING 1-1/2 IN. AND LARGER.**
2. Beam Clamps: Use top flange beam clamps to avoid burning metal deck.

R. Metal Fabrication:
1. Fit connections together to form hairline joints.
2. Field-weld connections that cannot be shop-welded because of shipping size, space limitations, and field conditions.
3. When field-welding, comply with AWS D1.1 procedures for shielded metal arc welding, appearance and quality of welds, and methods used in correcting welding work.

S. Ceilings:
1. Do **NOT** support piping from ceiling and ceiling grid systems.

2. Piping, and each ceiling and ceiling grid system, shall be a separate installation. Independently support each from the building structure.
3. Where interferences occur, in order to support piping, install trapeze-type hangers or supports. Locate them where they do not interfere with access to valves and other fire-suppression equipment items.

T. Painting:
1. Touch-up:
   a. Clean field welds, bolted connections, and abraded areas of all shop paint.
   b. Paint exposed areas immediately after erecting hangers and supports.
   c. Use same paint materials as used for shop painting.
   d. Apply paint by brush or spray to provide a minimum dry film thickness of 2.0 mils.
2. Galvanized surfaces: Clean and apply galvanizing repair paint to comply with ASTM A780.

INSTALLATION — inserts

U. Avoid cutting concrete or masonry by using inserts.

V. Refer to the Manufacturer's recommendations for correct selection as to piping size and loading.

W. Confirm with the Lead Contractor that the concrete used is of a sufficient strength to hold the insert.

X. Provide the correct size and type of inserts, along with information on their correct location, to the Lead Contractor, so as not to delay construction.

Y. Masonry Construction with Voids: Install appropriately sized all-thread rods within a 2-component polyester resin adhesive used in conjunction with a galvanized metal screen. Install rods in holes drilled with carbide-tipped drill bits.

Z. Existing Poured Concrete Installations: Provide insert-type expansion shield anchors with pull-out and shear capacities appropriate for loads to be supported. Install anchors in holes drilled with carbide-tipped drill bits.

END OF SECTION 21 05 29

SECTION 21 10 00

WATER-BASED FIRE-SUPPRESSION SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Section 21 05 23, “General-Duty Valves for Water-Based Fire-Suppression Piping.”

B. Section 21 05 29, “Hangers and Supports for Fire-Suppression Piping and Equipment.”

C. Section 21 05 53, “Identification for Fire-Suppression Piping and Equipment.”

D. Section 21 13 13, “Wet-Pipe Sprinkler Systems.”

1.2 DESCRIPTION

A. Provide piping and fittings as shown or required to completely install all water-based fire-suppression systems on this Project.

B. Valves: Refer to Section 21 05 23 and to the Drawings.

C. Provide water-based fire-suppression piping specialties or accessories as shown or required by the Equipment Manufacturer or AHJ to complete the installation of all fire-suppression systems installed on this Project.
1. Drains.
2. Identification signs.
3. Inspector’s test and drain assembly.
4. Switches, water flow.

D. All products of the same type shall be by the same Manufacturer.

1.3 QUALITY ASSURANCE

A. Standards:
1. American National Standards Institute (ANSI).
2. American Society for Testing and Materials (ASTM).
3. American Society of Mechanical Engineers (ASME):
   a. ASME/ANSI B31.1, “Code for Power Piping.”
   b. ASME Boiler and Pressure Vessel Code, Section IX, “Welding and Brazing Qualifications.”
4. American Society of Sanitary Engineers (ASSE).
5. American Welding Society (AWS).
6. Factory Mutual Global (FMG).
7. National Electrical Manufacturers Association (NEMA).
8. National Fire Protection Association (NFPA):
   a. 2022 NFPA 13, “Standard for the Installation of Sprinkler Systems.”
   b. 2022 NFPA 13R, “Standard for the Installation of Sprinkler Systems in Low-Rise Residential Occupancies.”
   c. 2023 NFPA 70, “National Electrical Code® (NEC),” Articles 110 and 408.
9. Underwriters Laboratories, Inc. (UL), including UL 393
10. Code of Federal Regulations (CFR) Title 40, “Protection of Environment,” Part 59, “National Volatile Organic Compound Emission Standards for Consumer and Commercial Products,” Subpart D, “National Volatile Organic Compound Emission Standards for Architectural Coatings.”

11. California Department of Health Services (CDHS) "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
12. Ohio Administrative Code (OAC) 4101:1, 2017 Ohio Building Code.

PART 2 - PRODUCTS

2.1 PIPING AND FITTINGS FOR SPRINKLERS

A. Threaded, Welded, Or Grooved Piping: Schedule 30 or Schedule 40 steel as listed in 2022 NFPA 13.

B. Piping, 2 in. and Smaller: **ANY WALL THICKNESS LESS THAN SCHEDULE 30 SHALL NOT BE USED.**

C. Black steel (ASTM A53).

D. Wrought steel (ANSI B36.10M).

E. Seamless welded steel (ASTM A53, ASTM A135, or ASTM A795).

F. Type "K," "L," or "M" seamless copper tubing (ASTM B88), equivalent in strength and pressure rating to respective steel pipe specified.

G. Fittings:
1. Cast iron threaded or flanged fittings: 125 lb. SWP or 250 lb. SWP (ANSI B16.4 and ANSI B16.1).
2. Malleable iron threaded fittings: 150 lb. SWP or 300 lb. SWP (ANSI B16.3).
3. Ductile iron grooved fittings (ASTM A536, Grade 65-45-12).
4. Factory-made wrought steel, butt-weld fittings (ANSI B16.9).
5. Butt-welding ends for pipe, valves, flanges, and fittings (ANSI B16.25).
6. Steel pipe flanges and flanged fittings (ANSI B16.5).
7. Forged steel fittings, socket-welded and threaded (ANSI B16.11).
8. Wrought copper and bronze solder-joint pressure fittings (ANSI B16.22).

H. Nipples: Same weight and material as connected pipe, except shoulder nipples shall be extra-heavy. Do not use short nipples.

I. CPVC Pipe:
1. ASTM F 442/F 442M and UL 1821, SDR 13.5, for 175-psig rated pressure at 150 degrees F., with plain ends. Include "LISTED" and "CPVC SPRINKLER PIPE" markings.
2. **Option:** Lubrizol "Blazemaster." CPVC pipe/fittings, SDR 13.5, meeting cell class 23547/24447 in accordance with ASTM D1784, with pipe in accordance with ASTM F442, and listed for automatic fire sprinkler systems.
   a. Acceptable Manufacturers: Lubrizol or approved equal Spears "FlameGuard."
3. CPVC Fittings: UL-listed, FMG-approved, 175-PSIG rated pressure at 150 degrees F, socket type. Include "LISTED" and "CPVC SPRINKLER FITTING" markings.
   a. NPS 3/4 to NPS 1-1/2: ASTM F 438 and UL 1821, Schedule 40, socket type.
   b. NPS 2 to NPS 3: ASTM F 439 and UL 1821, Schedule 80, socket type.
   c. CPVC-to-metal transition fittings: CPVC, 1-piece, with dimensions equivalent to pipe; (1) end with threaded brass insert, and (1) socket end.
   d. CPVC-to-metal transition unions: CPVC, with dimensions equivalent to pipe; (1) end with threaded brass insert, and (1) socket end.
   e. Flanges: CPVC, (1) or (2) pieces.

2.2 SOLDERING, BRAZING, AND WELDING

A. Solder: ASTM B32 alloy Sn94 and Sn95. 95/5 tin-antimony, Grade 95, lead free.
1. Acceptable Manufacturers and Models: Engelhard "Silvabrite 100," J.W. Harris Co. "Bridgit," or Oatey.

B. Brazing: AWS 5.8. Classification BCUP-3 or BCUP-4.

C. Welding: AWS D10.12 for sizes 8 in. or less.

2.3 SOLVENT CEMENTS AND ADHESIVE PRIMERS

A. For Joining CPVC Piping and Tubing: ASTM F493. Compliant with CDHS.
1. Use CPVC solvent cement with a VOC content of 490 grams/liter or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
2. Use adhesive primer with a VOC content of 550 grams/liter or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.4 JOINTS, UNIONS, AND CONNECTIONS

A. Threaded Piping Joints:
1. National Pipe Thread (NPT) taper, general purpose (ASME B1.20.1).
2. TFE tape, applied to male thread only.
3. **Option:** Thread compounds by Permatex.

B. Copper Pipe Unions: Cast bronze, Class 150, ground joint, solder end. Do **NOT** use wrought copper unions.
1. Acceptable Manufacturers: Chase, Crane, Dart, Epco, Flagg, Mueller, Nibco, or Rockwell.

C. Steel Pipe Unions: Black malleable iron, Class 250, bronze ground ball joint.
1. Acceptable Manufacturers: Chase, Crane, Epco, Fairbanks, Grinnell, Mueller, or Stockham.

D. Dielectric Unions: Metal union with dissimilar materials electrically separated by gasket. Union materials, end connections, and pressure rating compatible with piping materials, system fluid, system pressures, and system temperatures.
1. Acceptable Manufacturers: Capitol, Dart, Epco, Vogt, or Watts.

E. Flanges: Cast iron or cast bronze, 125 lb. or higher. ASME B16.5 flat-face or raised-face metal flange plates with matching bolt holes, gasket, bolts, nuts, and washers. Flange materials, end connections, and pressure rating compatible with piping materials, system fluid type, system pressures, and system temperatures.

F. Dielectric Flanges: Flange with electrically-isolating gasket, bolt sleeves, and bolt washers. Flange materials, end connections, and pressure rating compatible with piping materials, system fluid type, system pressures, and system temperatures.
1. Acceptable Manufacturers: Capitol, Crane, Dart, Epco, or Vogt.

G. Gaskets: Nonmetallic. ASME B16.21, 1/8 in. minimum thickness, fibrous type with double coat of graphite, asbestos-free.

1. **Exception:** Use Type 304 stainless steel with carbon steel guide on high temperature piping systems.

H. Bolts and Other Hardware:
1. Bolts for steel, cast iron, brass, and bronze, for 250 PSI working pressure and for 450 degrees F. or below: ASME B18.2.1 carbon steel with American Standard

regular, square heads. ASME B18.2.2 American Standard heavy-hexagon, semi-finished nuts. ASME B16.22.1 plain washers and ASME B18.21.1 lock washers.

a. **Option:** ASME B18.2.1 tee-head, high-tensile steel bolts and nuts may be used in mechanical joint pipelines.

2. Where equipment is installed outside, all hardware and bolts shall be stainless steel.

2.5 WATER-BASED FIRE-SUPPRESSION PIPING SPECIALTIES

A. Drains:

1. Acceptable Manufacturers: Automatic Sprinkler, Croker, Firematic, Globe Fire Sprinkler Corp., Keles, Potter Electric Signal, Potter Roemer, Reliable Automatic Sprinkler Co., System Sensor, Tyco Fire Products, Victaulic, or Viking.
2. Furnish drains using Schedule 80 black steel pipe (ASTM A53).
   a. **Exception:** Through exterior walls, the piping shall be galvanized or non-ferrous.

B. Identification Signs:

1. Acceptable Manufacturers: Reliable Automatic Sprinkler Co. or approved equal by Globe Fire Sprinkler Corp. or Tyco Fire Products.
2. Reliable Automatic Sprinkler Co. Model A:
   a. 18-gauge steel, porcelain-enameled, with white lettering on red background.
      1) Valve control: Style A.
      2) Specific identification: Style B.
      3) Fire alarm: Style D.
      4) Hydraulic calculated system: Style E.
   b. 20-gauge steel, porcelain-enameled, white lettering on red background.
      1) Cold weather: Style C.

C. Inspector's Test and Drain Assembly:

1. Acceptable Manufacturers: AGF Manufacturing Co. or approved equal by Reliable Automatic Sprinkler Co. or Tyco Fire Products.
2. AGF Manufacturing Co. Model 1011T. 1 in. test and drain ball valve, with locking kit and lock with (2) keys, pressure-relief valve, pressure gauge, tamper-resistant sight glass, and 1/4 in. 3-way globe valve, with flow equivalent to (1) sprinkler.

D. Switches, Water Flow:

1. Acceptable Manufacturers: Potter Electric Signal Co. or approved equal by Automatic Sprinkler, Croker, Firematic, Globe Fire Sprinkler Corp., Keles, Potter Roemer, Reliable Automatic Sprinkler Co., System Sensor, Tyco Fire Products, Victaulic, or Viking.
2. Potter Electric Signal Co. Model VSR-F. Vane-type sectional, with (2) single-pole double-throw snap action switches, 40 degrees F. to 120 degrees F. operating temperature range, 250 PSI service pressure, 8 GPM to 10 GPM minimum flow activation for alarm activation, and NEMA 4-rated enclosure.

PART 3 - EXECUTION

3.1 COORDINATION

A. Coordinate pipe elevations and final locations with existing conditions and the work of all other Contractors before installation.

3.2 INSTALLATION — PIPING AND FITTINGS

A. The installation instructions apply to all water-based fire-suppression piping systems, except where otherwise noted.

B. All piping materials and installation shall comply with State and Local Building Code requirements.

C. Provide information on chases, sleeves, and openings required for Fire Suppression Work to other Contractors.

D. Provide all fittings and accessories required to complete the installation.

E. Personnel Passages and Exit Paths: Do not install piping where it will impede personnel using exit paths.

F. Structural Members: Do not install piping where it will interfere with structural members. Do not cut structural members for piping installation without written approval from the Structural Engineer.

G. Ceilings: Piping subject to freezing may be installed in unheated ceiling spaces only where specifically shown, immediately above the ceiling of a heated space, with building insulation closely packed above the piping to protect it from freezing. Contractor providing the piping shall ensure that vulnerable piping is protected against freezing.

H. Walls:
   1. Coordinate penetration sizes, locations, sleeves, and weatherproofing, where applicable.
   2. For masonry unit walls, locate piping penetrations at masonry joints where feasible.
   3. Piping and sprinklers located in, and passing through, exterior walls shall be subject to review by the A/E.
   4. Do not install piping containing fluids subject to freezing in exterior walls, regardless of wall insulation location. Where unavoidable, obtain prior approval of the A/E, and install piping so that the wall insulation is between the pipe and the outside wall.

I. Doors: Do not install piping where it will restrict access to or operation of doors.

J. Windows: Do not install piping in front of windows or where it will restrict access to or operation of windows.

K. Access Doors or Panels: Do not install piping where it will restrict access to or operation of access doors or panels.

L. Piping, Conduit, Cable Trays, and Wiring: Coordinate all runs. Group runs to minimize space usage and maximize access.

M. HVAC Ductwork: Do not penetrate ductwork with piping without written approval of A/E (unless the Drawings specifically indicate the penetration).

N. HVAC Equipment: Do not install piping where it will restrict access to or operation of equipment.

O. Electrical Equipment:
   1. Do not install piping in an electrical equipment room unless it specifically serves that room.

2. Do not install piping above, within 36 in. of front of, or in the immediate vicinity of, electrical panels, electrical switchgear, or other electrical equipment, as described in 2017 NEC Articles 110 and 408.
   a. If compliance with these requirements is not possible, obtain approval in writing from the AHJ and A/E to provide a sheet metal drip pan under the piping to prevent water and condensation from running or dripping onto electrical items. Provide drip pan at no additional cost to the Owner.

P. Luminaires: Do not install piping across, in front of, or directly below luminaires.

Q. Interferences: If any system piping is placed where it causes or contributes to interference, relocate it. Obtain instructions from the A/E. The A/E's decision shall be final in regard to the arrangement of equipment, ductwork, piping, etc. Contractor causing the conflict shall assume all costs and responsibilities resulting from improper coordination of work for the corrective work of all Contractors.

3.3 PIPING LAYOUT

A. The Drawings are schematic and are not intended to precisely show piping locations.

B. Arrange all piping in accordance with the best standards of the Trade.

C. Install piping in a neat and workmanlike manner. Install horizontal piping parallel or perpendicular to building lines, unless indicated otherwise. Install vertical piping plumb, unless indicated otherwise.

D. Securely support piping from structure with approved hangers, rods, anchors, guides, brackets, and accessories.
   1. Independently support piping from building structural members. Do not support piping from ceilings, ducts, other pipes, cable trays, conduit, wiring, etc.
   2. Refer to Section 21 05 29.

E. Install piping systems with adequate provisions for expansion, contraction, vibration, and prevention of stresses on valves and equipment.

F. Except where shown or specified otherwise, install new piping generally in same location as removed piping, using existing piping hangers where possible. Refer to Section 21 05 29 regarding re-use of hangers.

G. Adjust locations and provide additional offsets, drains, and air vents needed to properly install piping system without interferences.

H. Exercise due and particular caution to determine that all parts of the work are quickly and easily accessible.

I. Where special conditions are encountered in the field, the A/E shall decide arrangement and alignment of piping.

J. Changes in Piping Direction:
   1. Make changes in piping direction with fittings. Do not bend or spring piping.
   2. Offset or reroute piping to resolve interferences that develop in the field.
   3. Provide offsets for the proper operation of the system.
   4. Offset piping around columns, beams, and other obstructions.
   5. In pipe spaces to be entered for servicing, offset piping so that, where possible:
      a. All lateral runs are located either near floor or 6 ft.-0 in. or higher above floor.
      b. All vertical piping is held close to the wall through 6 ft.-0 in. or higher above floor to permit access.
   6. Keep all piping to side of chases wherever possible.

K. Conceal pipes, except in equipment rooms, in rooms without ceilings, or where specifically indicated otherwise.

L. Install unions and valves in accessible locations. Use removable ceiling pads or provide access panels in ceilings, walls, and floors for service access. Coordinate installation of access panels.

M. Keep piping level, except where a slope is required.

N. Install piping in such a manner as to allow complete drainage of the water-based fire-suppression piping system. Provide rigid support for drain piping. If other means of draining are not provided, install drain valves at all low points.

O. Avoid trapping piping.
   1. Provide a 3/4 in. ball drain valve with capped hose end connection at each low point in the piping.
   2. Do not trap drain piping except at equipment connections.

P. Make reductions in piping lines with reducing couplings or weld fitting reducers.

Q. For horizontal piping, use eccentric reducer to keep top of pipe level.

R. **DO NOT USE BULLHEAD CONNECTIONS IN ANY PIPING SERVICE.**

S. Where connection size is smaller than piping, make reduction at final connection only. Do not reduce size of pipe drop.

T. Valves:
   1. Install valves at branch lines from main lines.
   2. Refer to Section 22 05 23 for valve requirements.

U. Provide piping identification. Refer to Section 21 05 53.

3.4 PIPING AND FITTINGS FABRICATION

A. Cut pipe accurately, and work into place without forcing or springing.

B. Clean piping components of loose material.

C. Protect all piping, fittings, and valves from excessive tool marks.

D. Joints, Unions, and Connections:
   1. Ream pipe or tubing ends and remove burrs to full inside diameter after cutting.
   2. Threaded connections:
      a. Threads shall conform to ASME B1.20.1.
      b. Provide union adjacent to each threaded valve (unless union is integral to valve body).
   3. Soldered or brazed connections:
      a. Soldering and brazing work shall comply with ASME/ANSI B31.1.
      b. Mating surfaces of joint shall be smooth and clean.
      c. Exterior of joint shall be smooth.
      d. 100% lead-free solder shall be used on water piping, joints, and fittings. Certify that the solder and brazing are lead-free
      e. Refer to Section 22 05 23 for valve requirements.
   4. Dissimilar material connections:
      a. Make joints using adapters compatible with materials of both piping systems.
      b. Install dielectric unions on all connections between copper tubing and ferrous metal piping or equipment having ferrous metal connection.

c. Isolate direct contact between pipe, fittings, valves, and hangers of dissimilar metal by use of dielectric unions, shims, gaskets, coatings, or other approved methods.
d. Use dielectric gaskets where joining dissimilar piping material.

E. Escutcheons:
1. Where exposed pipes pass through walls, floors, or ceilings of finished rooms, provide chrome-plated escutcheons.
2. Protect escutcheons from tool marks.

F. At the end of each day's work, cap or plug open ends in installed piping for protection.

3.5 WATER-BASED FIRE-SUPPRESSION PIPING CLEANING, TESTING, AND STERILIZATION

A. Pipe Cleaning:
1. After erection, lines shall be blown or flushed free of loose materials. Clean strainer screens and sediment pockets prior to putting lines in service.
2. Flush fire suppression mains at GPM flows required by 2022 NFPA 13.

B. Flush out all new water piping systems before connection to existing system and before systems are placed in operation.

C. Perform tests in accordance with AHJ requirements. Tests shall be witnessed by the A/E's Representative.

D. Take precautions to remove all air before performing hydrostatic tests.

E. Isolate existing piping as much as possible during test.

F. If a leak occurs, replace the defective piece or joint with new materials at no cost to the Owner. No caulking will be permitted. Repeat test until no leaks occur.

G. Contractor shall pay all fees for testing and use of testing equipment.

3.6 INSTALLATION — SPECIALTIES

A. **ALL** specialties listed in this Section shall conform to the following Standards:
1. ASTM.
2. FMG.
3. NEMA.
4. NFPA.
5. UL "Fire Protection Equipment List."

B. Provide specialties in locations accessible to qualified personnel for operation, removal, maintenance, or servicing, as shown on the Drawings, in accordance with 2022 NFPA 13, as discussed in other Sections of these Specifications, and in order to facilitate the maintenance, operation, and servicing of all fire-suppression piping systems. Coordinate with structure, and mechanical and electrical equipment.

C. Inspector's Test and Drain Assembly:
1. For each riser, provide assembly at end of branch most remote from the alarm valve.
2. Extend drain from assembly to the exterior, unless requested otherwise.
3. The A/E will review and approve all locations.
4. Torque plugs after fire pump test is completed.

D. Switches, Waterflow on limited area sprinkler systems:
1. Coordinate location and electrical requirements with the Electrical Contractor.

2. Provide a waterflow switch:
   a. On water supply line to sprinkler located in elevator pit.
3. Do not install a flow switch within 12 in. of a tee or elbow connection or within 18 in. of a gate valve.
4. Electrical Contractor shall provide wiring to the fire alarm panel.

END OF SECTION 21 10 00

SECTION 21 13 13

WET-PIPE SPRINKLER SYSTEMS

(PART OF PLUMBING WORK)

PART 1 - GENERAL

1.1 PREFACE

A. **ALTHOUGH SPECIFIED IN DIVISION 21, THIS WORK IS TO BE A PART OF THE PLUMBING WORK.**

B. **Terminology:** In this Section, the term "Contractor" shall mean the Contractor performing Plumbing Work on this Project, unless otherwise noted.

C. All provisions and requirements of Division 21, "Fire Suppression," and Division 22, "Plumbing," apply to this Section.

1.2 RELATED DOCUMENTS

A. Section 21 05 00.73, "Execution of Fire Suppression."

B. Section 21 05 00.78, "Closeout Submittals for Fire Suppression."

C. Section 21 05 23, "General-Duty Valves for Water-Based Fire-Suppression Piping."

D. Section 21 05 29, "Hangers and Supports for Fire-Suppression Piping and Equipment."

E. Section 21 10 00, "Water-Based Fire-Suppression Systems."

1.3 DESCRIPTION

A. Provide a hydraulically designed limited area wet-pipe sprinkler piping system where indicated on the Drawings, including piping, sprinklers, valves, and specialties. Hazard classification shall be in accordance with Code.
   1. Piping and fittings: Refer to Section 21 10 00 for additional requirements.
   2. Valves: Refer to Section 21 05 23.
   3. Access panels. Refer to Section 21 05 00.73.
   4. Specialties: Refer to Section 21 10 00.

B. Design, install, and test complete system in accordance with 2022 NFPA 13; perform hydraulic calculations, prepare drawings, and submit to AHJ for approval.

C. Connect to domestic cold water piping system as shown on the Drawings.

D. Test complete system.

1.4 QUALITY ASSURANCE

A. **S**tandards:
   1. American National Standards Institute (ANSI).
   2. American Society for Testing and Materials (ASTM):
      a. ASTM F 438.
      b. ASTM F 439.
      c. ASTM F 442/F 442 M.
      d. ASTM F 493.
   3. American Society of Mechanical Engineers (ASME).

4. American Welding Society (AWS).
5. Factory Mutual Global (FMG).
6. National Electrical Manufacturers Association (NEMA).
7. National Fire Protection Association (NFPA):
   a. 2022 NFPA 13, "Standard for the Installation of Sprinkler Systems."
8. Underwriters Laboratories, Inc. (UL) , including UL 1821.

1.5 SPARE PARTS

A. Spare Sprinklers: Provide a sprinkler replacement wrench and a stock of spare sprinklers, (2) minimum of each type, for future use for each type and temperature rating of sprinkler installed, and mount in a metal sprinkler cabinet. Furnish minimum total of spare sprinklers in accordance with the following schedule:

NUMBER OF SPRINKLERS	EXTRA SPRINKLERS
Up to 300	6

B. Refer to Section 21 05 00.78 for additional information regarding spare parts.

PART 2 - PRODUCTS

2.1 PIPING AND FITTINGS

A. Unless noted otherwise, the piping between Fire Department connection and check valve, and the drain lines, shall be galvanized Schedule 30 or Schedule 40 black steel (ASTM A53) as listed in 2022 NFPA 13.

B. **Option:** Flexible sprinkler drops. In lieu of rigid pipe offsets or return bends for sprinkler drops, a flexible stainless-steel sprinkler drop system may be used to locate sprinklers where required by final finished ceiling tiles and walls.
   1. FMG 1637-approved and UL 2443-approved.
   2. Drop shall include an FMG-approved and UL-approved braided hose.
   3. Drop system shall consist of a braided Type 304 stainless-steel flexible hose, zinc-plated steel male threaded nipple or groove style coupling for connection to branch-line piping, and a compatible connection to the sprinkler head.
   4. Flexible drop shall attach to ceiling using a bracket. Bracket shall allow installation before the ceiling tile is in place. Braided drop system is UL-listed for sprinkler services to 175 PSI and FMG-approved to 200 PSI.
   5. Maximum hose length is 6 ft.
   6. All hoses shall be factory-pressure-tested to 400 PSI.

2.2 VALVES

A. Acceptable Manufacturers: Victaulic or approved equal by Reliable Automatic Sprinkler Co., Tyco Fire Products, or Viking.

B. Alarm Check Valve and Trim: Victaulic Model 751 Groove X Groove. 4 in., 300 lb. maximum service pressure, ductile iron grooved body and handhole cover, bronze seat ring, aluminum bronze clapper, EPDM rubber clapper facing, retarding chamber with pressure switch, strainers, gauges, fittings, piping, drains, controls, and test valves, for installation in vertical position. Refer to Section 21 10 00 for required pressure switch.

2.3 SPRINKLERS

A. Acceptable Manufacturers: Automatic Sprinkler, Firematic, Globe, Reliable Automatic Sprinkler Co., Tyco Fire Products, Victaulic, or Viking.

B. Automatic spray, wet or dry, glass bulb, upright, pendent, sidewall, and concealed, directional deflectors, nominal 1/2 in. orifice, and 1/2 in. NPT threaded connection. Die cast brass, with hex-shaped wrench boss integrally cast into body.

C. Sprinkler types:
   1. Bottom of elevator hoistway (2 ft. above pit floor): Victaulic Model V2710. Quick response, 5.6 K-factor, standard coverage, horizontal sidewall, brass.
   2. facilities and has no projections: Chrome finish with deep cone escutcheon.

2.4 ESCUTCHEON PLATES

A. Flat, 1-piece or 2-piece, round, chrome-plated metal, unless noted otherwise.

PART 3 - EXECUTION

3.1 COORDINATION

A. Coordinate water line size requirements for the limited area sprinkler system with domestic water demand Increase water piping size if required for the limited area sprinkler system in accordance with the hydraulic calculations.

3.2 INSTALLATION

A. Verify that the domestic cold water piping system is adequate to supply the new sprinkler system.

B. Increase piping sizes if required to meet fire suppression needs.

C. Provide proper size tee and extend outlet of tee as shown on the Drawings.

D. Do not install wet piping in areas where space temperature may drop below 40 degrees F. Refer to Section 21 10 00 for additional piping requirements.

E. **Option:** Install flexible drops only in Manufacturer-approved ceiling types.
   1. Where installing in a ceiling grid, grid shall be a suspended medium or heavy load grid, shall meet ASTM C635/C635M construction, and shall be installed in accordance with ASTM C635/C635M requirements.
   2. Any flexible drop hoses kinked or bent beyond the FMG-recommended 8 in. bend radius shall be replaced with new hoses.

F. Where any wet sprinkler piping is installed above ceilings, and below ceiling insulation, ensure that the ceiling insulation has no insulation voids above the piping.

G. Provide shielding to prevent water from reaching electrical switchgear, computer equipment, electrical panels, or other equipment.

H. Install drainpipes at base of sprinkler riser. Locate Inspector’s Test and Drain Assembly at remote end of system. Pipe to nearest drain or outside to splash block. Discharge from drain/test pipes shall be at location approved by the A/E and Owner.

I. All drain and test piping passing through an exterior wall shall be galvanized or non-ferrous to prevent staining the exterior wall by rust.

J. Valves:
   1. Coordinate location of wet-pipe fire alarm valve risers and piping with equipment.
   2. Chain valves open.
   3. Provide access panels where necessary to permit access to check valves.

K. Sprinklers:
   1. Sprinkler layouts shall be subject to review and approval by the A/E.

L. Escutcheon Plates: Install where sprinklers protrude from ceiling, wall, or soffit. Match existing escutcheon plates.

3.3 TESTING

A. Perform all tests before any piping is covered or concealed.

B. Arrange and schedule all inspections required by the AHJ.

C. Purge limited area sprinkler system of air.

D. Test the limited area sprinkler system hydrostatically at 225 PSIG for (2) hours with no drop in pressure. This test shall occur before final tie into existing system. Measure the hydrostatic test pressure at the low point of the individual system or zone being tested. There shall be no visible leakage during the hydrostatic testing.

E. Isolate existing piping not associated with the renovation during test.

F. Should leaks occur, remove each defective section or defective fitting and replace with new materials at no cost to the Owner. Repeat tests until no leaks occur.

G. Do not use brine or other corrosive chemicals for testing systems.

H. Make provision for the disposal of water issuing from test outlets to avoid property damage.

3.4 CERTIFICATION

A. After all tests have been completed, complete and forward the Contractor's Material and Test Certificate, required by 2022 NFPA 13, to the AHJ.

END OF SECTION 21 13 13

SECTION 21 05 00.31

PROJECT COORDINATION FOR FIRE SUPPRESSION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Division 26, “Electrical.”

B. Section 26 05 00.31, “Project Coordination for Electrical.”

1.2 DESCRIPTION

A. Provide Fire Suppression Work associated with equipment being provided by other Trades.

B. Electrical Contractor shall provide all line-voltage wiring, and all control, interlock, and power wiring and conduit, regardless of voltage, required to power, control, monitor, or interlock fire-suppression equipment, unless noted otherwise.

C. Coordinate all wiring requirements for Fire Suppression Work with the Electrical Work.

D. Electrical Contractor shall provide power wiring, rough-in, and final connection, for each piece of fire-suppression equipment requiring power wiring.

E. Alternative Manufacturer Electrical Requirements: Contractor furnishing the equipment shall compensate the Electrical Contractor for the cost of any additional labor and materials required to wire and hook up equipment other than the Design Base Model and Manufacturer.

F. All electrical equipment shall be UL-listed and shall be furnished in accordance with Division 26 requirements.

1.3 QUALITY ASSURANCE

A. Standards:
   1. National Fire Protection Association (NFPA): 2023 NFPA 70, “National Electrical Code® (NEC).”
   2. Underwriters Laboratories, Inc. (UL).

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION

3.1 PREPARATION

A. Consult Drawings that may affect location of equipment, conduit, or wiring, and make minor adjustments in locations to secure coordination.

3.2 INSTALLATION

A. Installation shall comply with NEC and shall be inspected and approved by the AHJ.

B. Assist in the check-out and start-up operations for fire-suppression equipment.

C. Fire Suppression Contractor is responsible for the final operation of all equipment furnished under its Work.

D. Provide the Electrical Contractor with a full detailed set of all required wiring diagrams for equipment furnished under the Fire Suppression Work.

END OF SECTION 21 05 00.31

SECTION 21 05 00.33

SHOP DRAWING SUBMITTALS FOR FIRE SUPPRESSION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Division 01, "General Requirements."

B. Section 21 05 00, "Common Work Results for Fire Suppression."

1.2 DESCRIPTION

A. Submittal dates:
   1. Within (14) calendar days after the Award of Contract, submit complete materials list of all items proposed to be provided on this Project.
   2. Submit shop drawings within (28) days after the Award of Contract.

B. Materials and equipment installed under the Fire Suppression Work shall meet all the requirements of the Contract Documents. Do not order or install materials or equipment until submittals are reviewed by the A/E.

C. Submit shop drawings for the installation of the Fire Suppression Work for review by the A/E before any Fire Suppression Work is installed, enlarged, or extended. Under **NO** circumstances shall any Fire Suppression Work be performed prior to receiving shop drawings reviewed by the A/E.

D. The A/E's review is **ONLY** for conformance with the design concept of the Project and with the Contract Documents.

E. Catalog data for equipment reviewed by the A/E shall not take precedence over the requirements of the Contract Documents. Review by the A/E shall not relieve the Contractor from the responsibility for deviations from Drawings or Specifications, nor from the responsibility for providing proper clearance and coordination with other Contractors.

F. Color Selections: The A/E shall approve all color selections for fire suppression equipment.

1.3 SHOP DRAWINGS

A. Submit shop drawings for each manufactured item of equipment and all components to be used in the Work. Refer to the Shop Drawing Log attached to this Section and to the Sections listed in Section 21 05 00, Article 1.03, for items.

B. Submit shop drawings electronically in Portable Document Format (PDF). Submit number of copies indicated in Division 01. Contractor shall be responsible for making all copies for distribution and file.

C. Include the following information:
   1. Complete original PDF or first-generation scanned PDF copies of the Manufacturer's catalog sheets, brochures, diagrams, schedules, performance charts, illustrations, and other standard descriptive product data.
   2. Brand name.
   3. Catalog number.
   4. Specific performance data.
   5. Material description.
   6. Characteristics.

7. Ratings.
8. Capacities.
9. Working pressure.
10. Dimensional data.
11. Material gauge or thickness.
12. Wiring diagrams and control diagrams.
13. Arrangement of component parts, physical dimensions, clearances, materials, service requirements, colors (where required), controls, and accessories.

D. Clearly mark or highlight each shop drawing copy to identify pertinent materials, products, models, and colors (where appropriate).

E. Coordinate each submittal with requirements of the Work and the Contract Documents.

F. When (2) or more items of the same material or equipment are required, they shall be of the same Manufacturer.

G. Completely review shop drawings, product data, and samples prior to submission.

H. When submitted for review, all shop drawings shall bear the Contractor's stamped and signed certification of the following:
1. Contractor has reviewed, checked, and approved the shop drawings.
2. Contractor has coordinated shop drawings with the requirements of the Project and with the provisions of the Contract Documents.
3. Contractor has ensured that the equipment shown on the shop drawings meets all the requirements of the Contract Documents.
4. Contractor has determined and verified all of the following:
   a. Materials.
   b. Field measurements.
   c. Field construction criteria.
   d. Catalog numbers and similar data.
   e. Conformance with Specifications.
   f. Hands of equipment.
   g. Quantities and sizes.

I. **UNSIGNED COPIES WILL NOT BE REVIEWED.**

J. Notify the A/E, in writing, at the time of submission, of any deviations in the submittals from the requirements of the Contract Documents.

K. Provide the following certifications information:
1. Test Agency results verifying capacities, operating conditions, and power requirements at design conditions.
2. Manufacturer's statement of compliance with Standards discussed in individual Specification Sections.
3. Equipment labels indicating Certification requirements.
4. Quality standard designations on each unit piece, e.g., each pipe length, pressure vessel, or valve.
5. Typed verification that noted mixes, chemical compositions, and testing procedures were complied with.
6. Other Certifications listed in other Sections of the Specifications.

L. Contractor shall make submittals promptly in accordance with the approved schedule, and in such sequence as to cause no delay either in its Work or in the work of any other Contractor.

M. If a submittal is rejected, immediately make any corrections or changes required by the A/E. Resubmit until accepted.

N. If the Contractor orders equipment or materials, or begins installation, fabrication, or work prior to the return of approved submittals, it shall be "at the Contractor's own risk."

O. Incorporate Shop Drawings into the Operating and Maintenance Manuals.

1.4 REQUIRED SUBMITTAL INFORMATION

A. The form attached to this section contains a list of required submittals. This list may not be a complete list of all required submittals. Submit for approval all items to be provided, whether listed or not.

END OF SECTION 21 05 00.33

Roger D. Fields Associates, Inc.
580 N. 4th ST., Suite 240
Columbus, Ohio 43215
614-451-2248

SHOP DRAWING LOG FOR FIRE SUPPRESSION

PROJECT NAME: _____

PROJECT NUMBER: _____

SUBMITTAL KEY

A	Catalog Cuts/Shop Drawings	G	Completed start-up test forms
B	Installation instructions	H	Coordination Drawings / Studies
C	Color samples	I	Calculations
D	Product samples	J	Schedule
E	Typed statement of material to be furnished	K	Sample of finish
F	Typed verification of compliance with certification requirements		

STATUS KEY

APP	Approved (conforms)
CAN	Corrections Are Noted (conforms as noted)
ICN	Incorporate Corrections Noted
R&R	Revise & Resubmit
R	Rejected

Fire Suppression Submittals Required	Specification Section	Submittal Key	Contractor	Original Submittal			Re-submittal			Remarks / Reviewed by
				Date A/E Received	Date A/E Returned	Status Key	Date A/E Received	Date A/E Returned	Status Key	
Division 21										
Certificate of Fire Suppression Approval from AHJ	21 05 00	F								
Fire Suppression / Sprinkler Layout Drawings	21 05 00	A								
Hydraulic Calculations	21 05 00	A								
Access Panels	21 05 00.73	A								
Valves	21 05 23	A								
Hangers, Piping	21 05 29	A								
Pipe-Coding Materials	21 05 53	D								
Valve-Tagging Chart	21 05 53	D								
Valve-Tagging Materials	21 05 53	D								
Certificate of Completion of Water Line Chlorination	21 10 00	F								
Inspector’s Test and Drain Assembly	21 10 00	A								
Pipe and Fittings	21 10 00	E								
Switches, Valve Supervisory	21 10 00	A								
Switches, Water Flow	21 10 00	A								
Contractor’s Material and Test Certificate	21 13 13	F								
Escutcheon Plates	21 13 13	A								
Flexible Sprinkler Drops	21 13 13	A								
Sprinklers, Wet-Pipe	21 13 13	A								

SECTION 21 05 00.35

SPECIAL PROCEDURES FOR FIRE SUPPRESSION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Division 02, “Existing Conditions.”

1.2 QUALITY ASSURANCE

A. Standard: Occupational Safety and Health Administration (OSHA), including 29 CFR 1910.147.

1.3 SAFETY

A. Contractor shall be solely responsible for safety precautions and programs in connection with the Work. The Owner or A/E will not be responsible for the Contractor’s failure to employ proper safety procedures.

B. Maintain the Project in accordance with Federal, State, and Local Safety and Insurance Standards. All procedures shall comply with the latest OSHA regulations.

C. Contractor shall provide head, eye, and ear protection for each of its employees in accordance with OSHA regulations.

D. Exercise precaution for the protection of persons and property.
   1. Provide guard rails, barricades, enclosures, canopies, passageways, lanterns, warning lights, and other protective safety devices required by the AHJ, and required to protect persons and property against accidentally dropped materials or other construction hazards.
   2. Provide guard lights at all barricades, railings, obstructions in the streets or sidewalks, trenches, or pits.

E. Provide protection as may be required to prevent glass breakage. Replace broken glass at no cost to the Owner.

F. **DO NOT USE POWDER-ACTUATED ANCHORS OR FASTENERS.**

1.4 ENVIRONMENTAL PROCEDURES

A. Hazards Control:

B. Asbestos Abatement:
   1. During the course of Work, if any suspected asbestos is encountered, cease working in the area, and immediately notify the Owner and A/E. Do not remove or disturb any material suspected of, or identified as, containing asbestos.
   2. Do not drill, cut, sand, penetrate with nails, screws, or other fasteners, or otherwise disturb asbestos or asbestos-containing material, insulation, structure, or ceiling or floor covering.
   3. Immediately notify the Owner of the presence, or suspected presence, of asbestos or asbestos-containing materials. The Owner shall remove or encapsulate such materials **PRIOR** to any work under this Contract.
   4. Refer to Division 02 for additional requirements.

END OF SECTION 21 05 00.35

SECTION 21 05 00.40

QUALITY REQUIREMENTS FOR FIRE SUPPRESSION

PART 1 - GENERAL

1.1 DESCRIPTION

A. Provide Work of the highest quality, complete in every respect and conforming to the accepted practices and standards of the Trades involved.

B. Further definition of quality is given by reference to various Laws, Codes, Standards, and Regulations.

1.2 REGULATORY REQUIREMENTS

A. All work on this Project shall conform to the currently enforced Edition of all applicable National, Federal, State, and Local Laws, Rules, Regulations, Standards, and Building Codes, and any local ordinances and requirements pertaining to this work, unless otherwise noted.

B. Any Law, Regulation, Standard, or Code referred to in other Sections of Division 21 is included in its entirety as a part of these Specifications.

C. Give notice and comply with all Laws, Rules, Regulations, Ordinances, and lawful orders of the AHJ bearing on the performance of the Fire Suppression Work.
   1. If the Contractor observes that any of the Contract Documents are at variance therewith in any respect, it shall promptly notify the A/E in writing, and any necessary changes will be arranged by the A/E.
   2. If the Contractor performs any Work knowing it to be contrary to such Laws, Rules, Regulations, and Ordinances and fails to give prior notice to the A/E, the Contractor shall assume full responsibility for, and shall bear all costs associated with, correcting the Work.

D. Only a Contractor and craftsmen licensed by the AHJ shall provide this Fire Suppression Work.

E. Methods and materials shall be certified where noted in the individual Specification Sections.

F. All equipment and appliances installed on this Project shall bear the label of an Approved Testing Agency and shall be installed in accordance with the Manufacturer’s instructions for the labeled equipment and appliances.

G. All structural steel used on this Project shall be manufactured in the United States, in accordance with Ohio Revised Code 153.011, unless specifically approved otherwise by the Owner.

1.3 APPLICABLE PERMITS, FEES, BONDS, LICENSES, AND CERTIFICATIONS

A. The A/E will submit all Contract Drawings and Specifications and the plan approval application to the AHJ, pay the application fees, and obtain plan approval.

B. Contractor shall secure and pay for any **ADDITIONAL** permits, governmental fees, bonds, and licenses required for the proper execution and completion of the Fire Suppression Work.

C. Contractor shall pay for all other fees and other charges related to Fire Suppression Work and payable to Utility Companies or Code Enforcement Agencies.

1.4 REFERENCES

A. Titles, Abbreviations, and Symbols: Titles and abbreviations may be used in these Specifications. Abbreviations may be shown on the Fire Suppression Drawings. Refer to the list of abbreviations attached to this Section. Refer also to the symbols lists shown on the Drawings for further abbreviations. All titles and abbreviations may not necessarily apply to this Work.

B. Definitions:
   1. Provide: To furnish, install, and connect to make completely ready for regular operation.
   2. Furnish: To supply or deliver to site complete with all required accessories and installation instructions.
   3. Install: To mount, erect, hang, or fasten in place, and connect to make ready for regular operation.
   4. Concealed: Either embedded in masonry or other construction, or installed below floor slab, behind wall furring, within chases or soffits, within walls, within double partitions, above ceilings, in trenches, in tunnels, or within crawl spaces.
   5. Exposed: In full or partial view; not “Concealed” as defined above.
   6. Accessible Ceiling: Lay-in ceiling with removable ceiling tiles.
   7. Piping: Pipe, fitting, flanges, valves, controls, specialties, hangers, bracing, insulation, and other items required or necessary.
   8. Refer to additional Definitions in Division 01 and in the AHJ’s Building and Mechanical Codes.

TITLES, ABBREVIATIONS, AND SYMBOLS

#	Number
&	And
∠	Angle
@	At
Ø	Diameter
Ø	Round OR Phase
A.	Compressed air
A.D.	Access door OR Area drain
A.F.D.	Acid floor drain
A.F.F.	Above finished floor
A.P.	Access panel
A.W.C.O.	Acid wall cleanout
A/E	Architect/Engineer
AABC	Associated Air Balance Council
AB.	Above
ACI	American Concrete Institute
ACPA	American Concrete Pipe Association
ADA-AG	Americans with Disabilities Act — Accessibility Guidelines
ADC	Air Diffusion Council
AFCI	Arc-fault circuit interrupter
AH	Air handler
AHJ	Authority Having Jurisdiction
AHRI	Air-Conditioning, Heating, and Refrigeration Institute
ALT.	Alternate
ALUM.	Aluminum
AMCA	Air Movement and Control Association
amp	ampere
ANSI	American National Standards Institute
APPROX.	Approximately
ARCH.	Architect
ARR'T.	Arrangement
ASA	Acoustical Society of America
ASHRAE	American Society of Heating, Refrigerating, and Air Conditioning Engineers
ASME	American Society of Mechanical Engineers
ASPE	American Society of Plumbing Engineers
ASSE	American Society of Sanitary Engineering
ASTM	American Society for Testing & Materials
AUTO.	Automatic
AV	Acid vent
AW	Acid waste
AWG	American wire gauge
AWS	American Welding Society
AWWA	American Water Works Association
B.D.D.	Backdraft damper
B.T.	Bathtub
B.V.	Backwater valve
BAL.	Balancing
BFP	Backflow preventer
BHP	Brake horsepower
BICSI	Building Industry Consulting Services International
BLDG.	Building
BSBD.RAD.	Baseboard radiation
BSMT.	Basement
BTM.	Bottom
BTU	British thermal unit
c.	Conduit
C.B.	Catch basin
C.I.	Cast iron
C.O.	Clean out
C/C	Center to center
C/L	Center line
CAB.	Cabinet
CAP.	Capacity
CEIL./CLG.	Ceiling
CFC	Chlorofluorocarbon
CFH	Cubic feet per hour
CFM	Cubic feet per minute
CFR	Code of Federal Regulations
CGA	Compressed Gas Association
CHEM.	Chemical
CISPI	Cast Iron Soil Pipe Institute
CMA	Construction Manager Agent/Advisor
CMR	Construction Manager at Risk
COL.	Column
COMB.	Combination
CONC.	Concrete
COND.	Condensate OR Condenser
CONN.	Connection OR Connect
CONST.	Construction
CONTR.	Contractor
CONV.	Convector OR Converter
COORD.	Coordinate
CSA	CSA Group (formerly the Canadian Standards Association).
CSI	Construction Specifications Institute
CT	Current transformer
CU IN.	Cubic inch
CU. FT.	Cubic feet
CUH	Cabinet unit heater
Cx	Commissioning Agent
D.	Deep
D.F.	Drinking fountain
D.L.	Door louver
D.M.	Damper motor
D.S.	Downspout
D-B	Design-Build OR Design-Builder
DB	Dry bulb
DBL.	Double
DCW	Domestic cold water
DET.	Detail
DHW	Domestic hot water
DHWR	Domestic hot water return
DIA. / Ø	Diameter
DIFF.	Diffuser
DIM.	Dimension
DISCH.	Discharge
DN.	Down
DOE	United States Department of Energy
DPR.	Damper
DR.	Door
DW	Distilled water
DWG.	Drawing
DWH	Domestic water heater
DWV	Drain, waste and vent
E.A.T.	Entering air temperature
E.C.	Electrical Contractor
E.S.P.	External static pressure
E.T.	Expansion tank
E.W.T.	Entering water temperature
EA.	Each

EFF.	Efficiency
EIA	Electronic Industries Alliance
ELEC.	Electric OR Electrical
ELEM.	Element
ELEV.	Elevation
ENGR.	Engineer
ENT.	Entering
EPA	Environmental Protection Agency
EQUIP.	Equipment
ETL	Electrical Testing Laboratories
EW	Eye wash
EWC	Electric water cooler
EX.	Existing
EXH.	Exhaust
EXIST.	Existing
EXT.	Exterior
F & T	Float and thermostatic
F.	Fan OR Fire
F.D.	Fire damper
F.E.	Fire extinguisher
F.E.C.	Fire extinguisher cabinet OR Food Service Equipment Contractor
F.H.	Fire hydrant
F.H.C.	Fire hose cabinet
F.H.E.C.	Fire hose/extinguisher cabinet
F.V.	Flush valve
FCC	Federal Communications Commission
FD	Floor drain
FDA	Food and Drug Administration
FHA	Federal Housing Administration
FIG.	Figure
FIN.	Finish
FIN.RAD.	Finned radiation
FLEX.	Flexible
FLR. / FL.	Floor
FMG	Factory Mutual Global
FOR	Fuel oil return
FOS	Fuel oil supply
FPC / FSC	Fire Protection / Fire Suppression Contractor
FPM	Feet per minute
FT.	Feet
FT.HD.	Feet of head
FURN.	Furnish(ed)
G	Gas
G.C.	General Contracting OR General Contractor
G.I.	Grease interceptor
G.T.C.	General Trades Contractor
gal.	Gallon
GALV.	Galvanized
GEN.	General
GFI / GFCI	Ground-fault circuit interrupter
GPM	Gallons per minute
GR	Grille
GRAV.	Gravity
Grd.	Ground
H./HT.	Height
H.P.	High pressure
H.S.	Hair strainer
H'STAT	Humidistat
HAC	Heating and air conditioning
HB	Hose bibb
HCFC	Hydrochlorofluorocarbon
HHS	United States Department of Health and Human Services
HORIZ.	Horizontal
HP	Horsepower
HPC	High pressure steam condensate
HPS	High pressure steam
hr.	Hour
HTG.	Heating
HTR.	Heater
HUD	United States Department of Housing and Urban Development
HV	Heating and ventilating OR High velocity
HVAC	Heating, ventilating, and air conditioning
I.D.	Inside diameter
IAQ	Indoor air quality
IBC	International Building Code
ICC	International Code Council
ICEA	Insulated Cable Engineers Association, Inc.
IDF	Intermediate distribution frame
IEC	International Electrotechnical Commission
IEEE	Institute of Electrical and Electronics Engineers, Inc.
IESNA	Illuminating Engineering Society of North America
IN.	Inside OR Inches
IND.	Indirect
IND. U.	Induction unit
INSUL.	Insulation
INT.	Interior
INV.	Invert
INV. ELEV.	Invert elevation
IPS	Iron pipe size
ISO	International Organization for Standardization
J.R.	Janitor's receptor
JCAH	Joint Commission for Accreditation of Hospitals
kVA	Kilovolt-ampere
L.	Length
L.A.T.	Leaving air temperature
L.W.T.	Leaving water temperature
LAB	Laboratory
LAV	Lavatory
lb.	pound
LEED	Leadership in Energy and Environmental Design
LH	Left hand
LP	Liquefied petroleum
LPC	Low pressure steam condensate
LPS	Low pressure steam
LV'G.	Leaving
M.A.	Mixed air
M.O.	Motor operated
MAN. DPR.	Manual damper
MAT.	Material
MAX.	Maximum
MBH	1,000 British thermal units/hour
MECH.	Mechanical
MERV	Minimum efficiency reporting value
MET./MTL.	Metal
MEZZ.	Mezzanine
MFR.	Manufacturer
MH	Manhole
MIN.	Minimum
MISC.	Miscellaneous
MP	Multiple Prime
MPS	Medium pressure steam
MS	Motor starter

MSS	Manufacturers Standardization Society of the Valve and Fittings Industry Inc.
MTD./MT.	Mounted OR Mount
N.I.C.	Not in contract
N.T.S.	Not to scale
N2	Nitrogen
N2O	Nitrous oxide
NADCA	National Air Duct Cleaners Association
NAECA	National Appliance Energy Conservation Act
NB	National Board of Boiler and Pressure Vessel Inspectors
NCPI	National Clay Pipe Institute
NEBB	National Environmental Balancing Bureau
NEC	National Electrical Code
NECA	National Electrical Contractors Association
NEMA	National Electrical Manufacturers Association
NESHAPs	National Emissions Standards for Hazardous Air Pollutants
NFPA	National Fire Protection Association
NIOSH	National Institute for Occupational Safety and Health
NIST	National Institute of Standards and Technology
NO. OR #	Number
NOM.	Nominal
NP	Not permitted
NPT	National Pipe Thread Tapered
NSF	National Sanitation Foundation
NSPE	National Society of Professional Engineers
O.	Oxygen
O.A.	Outside air
O.D.	Outside diameter
O.I.	Oil interceptor
O.V.	Outlet velocity
O/C	On center
OAC	Ohio Administrative Code
ODH	Ohio Department of Health
ODOE	Ohio Department of Energy
ODOT	Ohio Department of Transportation
OPG.	Opening
OPP.	Opposite
ORC	Ohio Revised Code
OSHA	Occupational Safety and Health Administration
OU./OZ.	Ounce
P.D.	Pressure drop
P.I.V.	Post indicator valve
P/L	Property line
PDI	Plumbing & Drainage Institute
PEI	Petroleum Equipment Institute
PLBG.	Plumbing
PNEU.	Pneumatic
PRESS.	Pressure
PROP.	Propeller
PRV	Pressure-reducing valve
PSF	Pounds per square foot
PSI	Pound-force per square inch
PSIG	Pound-force per square inch gauge
PT	Plaster trap OR Potential transformer
PVC	Polyvinyl chloride
R	Register
R.A.	Return air
R.D.	Roof drain
R/W	Right of way
RAD.	Radius OR Radiation OR Radiator
RECIRC.	Recirculating
REG.	Register
REINF.	Reinforced
REL.	Relief
REQ'D.	Required
RH	Right hand
RHC	Reheat coil
RM.	Room
RPM	Revolutions per minute
RTA/C	Rooftop air-conditioning unit
RW	Raw water
RWC	Rainwater conductor
S	Sink
S & R	Supply and return
S. DPR.	Smoke damper
S.A.	Shock absorber OR Supply air
S.F.	Square feet
S.M., S/M	Sheet metal
S.P.	Static pressure
S.S.	Service sink OR Storm sewer
S.S., S/S	Stainless steel
SAN.	Sanitary sewer
SB	Shampoo bowl
SD	Shower drain OR Smoke detector
SECT.	Section
SHR.	Shower
SHT.	Sheet
SHT. MT'L.	Sheet metal
SMACNA	Sheet Metal and Air Conditioning Contractors National Association
SPD	Surge protection device
SPEC.	Specification
SQ.	Square
SQ. FT.	Square feet
SQ. IN.	Square inch
ST	Sound trap
STAT	Thermostat
STD.	Standard
STL.	Steel
STM.	Storm
SUCT./S	Suction
SW	Softened water
SW.	Switch
T.W.	Tempered water
T'STAT	Thermostat
TD	Temperature difference
TEMP.	Temperature
THERM.	Thermometer OR Thermostat
TIA	Telecommunications Industry Association
TYP.	Typical
UC	Undercut
UH	Unit heater
UL	Underwriters Laboratories, Inc.
UR	Urinal
USGBC	United States Green Building Council
UV	Unit ventilator
V.	Vent
V.T.R.	Vent through roof
VAC.	Vacuum
VC	Vacuum cleaning
VCP	Vitrified clay pipe
VERT.	Vertical
VIB. ISO.	Vibration isolator
VOC	Volatile organic compound
VSP	Vitrified sewer pipe

W.	Width OR Water
W.G.	Water gauge
W/	With
W/O	Without
W/W	Wall to wall
WAT.	Water
WB	Wet bulb
WC	Water closet OR Water column
WH	Wall hydrant OR Water heater
WO	Waste oil
WOG	Water/oil/gas
XFMR	Transformer
YD.	Yard
YH	Yard hydrant

END OF SECTION 21 05 00.40

SECTION 21 05 00.45

TESTING AND INSPECTING SERVICES FOR FIRE SUPPRESSION

PART 1 - GENERAL

1.1 INSPECTIONS, TESTS, AND APPROVALS

A. The Contract Documents, Laws, Ordinances, Rules, Regulations, or Orders of any AHJ may require the Work to be inspected, tested, or approved.

B. Contractor shall bear all costs of such inspections, tests, or approvals.

C. Contractor shall pay all professional engineering fees involved in required testing of equipment.

D. Contractor shall arrange and pay for all inspections required to obtain a Certificate of Occupancy. Contractor shall include this cost in its bid.

E. Arrange for inspection of the Work by the AHJ.

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION

3.1 TESTS AND INSPECTIONS

A. Notify the A/E of all scheduled tests and adjustments at least (48) hours before they are scheduled, so that the A/E may witness same. If the Contractor performs any test or adjustment without the A/E present, or without proper notification, the Contractor shall perform the test or adjustment a second time, in the presence of the A/E. Coordinate all test schedules with the Owner to minimize inconvenience.

B. Provide all required testing and obtain approvals. Secure required certificates of inspection, testing, or approval, and include them in the Operating and Maintenance Manual.

C. After Work has been completed, but before pipe covering has been applied, test each system in accordance with the requirements of other Sections of this Specification. At the test pressures, the circulation shall be free and the piping shall be proven free of leaks.

D. Concealed lines shall be tested and approved before being concealed. If a leak appears during the final test, repair the line and any damage resulting from the leak.

E. Coordinate the enclosure or concealment of the Work with the required inspections and tests so as to minimize the necessity of uncovering work for that purpose.

F. Should any of the Work be covered up or enclosed prior to completion of all required inspections, tests, and approvals, uncover the Work and, after it has been completely inspected, tested, and approved, make all repairs and replacements with such materials and workmanship as are necessary to secure the approval of the A/E, and at no additional cost to the Owner.

G. Furnish all test pumps, gauges, equipment, and personnel required, and test to demonstrate the integrity of the finished installation to the approval of the AHJ and the A/E.

H. Check each piece of equipment for defects and verify that all parts are properly furnished and installed, that all items function properly, and that all adjustments have been made.

I. Conduct such tests and adjustments of equipment to verify performance requirements or to meet the requirements of the A/E or AHJ. Submit data taken during such tests to the A/E.

J. Test and check all control valves, drain valves, gauges, alarm devices, and waterflow and supervisory switches for proper operation. Submit a written record of these tests to the A/E.

K. Demonstrate to the Owner that all Fire Suppression systems are operating properly.

3.2 FINAL OPERATING TESTS AND PROCEDURES

A. Prior to Contract completion, conduct system operational tests for a period of at least (5) days, not necessarily consecutive, as scheduled by the Owner, to demonstrate fulfillment of the requirements of the Contract. During this time, adjust equipment so that it will perform as the Manufacturer intended, and so that systems will function as designed.

B. Operate each system in every mode of operation, and check the position of valves, switches, and other devices for proper closure, operation, and switching.

3.3 CERTIFICATE

A. Furnish approved Certificate of Final Inspection.

3.4 FOLLOW-UP INSPECTIONS

A. Make an inspection within (90) days after occupancy of the building to make minor adjustments as needed to ensure that all equipment is operating properly and that satisfactory conditions are being maintained throughout, and to satisfy any unusual conditions. Schedule with the A/E. Consult with the Owner.

B. A minimum of (1) month before the end of the guarantee period, contact the A/E and Owner to discuss system operation, and to plan for the future care and maintenance of the system.

C. (1) month before the end of the guarantee period, contact the Owner and perform an inspection to review any items needing correction.

END OF SECTION 21 05 00.45

SECTION 21 05 00.50

TEMPORARY FACILITIES AND CONTROLS FOR FIRE SUPPRESSION

PART 1 - GENERAL

1.1 DESCRIPTION

A. Provide and maintain temporary facilities and controls required for construction as long as needed for the safe and proper completion of the Work and remove upon completion of the Work.

1.2 QUALITY ASSURANCE

A. Standards: Comply with the provisions of the following Codes:
   1. United States Department of Labor, Occupational Safety and Health Administration, Part 1926, “Safety and Health Regulations for Construction.”
   2. Applicable Local Building Codes.

1.3 TEMPORARY CONSTRUCTION

A. Materials shall be adequate in capacity for the required usage, shall not create unsafe conditions, and shall not violate applicable Codes and Standards.

B. Contractor shall be solely responsible for the structural design of all temporary items that it uses in the construction of the building, or that become a permanent part of the building, including, but not limited to:
   1. Hoisting.
   2. Temporary bracing for structural steel.
   3. Shoring for concrete and masonry work.
   4. Shoring for cut earth banks.
   5. Suspended ceilings, equipment, walls, etc.

C. Provide hoists, staging, rigging, scaffolding, runways, and necessary appurtenances required for the performance of the Work.

D. Provide necessary tarps or other appropriate cover material to protect openings.

E. Provide effective means of dust control. Dust enclosures shall extend tight to the structure and extend around all pipes, ducts, and similar items. Enclosures shall confine dust and dirt to the area of construction and completely seal off and isolate the area of construction from adjacent Owner-occupied areas.

F. Completely remove temporary materials and equipment when their use is no longer required.

G. Clean and repair damage caused by temporary installation or use of temporary facilities.

H. Restore existing facilities used for temporary services to original condition.

END OF SECTION 21 05 00.50

SECTION 21 05 00.60

PRODUCT REQUIREMENTS FOR FIRE SUPPRESSION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Division 00, “Procurement and Contracting Requirements.”

1.2 DESIGN BASE MANUFACTURER STANDARD

A. The Drawings and Specifications reflect a design based on the specific equipment requirements and configuration for a Design Base Manufacturer. Design coordination of equipment with the building and with other Trades has been made for this specific Model and Manufacturer of equipment. Where several Manufacturers are listed for an item of equipment or material, the first-named shall be considered the Design Base Manufacturer Standard.

1.3 OTHER ACCEPTABLE COMPONENTS (MANUFACTURERS)

A. Other Manufacturers listed in the Specifications shall be acceptable; however, whenever the Contractor elects to furnish specified equipment or material manufactured by other than the Design Base Manufacturer, the Contractor shall be responsible for the cost and coordination of all modifications required to accommodate the selected equipment or material, including any Work of other Trades that might be affected. Where changes to other Trades’ Work are required, the Contractor shall include the additional costs of all such Work in its bid.

B. Any specified Equipment Manufacturer furnished by the Contractor, other than the Design Base Manufacturer, shall be, in the opinion of the A/E, equivalent in quality, design, features, performance, arrangement, and appearance to that of the Design Base equipment or material, including any special features or requirements.

C. The inclusion of other Manufacturers in these Specifications shall not be construed to infer that each Manufacturer’s product has been reviewed by the A/E for this application, or that it will provide all the features or capabilities required, or that its physical dimensions can be accommodated in the available space. Verify that the proposed equipment will provide all features and accommodations provided by the Design Base Manufacturer, and that it will fit in the available space.

D. The A/E will not give consideration to any Manufacturer that the Contractor proposes as a Substitution, unless the A/E approves the Manufacturer during the bid period and specifically names the Manufacturer in the Contract Documents or Addenda thereto.

E. Where deemed necessary by the A/E, the Contractor shall, at no additional cost to the Owner, prepare layouts for these other brands of equipment that may have different dimensional or service requirements from the Design Base Manufacturer Standard. Submit these layouts to the A/E for review.

F. Contractor shall reimburse the Owner for the cost of any design changes incurred by the A/E in the preparation of revised Drawings or Specifications to accommodate the use of any Manufacturer other than the Design Base Manufacturer.

1.4 SUBSTITUTIONS

A. Refer to the Bid Documents for substitution requirements. If this Specification Section conflicts with the Bid Documents, comply with the Bid Documents.

B. Contractor shall submit information for review no later than (10) days prior to the bid opening to the A/E on any other proposed equipment or material that the Contractor desires to use.

C. Contractor shall be responsible for the same costs of coordination and modifications, etc., listed above in Article 1.03, "Other Acceptable Components (Manufacturers)."

D. If the A/E determines that the proposed Manufacturer is acceptable, the A/E will issue an Addendum adding that Manufacturer to the Specifications and/or the Drawings prior to the bid opening.

1.5 EQUIPMENT SUITABILITY

A. All equipment provided shall perform as intended. All items listed shall function properly, and as the Manufacturer intended. Install equipment according to the Manufacturer's recommendations. Properly attach equipment to the floor, wall, or structure. Each item of equipment shall be compatible with all other accessories or hook-ups, including piping, controls, wiring, and other equipment not furnished by the equipment Manufacturer, but required to achieve the intended function.

1.6 MISCELLANEOUS ACCESSORIES

A. Provide any additional adapters, fittings, trim, structural steel angles, channels, strut channels, brackets, or other appurtenances to securely install all items of equipment specified or shown on the Drawings.

B. All steel installed outside or exposed to moisture shall be hot-dipped galvanized.

C. These accessories are required even though they may not be shown or detailed on the Drawings.

D. Installation shall be compatible with the building construction on which the item is to be located.

E. Verify the type of construction prior to ordering the equipment item, so that all required accessories are included.

1.7 QUANTITIES

A. Equipment may be referred to in these Specifications, or on the Drawings, as either singular or plural; the Contractor shall verify the exact number of items required to complete its Work.

END OF SECTION 21 05 00.60

SECTION 21 05 00.71

EXAMINATION AND PREPARATION FOR FIRE SUPPRESSION

PART 1 - GENERAL

1.1 EXAMINATION OF SITE

A. Certain existing conditions may affect the manner or sequence of the performance of the Work.

B. Before submitting its Bid, it is recommended that the Contractor visit the site of the proposed Project.

C. After receipt of Bids, no adjustments to Bids will be permitted for lack of knowledge of Project conditions.

D. Verify and reconcile Work required by the Contract Documents with existing conditions at the Site.

E. Should the Contractor note any discrepancies during the Bidding Period, it shall notify the A/E immediately, in writing, to permit issuance of an Addendum to prevent misunderstandings at a later date.

F. Existing services, structures, and operating schedules may need to be reviewed, prior to bidding, to facilitate the installation of the Work without disrupting the normal operation of the facility.

1.2 PREPARATION

A. Provide a Superintendent, on site, whose duties include the directing and supervising of work. Inform the A/E of the Superintendent's name and phone number, and the method of contact when the Superintendent is not at the site.

B. As soon as possible after the Award of the Contract and the approval of shop drawings, the Contractor shall place orders for materials and equipment required for its Work. Immediately inform the A/E in writing as to any materials and equipment that cannot be obtained within the required time period, either due to conditions of the market or other governing factors.

C. Inspect each item of materials or equipment immediately prior to installation. Reject damaged and defective items.

D. Contractor shall determine erection procedures and sequence the construction to keep its work on schedule and to ensure the safety of the building and its occupants. This includes supplying any temporary bracing, guys, or tie-downs that might be required. Such materials shall remain the Contractor's property after completion of the Project.

E. Provide attachment and connection devices and methods for securing work. Secure all work true to line and level and within recognized industry tolerances. Allow for expansion and building movement.

F. Recheck measurements and dimensions of the Work as an integral step of starting each installation.

G. Where mounting heights are not indicated, individual units generally can be mounted at industry-recognized standard mounting heights for the particular application indicated. However, all mounting heights shall be approved by the A/E.

1.3 COORDINATION OF WORK

A. Contractor shall coordinate its Work carefully with all other Contractors.

B. Do not install work without first coordinating the layout, routing, etc., with other Contractors whose work may be affected.

C. Coordinate location of all work with other Contractors and equipment.

D. Consult all Contract Drawings that may affect the location of any equipment, apparatus, and piping, and make any other adjustments in location to secure coordination.

E. Coordinate locations of all Fire Suppression Work with hangers, piping, ductwork, diffusers, grilles, registers, cable trays, occupancy/vacancy sensors, bus ducts, luminaires, speakers, smoke and heat detectors, conduits, and other equipment, and with ceilings, soffits, structural members, joists, purlins, metal decks, bracing, etc.

F. Notify the A/E immediately of any changes in location or other conflicts that may affect the work of other Contractors.

G. Contractor shall be responsible for the cost of additional engineering work required for changes to the work as shown or described, due to the relocation of items requested by the Contractor.

H. Review all equipment nameplate ratings and advise the A/E immediately of any system design changes required to wire the equipment properly.

END OF SECTION 21 05 00.71

SECTION 21 05 00.73

EXECUTION OF FIRE SUPPRESSION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Division 00, “Procurement and Contracting Requirements.”

B. Division 01, “General Requirements.”

1.2 DESCRIPTION

A. Contractor shall be solely responsible for construction means, methods, techniques, sequences, and procedures in connection with the Work.

1.3 QUALITY ASSURANCE

A. Standard: National Fire Protection Association (NFPA). 2023 NFPA 262, “Standard Method of Test for Flame Travel and Smoke of Wires and Cables for Use in Air-Handling Spaces.”

1.4 CONTRACT DOCUMENTS

A. The Contract Drawings are schematic and show approximate locations, general arrangement, and general extent of Work. Not all items of work required for a complete and operating system are shown on the Drawings. Refer also to the Specifications for additional work that shall be provided. If a conflict occurs, the Contractor is responsible for the more restrictive requirement.

B. The Contract Drawings are not intended to show every vertical or horizontal offset that may be necessary to complete the systems. Having piping and fittings fabricated and delivered in advance of making actual measurements shall not be sufficient cause to avoid making offsets or other changes as may be necessary to install piping and equipment.

C. Verify exact locations in the field, and coordinate with all other Contractors.

D. The A/E shall approve, in writing, significant deviations from the Drawings.

E. The A/E reserves the right to make minor changes in location that do not require additional labor or material, up to the time of roughing-in, without additional cost. The A/E reserves the right to determine what is “significant” and what is “minor.”

F. If a conflict occurs between the Drawings and Specifications, or an overlap of work among the Trades become evident, immediately submit a written request for an interpretation or clarification from the A/E, who shall determine which interpretation has precedence. Refer to Division 00 General Conditions. In such event, none of the Contractors shall assume that it is relieved of the Work that is specified under its branch unless instructions are received, in writing, from the A/E.

1.5 UTILITIES AND OUTAGES

A. Locate and identify all existing utilities prior to construction.

B. Where necessary, make minor relocations to permit installation of the Fire Suppression Work.

C. Advise the A/E immediately of major conflicts to permit modification of the Contract Documents prior to bidding.

D. Conform to all Utility Company requirements.

E. Closely coordinate any utility service shutdowns or outages, interruptions, or downtime with the A/E and Owner.

F. Provide temporary service during the curtailment, if required by the A/E.

G. Avoid inconveniencing the Owner.

H. Notify the Owner at least (10) full working days in advance of commencing work in the area of existing utilities.

I. Contractor shall alert occupants of nearby premises of any emergency conditions that arise as a result of its work in connection with existing utilities.

1.6 PROTECTION

A. Unless equipment and material can be protectively stored in a manner acceptable to the A/E, they shall not be delivered to the site until the Work is ready to receive them.

B. Protect all equipment and materials during construction from damage by weather, water, dirt, paint droppings, welding and cutting spatters, and other construction activities.

C. All materials or equipment stored outside shall be elevated and protectively covered in a secured and locked area.

D. Store materials and equipment sensitive to weather or construction conditions inside. Where necessary, store sensitive equipment in a heated area.

E. During construction, cover all equipment and other items that are susceptible to damage until they can be installed in place.

F. Immediately repair or replace damaged equipment or materials to the satisfaction of the A/E and at no additional cost to the Owner.

G. Contractor shall protect the building and other Contractors' material and equipment from damage caused by its Work. Protect floors from cutting oil and chips.

H. Use all means necessary to protect materials before, during, and after installation.

I. Refer also to individual Specification Sections for specialized protection.

1.7 FIRE SUPPRESSION LUBRICATION AND PACKING

A. Contractor shall lubricate all the equipment that it furnishes with the correct grade, type, and quantity of lubrication before placing equipment and valves in service.

B. Refer to the Equipment Manufacturer's recommended lubricants. Furnish equal lubricants as supplied by Castrol, Mobil, Shell, or the Owner's present supplier.

C. Follow the Equipment Manufacturer's recommendations for specific lubricants and application schedule.

D. Check each shaft or valve stem containing a packing gland for condition and examine for proper packing.

E. When filling systems initially for hydrostatic pressure tests, adjust valve packing glands to finger-tight and allow packing to absorb water for (5) minutes prior to tightening packing nuts.

F. Maintain lubrication and packing seals during construction and ensure that, at the time of final acceptance, all are operating properly.

G. Contractor shall repair any damage caused by improper lubrication of the equipment that it furnished, at no expense to the Owner.

H. Incorporate lubrication instructions in the Operating and Maintenance Manual.

1.8 EQUIPMENT ACCESS

A. Locate all equipment to provide sufficient access to operate equipment or to service items requiring periodic maintenance. Coordinate with the structure and with all other Contractors' work.

1.9 ACCESS PANELS

A. Contractor shall be responsible, unless otherwise noted, for all access panels shown on the Drawings, or where otherwise required, to permit convenient access to concealed fire suppression equipment, boxes, connections, controls, or other devices requiring service, adjustment, or maintenance. Refer to the Architectural Drawings for location.

B. Acceptable Manufacturers: Inryco-Milcor, Babcock-Davis, Bilco, Boico, Cesco, Inland-Ryerson, JL, Milco, Karp, Larsen's Manufacturing Co., Mifab, Mitco, or Zurn.
   1. Manufacturer and Model Number listed below shall be considered to be the Design Base Manufacturer and Model Number. Other Acceptable Manufacturers will be permitted, unless specifically excluded.

C. Access Panels:
   1. Panels shall be 18 in. x 18 in., unless larger panels are shown or required. Panels shall be steel construction (except where aluminum or stainless steel is specified) with overlapping edges and concealed hinge door with screwdriver lock. Mounting frames shall be compatible with the building construction material in which they are installed. Each access panel in fire-rated shaft walls and in fire-rated ceilings shall be B Label.
   2. Ceiling access panels:
      a. Gypsum: Inryco-Milcor Style DW. Prime-painted for finish painting with ceiling.
      b. Plaster:
         1) Inryco-Milcor Style AP. With finish material same as ceiling material.
         2) Inryco-Milcor Style K. Prime-painted for finish painting with ceiling.
      c. Acoustical concealed spline: Inryco-Milcor Style AT.
      d. Fire-rated: Inryco-Milcor Style ATR.
   3. Wall access panels:
      a. Gypsum: Inryco-Milcor Style DW. Prime-painted for finish painting with wall.
      b. Plaster: Inryco-Milcor Style K. Prime-painted for finish painting with wall.
      c. Masonry and tile:
         1) Inryco-Milcor Style M Standard. Prime-painted for finish painting with wall.
         2) Inryco-Milcor Style M. Stainless steel.
      d. Fire-rated: Inryco-Milcor. Fire-rated access door, prime-painted for finish painting with wall.

D. Coordination:
   1. Coordinate closely with other Contractors to ensure that all panels furnished by the various Contractors shall be identical.
   2. Coordinate the location and installation of each access panel with equipment, the Lead Contractor, and other Contractors.

3. Advise other Contractors of specific requirements relating to access panel installation, including sizes of openings to receive access panel and frame, as well as locations of supports, inserts, and anchoring devices.

E. Determine specific locations and sizes for access panels needed, but not indicated on the Drawings, to gain access to concealed equipment.

F. Plan panel locations to clear ceiling luminaires, grids, and obstructions, and to allow, wherever possible, full shoulder clearance beside the device to be inspected, adjusted, or repaired.

1.10 AIR-HANDLING PLENUMS

A. Where space is used for air handling, such as above ceilings and elsewhere, do not install combustible or noxious materials.

B. All materials shall be listed for use in air-handling plenums. All wiring shall be listed with 2023 NFPA 262.

1.11 BLOCK COURSE COORDINATION

A. Mounting heights are called out on the Drawings for many items. Adjust equipment mounting heights to accommodate brick or block coursing.

B. Coordinate installation of all items in a masonry wall with the Lead Contractor and A/E.

1.12 CUTTING AND PATCHING

A. All cutting and patching shall be accomplished in a neat and workmanlike manner, acceptable to the A/E.

B. Cutting:
1. Contractor shall perform all cutting required for installing its own Work unless otherwise noted.
2. Cutting shall be done with such tools and methods so as to prevent unnecessary damage to surrounding areas and equipment.
3. Use rotary drills to cut holes through concrete, brick, plaster, or tile.
4. No cutting shall be done that will, in any way, reduce the structural strength of the building. Cutting of structural support beams, joists, plates, or other structural members is strictly prohibited without the specific written consent of the A/E and the Structural Engineer. Should such cutting be necessary, consult the A/E and do not proceed further without written approval of the A/E.

C. Patching:
1. Contractor shall be responsible for patching except as otherwise noted.
2. Only a qualified Finish Tradesperson, skilled in the respective craft required, shall perform patching.
3. Patching shall match adjacent surface construction.
4. Materials and equipment used in the patching work shall comply with requirements of other Sections of this Specification.

D. Perform all cutting and patching promptly. Make all repairs to leave the entire Work in good condition, including all cutting, fitting, and drilling of masonry, concrete, metal, wood, plaster, or other materials, as specified for proper assembly, fabrication, installation, and completion of the Work.

E. Coordinate drilling, welding, etc., and method of attachment to columns, joists, beams, purlins, etc., with the Lead Contractor and A/E before proceeding.

F. If a Contractor finds it necessary to cut into the Work of another Contractor, the cutting and patching shall be performed by such other Contractor at this Contractor's expense. With the written consent of the A/E, the Contractor shall be allowed to perform the cutting. Patching shall be similarly executed.

G. Contractor, or other Tradesperson approved by the A/E, shall replace floors, ceilings, roofs, etc., damaged during construction. The cost of repairs shall be borne by the Contractor causing damage.

H. Provide openings, with lintels if needed, for sleeves, piping, and other similar openings in new and existing interior masonry walls and floors. Locate and dimension the opening prior to construction. Refer to the Fire Suppression Drawings.

I. Remove and replace masonry, wall tile, drywall, ceilings, and ceiling tiles in order to install Fire Suppression Work.

J. Contractor shall be responsible for all cutting of the floor slab related to its own Work.

K. Contractor shall be responsible for construction that is disturbed during the installation of piping, sprinklers, or equipment.

L. Cutting and patching includes remodeling and repairing of previously graveled or paved areas, walks, curbs, sod, floors, etc. Saw cuts shall be done in neat, straight lines.

M. Contractor shall repair or replace any roads, sidewalks, or other items that its employees may damage during the performance of the Fire Suppression Work.

N. Cutting and Patching of Existing Work:
   1. Remodeling, modifying, patching, and repair of the existing building shall match the existing conditions. Complete all work necessary to achieve this requirement. Quality of workmanship, materials, and finish shall complement appearance of existing construction.
   2. Where limits of demolition are exposed in the existing finished work, cutting shall be made with saws, providing an absolutely straight line, plumb, true, and square.
   3. Use saws to cut existing plaster or gypsum wall board. Equip power saws with blades designed to cut plaster or gypsum wall board and with dust collection systems. Operate equipment so as to cause a minimum of damage to plaster or gypsum wall board that is to remain, and so as to keep creation of dust and dirt to a minimum.
   4. Fill existing holes where piping is removed.

O. Refer to Division 01 for additional requirements.

1.13 PAINTING AND RELATED WORK

A. **ALL PAINTING SHALL BE DONE BY A QUALIFIED TRADESPERSON SKILLED IN THE CRAFT.**

B. Contractor shall be responsible for finish painting of walls, ceilings, and other Architectural items in the areas of new or existing construction.

C. Previously Finished Areas: Contractor shall repaint any previously finished areas disturbed by its own cutting and patching. Painting of the patched area shall match the color of the adjacent construction in the general area of the patch. Repaint the entire wall-to-wall and floor-to-ceiling surface if, in the opinion of the A/E, a uniform appearance cannot be accomplished by touch-up.

D. Factory-Finished Equipment: Clean, spot-prime with zinc chromate, and finish, equal to the original quality, any new factory-finished equipment that has rusted, has been damaged, or has deteriorated. Repaint the entire surface if, in the opinion of the A/E, a uniform appearance cannot be accomplished by touch-up.

E. Support Steel / Ferrous Metal: Clean, remove rust from, and paint with zinc-chromate primer any fire suppression support steel and bare ferrous metal that is not factory-painted, shop-painted, or galvanized, and that remains exposed to view in the finished areas of the building. Ensure that the prime coat shall be compatible with the finish coat.

F. Steel Hangers, etc.: Clean, remove rust from, and paint with zinc-chromate primer and aluminum-bronze paint all steel hangers, boxes, straps, and rods furnished under the Fire Suppression Work, that are not provided with rust-protective finish or are damaged in installation, and that remain exposed to view or are in unfinished and mechanical spaces.

G. Exterior Ferrous Metal: Paint with a prime coat any ferrous metal installed outside the building that is not factory-painted, shop-painted, or galvanized.

H. Paint exposed piping, valves, etc.

END OF SECTION 21 05 00.73

SECTION 21 05 00.74

CLEANING AND WASTE MANAGEMENT FOR FIRE SUPPRESSION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Division 01, “General Requirements.”

1.2 CLEANING AND WASTE MANAGEMENT

A. Contractor shall do its own cleanup, shall move materials that are in the way of constructing its work, shall repair and replace any damage it does, and shall do any other work of a similar nature which shall be done.

1.3 PROGRESS CLEANING

A. Maintain all work areas in a neat and orderly manner, free of debris. Clean up all occupied travel areas at the end of each shift. Clean up material removed immediately after use.

B. Clean up building and site thoroughly every day.

C. Equipment cleaning and touch-up:
   1. Use only cleaning materials recommended by the Manufacturer of the surface to be cleaned.
   2. Clean interiors of all enclosures of dirt and debris before installing trim or covers.
   3. Brush-clean, prime, and paint-in-kind rust spots on any part.
   4. Clean galvanized piping in exposed areas with diluted acetic acid.
   5. Clean copper piping in exposed areas with fine emery cloth and solvent.
   6. Clean all gauges, thermometers, traps, dirt legs, strainers, and fittings.

1.4 CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

A. On-site rubbish collection containers shall be furnished and weekly rubbish removal service shall be provided or all rubbish and debris from the site shall be removed daily. Refer to Division 01.

B. Do **NOT** use the Owner’s dumpster for on-site rubbish and debris.

C. Disposal of material by removal:
   1. Prior to the completion of the work, remove from the construction area all material designated to be removed.
   2. All material to be removed shall become the property of the Contractor.
   3. Conduct cleaning and disposal operations in compliance with local ordinances and anti-pollution laws. Make all necessary arrangements with private parties and with local officials pertinent to locations and regulations for dumping. Contractor shall pay fees or charges required for dumping of materials.
   4. Contractor shall be responsible for locating a legal dump site and for all expenses due to length of haul.
   5. Do not burn or bury rubbish and waste materials on Project site. Do not dispose of waste into streams or waterways.

D. Prior to completion of the work, remove from the vicinity of the work all temporary structures, unused materials, concrete forms, and other like materials. All work areas shall

be graded and left in a neat manner conforming to the natural appearance of the landscape or as directed elsewhere in the Contract Documents.

1.5 FINAL CLEANING

A. Repair, patch, and touch up all scratched or damaged surfaces to specified finish that matches adjacent surfaces, before final acceptance of the work. Repair dents and marred finishes to the satisfaction of the A/E. Prepare for finish painting, where painting is specified.

B. Thoroughly clean all fixtures; material; finished surfaces of equipment; painted, enameled, or varnished work; and all other exposed finished surfaces. Remove all labels, stickers, marks, stains, fingerprints, spots, rust, oil, grease, dirt, dust, and other foreign materials, so that the Work is presented in a complete and finished condition, ready for acceptance and intended use.

C. Verify that all drains are free of debris.

D. Employ experienced workers or professional cleaners for final cleaning.

E. Expedite the cleaning, washing, waxing, and polishing required within other Sections of these Specifications.

F. Refer to Division 01 for additional requirements.

END OF SECTION 21 05 00.74

SECTION 21 05 00.77

CLOSEOUT PROCEDURES FOR FIRE SUPPRESSION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Division 01, “General Requirements.”

B. Section 21 05 00.33, “Shop Drawings Submittals for Fire Suppression.”

C. Section 21 05 00.45, “Testing and Inspecting Services for Fire Suppression.”

D. Section 21 05 00.73, “Execution of Fire Suppression.”

E. Section 21 05 00.74, “Cleaning and Waste Management for Fire Suppression.”

F. Section 21 05 00.78, “Closeout Submittals for Fire Suppression.”

G. Section 21 05 00.79, “Demonstration and Training for Fire Suppression.”

H. Section 21 05 53, “Identification for Fire Suppression Piping and Equipment.”

1.2 DESCRIPTION

A. Complete and submit the following items, which is a partial list of the items required prior to Contract Completion:

ITEM	**REFER TO SECTION**
Shop drawing submittals	21 05 00.33
Operational inspection, testing, adjusting, and balancing of all equipment and systems	21 05 00.45, as well as other Sections
Protection	21 05 00.73, as well as other Sections
Painting	21 05 00.73
Cleaning	21 05 00.74
Operating and Maintenance Manuals	21 05 00.78
All required certifications and labels	21 05 00.78, as well as other Sections
Guarantees and equipment warranties	21 05 00.78, as well as other Sections
Spare parts	21 05 00.78, as well as other Sections
As-Built Documents	21 05 00.78
Instruction of the Owner’s personnel	21 05 00.79, as well as other Sections
Equipment and piping identification; valve tagging	21 05 53

B. Provide or perform all of the above items before Contract Completion.

1.3 PUNCH LIST PROCEDURE

A. Refer to Division 01.

END OF SECTION 21 05 00.77

SECTION 21 05 00.78

CLOSEOUT SUBMITTALS FOR FIRE SUPPRESSION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Division 00, “Procurement and Contracting Requirements.”

B. Division 01, “General Requirements.”

C. Section 21 05 00.77, “Closeout Procedures for Fire Suppression.”

D. Section 21 05 00.79, “Demonstration and Training for Fire Suppression.”

1.2 OPERATING AND MAINTENANCE MANUALS

A. An Operating and Maintenance Manual, approved by the A/E, is required for Contract Completion. Compile and submit a draft of the Operating and Maintenance Manual to the A/E (90) days before Contract Completion.

B. Submit the final corrected Operating and Maintenance Manual (7) days before Contract Completion.

C. Upon approval, provide:
1. (1) Operating and Maintenance Manual in the physical format described below.
2. A Portable Document Format (PDF) file containing a copy of the Operating and Maintenance Manual saved on a Universal Serial Bus (USB) flash drive.

C. The following items, together with any other pertinent data, shall be included in each Operating and Maintenance Manual. This list is not necessarily complete and shall be used only as a guide. Format of manual is to be as follows:
1. Operating and Maintenance Manual binders shall be heavy-duty, loose-leaf, 3-ring, vinyl-covered binders, no larger than 11 in. wide x 12 in. high, with pocket inside the covers to receive folded oversized sheets.
2. Identify each binder on front and spine with the printed title “OPERATION AND MAINTENANCE MANUAL,” project name, and subject matter of contents.
3. Material shall be typewritten or printed and shall be fully legible.
4. Inside cover:
   a. Title of Project.
   b. Date of Project completion.
   c. Name and address of the Owner.
   d. Name and address of the Prime Contractor.
   e. Date of submittal.
   f. Name and address of the Contractor.
   g. Name and address of the Architect.
   h. Name and address of the Engineer.
5. Second Page: Index.
6. Each section shall be divided by labeled tabs.
7. First Section: A copy of each shop drawing and approved submittal with an index at the beginning of the section.
8. Second Section:
   a. A list of all equipment used on the job.

b. Complete list of all devices installed and cross-referenced to room number or location.
c. Parts list with numbers of replaceable items, including sources of supply.
d. Model and serial numbers of components of systems installed.
e. Suppliers and Manufacturers List:
1) Typed statement of material to be furnished.
2) Manufacturers' and nearest Factory Representatives' names, addresses, telephone numbers, and e-mail addresses.
3) Routine and 24-hour emergency service/repair information:
a) Name, address, telephone number, and e-mail address of servicing agency.
b) Names of personnel to be contacted for service arrangements.

9. Third Section:
a. Description of systems.
b. Manufacturer's literature describing each piece of equipment, including the following:
1) Operating and maintenance instructions.
2) Lubrication instructions.
3) Start-up and shutdown procedures.
4) Routine and emergency servicing instructions.
c. Valve charts.
d. Special wrenches, keys, etc.
e. Copies of all testing, adjusting, and balancing reports.
f. Prints of all system wiring and control diagrams.
g. All certifications and related information.
1) Typed verification of compliance with certification requirements.
h. Copies of all written warranties.
i. The Owner's receipt of spare parts.
j. The Owner's statement of completion of instruction. Refer to Section 21 05 00.79.

D. Refer to Division 01 for additional requirements.

1.3 GUARANTEES AND WARRANTIES

A. Guarantee: Contractor shall guarantee its equipment, workmanship, and materials for a period of (1) year from the date of Contract Completion. Should defects develop within this period, the Contractor shall, at no cost to the Owner, remedy the defects and reimburse the Owner for all damage to other Work caused either by the defects or as a result of the work of correcting the same.

B. Extended Warranties: The table below contains a list of items with warranty requirements and their specification sections. These extended warranties are over and above the 1-year guarantee specified above. This list may not be a complete list of all required warranties. Include copies of all written warranties in the Operating and Maintenance Manual, whether listed or not.

C. Post-Warranty Service:
1. The products and Manufacturers identified throughout these Specifications represent reputable suppliers that generally have an inventory of spare parts, and a network of authorized service providers that can support the products installed on this Project.
2. Contractor shall, for a reasonable charge, assist the Owner for a period of (7) years in obtaining parts and service on the products installed.

3. Once the Contractor's 1-year guarantee has expired, the Owner will pay the cost of these parts and service.
4. If the item cannot be repaired, the Contractor shall recommend an equivalent replacement item at a reasonable cost to the Owner.

1.4 PROJECT AS-BUILT DOCUMENTS

A. Contractor shall maintain, at the job site, (1) copy of the As-Built Documents, including the following items related to its Trade:
1. Contract Drawings.
2. Specifications.
3. Addenda.
4. Reviewed Shop Drawings.
5. Change Orders.
6. Other modifications to Contract.
7. Field Test Records and Start-Up Reports.
8. Minutes of Coordination and Progress Meetings.
9. (1) set of the Contract Drawings that will be used for As-Built Drawings. This set shall be used exclusively for documenting and recording the exact location of all installed Work.
10. **Option:** With the approval of the A/E and Owner, As-Built Documents may be made available in an electronic format via an Internet-accessible server.

B. Do not use As-Built Documents for construction purposes.

C. Store As-Built Documents apart from documents used for construction at the Contractor's temporary field office, or in another location readily available to the A/E.

D. Provide files and racks for storage of As-Built Documents, as appropriate, with As-Built Documents identified.

E. Maintain As-Built Documents in clean, dry, legible condition.

F. Use red ballpoint pen for all marking of As-Built Documents.

G. As-Built Documents shall be available at all times for inspection by the A/E and Owner.

H. As-Built Drawings:
1. As-Built Drawings shall be legibly marked to record actual "as-built" construction with the following information (some of these items may not be applicable):
a. Horizontal and vertical location of above-ground and underground utilities and appurtenances referenced to permanent surface improvements.
b. Location of internal utilities and appurtenances concealed in construction referenced to visible and accessible features of structure.
c. Field changes of dimension and detail.
d. Changes made by Change Order.
e. Details not on the original Contract Drawings.
2. Do not permanently conceal any work until the required information has been recorded.
3. Record the location of all concealed utilities on the As-Built Drawings.
4. Record deviations in locations of concealed piping, valves, equipment, and all buried or concealed utility lines and services, etc., dimensioned from a fixed control point, including the following:
a. Depth of bury.
b. At each change of direction.

c. At each change of slope.
d. Additional dimensions in order to fully define location.

5. Minor piping variations need not be recorded.
6. Record locations of abandoned piping, including exterior lines.
7. Record deviations made necessary to incorporate equipment different from the Design Base equipment.
8. Record all Addendum Items.
9. Mark locations of access panels on the As-Built Drawings.
10. Add valve tag numbers to the As-Built Drawings.

I. Include a complete list of all devices installed and cross-referenced to room number or location.

J. At completion of project, the Contractor shall deliver (1) printed copy of its As-Built Documents to the A/E.

K. Contractor shall accompany its As-Built Documents with a transmittal letter, in duplicate, containing the following information:
1. Date.
2. Project title and number.
3. Contractor's name and address.
4. Title and number of each As-Built Document.
5. Certification that each As-Built Document as submitted is complete and accurate.
6. Signature of the Contractor or its Authorized Representative.

1.5 SPARE PARTS

A. Provide a receipt, signed by the Owner, for (1) complete set of all the operating appurtenances and loose items related to the operation and maintenance of the completed Project for the Owner's use after the guarantee period expires. Insert the receipt in the Operating and Maintenance Manual. These appurtenances and items include, but not are limited to, the following:
1. Keys to panels, door and window hardware, and other devices not directly provided to the Owner from the Manufacturer.
2. Operating handles, levers, cranks, specialized wrenches or drivers, remote controls, and similar items.
3. Extra materials (e.g., attic stock) listed below. This list may not be a complete list of all spare parts. Provide all spare parts, whether listed or not.

SPARE PART AND QUANTITY	SPECIFICATION SECTION
Division 21 items	
Sprinklers — (2) minimum of each type	21 13 13
Any other parts mentioned elsewhere	

END OF SECTION 21 05 00.78

SECTION 21 05 00.79

DEMONSTRATION AND TRAINING FOR FIRE SUPPRESSION

PART 1 - GENERAL

1.1 DESCRIPTION

A. Provide training schedule and training outline for approval (45) days prior to Contract Completion.

B. Provide in-service training for the system's operators. Provide all applicable user manuals and related training documentation.

C. After all system operational tests have been completed, schedule an instruction period with the Owner. Schedule well in advance, so that all the Owner's personnel may attend if they desire. Coordinate with the Owner and A/E for date and time of training sessions.

D. Participate in training sessions. Instruct the Owner in the operation and maintenance of all systems and equipment. Use Operating and Maintenance Manuals to familiarize the Owner with equipment and procedures. Allow sufficient time for this instruction.

E. Instruction shall include the following:
   1. Location of equipment and explanation of what it does (function).
   2. Reference to operating instruction manuals for record and clarity.
   3. Coordination of written and verbal instructions, so that the operation of each system is fully understood by operating personnel.
   4. Complete review of items contained in Operating and Maintenance Manuals.
   5. Discussion of maintenance procedures that are required be followed by the Owner, including cleaning procedures and what items to check.
   6. Complete demonstration and explanation of each System.

F. Provide a copy of the Owner's "Certificate of Equipment Demonstration," signed by the Contractor, the Owner, and the A/E, in each Operating and Maintenance Manual. If the Owner does not have a standard demonstration form, the A/E will provide one.

END OF SECTION 21 05 00.79

SECTION 22 05 00

COMMON WORK RESULTS FOR PLUMBING

PART 1 - GENERAL

1.1 PREFACE

A. The Work shall be performed using the General Contracting (GC) / Single-Prime Contractor project delivery method and the Design-Bid-Build process. References to Work to be performed by different Trades Contractors or Subcontractors are all subject to the Scope of Work by the Prime Contractor. Any conflicts regarding Scope of Work shall be directed to the Prime Contractor for resolution. **THE PRIME CONTRACTOR FOR THIS PROJECT SHALL ALSO BE KNOWN AS THE LEAD CONTRACTOR.**

B. **Terminology:** The terms below will be used throughout Division 22, in accordance with Division 00 and Division 01.
   1. Owner: Mt. Gilead Exempted Village Schools.
   2. Architect/Engineer (A/E): Schorr Architects, Inc. / Roger D. Fields Associates, Inc.
   3. Contractors:
      a. All Trade Contractors listed below are Subcontractors.
      b. General Trades: Refer to Divisions 02 through 14.
      c. Fire Suppression: Refer to Division 21.
      d. Plumbing: Refer to Division 22.
      e. HVAC: Refer to Division 23.
      f. Electrical: Refer to Division 26.
      g. Communications: Refer to Division 27.
      h. Electronic Safety and Security: Refer to Division 28.
      i. Site: Refer to Divisions 31 through 35.
   4. Authority Having Jurisdiction (AHJ) mentioned in Division 22:
      a. Morrow County Health District.
      b. City of Mt. Gilead Fire Department.
      c. State of Ohio Department of Commerce, Division of Industrial Compliance.
      d. State of Ohio Department of Commerce, Division of State Fire Marshal.
      e. State of Ohio Department of Health.

C. Scope of Work Summary for the Contractor Performing Plumbing Work on this Project:
   1. Provide renovations to the existing plumbing systems as shown on the drawings..

1.2 RELATED DOCUMENTS

A. Refer to the additional Divisions below for specific requirements, responsibilities, and methods relating to Division 22 Work. If there is a conflict, comply with the more restrictive requirements.
   1. Division 00, “Procurement and Contracting Requirements”: All sections.
      a. The “General Conditions” will provide additional information on the Contractor’s Scope of Work responsibilities.
   2. Division 01, “General Requirements”: All sections.

B. Read the entire Specification covering other branches of the Work. Contractor shall be held responsible for the coordination of its work with the work performed by other Trades.

1.3 DESCRIPTION

A. Plumbing Work includes the Work described in Division 22, "Plumbing," Sections 22 00 00 through 22 99 99 (as included), unless otherwise noted.

B. Plumbing Work also includes the Work described in the following Sections:
   1. Division 21, "Fire Suppression," Section 21 13 13, "Wet-Pipe Sprinkler Systems."

C. In the Sections listed above, the term "Contractor" shall mean the Contractor performing Plumbing Work on this Project, unless otherwise noted.

D. Plumbing Work includes, but is not limited to, the following:
   1. Unit Prices, Allowances, or Alternates, as shown, if any.
   2. Selective demolition.
   3. Plumbing insulation.
   4. Plumbing piping:
      a. Interior domestic water system.
      b. Interior sanitary system.
      c. Sump pumps.
   5. Plumbing fixtures.

E. Contractor is responsible for the more restrictive requirement between these general provisions and other requirements contained elsewhere in the Contract Documents.

F. Furnish material, labor, tools, accessories, and equipment to complete and leave ready for operation all plumbing systems of this Project as described in these Specifications and as shown on the Drawings.

G. Use sufficient skilled workers and competent supervisors in the execution of this portion of the Work to ensure proper and adequate installation throughout.

H. Refer to Section 22 05 00.31, "Project Coordination for Plumbing," regarding final electrical connections.

I. Maintain existing facilities in operation whenever possible. Occupied sections of the building will remain in use throughout construction. Coordinate with the A/E and Owner.

J. Work Sequence:
   1. The Work shall be conducted in one phase.
   2. Complete work in one Area before proceeding to the next Area. Coordinate with all Trades, the Owner, and the A/E.

K. All plumbing systems shall be provided as complete and operational, and shall not be considered complete unless, and until, at a minimum, all Code and Governing Agency requirements are satisfied.

1.4 COORDINATION MEETINGS AND COORDINATION DRAWINGS

A. Terminology:
   1. Coordination Meetings: Coordination Meetings shall be held to identify Coordination Areas and the need for a Coordination Drawing for any Coordination Area. The Lead Contractor shall schedule and conduct the Coordination Meetings.
   2. Coordination Areas: Areas of the project that require special attention, i.e., where there are potential conflicts between Trades.
   3. Coordination Drawings: Drawings and electronic files prepared by the Coordination Participants to demonstrate how multiple-system and interdisciplinary work shall be coordinated.

4. Coordination Participants: All Contractors shall participate in the process of developing the Coordination drawings, including, at a minimum, the following Trades:
   a. General Trades.
   b. Fire Suppression.
   c. Plumbing.
   d. HVAC.
   e. Electrical.
   f. Communications.
   g. Electronic Safety and Security.

1.5 QUALITY ASSURANCE

A. Standards: Refer to individual Specification Sections for additional referenced standards. If a standard is undated, the referenced edition or most recent version of the standard applies.

B. Standards: The following is a list of referenced standards. Not all of these standards necessarily apply to this Project. Refer to individual Specification Sections. If a standard is undated, the referenced edition or most recent version of the standard applies.
   1. American Institute of Architects Committee on Architecture for Health (AIA/CAH), Health Guidelines Revision Committee (HGRC): 2014 Guidelines for Design and Construction of Hospitals and Outpatient Facilities.
   2. American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE):
      a. Standard 62.1, Current Enforced Edition, “Ventilation for Acceptable Indoor Air Quality.”
      b. Standard 90.1, Current Enforced Edition, “Energy Standard for Buildings Except Low-Rise Residential Buildings.”
   3. American Society of Mechanical Engineers (ASME).
      a. Boiler and Pressure Vessel Code (BPVC), Section IX, “Welding and Brazing Qualifications.”
   4. Americans with Disabilities Act (ADA), 2010, Accessibility Guidelines, Code of Federal Regulations (CFR), 36 CFR 1191.
   5. National Fire Protection Association (NFPA):
      a. 2023 NFPA 70, “National Electrical Code® (NEC).”
   6. The Joint Commission.
   7. United States Department of Labor, 29 CFR 1910.7, Occupational Safety and Health Administration (OSHA), Part 1926, “Safety and Health Regulations for Construction.”
   8. United States Environmental Protection Agency (EPA).
   9. State of Ohio:
      a. Ohio Administrative Code (OAC):
         1) OAC 1301:7-7: 2017 Ohio Fire Code.
         2) OAC 3701: Health Code, Current Edition.
         3) OAC 4101:1: 2024 Ohio Building Code.
         4) OAC 4101:2: 2024 Ohio Mechanical Code.
         5) OAC 4101:3: 2024 Ohio Plumbing Code.
         6) OAC 4101:5: 2024 Elevator Code.
         7) 2024 Ohio Existing Building Code.
      b. Ohio Revised Code 153.011.
      c. Ohio Environmental Protection Agency (EPA).

END OF SECTION 22 05 00

SECTION 22 05 05

SELECTIVE DEMOLITION FOR PLUMBING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Division 01, “General Requirements.”

B. Section 22 05 00.35, “Special Procedures for Plumbing.”

C. Section 22 05 00.78, “Closeout Submittals for Plumbing.”

1.2 DESCRIPTION

A. Provide demolition and renovation work as shown on the Plumbing Drawings.

B. Provide demolition needed in order to install the new Plumbing Work.

C. Remove existing piping as shown on the Drawings.

D. Relocate any existing pipe, equipment, and similar items in order to accommodate the installation of the Work. **THE DRAWINGS DO NOT SHOW EVERY ITEM OF DEMOLITION OR RENOVATION REQUIRED TO COMPLETE THE WORK.** Review the existing conditions and plan work accordingly.

E. Maintain existing services in areas beyond phase being renovated.

1.3 ENVIRONMENTAL HAZARDS

A. Asbestos Abatement: Refer to Section 22 05 00.35.

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION

3.1 EXAMINATION

A. At the beginning of construction, carefully inspect the entire Project and verify with the A/E and Owner all items designated to be removed or to remain.

B. Locate all existing utilities requiring removal and determine requirements for disconnecting and capping.

C. Locate all existing active utilities designated to remain. Protect in order to keep in service.

3.2 PREPARATION

A. Notify the A/E and Owner at least 2 full working days in advance of commencing work in a particular area.

B. Schedule all work in a careful manner with full consideration for the Owner and its personnel, avoiding interference with the use of, and passage to and from, adjacent areas and facilities designated to remain in use during demolition.

C. Disconnect, or arrange for the disconnection of, all utilities or equipment designated to be removed or replaced. Perform all such work in accordance with the requirements of the Owner.

D. Coordinate all demolition, and any disconnection of utilities or equipment designated to be removed, with the A/E, Owner, Work of other Contractors, and Utility Company.

E. Coordinate disconnection of electrical service to equipment to be removed and the removal of conduit, wiring, and other electrical devices with the Electrical Contractor.

F. Maintain, in operating condition, all active utilities designated to remain. Provide temporary caps as needed (not shown). Provide temporary connections and reconnections as needed (not shown).

G. Provide protection for the Owner's personnel and others.

H. Protect remaining property from damage during demolition and removal of debris.

3.3 DEMOLITION

A. Demolish and remove abandoned utility lines, piping, equipment, equipment foundations and supports, and all other existing items that are designated for removal or that need to be removed for the renovation.

B. Temporarily cap and plug sewers and piping where demolition begins.

C. Do not use equipment or methods that will cause damage to adjacent construction designated to remain.

D. Protect and maintain all active utilities and services. Repair or replace, at no expense to the Owner, all such items disturbed in the execution of Work.

E. Repair or replace surfaces and elements of structures **NOT** scheduled to be demolished, but damaged due to demolition or lack of protection.

F. Items that are completely concealed in existing structure and will not interfere with new work may remain. Cap and plug at ends.

G. Construct dust barriers to prevent dust and dirt from entering occupied areas or areas outside of general remodeling work.

H. Sprinkle rubbish and debris to keep dust laid.

I. Reroute and relocate any items to permit installation of new work.

3.4 REMOVAL AND SALVAGE

A. Remove all items of piping, equipment, and material as shown on the Drawings and in these Specifications. Unless otherwise noted, all usable items shall be salvaged and reused where possible.

B. Items Being Removed That Are to Be Reused:
   1. Carefully remove and store usable items until reinstallation is to proceed.
   2. Coordinate locations of stored materials with the Lead Contractor, A/E, and Owner.

C. Items Being Removed That Are **NOT** to Be Reused:
   1. The Owner will have first right of refusal.
   2. Carefully remove any items that the Owner wishes to keep and deliver them in good condition to the permanent storage location on site designated by the Owner.

D. Dispose, off-site, of all items not wanted by the Owner.

3.5 PLUMBING RENOVATION WORK

A. Remove or relocate portions of the existing domestic water system, except as noted otherwise. Retain water piping designated to remain.

B. Where new piping is indicated, do not reuse existing or removed piping. During construction, if the A/E determines that a section of piping could be reused, a Deduct Change Order will be issued specifically addressing reuse of that section of pipe. Each portion of the reused piping shall pass the same pressure test requirements that new piping is required to pass.

C. Remove portions of sanitary, waste, and vent lines. Cap or plug remaining lines. Refer to the Drawings.

D. Portions of the waste and vent system designated to remain shall be tested and meet the same pressure test requirements as new piping.

E. Remove water heater.

F. Remove existing plumbing fixtures where indicated on the Drawings and give to the Owner. Reuse fixtures where indicated on the Drawings. Refer to the Drawings.

G. Remove existing gas regulator, meter, meter setting, and existing gas line downstream of meter (except portions designated to remain).

H. Piping below the floors, or concealed in walls or above ceilings, may be abandoned in place if it does not interfere with new construction.

I. Note locations of any piping abandoned below floors, in walls, or above ceilings, including exterior lines, on the As-Built Drawings. Refer to Section 22 05 00.78.

3.6 ROOFING RENOVATION WORK

A. Where the Contractor removes items from the roof such that the waterproofing integrity of the roof is affected, the Contractor is responsible for proper repair of roof and shall bear the entire expense of repair. Qualified roofing craftsmen shall repair the roof in accordance with Manufacturer’s instructions so as not to void the warranty. The Roofer shall be approved by the Owner and A/E before work begins.

END OF SECTION 22 05 05

SECTION 22 05 16

EXPANSION FITTINGS AND LOOPS FOR PLUMBING PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Section 22 05 48, “Vibration and Seismic Controls for Plumbing Piping and Equipment.”

B. Section 22 11 19, “Domestic Water Piping Specialties.”

1.2 DESCRIPTION

A. Provide thermal expansion control for all piping (not shown on the Drawings).

B. Isolate all piping for both noise and vibration transmission.

C. To prevent damage to building, equipment, joists, hangers, and piping, provide expansion loops, guides, anchors, and offsets in piping systems to accurately control pipe movement due to equipment operation or thermal gradients.

D. Anchor points are not indicated on the Drawings. Install anchor points as needed to properly control piping movement. Typically, piping shall be anchored at tees, elbows, and bends. Piping shall also be anchored in each direction.

PART 2 - PRODUCTS

2.1 EXPANSION JOINTS

A. Acceptable Manufacturers: Metraflex or approved equal by Flexicraft, Flexonics Products, Hyspan Precision Products Inc., Minnesota Flexible Corp., Twin City Hose Inc., or Uniroyal General Rubber.

B. Metraflex. Stainless steel bellows and elements; cast iron equalizing rings, tie-rods, and pipe connections; 250 PSIG working pressure. Use packless, internally guided type for lines 2 in. and smaller.

C. 2 in. and Smaller Lines: Metraflex HPMF. Stainless steel with copper sweat ends, packless, internally guided expansion compensator type.

D. Seismic/Thermal Expansion Joints: Metraflex Metraloop®.

2.2 PIPE ALIGNMENT GUIDES

A. Acceptable Manufacturers: Metraflex or approved equal by Flexicraft, Flexonics Products, Hyspan Precision Products Inc., Minnesota Flexible Corp., Twin City Hose Inc., or Uniroyal General Rubber.

B. Metraflex. Painted steel cylinder guide assembly with welded mounting brackets, 2-piece pipe clamp “Spider” assembly.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Line Expansion:
   1. U-Bends: Install U-bends or loops in all piping subject to expansion and contraction.
      a. **Option:** Provide Metraflex Metraloop, sized in accordance with the Manufacturer's recommendations.
   2. Expansion Joints: Where unable to provide U-bends, or where specifically shown or specified, provide expansion joints. Install according to the Manufacturer's instructions.

B. Branch Connections: Branch connections to mains shall be made with a minimum of (2) 90-degree elbows, and shall incorporate at least (1) change of direction in the horizontal plane and (1) change of direction in the vertical plane, before connecting to equipment or fixtures or before dropping in or rising in a wall.

C. Guides: Supplement all loops and expansion joints with adequate guides as close to loops and joints as possible, and at recommended intervals from loops and joints, to preserve alignment and pitch. Guides shall be rigidly secured to the structure and shall permit axial movement only. Follow the Manufacturer's instructions where applicable.

D. Anchors: Install pipe anchors where required to secure the pipe and eliminate movement. Attach pipe anchors securely to the structure.

END OF SECTION 22 05 16

SECTION 22 05 17

SLEEVES AND SLEEVE SEALS FOR PLUMBING PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Division 01, “General Requirements.”

B. Division 07, “Thermal and Moisture Protection.”

1.2 DESCRIPTION

A. Provide sleeves and sleeve seals, including all accessories required for a complete installation, at penetrations of exterior floor and wall assemblies. Sleeve where piping:
   1. Passes through equipment room walls.
   2. Passes exposed through non-fire-rated construction walls.
   3. Passes exposed through non-fire-rated construction above-grade floors.
   4. Passes through smoke-rated or fire-rated separations. Apply firestopping to plumbing penetrations of fire-rated floor and wall assemblies to maintain or restore original fire-resistance rating of assembly according to Division 07.

1.3 TERMINOLOGY

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.

1.4 QUALITY ASSURANCE

A. Standards:
   1. American Society for Testing & Materials (ASTM):
      a. ASTM E 84, Standard Test Method for Surface Burning Characteristics of Building Materials.”
      b. ASTM E 814, “Standard Method of Fire Tests of Through Penetration Fire Stops.”
   2. Factory Mutual Global (FMG).
   3. National Fire Protection Association (NFPA):
      a. 2023 NFPA 70, “National Electrical Code® (NEC).”
      b. 2021 NFPA 101, “Life Safety Code.”
   4. Underwriters Laboratories, Inc. (UL) 1479, “Fire Tests of Through-Penetration Firestops.”

1.5 SUBMITTALS

A. Submit Manufacturer’s product data, installation instructions, and details for each required product.

PART 2 - PRODUCTS

2.1 SLEEVE SEALS — NON-FIRE-RATED PLUMBING PENETRATIONS

A. Piping Sleeve Material:
   1. Up to 8 in. diameter: Machine-cut Schedule 40 black steel pipe.
   2. 8 in. and larger: Schedule 30 black steel pipe.

3. Bare copper piping: Copper sleeves.
4. **Option:** Schedule 40 plastic pipe may be used for piping sleeves, where adjacent ceiling space is not used for return air plenum. Refer to the Drawings.
5. Sleeves may be split, where used on existing piping through non-bearing walls.

B. Sizing: Sleeves shall be large enough for insulation to be continuous, or for sleeve seals to be installed. Size to allow 1/2 in. minimum clearance all around piping or piping insulation.

2.2 SLEEVE SEALS — FIRE-RATED PLUMBING PENETRATIONS

A. Acceptable Manufacturers: Either provide sleeves and sleeve seals from the Manufacturers listed in Division 07 or provide sleeves and sleeve seals from the following Manufacturers: 3M Fire Barrier caulking or putty, BP Fyre Putty, Carborundum Fibersil, Chase Foam, CSD Sealing Systems "FSP," Dow Corning 3-6548, Hilti Fire Stop, International Protective Coatings Corporation "Flame-Safe," Johns-Manville Cerafiber, KBS Mortar Seal, or Nelson Fire Stop.

B. ASTM E119 and E814 Silicone RTV foam, UL-approved.

C. Sleeves shall be large enough for fire-rated sleeve seals to be installed. Size to allow 1/2 in. minimum clearance all around.

2.3 FIRESTOP PILLOWS

A. Acceptable Manufacturers: KBS or approved equal by 3M or Specified Technologies Inc.

B. KBS SEALBAG™: UL-listed, FMG-approved.

2.4 SLEEVE SEALS — WATERTIGHT PLUMBING PENETRATIONS

A. Provide sleeves with waterstop anchor flange at midpoint where penetrating structure at or below grade.
1. Acceptable Manufacturers: Calpico, 3M, or Hilti.

B. **Option:** Compression Seals: GPT Industries Link-Seal. Stainless steel bolts and nuts. Provide correct size seal and coordinate with sleeve size.
1. Acceptable Manufacturers: GPT Industries or approved equal by Metraflex, Wayne, Michigan, or Calpico.

C. Sleeves shall be large enough for watertight sleeve seals to be installed. Size to allow 1/2 in. minimum clearance all around.

PART 3 - EXECUTION

3.1 COORDINATION

A. Coordinate location of sleeves, core-drilled holes, and other holes required with the Lead Contractor, Structural Engineer, equipment, and other Trades.

3.2 INSTALLATION — GENERAL

A. Indicated sizes and locations are based on early Project information and should be verified by the Contractor.

B. Chases and constructed openings that are not indicated on the Drawings shall be provided at the expense of the Contractor requiring the chase or constructed opening.

C. If it becomes necessary to cut into the work because of the failure of the Contractor to notify the Lead Contractor, then the Lead Contractor shall do any cutting and patching required later, at the Contractor's expense.

D. Provide dimensions and locations of openings required in walls for sleeves, piping, and similar items, and deliver sleeves, to the Lead Contractor, so as not to delay construction.

E. **BEFORE CONSTRUCTION OF MASONRY OR CONCRETE WALLS IS STARTED**, give the Lead Contractor locations and sizes of all openings required for the installation of equipment or sleeves.

F. If sleeves are not installed due to the fault of the Contractor, the Lead Contractor shall core-drill holes through masonry or concrete construction at the expense of the Contractor.

G. In New Drywall, Masonry, or Concrete Wall Construction, as applicable to this Project:
   1. Provide sleeves for plumbing items.
   2. Carefully coordinate and check locations of sleeves immediately before and after each concrete pour and/or masonry installation.
   3. **Option** for above ceiling only: Lead Contractor shall omit concrete block(s) where required for penetrations and shall provide square-finished opening. Do not omit concrete blocks in sound barrier walls, under bearing points, or in fire-rated or smoke-rated walls.
   4. Coordinate with other Contractors, Structural Engineer, and A/E.

H. In Existing Walls: Contractor shall provide sleeves for its own Work, unless specifically shown otherwise. Perform one of the following for piping penetrations and other openings through masonry or concrete walls:
   1. Knock out concrete block(s). Do not knock out concrete blocks under bearing points. Install sleeve. Repair wall. Coordinate with the A/E.
   2. Knock out concrete block(s). Do not knock out concrete blocks under bearing points. No sleeve needed if no fire rating required. Coordinate with the A/E.
   3. Core-drill through walls where required. No sleeve needed if smooth opening and no fire rating required.
   4. Provide own sleeves and all required cutting, drilling, and patching for openings required through below-grade walls, or under interior bearing walls. Install sleeve such that the wall does not bear on the plumbing work.

I. Sleeves are not required in floor slabs on grade or in core-drilled openings not requiring firestopping or watertightness.
   1. **Exception:** Sleeves are required at core-drilling through hollow-core pre-cast concrete slabs and through concrete block walls to facilitate containment of required firestopping material.

J. Provide all conduit sleeves and caulking for openings in new walls.

K. Piping shall not bear on sleeves. Install sleeves plumb and true to line, grade, and position.

L. Cutting:
   1. Cut off sleeves through walls flush with each surface.
   2. Cut off sleeves 1/8 in. above finished floors and 3 in. above floors in kitchens, utility rooms, equipment rooms, and shafts. Cut off bottom of sleeve flush with surface.
   3. Refer to Division 01 for specific requirements regarding approved cutting methods.

M. All piping sleeves and escutcheons shall have ample clearance for pipe and covering and shall have chrome-plated wall and floor escutcheons over the pipe in finished areas. Provide chrome-plated or prime-coated escutcheons in other rooms.

N. Unused sleeves shall be plugged and fire-packed. Provide finish that matches finish of adjacent surface.

3.3 INSTALLATION — FIRE-RATED PLUMBING PENETRATIONS

A. Verify which walls, ceilings, or floors are fire-rated, if any, and provide approved fire-blocking or fire-protective devices.

B. Use approved, UL-listed, fire-retardant sealants, backing, and packing to maintain fire rating of the structure penetrated.

C. Spray UL-listed foam sealant around exposed piping entering and leaving fire-rated wall or floor structures.

D. To ensure fire blocking, close space around piping and other plumbing items passing through walls and floors. Seal space up to a 1/2 in. gap with sealant or caulking. Close off space greater than a 1/2 in. gap with sheet metal and seal airtight.

E. For larger openings, provide firestop pillows.

F. Pack all fire-rated or sound-rated separation sleeves with glass fiber, high-temperature mineral wool, aluminum-silica fiber, fire-retardant rope, calcium silicate, or other noncombustible material to maintain fire rating of structure, and finish with fire-rated sleeve seals.

G. Fill space around all sleeves extending into exposed areas with material compatible with adjacent construction and finish.

H. All openings shall have been UL-tested utilizing the proper rated penetrations to be equal to, or greater than, the barrier assembly in which the penetration occurs.

I. Install all penetrations and openings in accordance with the Manufacturers' instructions.

J. The fire-blocking assembly shall maintain the required fire-resistance rating of the wall or floor in which it is placed. Apply a further sealant, if necessary, to attain a smoke-tight condition. Close openings without sleeves in the same manner.

K. Refer to Division 07 for additional requirements.

3.4 INSTALLATION — WATERTIGHT PLUMBING PENETRATIONS

A. Sleeving with absolutely watertight seal is required for plumbing work passing through exterior walls above grade, and foundation walls and penetrations into building.

B. Piping sleeves penetrating outside wall or slabs on grade shall have welded intermediate flange imbedded in masonry. Space around piping shall be clamped, packed, and caulked to make an absolutely watertight seal within sleeve. Caulk around outside of sleeve.
   1. **Option:** Install compression seals.

END OF SECTION 22 05 17

SECTION 22 05 23

GENERAL-DUTY VALVES FOR PLUMBING PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Section 22 05 53, “Identification for Plumbing Piping and Equipment.”

1.2 DESCRIPTION

A. Provide valves and accessories for plumbing piping system(s):
1. In locations accessible to qualified personnel for operation, removal, maintenance, or servicing.
2. As shown on the Drawings and as discussed in other Sections of these Specifications.
3. To facilitate the maintenance, operation, isolation, and servicing of all plumbing piping systems.

1.3 QUALITY ASSURANCE

A. Standards:
1. American National Standards Institute (ANSI).
2. American Society for Testing and Materials (ASTM).
3. American Society of Mechanical Engineers (ASME).
4. American Society of Sanitary Engineers (ASSE).
5. American Water Works Association (AWWA).
6. California Assembly Bill (AB) 1953.
7. Manufacturer’s Standardization Society of the Valve and Fittings Industry (MSS).
8. National Science Foundation (NSF) 61.

PART 2 - PRODUCTS

2.1 MANUFACTURERS AND MODEL NUMBERS

A. Manufacturer and Model Number listed below shall be considered to be the Design Base Manufacturer and Model Number. Other Acceptable Manufacturers will be permitted, unless specifically excluded.

B. All valves of the same type used on the Project shall be by the same Manufacturer.

2.2 BALANCING VALVES (2 IN. AND SMALLER)

A. Acceptable Manufacturers: Bell & Gossett CB Series (Xylem Inc.), Flo Pac Model MB, Nibco Fig. 1710, or Taco ACUF Series, or approved equal by Apollo, Hammond, Kitz, Milwaukee, Red-White, or Watts.

B. 200 PSIG, ASTM B-62 bronze body/brass ball, threaded or solder joint ends, differential pressure read-out ports, 1/4 in. drain port, memory stop feature to allow valve to be closed for service and reopened to setpoint without disturbing balance position, and calibrated nameplates to ensure specific valve settings.

2.3 BALANCING VALVES, THERMOSTATIC (2 IN. AND SMALLER)

A. Acceptable Manufacturers: ThermOmegaTech or approved equal by Caleffi or Acorn.

B. ANSI/AWWA C800. NSF 61 and California AB1953 for lead content. Inline valve with integral check valve and spring-operated thermal actuator. Type 303 stainless steel body. Tapered female threaded, NPT, end connections: Factory setting range 105 degrees F. to 180 degrees F. 200 psig maximum working pressure. 300 degrees F. maximum working temperature.

2.4 BALL VALVES (3 IN. AND SMALLER)

A. 150 lb. SWP, bronze body, threaded or solder joint ends, TFE seat and seals, stainless steel ball, blow-out-proof stem, extended handle with vapor seal, adjustable memory stop, and protective sleeve.
1. **ONLY** Acceptable Manufacturers and Model Numbers: Milwaukee Model BA-100 or BA-150 or approved equal by Watts No. B-6000 or B-6001, Apollo 70-100 or 70-200, Hammond 8501 or 8511, Nibco 580-70 or 585-70, Kitz 68 or 69, or Red-White 5044F or 5049F.

B. With Lockable Handles: 150 lb. SWP, bronze body, threaded ends, TFE seat and seals, stainless steel ball, extended handle with vapor seal, adjustable memory stop, and protective sleeve.
1. Acceptable Manufacturers and Model Numbers: Milwaukee Model BA-100 LD, Apollo No. 70-100-27, or Nibco 580-70-LH, or approved equal by Hammond, Kitz, Red-White, or Watts.

2.5 CHECK VALVES

A. Acceptable Manufacturers: Milwaukee or approved equal by Apollo, Hammond, Kitz, Nibco, Red-White, or Watts.

B. 2 in. and Smaller: Milwaukee Fig. 509 or 1509. 125 lb. SWP, ASTM B-62 bronze body, swing check, threaded or solder joint tubing ends, with renewable bronze disc and integral seat.

C. 2-1/2 in. and Larger (swing): Milwaukee Fig. F-2974. 125 lb. SWP, iron body, bronze trim, with flanged ends.

2.6 DRAIN VALVES

A. Acceptable Manufacturers: Milwaukee or approved equal by Nibco or Walworth.

B. Milwaukee BA-100H or BA150H. 3/4 in. bronze hose-end ball valve, with cap and chain (where concealed). Provide 3/4 in. garden hose thread adapter on outlet of drain valve, with cap.

2.7 SEALANT TAPE

A. Polytetrafluoroethylene (PTFE) tape.

PART 3 - EXECUTION

3.1 COORDINATION

A. Coordinate valves and accessories with structure and with mechanical and electrical equipment.

B. Coordinate all access panel locations, if required, with the Lead Contractor.

3.2 INSTALLATION

A. Install valves:
   1. At service connections to equipment not provided with valves.
   2. At branch lines from main lines.
   3. At low points for draining.

B. Install valves with handwheel at or above centerline of pipe.

C. Install valve at inlet and outlet to water heater.

D. Thermostatic Balancing Valve (TBV):
   1. Install TBV at the end of each domestic hot water supply just before the return line. Refer to the Drawings for locations.
   2. Provide a shut-off valve before and after the TBV with a union after the TBV.
   3. Provide a strainer upstream of each valve.
   4. Install valve with proper flow direction as marked on the valve body.
   5. Provide pipe thread sealant rated for domestic water applications on all male pipe threads except on the stainless-steel union threads, which have an integrated O-ring that fully seals when hand-tightened.
   6. If using PTFE tape, do not apply tape to first thread to avoid cutting tape and causing obstructions to flow.
   7. Closing temperature shall be 125 deg. F. except for 140 deg. F. kitchen domestic hot water which shall have a 140 deg. F. closing temperature.

E. Ball Valves:
   1. Install on hot- and cold-water branches serving more than (1) fixture.
   2. Install on (food service) (kitchen) equipment connection.
   3. Install in domestic water supply lines to any equipment or fixtures not provided with stops.

F. Drain Valves: Install 3/4 in. valves at low points in piping to provide complete drainage of all systems.

G. Open valves fully before soldering to piping.

H. Do **NOT** install solder joint valves on systems where the fluid temperature may soften the solder.

I. During soldering or brazing, remove valve internals and protect the remaining element of sweat end valves against heat damage.

J. Do **NOT** install any valves where the fluid operating pressure exceeds 80% of the valve's pressure rating.

K. Do **NOT** use bronze valves on iron fittings or pipe without dielectric unions.

L. Tighten packing glands before placing valves in service.

M. Tag all valves. Refer to Section 22 05 53.

3.3 TESTING

A. Test all valves for tightness.

B. TBV: Verify proper operation.

C. Test-operate all valves at least once from closed-to-open-to-closed positions while valve is under pressure.

END OF SECTION 22 05 23

SECTION 22 05 29

HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Section 22 05 16, “Expansion Fittings and Loops for Plumbing Piping.”

B. Section 22 07 00, “Plumbing Insulation.”

1.2 DESCRIPTION

A. Hangers and Supports for Plumbing Equipment and Systems: Provide for piping installed under the Plumbing Work.

B. Supports for Equipment:
1. Provide all structural supports between building structural framing members to support major plumbing equipment.
2. Attach all items of equipment securely to structure, floor, or concrete pad. Means of attachment shall be approved by the A/E and shall not degrade the structure.
3. For any variation in supports needed for equipment actually purchased, the Contractor shall bear all costs of modifications, including redesign costs.

C. Support Steel: Attach to building structure to support piping and smaller plumbing equipment items. Provide supports between structural members, except where specifically called out to be provided as part of the General Trades Work. Obtain prior written approval of the A/E.

D. Hangers for Piping: Install all necessary pipe hangers, supports, clamps, wall brackets, and attachments in order to:
1. Properly support piping from building structure.
2. Allow controlled thermal movement of piping systems.
3. Facilitate action of expansion joints, loops, and bends, where used.
4. Provide slope where indicated.

E. Concrete Work: A qualified Tradesperson shall provide all concrete work.

F. Provide all necessary inserts, expansion shields, beam clamps, piping floor supports, auxiliary steel, angles, clips, mechanical fasteners, reinforcement steel, structure drilling, welding to structure, etc.

G. Components shall be selected and matched to the load imposed on them.

H. Refer to Structural and Architectural Drawings and Specifications to determine what supports are provided as part of the General Trades Work.

1.3 TERMINOLOGY

A. Abbreviations:
1. Chlorinated polyvinyl chloride (CPVC).
2. Cross-linked polyethylene (PEX).
3. Polyvinyl chloride (PVC).

1.4 QUALITY ASSURANCE

A. Standards:
1. American National Standards Institute (ANSI)
2. American Society for Testing and Materials (ASTM).
3. American Society of Mechanical Engineers (ASME), including:
a. ASME B31.1, “Code for Power Piping.”
b. ASME B31.9, “Building Services Piping.”
4. Factory Mutual Global (FMG).
5. Manufacturers Standardization Society of the Valve and Fittings Industry (MSS).
a. Standard Practice 58.
b. Standard Practice 69.
c. Standard Practice 89.
6. National Fire Protection Association (NFPA).
7. Underwriters Laboratories, Inc. (UL).

PART 2 - PRODUCTS

2.1 STRUCTURAL STEEL

A. Steel plates, shapes, and bars; steel beams; strut channels; standard-weight black steel pipe; or steel angle. ASTM A36 / ASTM A36M, black and galvanized, of adequate size and strength to safely carry the weight of equipment item.

2.2 HANGERS FOR PIPING

A. Acceptable Manufacturers: Anvil International, B-Line Systems Inc., Carpenter & Patterson Inc., ERICO, Globe Pipe Hanger Products Inc., Klo-Shure, National Pipe Hanger Corp., or PHD Manufacturing Inc.

B. Uninsulated Piping:
1. Steel, cast iron, or plastic; 1/2 in. to 8 in.: Anvil International Fig. 69. Galvanized carbon steel, adjustable swivel ring.
2. Steel, cast iron, or plastic; 10 in. and larger: Anvil International Fig. 260. Adjustable clevis, carbon steel yoke, U-strap, rod, and hex nuts.
3. Copper, 1/2 in. to 4 in.: Anvil International Fig. CT-65. Copper-plated hangers, adjustable tubing ring, carbon steel ring, and malleable iron adjusting nut.

C. Insulated Piping:
1. Steel, plastic, or copper; all sizes: Anvil International Fig. 260. Adjustable clevis, carbon steel yoke, U-strap, rod, and hex nuts.
2. Cast iron, all sizes: Anvil International Fig. 590. Adjustable clevis, carbon steel yoke, U-strap, rod, and hex nuts.
3. Thermal protector: Thermal Pipe Shields Model T2000. Vapor barrier, galvanized steel sheet metal jacket, cellular glass thermal insulation (ASTM C552) same thickness as pipe insulation. Refer to Section 22 07 00 for Insulation dimensions.
a. Acceptable Manufacturer: Thermal Pipe Shields Inc.

D. Vent Piping:
1. Plastic: Anvil International Fig. 69. Galvanized carbon steel, adjustable swivel ring.
2. Metal: Anvil International Fig. 97. Adjustable pipe ring, steel band, malleable iron adjusting nut.

E. For Piping Indicated to be Installed "Tight to Ceiling or Wall":
   1. Uninsulated, 1/2 in. to 4 in.: Anvil International Fig. 262. Carbon steel.
      a. **Option:** PowerStrut channels with PowerStrut Model PS 3126 hold-down clamp. Use with rubber cushion for copper pipe.
   2. Insulated, 3/4 in. to 8 in.: Anvil International Fig. 103. Carbon steel, offset pipe clamp.

F. Vertical Piping:
   1. Anvil International Fig. 261. Friction riser clamp with 2-point bearing.
   2. Use Anvil International Fig. CT-121 copper-plated riser clamp for copper pipe.

2.3 HANGER RODS, CLAMPS, AND BRACKETS FOR PIPING

A. Acceptable Manufacturers: Anvil International, B-Line Systems Inc., Carpenter & Patterson Inc., Globe Pipe Hanger Products Inc., ERICO, Miro, National Pipe Hanger Corp., PHD Manufacturing, Inc., or Klo-Shure.

B. Hanger Rods: Solid steel, threaded ends or all-thread rods of diameter listed below, with double nut attachment to the hanger and at the hanger attachment. Sizes are as follows:

PIPE SIZES	**ROD DIAMETER**
Up to 2 in.	3/8 in.
2-1/2 in. and 3 in.	1/2 in.
4 in. and 5 in.	5/8 in.
(3/8 in. rods are acceptable for plastic vent lines)	

C. Hanger Clamps:
   1. Beam clamps (up to 8 in. diameter pipe): Anvil International Fig. 218, Fig. 228, or Fig. 292. Top beam clamp, steel jaw, hook rod with nut, and spring washer steel eye-bolt, with Anvil International Fig. 157 or Fig. 290 extension piece for appropriate rod diameter.
      a. **Option:** Anvil International Fig. 86, Fig. 93, or Fig. 94. Malleable iron clamp, hardened steel cup point set screw with Anvil International Fig. 89 steel retaining clip.

D. Hanger Brackets:
   1. Acceptable Manufacturers: Anvil International, B-Line Systems Inc., Carpenter & Patterson Inc., Globe Pipe Hanger Products Inc., ERICO, National Pipe Hanger Corp., PHD Manufacturing Inc., Klo-Shure, Unistrut Corp., or ABB (Thomas & Betts) Superstrut®.
   2. Wall brackets: Carbon steel, back plates, and bolts.
      a. Anvil International Fig. 194. Lightweight 750 lb. load.
      b. Anvil International Fig. 195. Medium-weight 1,500 lb. load.
      c. **Option:** Unistrut or ABB Superstrut® A1200.

2.4 SPRING HANGERS FOR PIPING

A. Acceptable Manufacturers: Anvil International, or Kinetics Noise Control, or approved equal by B-Line Systems Inc., Carpenter & Patterson Inc., ERICO, Globe Pipe Hanger Products Inc., Klo-Shure, National Pipe Hanger Corp., or PHD Manufacturing Inc.

B. Anvil International Fig. B268, Type A or B. Steel, adjustable pre-compressed variable spring.

C. Kinetics Noise Control Model SH.

2.5 TRAPEZE HANGERS FOR PIPING

A. Acceptable Manufacturers: Unistrut Corp., or ABB (Thomas & Betts) Superstrut®, or approved equal by Anvil International, B-Line Systems Inc., ERICO, GS Metals Corp., National Pipe Hanger Corp., Powerstrut, or Wesanco Inc.

B. Unistrut P1000 or ABB Superstrut® A1200. Angle iron, or channel of sufficient length to support pipes and insulation on individual hangers, roller supports, or saddles with insulation protectors.

2.6 HANGER COVERS FOR PIPING

A. Acceptable Manufacturers: Buckaroos Inc. or approved equal by Pipe Shields Inc. or PHS Industries.

B. Buckaroos Wraparoos. 2-piece PVC cover. Snap-on design, adhesive seals, to 205 degrees F. temperature. Includes 18 in. long PVC hanger rod cover. Available in multiple colors. The A/E shall approve all color selections for plumbing equipment.

2.7 PIPE-INSULATING SUPPORT

A. Piping 1-1/2 in. and Smaller: Anvil International Fig. 167. 12 in. long, 18-gauge galvanized or stainless steel sheet metal half round piping shield inside clevis hanger.
   1. Acceptable Manufacturers: Anvil International or approved equal by Buckaroos Inc., Carpenter & Patterson Inc., PHS Industries Inc., Pipe Shields Inc., Rilco Manufacturing Co. Inc., or Value Engineered Products Inc.

B. Piping 2 in. and Larger: Insul-Coustic Co. Insul-Shield. Pre-compressed fiberglass load-bearing segment, integral fire-retardant vapor barrier jacket and saddle.
   1. Acceptable Manufacturers: Insul-Coustic Co. or approved equal by Pipe Shields Inc., Buckaroos Inc., or ERICO.

2.8 PIPE ROLL STANDS

A. Acceptable Manufacturers: Anvil International or approved equal by B-Line Systems Inc., Carpenter & Patterson Inc., Globe Pipe Hanger Products Inc., ERICO, National Pipe Hanger Corp., PHD Manufacturing Inc., or Klo-Shure.

B. Anvil International Figure 271. Cast iron roll, stand with holes for anchoring, sized for use with protection saddle.

2.9 FINISH

A. Unless otherwise noted, all steel hangers and supports shall be standard black.
   1. **Exception:** Hangers and supports for exposed exterior applications shall be galvanized.

2.10 INSERTS

A. In Masonry with Voids: Master-Carr #94255A100. Steel plated with yellow chromated zinc, female threaded toggle.
   1. Acceptable Manufacturers: Master-Carr or approved equal by Vertical Solutions or Hohmann & Barnard.

B. In Poured Concrete: Anvil International Fig. 282. Malleable iron, universal mounting, lateral adjusting.
   1. Acceptable Manufacturers: Anvil International Inc. or approved equal by B-Line Systems Inc., Carpenter & Patterson Inc., Globe Pipe Hanger Products Inc., ERICO, Klo-Shure, National Pipe Hanger Corp., PHD Manufacturing Inc., or Unistrut.

PART 3 - EXECUTION

3.1 INSTALLATION

A. All piping supports, parts, and installation shall conform to the latest requirements of ASME B31.1 and MSS SP-58, SP-69, and SP-89, and shall not exceed the maximum pipe deflections allowed by ASME B31.9, except as supplemented or modified by the requirements of this Specification.

B. Install all piping systems with adequate provisions made for expansion and to prevent stresses on valves and equipment. Provide adequate pipe anchors, guides, and supports from building structure to properly control pipe movement. Method shall suit job conditions. Refer to Section 22 05 16.

C. Provide proper steel angles and channel systems, etc., between structural members for hanger supports where necessary. Weld to steel structural members where noted. Consult with the A/E regarding this procedure.

D. All hangers installed shall be appropriate for type of building structure indicated.

E. Do not support hangers from roof deck or floor above. Span from structural members with supplementary steel where direct attachment to structural members is not practical.

F. Install hangers and supports with all necessary inserts, bolts, rods, nuts, washers, and other accessories, according to the Manufacturer's recommendations. Hangers shall be double-nutted.

G. Use a separate hanger for each pipe. Do not hang one pipe from another.

H. Provide additional supports required to maintain piping alignment.

I. Spacing of Piping Supports: Maximum spacing of piping supports shall be as follows:

PIPE SIZE	STEEL PIPE	COPPER PIPE
3/4 in. or smaller	6 ft.	5 ft.
1 in. through 1-1/4 in.	6 ft.	6 ft.
1-1/2 in.	6 ft.	8 ft.
2 in.	10 ft.	8 ft.
2-1/2 in.	10 ft.	9 ft.
3 in. and larger	10 ft.	10 ft.

1. Cast iron: 5 ft. maximum spacing (10 ft. spacing permitted where 10 ft. pipe lengths are installed) behind every hub, at branch connections, and at each change of direction.
2. Plastic: Locate and space in accordance with the Manufacturer's recommendations. (4 ft. maximum spacing on plastic soil and vent piping.)

J. Support piping near elbows, such that the total cantilevered length for both sides of the elbow does not exceed 3 ft.

K. Support piping at pumps and equipment from floor, structure, or walls, so that piping weight is not supported by pumps or by equipment.

L. Vertical Stacks: Rest vertical storm and waste stacks firmly on masonry footings and support them firmly at each floor.

M. Structural Steel: Verify size required with the Structural Engineer.

N. Insulated Piping Hangers:
   1. Adjust pipe hangers and hanger rods to proper elevation in a plumb position before pipe insulation is installed.
   2. Hanger size shall be sufficient to accommodate pipe and insulation without compressing the insulation. Size hangers for outer diameter of insulation so that hangers pass freely around the insulation.
   3. Install 12 in. long, 18-gauge half-round shields inside clevis pipe hangers at all hangers (regardless of size). Verify method to be used.
   4. Install insulating saddles of non-compressible insulation with a continuous vapor barrier on pipes 2 in. and larger during the period that the insulation is being applied.
   5. Do not apply insulation to piping until insulation shields and saddles are in place at each pipe hanger.

O. **Option:** Trapeze hangers may be used where parallel runs of pipe occur.

P. Vertical Piping Hangers:
   1. Support vertical risers at the floor with friction riser pipe clamps.
   2. Shorten legs to conceal riser clamp within pipe chase and still provide adequate support.

Q. Hanger Clamps:
   1. **DO NOT USE C-CLAMPS WITHOUT RETAINING CLIPS ON PIPING 1-1/2 IN. AND LARGER.**
   2. Beam Clamps: Use top flange beam clamps to avoid burning metal deck.

R. Metal Fabrication:
   1. Fit connections together to form hairline joints.
   2. Field-weld connections that cannot be shop-welded because of shipping size, space limitations, and field conditions.
   3. When field-welding, comply with AWS D1.1 procedures for shielded metal arc welding, appearance and quality of welds, and methods used in correcting welding work.

S. Roofs:
   1. Roof integrity and warranty shall be preserved.
   2. Coordinate installation of supports and roof penetrations.
   3. Provide pipe supports for piping installed on roof under Plumbing Work.
   4. Seal all penetrations through roof.
   5. Coordinate with the Lead Contractor **BEFORE** cutting.

T. Ceilings:
   1. Do **NOT** support piping from ceiling and ceiling grid systems.
   2. Piping, and each ceiling and ceiling grid system, shall be a separate installation. Independently support each from the building structure.
   3. Where interferences occur, in order to support piping, install trapeze-type hangers or supports. Locate them where they do not interfere with access to valves and other plumbing equipment items.

U. Re-Use of Existing Piping Hangers:
   1. **Option:** Piping hangers may be reused; however, all components shall meet the same requirements as specified for new piping hangers.
   2. Test existing piping hangers before re-use. Piping hangers shall withstand a drop test using a 25-pound weight dropped from 2 ft.

V. Painting:
1. Touch-up:
a. Clean field welds, bolted connections, and abraded areas of all shop paint.
b. Paint exposed areas immediately after erecting hangers and supports.
c. Use same paint materials as used for shop painting.
d. Apply paint by brush or spray to provide a minimum dry film thickness of 2.0 mils.
2. Galvanized surfaces: Clean and apply galvanizing repair paint to comply with ASTM A780.

3.2 INSTALLATION — SPRING HANGERS FOR PIPING

A. Install on inlet and outlet piping of new pumps.

3.3 INSTALLATION — TRAPEZE HANGERS FOR PIPING

A. Design support system. Provide support capacity, support spacing, trapeze hanger rod diameter, and quantity to support total piping load.
1. All rods on trapeze hangers shall be 1/2 in. minimum.
2. Clamp each pipe individually.
3. Provide individual U-bolt clamps for insulated pipes.
4. Clamp size shall accommodate insulation and shield.
5. Provide individual piping attachment to each strut channel hanger, angle, or channel.

B. Obtain approval of a Structural Engineer licensed in Ohio. Submit details to the A/E for approval.

3.4 INSTALLATION — INSERTS

A. Avoid cutting concrete or masonry by using inserts.

B. Refer to the Manufacturer’s recommendations for correct selection as to piping size and loading.

C. Confirm with the Lead Contractor that the concrete used is of a sufficient strength to hold the insert.

D. Provide the correct size and type of inserts, along with information on their correct location, to the Lead Contractor, so as not to delay construction.

E. Masonry Construction with Voids: Install appropriately sized all-thread rods within a 2-component polyester resin adhesive used in conjunction with a galvanized metal screen. Install rods in holes drilled with carbide-tipped drill bits.

F. New Poured Concrete: Before pouring, the Contractor shall provide inserts (when used or required) for its Work to the Lead Contractor, who shall install where directed by the Contractor.

G. Existing Poured Concrete Installations: Provide insert-type expansion shield anchors with pull-out and shear capacities appropriate for loads to be supported. Install anchors in holes drilled with carbide-tipped drill bits.

END OF SECTION 22 05 29

SECTION 22 05 53

IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 DESCRIPTION

A. Identify the following plumbing items by labels, tags, or stencils:
   1. New equipment:
      a. Domestic water heaters, domestic hot water recirculating pump, control cabinets, and similar items.
      b. All shock absorbers, whether accessible or not.
      c. Trap primers, including description of what floor drains are served.
   2. New piping:
      a. Exposed in equipment rooms, accessible service areas, or accessible chases.
      b. Running above accessible ceiling construction.
   3. All new valves, including control valves.
      a. **Exception:** Valves or stops serving only (1) fixture need not be tagged.
   4. New valves located above an accessible ceiling: Every location of a shut-off valve, etc.

B. Do **NOT** use "Dymo" or similar tape type labels.

1.2 QUALITY ASSURANCE

A. Standards:
   1. American National Standards Institute / American Society of Mechanical Engineers (ANSI/ASME):
      a. ANSI/ASME A13.1, "Scheme for the Identification of Piping Systems."
      b. ANSI Z535.1, "Safety Color Code."
   2. Occupational Safety and Health Administration (OSHA).

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Seton, Brady, Emedco, or MSI.

2.2 EQUIPMENT IDENTIFICATION

A. Label: Aluminum, brass, laminated multi-color rigid plastic, or stainless steel, with holes for attachment to equipment.
   1. Size: Sufficient for text, minimum 2-1/2 in. wide by 3/4 in. high.
   2. Text characters: Engraved or stamped. Equipment tag text characters sized for normal viewing distance, minimum 1/4 in. high, maximum 3/4 in. high. Equipment specification number text characters approximately 3/4 size of tag characters.
   3. For laminated plastic labels, match background and character colors in system identification schedules in Part 3. If exact matches are not available, match background colors from schedules, and provide character colors in contrasting white on black.

2.3 PIPING IDENTIFICATION

A. Labels: Preprinted, color-coded plastic, with text characters indicating pipe service and arrows indicating flow direction. Include pressure rating where applicable.
   1. Pre-tensioned: Pre-coiled and semi-rigid label formed to cover full circumference of pipe (including insulation and jacket) and to adhere to pipe without fasteners or adhesives.
   2. Self-adhesive: Flexible label long enough to cover full circumference of pipe (including insulation and jacket) with permanent contact adhesive backing.

2.4 VALVE IDENTIFICATION

A. Tags: Aluminum, brass, laminated multi-color rigid plastic, or stainless steel, with hole for attachment to valve.
   1. Size: Minimum 2 in. diameter round or 1-1/2 in. square.
   2. Text characters: Engraved or stamped. 1/4 in. high indicating pipe service and 1/2 in. high indicating valve number.
   3. Fasteners: Metal bead chain, metal "S" hook, or nylon tie.

B. Location Identification for Valves Located above Accessible Ceilings: Multi-color, pressure-sensitive-adhesive labels, or pressure-sensitive-adhesive valve tag.

2.5 STENCILS

A. Card stock or metal pre-cut stencil with equipment tag, or piping service and flow direction arrow.

B. Paint: Exterior grade, gloss alkyd enamel. Colors in accordance with schedules listed in Part 3.

PART 3 - EXECUTION

3.1 PREPARATION

A. Clean surfaces of substances which could impair bond of identification device adhesive, where applicable.

3.2 COORDINATION

A. Coordinate to ensure that the identification used by all Trades is uniform in type, style, and appearance.

B. Equipment: Coordinate the exact nomenclature to be used on labels with the Owner and A/E.

C. Piping: Coordinate with the Owner regarding piping identification system. If piping identification system does not exist, refer to Identification Schedule.

D. Valves: Coordinate with the Owner regarding valve numbering system. If valve-tagging system does not exist, refer to Identification Schedule.

E. Valves Located above Accessible Ceilings: Coordinate with the Owner regarding color-coded valve location identification system. If color-coded valve system does not exist, refer to Identification Schedule.

F. Coordinate label, tag, and fastener materials with expected conditions. Do not use plastic materials in locations where expected temperatures are outside of the Manufacturer's recommended limits.

3.3 INSTALLATION

A. Equipment:
1. Provide a label for each equipment item that has a unique tag. Do not provide a label if multiple items of equipment have the same tag.
2. Locate equipment label where it will be accessible and visible when project is complete. For equipment that is installed exposed in finished space, locate tag in an accessible concealed location, such as behind an access door.
3. Attach label with stainless steel screws.
   a. **Exception:** Use compatible adhesive where screws might damage equipment.

B. Piping:
1. Apply piping identification only after any finish painting is completed.
2. Provide labels for piping at **MAXIMUM 25 FT.** intervals.
3. Identify piping at connections to equipment, at valves, at branches from main, and at each riser.
4. Where a pipe passes through a wall, label the pipe where it enters and exits the wall.
5. **Option:** Stencils may be used instead of manufactured labels. Apply stencil over background, in colors indicated. When paint is dry, provide a clear coat finish over stencil. Stencils shall be legible from a standing position.

C. Valves:
1. Provide a unique tag on each valve. Tags shall be stamped with service designation and numbered consecutively for each service. Attach tags to valves in such a manner that valve shall be operable without removing or damaging tag. Tags shall be readable from a standing position when valve is in normal position. Add valve tag numbers to As-Built Drawings.
2. Valves located above accessible ceilings:
   a. In addition to attaching identification on the equipment, attach equipment location identification to the accessible ceiling grid at the point of equipment access.
   b. Apply pressure-sensitive adhesive labels or tags to a clean, dry surface.
3. Prepare a valve tag directory with charts showing locations, designations, and sizes of valves. Laminate under plastic and mount as directed by the A/E. Include additional copies of valve charts in the Operating and Maintenance Manuals.

3.4 PIPING IDENTIFICATION SCHEDULE

A. Text character size shall be as follows:

Overall Pipe/Insulation Size	**Minimum Character Height**
Up to 1-1/4 in. diameter	1/2 in. high
1-1/2 in. to 2 in. diameter	3/4 in. high
2-1/2 in. to 6 in. diameter	1-1/4 in. high

B. Identify piping as follows:

Type of Service	**Background Color**	**Character Color**	**Designation**
Domestic Cold Water Supply	Green	White	DCW
Domestic Hot Water Supply (120 degrees F.)	Yellow	Black	DHW-120
Domestic Hot Water Return (120 degrees F.)	Yellow	Black	DHWR-120
Sanitary	Green	White	SAN

Type of Service	Background Color	Character Color	Designation
Sanitary Vent	Yellow	Black	V

3.5 VALVE IDENTIFICATION SCHEDULE

A. Identify valves as follows:

Type of Service	Valve Tag Designation
Domestic Cold Water Supply	DCW
Domestic Hot Water Supply (120 degrees F.)	DHW-120
Domestic Hot Water Return (120 degrees F.)	DHWR-120

END OF SECTION 22 05 53

SECTION 22 07 00

PLUMBING INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Section 22 05 29, “Hangers and Supports for Plumbing Piping and Equipment.”

1.2 DESCRIPTION

A. Provide insulation for new work.

B. Provide insulation for existing piping presently uninsulated.

C. Insulate the following items:
   1. Piping:
      a. Domestic cold-water supply, regardless of length or location.
      b. Domestic hot-water supply, regardless of length or location.
      c. Domestic hot-water return, regardless of length or location.
      d. Domestic water supply and drain piping under all lavatories and sink fixtures, including non-ADA fixtures, that could come in contact with wheelchair occupants.
      e. Each above-ground drain that receives cold water wastes to a point where it connects to the main drain.
      f. Electric water cooler waste traps and piping to wall.
      g. **Note:** Insulation is not required on for limited area sprinkler piping.

1.3 TERMINOLOGY

A. “Concealed” insulation: Either embedded in masonry or other construction, or installed above ceilings, below floor slab, behind wall furring, in trenches or tunnels, or within chases, soffits, walls, double partitions, or crawl spaces.

B. “Exposed” insulation: In full or partial view; not “Concealed” as defined above.

C. Abbreviations:
   1. All-service jacket (ASJ).
   2. Chlorofluorocarbons (CFCs).
   3. Foil/scrim/kraft (FSK).
   4. Hydrochlorofluorocarbons (HCFCs).
   5. Polyvinyl chloride (PVC).
   6. Polyvinylidene chloride (PVDC).
   7. Volatile organic compounds (VOCs).

1.4 QUALITY ASSURANCE

A. Standards:
   1. American Society of Heating, Refrigerating, and Air Conditioning Engineers (ASHRAE) 90.1, Current Enforced Edition, “Energy Standard for Buildings Except Low-Rise Residential Buildings.”
   2. American Society for Testing and Materials (ASTM).
   3. Americans with Disabilities Act (ADA).
   4. International Association of Plumbing and Mechanical Officials (IAPMO).

5. International Code Council, Inc. (ICC):
   a. International Building Code (IBC).
   b. International Energy Conservation Code (IECC), Current Edition.
6. Underwriters Laboratories, Inc. (UL), including UL 723/ASTM E84, "Test for Surface Burning Characteristics of Building Materials."
7. Code of Federal Regulations (CFR) Title 40, "Protection of Environment," Part 59, "National Volatile Organic Compound Emission Standards for Consumer and Commercial Products," Subpart D, "National Volatile Organic Compound Emission Standards for Architectural Coatings."
8. U.S. Environmental Protection Agency (EPA).
9. U.S. Military Standards (MIL).
10. State of Ohio: Ohio Administrative Code (OAC):
    a. OAC 4101:1: Ohio Building Code, including OAC 4101:1-13, Energy Efficiency.
    b. OAC 4101:2: Ohio Mechanical Code.
    c. OAC 4101:3: Ohio Plumbing Code.
    d. Ohio Existing Building Code.

B. Insulation shall be in accordance with IECC and OAC 4101:2.
   1. Pipe insulation thickness shall comply with ASHRAE 90.1 "Minimum Pipe Insulation Thickness" Table.
   2. Water heater insulation R-value shall comply with ASHRAE 90.1.
   3. Storage tank insulation shall provide a maximum allowable heat loss of 15 BTUH per sq. ft. of tank surface.

C. Fire and Smoke Hazard Ratings: Insulation and related components, such as coverings, coatings, tapes, and cloths, shall not exceed 25 Flame Spread, 50 Smoke Developed, and 50 Fuel Contributed on above ground insulation, according to UL 723/ASTM E84.

D. Installation shall be done by Tradesmen specializing in insulation work in strict accordance with Manufacturer's recommendations.

PART 2 - PRODUCTS

2.1 MANUFACTURERS AND MODEL NUMBERS

A. Manufacturer and Model Number listed below shall be considered to be the Design Base Manufacturer and Model Number.

B. Other Acceptable Manufacturers will be permitted, unless specifically excluded.

2.2 PIPING INSULATION

A. Insulation for Above-Ground Piping:
   1. Indoor: Owens Corning Fiberglas 25 ASJ/SSL/II. 1-piece, heavy-duty, fiberglass insulation with all-purpose vapor barrier jacket of white kraft bonded to aluminum foil and reinforced with fiberglass yarn, longitudinal pressure-sensitive tape for sealing of lap joint, 0 degrees F. to 800 degrees F. temperature rating. **Thermal conductivity:** 0.22 to 0.28 BTU per hour per inch thickness per cubic foot per degrees F.
      a. Insulation dimensions:
         1) Domestic cold water, make-up water, well water, electric water cooler waste trap, and trap primer drain piping:
            a) 1 in. and smaller: 1/2 in. thick minimum, 6 in. long.

b) 1-1/4 in. to 10 in.: 1 in. thick minimum, 6 in. long.
c) 12 in. and larger: 1 in. thick minimum, 9 in. long.
d) **Option:** 3/4 in. thick fire-rated Armaflex may be used in walls (not in chases).

2) Domestic hot water and domestic hot water recirculating piping:
a) 2 in. and smaller: 1 in. thick minimum, 6 in. long.
b) 2-1/2 in. to 6 in.: 1-1/2 in. thick minimum, 6 in. long.
c) 8 in. and larger: 1-1/2 in. thick minimum, 9 in. long.

3) Above-ground drains, floor drains with trap primers, and storm piping: 1 in. thick, minimum.

b. Acceptable Manufacturers: Owens Corning Fiberglas or approved equal by Armacell, CertainTeed Corp., Imcoa, Johns-Manville, Knauf, Manson, or Rubatex.

2. In-wall piping: Armacell fire-rated "Armaflex." Closed cell, foamed plastic, tubular, 1/2 in. minimum wall thickness, fire-rated, 220 degrees F. temperature rating. Pipe and joints shall be sealed with Manufacturer's approved adhesive.
a. Acceptable Manufacturers: Armacell or approved equal by K-Flex, Kaiflex, Aeroflex, Imcoa, Rubatex, Owens Corning, Johns Manville, Knauf, or Manson.
b. **Option:** Indoor pipe insulation, listed in Paragraph A. 1. above, may be used in walls.

3. Domestic hot water piping insulation shall provide a maximum allowable heat loss of 35 BTUH per sq. ft. of pipe surface area for above-ground piping.

B. Wall-Mounted Lavatory Trap / Supply Enclosures: Truebro Lav-Shield Model #2018-AS-L. High-impact, stain-resistant, molded PVC, single-piece construction, china white, with stainless steel vandal-resistant fasteners. Encloses all supply and drain piping, and electronic faucet equipment.
1. Acceptable Manufacturers: Truebro or approved equal by Brocar, McQuire, or Plumberex.

C. Pipe Fittings Insulation: Owens Corning TIW-1. Wrapped 1 lb. density fiberglass blanket with reinforced foil and kraft vapor barrier facing or molded fiberglass segments with pre-molded, 1-piece PVC covers. Wrapped fiberglass blanket shall be installed to same thickness as pipe insulation.
1. Acceptable Manufacturers: Owens Corning or approved equal by Armacell, CertainTeed Corp., Imcoa, Johns-Manville, Knauf, Manson, or Rubatex.

D. Pipe Fittings Insulation Covers: Pre-molded, 1-piece PVC covers, with maximum 25 Flame Spread and 50 Smoke Developed ratings. Shall be listed and certified for installation in ceiling plenum spaces.
1. Acceptable Manufacturers: Ceelco, Johns-Manville, Knauf, Proto, Speedline, or Zeston.

E. PVC Jacket over Piping Insulation: Ceelco 25/50. UL-approved 1-piece molded PVC jacket covers, solvent weld joints, minimum 20 mil thickness. UV-resistant for outdoor applications.
1. Acceptable Manufacturers: Ceelco or approved equal by Johns-Manville, Knauf, Proto, Speedline, or Zeston.

2.3 MASTICS, ADHESIVES, SEALANTS, AND FINISHES

A. Acceptable Manufacturers: Aerobol, Benjamin-Foster, ICC, or Vimasco.

B. Mastics, adhesives, sealants, and finishes shall be approved for their intended use by the Insulation Manufacturers.

C. Do **NOT** use vegetable or wheat paste.

D. Materials Free of HCFCs, CFCs, VOCs, etc.
   1. Mastics: Materials shall be compatible with insulation materials, jackets, and substrates. Comply with MIL-C-19565C, Type II. For indoor applications, use mastics with an acceptable VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
   2. Adhesives:
      a. Calcium silicate: Fibrous, sodium-silicate-based adhesive with a service temperature range of 50 degrees F. to 800 degrees F. For indoor applications, use adhesive with a VOC content of 80 grams/liter or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
      b. Cellular-glass, phenolic, polyisocyanurate, and polystyrene: Solvent-based resin adhesive, with a service temperature range of -75 degrees F. to +300 degrees F. For indoor applications, use adhesive with a VOC content of 50 grams/liter or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
      c. Flexible elastomeric and polyolefin: Comply with MIL-A-24179A, Type II, Class I. For indoor applications, use adhesive with a VOC content of 50 grams/liter or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24)
      d. Mineral-fiber: Comply with MIL-A-3316C, Class 2, Grade A. For indoor applications, use adhesive with a VOC content of 80 grams/liter or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
      e. ASJ adhesive, and FSK and PVDC jacket adhesive: Comply with MIL-A-3316C, Class 2, Grade A for bonding insulation jacket lap seams and joints. For indoor applications, use adhesive with a VOC content of 50 grams/liter or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
      f. PVC jacket adhesive: Compatible with PVC jacket. For indoor applications, use adhesive with a VOC content of 50 grams/liter or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
   3. Lagging Adhesives: Comply with MIL-A-3316C Class I, Grade A. Shall be compatible with insulation materials, jackets, and substrates. For indoor applications, use lagging adhesives with an acceptable VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
   4. Sealants:
      a. Joint sealants for polystyrene products: For indoor applications, use sealants with a VOC content of 250 grams/liter or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
      b. FSK and metal jacket flashing sealants: For indoor applications, use sealants with a VOC content of 250 grams/liter or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
      c. ASJ flashing sealants, and vinyl, PVDC, and PVC jacket flashing sealants: For indoor applications, use sealants with a VOC content of 250 grams/liter or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

PART 3 - EXECUTION

3.1 DELIVERY, STORAGE, AND HANDLING

A. Protection: Leave insulation boxed and stored until time for use. Elevate and cover material to avoid moisture contamination and physical abuse.

3.2 INSTALLATION — PIPING INSULATION

A. Coordinate installation of insulation with pressure testing of piping. Piping shall be pressure-tested and accepted before piping insulation is installed.

B. Complete installation of insulation and sealing shall be in strict accordance with the Manufacturer's recommendations.

C. Do not use damaged or water-soaked insulation.

D. Maintain continuity of all insulation. No voids in insulation or vapor barrier will be permitted.

E. Insulation shall be continuous through sleeves and hangers and through walls where no sleeves are required.

F. Make application on clean, dry pipes, with all joints butted firmly together.

G. Leave no "raw" ends on insulation. Bevel insulation terminations, seal with insulating cement or mastic, and cover ends same as pipe insulation covering.
   1. **Option:** In lieu of beveling, use PVC caps over straight-cut ends that have been vapor-sealed.

H. Insulation of Pipe Hangers and Supports:
   1. Insulate any pipe hanger, hanger rod, or pipe support that has direct contact with any hot or cold piping or any item that is subject to sweating.
   2. Set all hangers perpendicular to the axis of the piping before any insulation is applied. Do not apply insulation until insulation saddles are in place.
   3. Install insulating saddles of non-compressible insulation with a continuous vapor barrier on pipes 2 in. and larger.
   4. Install pipe insulating support at all hangers (regardless of size), unless insulating-type hangers are used. Verify method to be used.
   5. Refer to Section 22 05 29 for additional information on pipe hangers, insulation shields, insulating saddles, and pipe insulating support.

I. Where piping is installed above the ceiling, and below ceiling insulation, ensure that ceiling insulation has no insulation voids above piping.

J. Insulate piping where concealed in walls or chases.

K. Insulate piping located in walls with 1/2 in. thick fire-rated foam insulation or indoor pipe insulation.

L. All exposed insulated piping and fittings, from floor up to 7 ft.-6 in. above floor, shall have a PVC cover applied over pipe insulation and solvent welded together. Material shall be same as PVC fitting covers.

M. Exposed insulation shall be finished smooth, sized if required, and left ready for painting.

N. Attach labels to all piping insulation every 50 ft. stating "NON-ASBESTOS CONTAINING."

O. Contractor shall replace all damaged insulation at its own expense.

P. Water pipes of differing temperatures shall be insulated individually and not bundled together.

3.3 INSTALLATION — PIPE FITTINGS INSULATION

A. Insulate valves for all services, unless otherwise noted. Insulate all couplings. During bidding, the Contractor shall verify the extent of these connections and shall prepare its bid accordingly.

B. Insulation of Fittings:
1. Insulate fittings with factory-formed mitered sections of pipe insulation or 1 lb. density fiberglass blanket insulation wrapped under compression to full thickness of the pipe insulation.
2. Secure mitered sections and blanket insulation with double wrapping of tape over the entire fitting.
3. Apply vapor barrier mastic on concealed fittings to maintain vapor barrier.
4. Cover with molded PVC cover.

C. Insulation of Unions:
1. Do not cover unions initially.
2. Bevel insulation and apply cement to ends.
3. Then add insulation over these items, so that it can be removed without disturbing adjacent pipe insulation.
4. Cover with molded PVC cover.

D. Insulation of Fittings, Unions, and Valve Bonnets:
1. Wrap with oversized pipe insulation to provide the same insulation thickness as pipe insulation.
2. Use oversized insulation sections to form a collar between the (2) insulation sections with blanket insulation used to fill the gaps.

E. Where insulation terminates, taper insulation down to the pipe surface complete with jacket.

F. **PATCH ALL EXISTING INSULATION THAT IS DISTURBED DURING ANY ALTERATION WORK.**

G. PVC Jacket: In addition to insulation jacketing and fitting covers specified above, install PVC jacket over all exposed insulation below 7 ft.-6 in. above floor. Jacket shall have overlapping joints and shall be sealed with suitable adhesive. Butt joints shall be sealed with matching 3 in. wide ASJ pressure-sensitive tape.

END OF SECTION 22 07 00

SECTION 22 10 00

PLUMBING PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Section 22 05 23, “General-Duty Valves for Plumbing Piping.”

B. Section 22 05 29, “Hangers and Supports for Plumbing Piping and Equipment.”

C. Section 22 05 53, “Identification for Plumbing Piping and Equipment.”

D. Section 22 07 00, “Plumbing Insulation.”

E. Section 22 11 16, “Domestic Water Piping.”

F. Section 22 11 19, “Domestic Water Piping Specialties.”

G. Section 22 13 00, “Facility Sanitary Sewerage.”

1.2 DESCRIPTION

A. Provide piping and fittings as shown or required to completely install all plumbing systems on this Project, including the following:
   1. Domestic water piping system. Refer also to Section 22 11 16. For specialties, refer to Section 22 11 19
   2. Sanitary sewer piping system. Refer also to Section 22 13 00.
   3. Storm sewer piping system. Refer also to Section 22 14 00.
   4. Compressed air piping system. Refer also to Section 22 15 00.

B. Valves: Refer to Section 22 05 23 and to the Drawings.

1.3 QUALITY ASSURANCE

A. Standards:
   1. American National Standards Institute (ANSI).
   2. American Society for Testing and Materials (ASTM):
      a. ASTM B88, “Standard Specification for Seamless Copper Water Tube.”
      b. ASTM E84.
      c. ASTM B32/NSF 61.
   3. American Society of Mechanical Engineers (ASME):
      a. ASME/ANSI B31.1, “Code for Power Piping.”
      b. ASME Boiler and Pressure Vessel Code, Section IX, “Welding and Brazing Qualifications.”
   4. American Welding Society (AWS).
   5. National Sanitation Foundation (NSF).
   6. National Fire Protection Association (NFPA): 2023 NFPA 70, “National Electrical Code® (NEC),” Articles 110 and 408.
   7. Underwriters Laboratories, Inc. (UL).
   8. Ohio Administrative Code (OAC) 4101:1:
      a. OAC 4101:1: 2024 Ohio Building Code.
      b. OAC 4101:3: 2024 Ohio Plumbing Code.

PART 2 - PRODUCTS

2.1 PIPING AND FITTINGS

A. Cast Iron Threaded or Flanged Fittings: 125 lb. SWP or 250 lb. SWP (ANSI B16.4 and ANSI B16.1).

B. Malleable Iron Threaded Fittings: 150 lb. SWP or 300 lb. SWP (ANSI B16.3).

C. Ductile iron grooved fittings (ASTM A536, Grade 65-45-12).

D. Factory-made wrought steel, butt-weld fittings (ANSI B16.9).

E. Butt-welding ends for pipe, valves, flanges, and fittings (ANSI B16.25).

F. Steel pipe flanges and flanged fittings (ANSI B16.5).

G. Forged steel fittings, socket-welded and threaded (ANSI B16.11).

H. Wrought copper and bronze solder-joint pressure fittings (ANSI B16.22).
   1. **Option:** "T-drill" mechanically formed tee connections, brazed joints.

I. Nipples: Same weight and material as connected pipe, except shoulder nipples shall be extra-heavy. Do not use short nipples.

2.2 JOINTS, UNIONS, AND CONNECTIONS

A. Threaded Piping Joints:
   1. National Pipe Thread (NPT) taper, general purpose (ASME B1.20.1).
   2. TFE tape, applied to male thread only.
   3. **Option:** Thread compounds by Permatex.

B. Filler Materials:
   1. Solder: ASTM B32 alloy Sn94 and Sn95. 95/5 tin-antimony, Grade 95.
      a. Acceptable Manufacturers: Engelhard, J. W. Harris, or Oatey.
   2. Brazing: AWS A5.8. Classification BCUP-3 or BCUP-4.

C. Copper Pipe Unions: Cast bronze, Class 150, ground joint, solder end. Do **NOT** use wrought copper unions.
   1. Acceptable Manufacturers: Chase, Crane, Dart, Epco, Flagg, Mueller, Nibco, or Rockwell.

D. Steel Pipe Unions: Black malleable iron, Class 250, bronze ground ball joint.
   1. Acceptable Manufacturers: Chase, Crane, Epco, Fairbanks, Grinnell, Mueller, or Stockham.

E. Dielectric Unions: Metal union with dissimilar materials electrically separated by gasket. Union materials, end connections, and pressure rating compatible with piping materials, system fluid, system pressures, and system temperatures.
   1. Acceptable Manufacturers: Capitol, Dart, Epco, Vogt, or Watts.

F. Bolts and Other Hardware:
   1. Bolts for steel, cast iron, brass, and bronze, for 250 PSI working pressure and for 450 degrees F. or below: ASME B18.2.1 carbon steel bolts, with American Standard regular, square heads. ASME B18.2.2 American Standard heavy-hexagon, semi-finished nuts. ASME B16.22.1 plain washers and ASME B18.21.1 lock washers.
      a. **Option:** ASME B18.2.1 tee-head, high-tensile steel bolts and nuts may be used in mechanical joint pipelines.

2.3 ROLL GROOVED COUPLINGS AND FITTINGS:

A. Acceptable Manufacturers: Victaulic Co., Anvil International "Gruvlok", or Tyco Grinnell.

B. Rigid couplings with 300 PSI pressure rating and 180 degrees F. temperature rating:
1. Victaulic Style 607 (slant bolt pad) with bolt pads metal-to-metal.
2. Tyco-Grinnell Figure 672 with even-gap bolt pads.
3. Anvil-Gruvlok Figure 6400 with even-gap bolt pads.
4. **Option:** Grooved couplings may be installed on 2 in. to 8 in. roll grooved standard weight pipe.

C. Install copper tubing in accordance with Coupling Manufacturer's instructions.

D. Pre-lubricated, EPDM gasket, Grade EHP material, rated for maximum 250 degrees F. Gaskets used on potable water systems shall be UL-classified in accordance with ANSI/NSF 61.
1. Gruvlok gaskets NSF 61 approved **ONLY** for cold water, up to 86 degrees F., and shall be lubricated, inside and out, with Gruvlok Xtreme Lubricant in any copper application.

E. **DO NOT USE ANY OTHER TYPE OF ROLL GROOVED COUPLINGS.**

F. **Option for branch:** Installing Contractor may use a ductile iron bolted branch outlet with locating collar, Grade E pressure-responsive gasket seal, and carbon steel bolts and nuts.

G. Grooved valves and accessories are acceptable.

2.4 PIPE BOOTS

A. Acceptable Manufacturers: PortalsPlus or approved equal by Pate.

B. PortalsPlus "Quadraseal" or "Pipe Boot." Molded 1/16 in. thick minimum EPDM pipe boot, ozone-resistant, ultraviolet-resistant, with 3 in. base flange, conically shaped, watertight, fully compatible with roof construction.

C. Shingled Roofs: Oatey, Dektite, or Gibraltar Building Products.

2.5 ROOFING MEMBRANE SEALANT

A. Pourable Sealant: Carlisle.

PART 3 - EXECUTION

3.1 INSTALLATION

A. These installation instructions apply to all piping systems, including domestic water, sanitary sewer, storm sewer, and compressed air, except where otherwise noted.

B. Coordinate pipe elevations and final locations with existing conditions and the work of all other Contractors before installation.

C. Provide information on chases, sleeves, and openings required for Plumbing Work to other Contractors.

D. All piping materials and installation shall comply with State and Local Building Code requirements.

E. Provide all fittings and accessories required to complete the installation.

F. Personnel Passages and Exit Paths: Do not install piping where it will impede personnel using exit paths.

G. Structural Members: Do not install piping where it will interfere with structural members. Do not cut structural members for piping installation without written approval from the Structural Engineer.

H. Equipment, Such as Cranes: Do not install piping where it will interfere with equipment operation.

I. Roofs:
   1. Coordinate penetration sizes and locations, sleeves, and weatherproofing.

J. Protect non-ferrous metallic piping from contact with steel framing members, concrete, masonry, and corrosive soil via pipe sleeves or plastic sheathing.
   1. Furnish pipe boots and flashing. Lead Contractor shall provide piping penetrations through roof and install pipe boots and flashing. Lead Contractor shall provide copper pitch box filled with roofing membrane sealant and secured to roof deck. Install piping. Lead Contractor shall "roof in," making watertight after piping is in place.
   2. Provide weather-tight curb cap if piping cannot be put in place immediately.
   3. Piping subject to freezing may be installed in unheated ceiling spaces below roofs only where specifically shown immediately above the ceiling of a heated space and with building insulation closely packed above the piping to protect it from freezing. Ensure that vulnerable piping is protected against freezing.

K. Walls:
   1. Coordinate penetration locations, sleeves, and weatherproofing (where applicable).
   2. For masonry unit walls, locate piping penetrations at masonry joints where feasible.
   3. Do not install piping containing fluids subject to freezing in exterior walls, regardless of wall insulation location. Where unavoidable, obtain prior approval of the A/E, and install piping so that the wall insulation is between the pipe and the outside wall.

L. Doors: Do not install piping where it will restrict access to or operation of doors.

M. Windows: Do not install piping in front of windows or where it will restrict access to or operation of windows.

N. Floors:
   1. Coordinate penetration locations, sleeves, and weatherproofing (where applicable).
   2. 3 in. high concrete curbs shall be provided around pipe sleeves where pipes penetrate floors in kitchens, utility rooms, equipment rooms, shafts, or other areas potentially subject to flooding. Refer to Section 22 05 29 regarding concrete work.

O. Access Doors or Panels: Do not install piping where it will restrict access to or operation of doors or panels.

P. All piping installed exposed in mechanical closets (at water heaters, for example) shall comply with ASTM E84 flame spread/smoke developed requirements for plenum-rated piping.

Q. Pipe Chases or Pipe Spaces. Where feasible, install piping near walls and either near floor or at least 6 ft. above floor to maximize access.

R. Piping, Conduit, Cable Trays, and Wiring: Coordinate all runs. Group runs to minimize space usage and maximize access.

S. Plumbing Fixtures and Equipment: Do not install piping where it will restrict access to or operation of fixtures or equipment.

T. HVAC Ductwork: Do not penetrate ductwork with piping without written approval of A/E (unless the Drawings specifically indicate the penetration).

U. HVAC Equipment: Do not install piping where it will restrict access to or operation of equipment.

V. Electrical Equipment:
   1. Do not install piping in an electrical equipment room unless it specifically serves that room.
   2. Do not install piping above, within 36 in. of front of, or in the immediate vicinity of, electrical panels, electrical switchgear, or other electrical equipment, as described in 2017 NEC Articles 110 and 408.
      a. If compliance with these requirements is not possible, obtain approval in writing from the AHJ and A/E to provide a sheet metal drip pan under the piping to prevent water and condensation from running or dripping onto electrical items. Provide drip pan at no additional cost to the Owner.

W. Luminaires: Do not install piping across, in front of, or directly below luminaires.

X. Interferences: If any system piping is placed where it causes or contributes to interference, relocate it. Obtain instructions from the A/E. The A/E's decision shall be final in regard to the arrangement of equipment, ductwork, piping, etc. Contractor causing the conflict shall assume all costs and responsibilities resulting from improper coordination of work for the corrective work of all Contractors.

3.2 PIPING LAYOUT

A. The Drawings are schematic and are not intended to precisely show piping locations.

B. Arrange all piping in accordance with the best standards of the Trade.

C. Install piping in a neat and workmanlike manner. Install horizontal piping parallel or perpendicular to building lines, unless indicated otherwise. Install vertical piping plumb, unless indicated otherwise.

D. Securely support piping from structure with approved hangers, rods, anchors, guides, brackets, and accessories.
   1. Support piping in accordance with the Manufacturer's recommendations.
   2. Where multiple piping services run parallel to each other in the same area, trapeze hangers may be used for racking the pipes.
   3. Independently support piping from building structural members. Do not support piping from ceilings, ducts, other pipes, cable trays, conduit, wiring, etc.
   4. Refer to Section 22 05 29.

E. Install piping systems with adequate provisions for expansion, contraction, vibration, and prevention of stresses on valves and equipment.

F. Adjust locations and provide additional offsets, drains, and air vents needed to properly install piping system without interferences.

G. Exercise due and particular caution to determine that all parts of the work are quickly and easily accessible.

H. Where special conditions are encountered in field, the A/E shall decide arrangement and alignment of piping.

I. Changes in Piping Direction:
   1. Make changes in piping direction with fittings. Do not bend or spring piping.

2. Offset or reroute piping to resolve interferences that develop in the field.
3. Provide offsets for the proper operation of the system.
4. Offset piping around columns, beams, and other obstructions.
5. Offset vents immediately above connection to waste piping.

J. Conceal pipes, except in equipment rooms, in rooms without ceilings, or where specifically indicated otherwise.

K. Install unions and valves in accessible locations. Use removable ceiling pads or provide access panels in ceilings, walls, and floors for service access. Coordinate installation of access panels.

L. Keep piping level, except where a slope is required.

M. Slope piping to drainage points with minimum slope of 1 in. in 40 ft. (0.2%).

N. Sanitary and vent lines shall be continuously sloped.

O. Avoid trapping piping.

P. Do not trap drain piping except at equipment connections.

Q. Do **NOT** trap sanitary and vent lines.

R. Make reductions in piping lines with reducing couplings or weld fitting reducers.

S. For horizontal piping, use eccentric reducer to keep top of pipe level.

T. For vertical piping, use concentric reducer to keep pipe plumb.

U. For horizontal piping, connect branches at or above centerlines of mains.

V. **DO NOT USE BULLHEAD CONNECTIONS IN ANY PIPING SERVICE.**

W. If equipment connection size is smaller than branch piping to connection, make reduction at equipment connection point. Do not reduce size of branch piping.

X. Valves:
1. Refer to Section 22 05 23 for valve requirements.

Y. Insulation:
1. Install pipes, valves, fittings, etc., requiring insulation with a minimum of 1/2 in. clearance between the finished covering and other work and between the finished coverings of parallel, adjacent pipes.
2. Refer to Section 22 07 00 for additional insulation requirements.

Z. Provide piping identification. Refer to Section 22 05 53.

3.3 PIPING AND FITTINGS FABRICATION

A. Cut pipe accurately, and work into place without forcing or springing.

B. Clean piping components of loose material.

C. Protect all piping, fittings, and valves from excessive tool marks.

D. Joints, Unions, and Connections:
1. Ream pipe or tubing ends and remove burrs to full inside diameter after cutting.
2. Threaded connections:
   a. Threads shall conform to ASME B1.20.1.
   b. Provide union adjacent to each threaded valve (unless union is integral to valve body).

3. Soldered or brazed connections:
   a. Soldering and brazing work shall comply with ASME/ANSI B31.1.
   b. Mating surfaces of joint shall be smooth and clean.
   c. 100% lead-free solder shall be used on water piping, joints, and fittings.
   d. Open valves fully before soldering. Protect or remove parts of valves and specialties subject to deterioration by heat.
4. Dissimilar material connections:
   a. Install dielectric connectors at all connections of:
      1) Copper and ferrous metal piping.
      2) Copper piping and equipment having ferrous metal connection.
   b. Isolate direct contact between pipe, fittings, valves, flanges, and hangers of dissimilar metal by use of dielectric unions, shims, gaskets, coatings, or other approved methods.
   c. Use dielectric gaskets where joining dissimilar piping material.

E. Grooved Connections:
1. A factory-trained representative of the Coupling Manufacturer shall provide on-site training for the Contractor's field personnel in the use of grooving tools, application of groove, and installation of grooved joint products.
   a. The Manufacturer's Representative shall periodically visit the job site and review installation.
   b. Provide documentation of the site visits by the Manufacturer's Representative in the Operating and Maintenance Manuals.
   c. Include verification of proper gasket lubricants, uniform gap spacing of couplings, proper torque requirements, and notation of any installation deficiencies.
2. Grooved Piping Installing Contractor shall have prior experience installing at least (5) grooved mechanical piping systems.
3. Install grooved joint couplings, gaskets, and fittings in accordance with the Coupling Manufacturer's written installation instructions.
4. Each grooved pipe end shall be clean and free from indentations, projections, and roll marks in the area from pipe end to groove and on both sides of groove.
5. Provide elastomer gasket suitable for the intended service. The Coupling Manufacturer shall produce gasket.
6. Verify and use the Coupling Manufacturer's recommended gasket lubricants, including any specific lubricants to enhance the temperature rating of the coupling. Lubricate gasket both inside and out where required by the Coupling Manufacturer. Submit lubricant data prior to installation and provide proof that the lubricant is being used on the job site.
7. Alternate tightening bolts until properly torqued in accordance with the Coupling Manufacturer's specifications.
8. If the Coupling Manufacturer specifies torque requirements for its fittings, test random couplings, at the A/E's discretion, to verify that proper torque requirements were achieved during installation.
9. Verify that there are no bolt pad gaps on metal-to-metal type couplings, or that equal gaps are maintained on both sides of the coupling, in accordance with the Coupling Manufacturer's written installation instructions.
10. Remove and replace any joints deemed improperly installed.

F. Escutcheons:
1. Where exposed pipes pass through walls, floors, or ceilings of finished rooms, provide chrome-plated escutcheons.

a. **Option:** Prime-coated steel or rough brass escutcheons may be provided in unfinished rooms.

2. Protect escutcheons from tool marks.

G. At the end of each day's work, cap or plug open ends in installed piping for protection.

3.4 INSTALLATION — PIPE BOOTS

A. Coordinate all locations and sizes of roof penetrations for the Plumbing Work.

B. Furnish pipe boots and flashing for all piping penetrations through roof.

C. Lead Contractor shall install pipe boots and flashing.

D. Lead Contractor shall make watertight.

END OF SECTION 22 10 00

SECTION 22 11 16

DOMESTIC WATER PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Section 22 05 23, “General-Duty Valves for Plumbing Piping.”

B. Section 22 05 29, “Hangers and Supports for Plumbing Piping Equipment.”

C. Section 22 07 00, “Plumbing Insulation.”

D. Section 22 10 00, “Plumbing Piping.”

E. Section 22 11 19, “Domestic Water Piping Specialties.”

F. Section 22 40 00, “Plumbing Fixtures.”

1.2 DESCRIPTION

A. Provide a complete system of domestic hot- and cold-water supply and hot-water return piping to new fixtures.

B. Test and sterilize complete system.

1.3 TERMINOLOGY

A. Abbreviations:
1. Volatile organic compounds (VOCs).

1.4 QUALITY ASSURANCE

A. Standards:
1. American National Standards Institute (ANSI).
2. American Society for Testing and Materials (ASTM) E184, “Fire Tests of Through Penetration.”
3. American Society of Mechanical Engineers (ASME).
4. American Water Works Association (AWWA).
5. American Welding Society (AWS).
6. California Department of Health Services (CDHS), “Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers.”
7. CSA Group (formerly the Canadian Standards Association).
8. Factory Mutual Global (FMG).
9. National Sanitation Foundation (NSF).
10. Plumbing and Drainage Institute (PDI).
11. Underwriters Laboratories, Inc. (UL).
12. U.S. Environmental Protection Agency (EPA).
13. Code of Federal Regulations (CFR) Title 40, “Protection of Environment,” Part 59, “National Volatile Organic Compound Emission Standards for Consumer and Commercial Products,” Subpart D, “National Volatile Organic Compound Emission Standards for Architectural Coatings.”
14. State and Local Building Code requirements.
15. Local Water Department.

PART 2 - PRODUCTS

2.1 PIPING AND FITTINGS

A. Above-Ground:
1. Type "L" hard drawn copper tubing with wrought or forged copper solder fittings (ASTM B88).
a. **Option:** "T-Drill" mechanically formed connections and brazed joints, if approved by the Owner.
b. **Option:** Copper press fittings, if approved by the Owner. Copper press fittings shall conform to the material and sizing requirements of ASME B16.18 or B16.22. O-rings for copper press fittings shall be of EPDM construction.
1) Acceptable Manufacturers: Viega "ProPress," NIBCO Inc. "Press System," or Aalberts Integrated Piping Systems "Apollo Press."
c. **Option:** In lieu of copper piping:
1) 1 in. and smaller: PEX tubing, PEX tube fittings, and crimped joints.
2) 2 in. and smaller: CPVC Schedule 40 pipe, CPVC Schedule 40 socket fittings, and solvent-cemented joints.
3) 2-1/2 in. to 4 in: CPVC, Schedule 80 pipe, CPVC Schedule 80 socket fittings, and solvent-cemented joints.
d. **Option:** Lines 2-1/2 in. and larger: Galvanized steel piping (ASTM A53CW) with 150 lb. galvanized malleable iron threaded or flanged fittings.
2. CPVC piping (ASTM Class 23447 and ASTM D2486, ASTM F441, ASTM F442): CPVC SDR 11 Series, listed for hot and cold domestic water piping. Piping shall be manufactured from Type IV, Grade I CPVC compound with a cell classification of 23447 (CPVC4120) per ASTM D1784. Piping shall be manufactured per ASTM D2846 at an ISO 9001 certified facility. Piping shall carry NSF approval for potable water applications. Pressure ratings shall be based on 180 degree F. water temperature.
a. Acceptable Manufacturer: Harvel "HydroKing."

B. For Replacement in Inaccessible Existing Walls: Type "K" soft copper piping (ASTM B88), wrought or forged copper fittings, and brazed joints.

2.2 SOLDER AND BRAZING ALLOYS

A. Solder: 95-5 tin-antimony, lead free.
1. Acceptable Manufacturers and Models: Engelhard "Silvabrite 100," J.W. Harris Co. "Bridgit," or Oatey.

B. Copper Brazing Alloys. Silver/phosphorous or silver/zinc alloys having a melting point greater than 1,000 degrees F. (ANSI B31.1 and AWS A58).
1. Acceptable Manufacturers and Models: Handy Harman Sil-Fos, Airco Welding Products Aircosil, Harris Products Group Stay-Silv, or ESAB All-State.

2.3 STERILIZATION SOLUTION

A. Acceptable Hypochlorite Manufacturers: H.T.H., Perclorn, or Pittchlor.

B. 400 minimum to 1,000 maximum parts per million chlorine solution made from a sanitation grade of hypochlorite, 70% available chlorine.

PART 3 - EXECUTION

3.1 COORDINATION

A. Coordinate location, size, and depth of site water service line entrance into building with the Lead Contractor, Water Utility Company, equipment, and doors.

B. Coordinate location of water meter and remote reader with the A/E, Water Utility Company, equipment, and doors.

C. Coordinate location and size of existing water service line connection.

D. Coordinate shut-down time for water service connection(s) with the Lead Contractor, A/E, and Owner.

E. Coordinate location of rough-in and final connections to equipment with the Lead Contractor, A/E, and Owner.

F. Coordinate installation height of faucets with the A/E.

3.2 INSTALLATION

A. Refer to Section 22 10 00 for general piping installation instructions.

B. Install piping in such a manner as to allow complete drainage of the domestic water piping system, toward the source. Provide rigid support for drain piping. If other means of draining are not provided, install drain valves at all low points.

C. Domestic Hot Water Recirculating System:
1. Install, extending to within 10 ft. of the end of each branch or main (whether shown or not).
2. Balance to provide an adequate flow from each branch.
3. Provide balancing valves and shut-off valves at each branch.

D. Valves (refer to Section 22 05 23): Install shut-off valves at an accessible height:
1. On hot and cold water on each branch serving more than (1) fixture.
2. On each domestic hot water return line.
3. On each long run off of a main line.
4. Where shown on the Drawings.

E. Except where shown or specified otherwise, install new piping generally in same location as removed piping, using existing piping hangers where possible. Refer to Section 22 05 29 regarding re-use of hangers.

F. Install copper press fittings in accordance with the Fitting Manufacturer’s written instructions using Fitting Manufacturer’s approved tools.

G. Joint Construction:
1. Dissimilar-material piping joints: Make joints using adapters compatible with materials of both piping systems.

H. Solder and Brazing: Certify that solder and brazing used for entire piping system are lead-free.

3.3 DOMESTIC WATER PIPING CLEANING, TESTING, AND STERILIZATION

A. Perform all tests and inspections before backfilling, insulating, covering, or concealing any piping.

B. If new piping connects to existing, install shut-off valves to isolate new piping from existing piping.

C. After water piping is complete and fixtures have been installed, flush piping clean.

D. Flush out all new water piping systems before connection to existing system and before systems are placed in operation.

E. Clean out and flush all new water piping systems in accordance with AHJ requirements to remove dirt, grease, and loose materials from pipes and equipment.

F. Provide a temporary inline pump if necessary.

G. Clean strainers after each flushing until they remain clean.

H. Perform tests in accordance with AHJ requirements. Tests shall be witnessed by the A/E.

I. Take precautions to remove all air before performing hydrostatic tests.

J. Test piping at 125 PSIG for (6) hours with no pressure drop.

K. Isolate existing piping as much as possible during test.

L. If a leak occurs, replace the defective piece or joint with new materials at no cost to the Owner. No caulking will be permitted. Repeat test until no leaks occur.

M. Contractor shall pay all fees for testing and use of testing equipment.

N. Sterilization of the system may be performed at same time the pressure test is conducted.

O. Sterilize complete domestic water system, including site domestic water service line, beginning at curb valve.

P. Isolate new work from existing water piping as much as possible; however, sterilize all new branches from existing system.

Q. Sterilize all new domestic hot- and cold-water supply and hot-water return piping, as shown on the Drawings.

R. Sterilization shall be done under the immediate on-the-job supervision of a Water Testing Laboratory regularly engaged in the service.

S. With all outlets closed, fill system to working pressure and close valve on supply main.

T. Open all fixtures slightly and pump sterilization solution into test tap.

U. In order to add sterilization solution into the domestic water piping system:
   1. Provide 3/4 in. valved branches on domestic water system at point of entry into building, just past main backflow preventer.
   2. Provide 3/4 in. valved branches at the beginning of each new branch.

V. Each outlet, hot and cold, shall be tested during fill to prove the presence of chlorine at that outlet. Chlorine shall be present at all outlets.

W. Water piping system shall remain filled for a period of (24) hours and each outlet shall be again tested and shall have at least 100 parts per million of chlorine remaining.

X. Upon completion of sterilizing, all outlets shall be opened wide and the main supply valves shall be opened, flushing system free of chlorine. Check outlets again and flush until free of chlorine. Flush main valves and entire building domestic water system. Coordinate with the A/E and Owner.

Y. If new piping connects to existing, open valves to connect new piping to existing piping. Coordinate flushing of existing building domestic water lines with the Owner after sterilization of new domestic water lines.

Z. After final flushing, remove, clean, and replace all electric water cooler inlet strainers and all faucet aerators. Clean strainer screens and sediment pockets prior to putting lines in service.

AA. Provide the A/E with a "Certificate of Completion of Chlorination" after chlorination is completed.

BB. Disposal of Chemical Solutions: Dispose of all chemicals in accordance with local AHJ requirements. Coordinate with the AHJ.

END OF SECTION 22 11 16

SECTION 22 11 19

DOMESTIC WATER PIPING SPECIALTIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Section 22 05 00.78, “Closeout Submittals for Plumbing.”

B. Section 22 05 29, “Hangers and Supports for Plumbing Piping and Equipment.”

C. Section 22 10 00, “Plumbing Piping.”

1.2 DESCRIPTION

A. Provide plumbing piping specialties or accessories as shown or required to complete the installation of all plumbing systems installed on this Project.
   1. Shock absorbers.
   2. Thermostatic mixing valves (TMVs).

B. All products of the same type shall be by the same Manufacturer.

1.3 QUALITY ASSURANCE

A. Standards:
   1. American National Standards Institute (ANSI).
   2. American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE) 188.
   3. American Society of Mechanical Engineers (ASME).
   4. American Society of Sanitary Engineering (ASSE).
   5. Factory Mutual Global (FMG).
   6. Food and Drug Administration (FDA).
   7. Plumbing and Drainage Institute (PDI).
   8. Underwriters Laboratories, Inc. (UL).
   9. U.S. Public Health Service.

PART 2 - PRODUCTS

2.1 SHOCK ABSORBERS

A. Acceptable Manufacturers: WADE (McWane Inc.) or approved equal by Josam, Jay R. Smith Mfg. Co.®, MIFAB Inc., Precision Plumbing Products, Sioux Chief, Watts, or Zurn Industries LLC.

B. WADE “Shokstops.” (ASSE Standard 1010, PDI-WH201) shock absorbers (water hammer arrestors). Sizes as shown on the Drawings.
   1. SA-A: 3/4 in. pipe. ([1] to [11] fixture units.)
   2. SA-B: 1 in. pipe. ([12] to [32] fixture units.)
   3. SA-C: 1 in. pipe. ([33] to [60] fixture units.)

2.2 THERMOSTATIC MIXING VALVES

A. TMV-1, for single fixture, outlet temperature 109 degrees F. hot water: Bradley “Navigator,” Model S59-4000A (ASSE 1070). Water temperature-limiting device, lead-free body, vandal-resistant adjustment, adjustable temperature setpoint within fixed range,

and mounting bracket. Maximum flow 4.5 GPM at 15 PSI pressure drop. Upon failure, unit shall fail safe.

1. Acceptable Manufacturers: Bradley Corp. or approved equal by Lawler Manufacturing Company, Powers (Watts), Symmons, Watts, or Zurn Wilkins.

PART 3 - EXECUTION

3.1 INSTALLATION — SHOCK ABSORBERS

A. Locate where shown on the Drawings, according to PDI Standard WH-201. Size as shown on the Drawings.

B. Install at the end of each main or branch, unless otherwise noted.

3.2 INSTALLATION — THERMOSTATIC MIXING VALVES

A. Install TMVs so as to be easily accessible, and at a maximum of 9 ft. above the floor.

B. Provide TMV assembly and piping.

C. Connect piping according to Manufacturer's requirements.

D. After installation, flush water supply line to remove debris.

E. Set domestic hot water outlet TMV temperature for 109 degrees F.

END OF SECTION 22 11 19

SECTION 22 13 00

FACILITY SANITARY SEWERAGE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Section 22 05 29, “Hangers and Supports for Plumbing Piping and Equipment.”

B. Section 22 05 76, “Facility Drainage Piping Cleanouts.”

C. Section 22 10 00, “Plumbing Piping.”

D. Section 22 13 23, “Sanitary Waste Interceptors.”

E. Section 22 14 29, “Sump Pumps.”

F. Section 22 40 00, “Plumbing Fixtures.”

G. Section 22 66 00, “Chemical-Waste Systems for Laboratory and Healthcare Facilities.”

H. Refer to Drawings for Fixture and Equipment Branch Size Connection Schedule.

1.2 DESCRIPTION

A. Connect to existing building sanitary drain system where shown on the Drawings.

B. Provide a complete system of interior soil, waste, and vent piping to fixtures including the following items:
   1. Cleanouts.
   2. Vents.

C. Test complete system.

1.3 TERMINOLOGY

A. Abbreviations:
   1. Acrylonitrile Butadiene Styrene (ABS).
   2. Drain, waste, and vent (DWV).
   3. Polyvinyl chloride (PVC).
   4. Volatile organic compounds (VOCs).

1.4 QUALITY ASSURANCE

A. Standards:
   1. American National Standards Institute (ANSI).
   2. American Society for Testing and Materials (ASTM).
   3. American Society of Mechanical Engineers (ASME)
   4. American Society of Sanitary Engineers (ASSE).
   5. Cast Iron Soil Pipe Institute (CISPI).
   6. Factory Mutual Global (FMG).
   7. International Code Council, Inc. (ICC): International Plumbing Code (IPC).
   8. National Sanitation Foundation (NSF).
   9. Code of Federal Regulations (CFR) Title 40, “Protection of Environment,” Part 59, “National Volatile Organic Compound Emission Standards for Consumer and Commercial Products,” Subpart D, “National Volatile Organic Compound Emission Standards for Architectural Coatings.”

10. U.S. Environmental Protection Agency (EPA).
11. Ohio Administrative Code (OAC):
    a. OAC 3701: Health Code, Current Edition.
    b. OAC 4101:1: 2024 Ohio Building Code.
    c. OAC 4101:3: 2024 Ohio Plumbing Code.

B. All pipe and fittings shall conform to the requirements of ASTM A74.

C. All piping materials and installation shall comply with State and Local Building Code requirements.

1.5 SUBMITTALS

A. Floor Drains: Each floor drain grate that has a load rating shall have an ANSI load rating indicated on shop drawings. If rating is not indicated on shop drawings, they will be rejected.

PART 2 - PRODUCTS

2.1 PIPING AND FITTINGS

A. Manufacturer and Model Number listed below shall be considered to be the Design Base Manufacturer and Model Number. Other Acceptable Manufacturers will be permitted, unless specifically excluded.

B. Acceptable Manufacturers:
1. Cast iron: American Cast Iron, Clow, Griffin, MWI, Tyler Pipe, or U.S. Pipe & Foundry.
2. Copper: American Brass Co., Chase Brass Co., Nibco, or Revere.
3. ABS or PVC plastic: Charlotte, Crestline, Nibco, or Yardley.
4. Steel: Armco, Republic, or Wheeling.

C. Interior above-grade sanitary waste and vent piping and fittings:
1. Service weight, single hub cast iron (ASTM A74), factory-coated with coal tar enamel.
2. Hubless cast iron (CISPI 301, ASTM A888), factory-coated with coal tar enamel.
3. Steel pipe, 2-1/2 in. and smaller (ASTM A53): Type E or S, Grade A or B, Schedule 40, galvanized.
4. Copper DWV tube, 4 in. and smaller (ASTM B306): Type L drainage tube, drawn temper.
5. PVC Schedule 40 solid wall pipe according to ASTM D 1784, D 1785, and D 2665. PVC DWV fittings conforming to ASTM D 1784 and D 2665.

D. All fittings shall be compatible with piping for size, material, and joint type.

E. Joints:
1. Cast iron:
    a. ASTM A 74 / ASTM C 564 Neoprene molded gasket for sealing hub and spigot cast iron fittings; service-weight or extra-heavy pipe fittings, as appropriate.
    b. Compression-type plastic seal (ASTM C-564).
    c. Joints in hubless cast iron pipe:
        1) Sizes 1-1/2 in. to 10 in.: Coupling approved to FMG 1680 Class 1 and marked with the logo.
            a) Sizes 1-1/2 in. to 4 in.: Clamp-All Model #80.

b) Sizes 5 in. to 10 in.: Clamp-All Model #125.
c) Acceptable Manufacturer: Clamp-All Corporation.

2) Sizes 1-1/2 in. to 2 in., where exposure to head pressure cannot exceed 10 ft., coupling approved to CISPI 310.
a) Acceptable Manufacturers: Anaco, Charlotte, Jones, or Tyler.

2. Copper: Cast (ASTM B16.23) or wrought (ASTM B16.29) copper drainage fittings with solder joints.
3. Galvanized steel: Threaded, galvanized cast iron drainage fittings.
4. ABS or PVC plastic: Solvents and cements as recommended by the Manufacturer.

2.2 SOLVENT CEMENTS AND ADHESIVE PRIMERS

A. For ABS Pipe and Fittings:
1. Use ABS solvent cement with a VOC content of 325 grams/liter or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
2. Use adhesive primer with a VOC content of 550 grams/liter or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

B. For Joining PVC Piping: ASTM D2564. Include primer according to ASTM F656.
1. Use PVC solvent cement with a VOC content of 510 grams/liter or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
2. Use adhesive primer with a VOC content of 550 grams/liter or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.3 VENTS — CAPS

A. Acceptable Manufacturers: MIFAB Inc. or approved equal by Jay R. Smith Mfg. Co.®, Josam, Stoneman,WADE (McWane Inc., or Zurn Industries LLC.

B. MIFAB #R1930. Cast iron with set screws, vandal-resistant.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine the areas and the conditions under which interior sanitary piping system work is to be installed. Notify the A/E and Owner of conditions detrimental to the proper and timely completion of the Work.

B. Do not proceed with the Work until unsatisfactory conditions have been corrected and interior sanitary piping location and depth have been established.

C. The location of existing interior sanitary piping shown on the Drawings was determined from available construction records and should be considered approximate.

D. Contractor shall determine the exact location of any existing pipe to which it shall make connections, or which it may disturb during earth-moving operations, or which may be affected in any way by its work.

3.2 INSTALLATION — PIPING AND FITTINGS

A. Coordinate location, size, and depth of existing site sanitary sewer with the Lead Contractor.

B. Coordinate location, elevation, and installation of standpipes with the equipment, concrete pads, Lead Contractor, and A/E.

C. Coordinate location and depth of building sanitary drain installation with the building foundation and the Lead Contractor.

D. Refer to Section 22 10 00 for general piping installation instructions.

E. Sanitary lines shall be continuously sloped.
   1. Pitch soil and waste piping in direction of flow at not less than 1/8 in./ft. and not more than 1/4 in./ft.
   2. Pitch pipes 2 in. and smaller at 1/4 in./ft.

F. Do **NOT** provide "dead-end" sanitary branches longer than 2 ft.-0 in.

G. Make all connections and changes in direction of the sanitary drainage system with approved drainage fittings.
   1. Fittings shall not have ledges or shoulders capable of obstructing piping flow.
   2. Install fittings to guide waste in the direction of flow.
   3. For lavatory waste drainage fittings, provide sanitary tee branch or combination wye and 1/8 bend for single fixture.
   4. For back-to-back lavatory waste, provide sanitary cross or combination wye and 1/8 bend, double size.

H. Plastic Piping: Do not install plastic piping:
   1. Where it may be vulnerable to physical damage.
   2. Where run exposed.
   3. Where run exposed below joist level.
   4. Where run exposed below 8 ft. above floor.
   5. In ceiling spaces used for return air plenums. Refer to Architectural and HVAC Drawings for the location of these areas.
   6. On waste lines capable of receiving discharge from a boiler, water heater, or other piece of equipment operating above 140 degrees F., for a distance of 25 ft. downstream of the discharge point.

I. Connect to existing sanitary drains with "No-Hub" fittings and "No-Hub" stainless steel bands.

J. Conceal all piping, unless indicated otherwise on the Drawings.

K. Cleaning and Testing:
   1. After erection, and prior to putting in service, blow or flush lines free of loose materials.
   2. Prior to the completion of work, "power jet" all sanitary mains and branches.
   3. Perform tests in accordance with AHJ requirements. Tests shall be witnessed by the A/E's Representative.
   4. Isolate existing system as much as possible during test.
   5. For a minimum test, plug piping at the lowest point and fill with water to highest point on roof to provide a minimum of 10 ft. hd. of water on all parts of the system.
      a. Maintain for (1) hour with no leakage. If a leak occurs, replace the defective piece or joint with new materials at no cost to the Owner.
      b. Repair any deficiencies.
      c. Conduct final test with smoke or peppermint at 1 in. W.G. for (15) minutes.
      d. Repeat tests until no leaks occur.
      e. Install gaskets or reset fixtures.

3.3 INSTALLATION — VENTS

A. Coordinate location of vent penetrations through roof with the HVAC Work, Lead Contractor, and A/E.

B. Pitch all vents for proper drainage.

C. All exposed vent piping shall be galvanized steel.

D. Connect to existing vents where shown on Drawings.

A. Install vents through roof as follows:
   1. 3 in. minimum size.
   2. Locate at least 8 ft. away from outside wall of building and 20 ft. away from outside air intakes or operable windows.
   3. Offset vent piping below roof to allow for thermal expansion and contraction of roof. Minimum of 4 ft. offset.
   4. Vents shall extend a minimum of 12 in. above roof, except where specifically required to be higher by Code.
   5. Roofs: Refer to Section 22 10 00 for additional requirements regarding roofs.
      a. Built-up roof: Vent flashing shall extend at least 12 in. from vent pipe, clamp between built-up roofing, and extend up, over, and turn down inside vent pipe.
      b. Single membrane roofs: Install vent through vent pipe boot.
   6. Provide vandal-resistant vent caps on roof vent outlets.

END OF SECTION 22 13 00

SECTION 22 14 29

SUMP PUMPS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Section 22 05 29, “Hangers and Supports for Plumbing Piping and Equipment.”

B. Section 22 13 00, “Facility Sanitary Sewerage.”

C. Section 22 14 00, “Facility Storm Drainage.”

1.2 DESCRIPTION

A. Provide sump pump and basin complete with controls in a pit at the bottom of the elevator shaft.

1.3 RATINGS AND CAPACITIES

A. Pump Operating Point Requirements: The operating point of each pump at the conditions shown shall be within (5) percentage points of the maximum efficiency on its impeller curve. The impeller furnished shall not exceed 90% of the cut water diameter available for the pump casing furnished. The impeller curve shall be continuously rising throughout the range contained within its efficiency curves. The peak of the impeller curve shall be a minimum of 10% above the total head shown on the Drawings. The pump shall not overload the motor at any point on the impeller curve.

B. Motors: Unless otherwise noted, high-efficiency motors shall be NEMA Design B, continuous rated with 1.15 service factor, with Class F insulation and Class B temperature rise, copper windings and leads, 1,750 RPM with the horsepower indicated on the Drawings. All motors shall be equipped with ball bearings.

C. Refer to Drawings for gallons per minute, suction and discharge pressures, feet of head, horsepower, and electrical requirements. Each pump shall be rated for 65% of total design flow.

1.4 QUALITY ASSURANCE

A. Standards:
1. National Electrical Manufacturers Association (NEMA).
2. Underwriters Laboratories, Inc., (UL) Label.
3. Installation shall comply with all State and Local Code requirements.

B. Each pump and drive unit shall be performance-tested at the factory at design conditions. The system shall be hydrostatically tested. The entire assembly shall be painted after shop testing.

1.5 SUBMITTALS

A. Shop drawings and pump curves shall indicate materials, size, revolutions per minute, gallons per minute, feet of head, efficiency, and brake horsepower at the design conditions. Provide wiring diagrams.

PART 2 - PRODUCTS

2.1 SUMP PUMPS

A. P-1: Liberty Pumps Model 283. 50 GPM, 10 ft. hd., permanently sealed ball bearing, 3,450 RPM, 1/2 HP, 120 volts, 1-phase, centrifugal type, cast iron casing, dynamically balanced cast iron impeller, stainless steel shaft, automatic thermal overloads, piggyback float switch controls, length of power cord as required, 1-1/2 in. discharge. Provide (1) pump in basin.
   1. Other Acceptable Manufacturers: Approved equal by Liberty, Zoeller, Weinman, Weil Pump, or Crane/Barnes.

2.2 PUMP CONTROL PANEL

A. Acceptable Manufacturer: Anchor Scientific.

B. Anchor Scientific Model 4201-AC. Wall-mounted NEMA 12 enclosure with individual pump circuit breakers, individual double pole, definite purpose contactors rated at 1 HP, terminals for sensors, pumps, incoming power and grounding lugs, individual HAND/OFF/AUTO selector switches, individual pump running lights, lead pump indicating light, alternating pump relay, panel door-mounted red light, and 4 in. horn and test/silencing push-button.
   1. Float switches: (4) pump discharge-mounted, normally open mercury float switches, shall extend to electrical receptacle. Functions:
      a. OFF.
      b. LEAD PUMP ON.
      c. LAG PUMP ON.
      d. HIGH WATER ALARM.
   2. Provide engraved signs on panel door:
      a. “HIGH WATER ALARM HORN” (top of horn).
      b. “PUSH TO SILENCE” (next to silence push-button).

C. Remote High-Water Alarm Panel: Anchor Scientific Model 1100-1: Wall-mounted high-water alarm panel with red light, 4 in. horn, and test/silencing switch. Provide engraved sign for “STORM SUMP HIGH WATER ALARM” on enclosure.

2.3 FLOAT CONTROLS

A. Basin-cover-mounted, NEMA 4 automatic alternating type with float switch, rod, and float. Provide (4) float level controls:
   1. OFF.
   2. DUTY PUMP ON.
   3. STANDBY PUMP ON.
   4. HIGH WATER ALARM, with NEMA 1 terminal.

B. Extend control wiring through cover plate.

2.4 SUMP BASIN

A. 30 in. diameter x 6 ft.-0 in. deep fiberglass basin with below grade inlet, below grade outlet, and below grade control wiring openings. Gasketed and bolted nonslip steel cover.

B. Cover: Zurn Model Z-784-2W. Light-duty grating, 24 in. x 24 in., with slot and grommet for power cord.
   1. Acceptable Manufacturer: Zurn Industries LLC.

PART 3 - EXECUTION

3.1 INSTALLATION — SUMP PUMPS

A. Coordinate location of each sump pump with the elevator equipment, HVAC Work, Electrical Work, and Lead Contractor.

B. Install sump pumps on 8 in. solid concrete blocks, where shown on the Drawings, in accordance with the Manufacturer's recommendations. Refer to Section 22 05 29 regarding concrete work.

C. Sump pump discharge piping shall be galvanized steel, to a point of connection to the large gravity line.

D. Arrange piping and provide unions so that the pump can be easily removed.

E. Install a union, nonslam check valve, and ball valve in each pump discharge piping.

F. Adjust sump pump level switches.

G. Simplex Clear Water Sump Pump:
   1. Extend sump pump discharge line up on elevator shaft wall, through exterior wall, and to splash block as shown on the Drawings.
   2. Lead Contractor shall provide sump pit in bottom of elevator shaft.
   3. Electrical Contractor shall provide waterproof receptacle for elevator sump pump.

H. Test sump pumps and controls by filling basin with water and operating through all modes of operation.

3.2 INSTALLATION — PUMP CONTROL PANEL

A. Coordinate location of control panel with the equipment, HVAC Work, Electrical Work, and Lead Contractor.

B. Install control panel where shown on the Drawings in accordance with the Manufacturer's recommendations.

C. Install top of control panel at 6 ft.-0 in. above finished floor.

D. Furnish remote high-water alarm panel.

E. Provide in-panel relay for remote high-water alarm.

F. Electrical Contractor shall:
   1. Install remote high-water alarm panel.
   2. Wire water level switches to control panel and high-water alarm panel.
   3. Provide waterproof male and female plugs.

3.3 INSTALLATION — FLOAT CONTROLS

A. Install float controls in accordance with the Manufacturer's recommendations.

3.4 INSTALLATION — SUMP BASIN

A. Coordinate location of each sump basin with the elevator equipment, HVAC Work, Electrical Work, and Lead Contractor.

B. Refer to the Drawings for locations of inlet and outlet openings.

C. Install sump basin where shown on the Drawings in accordance with the Manufacturer's recommendations.

D. Coordinate the pouring of a minimum of 6 in. of concrete around the sump basin with the Lead Contractor. Refer to Section 22 05 29 regarding concrete work.

E. Vent the top portion of the basin.

F. Install sump basin cover and frame.

G. Secure sump basin cover so that it is absolutely airtight and flush with finished floor.

3.5 WIRING

A. Coordinate electrical requirements with the Electrical Work.

B. Electrical Contractor shall provide:
   1. Wiring to the pumps, control panel, and remote high-water alarm.
   2. Power wiring.
   3. Receptacle

END OF SECTION 22 14 29

SECTION 22 40 00

PLUMBING FIXTURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Section 22 07 00, “Plumbing Insulation.”

B. Section 22 11 16, “Domestic Water Piping.”

C. Section 22 11 19, “Domestic Water Piping Specialties.”

D. Section 22 13 00, “Facility Sanitary Sewerage.”

1.2 DESCRIPTION

A. Provide commercial-quality, defect-free, plumbing fixtures, with vandal-resistant carriers, handles, aerators, nuts, and bolts; supports; water supply and waste piping; trim including escutcheons; fittings; angle stop valves; and all accessories required for a complete installation, as shown on the Drawings.
   1. Water closets.
   2. Urinals.
   3. Lavatories.
   4. Sinks.
   5. Plumbing fixture controls:
      a. Flushometers.
      b. Automatic flush valve circuit timers.
      c. Automatic urinal flush valve sensor system.
      d. Transformers.
   6. Water coolers.

B. Color Selections: The A/E shall approve all color selections for plumbing equipment, including fixtures, faucets, and trim. Plumbing fixtures shall be white in color, unless otherwise noted. Refer to the Plumbing Fixture Schedule on the Drawings.

C. All exposed trim, piping, and metal parts shall be nonferrous and chrome-plated, unless otherwise noted.

D. Fixture connection sizes are shown on Drawings.

E. Faucets shall have ceramic disc valve cartridges.

F. Carriers:
   1. All carriers shall be specifically chosen to accommodate the particular brand and style of fixture actually installed, the particular type of floor and wall actually present at each fixture location, and the piping arrangement at each fixture. Furnish plastic or metal positioning frames to isolate carrier bolts from wall construction.
   2. Provide a heavy-duty, rectangular vertical support, floor-supported, commercial type fixture carrier for each wall-mounted plumbing fixture, unless noted otherwise.

1.3 QUALITY ASSURANCE

A. Standards:
   1. American National Standards Institute (ANSI).

2. American Society for Testing and Materials (ASTM).
3. American Society of Mechanical Engineers (ASME)
4. American Society of Sanitary Engineering (ASSE).
5. Americans with Disabilities Act (ADA) Accessibility Guidelines.
6. Architectural Barriers Act (ABA) Accessibility Guidelines.
7. Federal Energy Policy Act of 1992.
8. International Association of Plumbing and Mechanical Officials (IAPMO).
9. International Cast Polymer Alliance (ICPA).
10. International Code Council, Inc. (ICC) A117.1, "Accessible and Usable Buildings and Facilities."
11. National Electrical Manufacturers Association (NEMA).
12. National Sanitation Foundation (NSF).
13. Plumbing and Drainage Institute (PDI).
14. Underwriters Laboratories, Inc. (UL).
15. State of Ohio Administrative Code (OAC):
    a. OAC 4101:1, 2024 Ohio Building Code: OAC 4101:1-13, Energy Efficiency.
    b. OAC 4101:3: 2024 Ohio Plumbing Code.
16. Local Plumbing and Energy Codes.

1.4 SUBMITTALS

A. Submit Manufacturer's product data for all products specified in this Section and shown on the Drawings.

B. Each shop drawing submittal shall be clearly marked with model number and fixture designation number and shall indicate all required accessories, dimensions, construction, color, and rough-in requirements.

C. Submit color charts for all fixtures, faucets, and trim (minimum [3] color options).

D. Product Data: Documentation indicating flow and water consumption requirements.

PART 2 - PRODUCTS

2.1 PLUMBING FIXTURES AND ACCESSORIES

A. Manufacturer and Model Number listed in the Plumbing Fixture Schedule on the Plumbing Drawings shall be considered to be the Design Base Manufacturer and Model Number. Other Acceptable Manufacturers listed herein will be permitted, unless specifically excluded.

B. Refer to the Plumbing Fixture Schedule for the Manufacturer, Model, description, and location tags.

2.2 WATER CLOSETS

A. All water closets shall comply with the Federal Energy Policy Act of 1992 and shall have 1.6 gallons/flush maximum.

B. Water closet flush valve handle shall be left-handed operation, unless required to be right-handed operation to be ADA-compliant.

C. All water closet bowls for public or employee toilet facilities shall be of the elongated type.

D. Acceptable Manufacturers:
1. Vitreous china fixtures: American Standard, Crane, Gerber, Kohler, Toto, or Zurn Industries LLC.

2. Water closet seats: Bemis, Beneke, Centoco, Church, Kohler, Olsonite, or Sperzel.

3. Flush valves (with vandal-resistant stop), AC-powered, non-diaphragm, piston-operated: American Standard, Hydrotek, or Moen.
4. Supplies, escutcheons, and traps: Anso-Flex, Brasscraft, Bridgeport, Consolidated, Dearborn, EBC, Frost, McGuire Mfg. Co., Sanitary-Dash, Speedway, Waterway, or Zurn Industries LLC.
5. Carriers:
   a. Zurn Model Z1203 (side outlet) or Z1204 (bottom outlet). Floor-supported, with buttress foot and foot anchor, rear foot support, flush valve supply support, cast iron, commercial type. Coordinate location of carrier closely with the A/E.
   b. Acceptable Manufacturers: Zurn Industries LLC or approved equal by Jay R. Smith Mfg. Co.®, Josam, MIFAB Inc., or WADE (McWane Inc.).

2.3 URINALS

A. All urinals shall comply with the Federal Energy Policy Act of 1992 and shall have 1.0 gallon/flush maximum.

B. Urinal flush valve manual override button shall be left-handed operation.

C. Acceptable Manufacturers:
1. Vitreous china fixtures: American Standard, Crane, Gerber, Kohler, or Zurn Industries LLC.
2. Flush valves (with vandal-resistant stop), AC-powered or battery-powered, non-diaphragm, piston-operated: American Standard, Hydrotek, Moen, Toto, or Zurn Industries LLC.
3. Supplies, escutcheons, and traps: Anso-Flex, Brasscraft, Bridgeport, Consolidated, Dearborn, EBC, Frost, McGuire Mfg. Co., Sanitary-Dash, Speedway, Waterway, or Zurn Industries LLC.
4. Carriers: Heavy-duty type Zurn Industries LLC Model Z1222 or approved equal by Jay R. Smith Mfg. Co.®, Josam, MIFAB Inc., or WADE (McWane Inc.).

2.4 LAVATORIES

A. Acceptable Manufacturers:
1. Vitreous china fixtures: American Standard, Crane, Gerber, Kohler, or Zurn Industries LLC.
2. Stainless steel fixtures: Bradley, Metcraft Industries, or Willoughby Industries.
3. Faucets: American Standard, Chicago Faucet, Elkay, Hyrotek, Moen, Sloan, or Zurn Industries LLC.
4. Supplies, escutcheons, and traps: Anso-Flex, Brasscraft, Bridgeport, Consolidated, Dearborn, EBC, Frost, McGuire Mfg. Co., Sanitary-Dash, Speedway, Waterway, or Zurn Industries LLC.
5. Carriers: Heavy-duty type Zurn Industries LLC Model Z1231 or approved equal by Jay R. Smith Mfg. Co.®, Josam, MIFAB Inc., or WADE (McWane Inc.).

2.5 SINKS

A. Coordinate size of countertop sink with the Casework Contractor before ordering sink. Install sink in countertop and casework.

B. Acceptable Manufacturers:
   1. Commercial stainless-steel sinks: Amtekco, Elkay, Just Mfg. Co., Franke Commercial, Metcraft Industries, Moen, or Republic.
   2. Faucets: American Standard, Bradley, Chicago Faucet, Crane, Delta, Elkay, Gerber, Grohe, Kohler, Moen, Sloan, Speakman, Symmons, T & S Brass Company, or Zurn Industries LLC.
   3. Aerators: American Standard, Bradley, Chicago Faucet, Crane, Delta, Gerber, Grohe, Kohler, Moen, Neoperl, Sloan, Speakman, Symmons, T & S Brass Company, or Zurn Industries LLC.
   4. Supplies, escutcheons, and traps: Anso-Flex, Brasscraft, Bridgeport, Consolidated, Dearborn, EBC, Frost, McGuire Mfg. Co., Sanitary-Dash, Speedway, Waterway, or Zurn Industries LLC.

2.6 PLUMBING FIXTURE CONTROLS

A. Flushometers for Urinal-Type Fixture: Consumption: 0.5 gallon/flush.

B. Acceptable Manufacturers:
   1. Automatic flush valve circuit timers: Sloan.
   2. Automatic urinal flush valve occupancy sensor: Tork Model OSCW5P or approved equal by Hubbell “H-Moss” Control Unit #257-151-CBA or My Tech.
   3. Transformers: Sloan or approved equal by American Standard or Zurn Industries LLC.

2.7 WATER COOLERS

A. Acceptable Manufacturers:
   1. Electric water coolers: Aquarius, Elkay, Halsey-Taylor, Haws, Oasis, Western, or White-Westinghouse.
   2. Supplies, escutcheons, and traps: Anso-Flex, Brasscraft, Bridgeport, Consolidated, Dearborn, EBC, Frost, McGuire Mfg. Co., Sanitary-Dash, Speedway, Waterway, or Zurn Industries LLC.
   3. Carriers:
      a. Bi-level electric water coolers: Zurn Model Z1225-BL.
      b. Acceptable Manufacturers: Zurn Industries LLC or approved equal by Jay R. Smith Mfg. Co.®, Josam, MIFAB Inc., or WADE (McWane Inc.).

PART 3 - EXECUTION

3.1 DELIVERY, STORAGE, AND HANDLING

A. Fixtures and trim shall remain crated and stored until installation to prevent physical damage and moisture and dirt contamination.

B. Adequately protect installed fixtures from damage with cardboard, plywood, or other rigid material.

3.2 INSTALLATION — GENERAL

A. Coordinate exact location and installed height of plumbing fixtures with the Lead Contractor and A/E.

B. Coordinate mounting height of all fixtures and controls to be used by the physically handicapped. Refer to ADA Accessibility Guidelines.

C. Verify that colors of fixtures, faucets, and trim match approved shop drawings.

D. Install fixtures and trim according to the Manufacturer's recommendations.

E. Install carriers and accessories on wall-mounted fixtures. Anchor carriers securely to floor.

F. Carefully assemble and connect fixtures to the required inlets and outlets.

G. Provide stops on all hot- and cold-water supplies to fixtures.

H. Provide all required seals, gaskets, nuts, bolts, and washers.

I. Insulate domestic water supply and drain piping that could come in contact with wheelchair occupants. Refer to Section 22 07 00.

J. Install chrome-plated brass escutcheons on waste and supply piping at walls, including piping located inside cabinets.

K. Caulk between fixture, floor, and wall, with caulking compatible with the wall finish, at all new floor-mounted and wall-mounted fixtures.

L. After the installation of the fixtures and trim is completed, flush out all connecting pipes through the fixtures to eliminate scale. Clean faucet strainers. Refer to Section 22 11 16 regarding sterilization of water lines.

M. Test to ensure that the fixtures shall function correctly when the Work is completed.

N. Thoroughly clean all fixtures of paper and dirt before final acceptance.

3.3 INSTALLATION — WATER CLOSETS

A. Mount wall-mounted water closets at the following heights or according to Manufacturer's recommendations, unless noted or directed otherwise:

Fixture	**Height**
Water Closet	15 in. to top (not including seat).
ADA-Compliant Water Closet	17 to 19 in. to top of seat. Flush valve at 44 in. maximum.

B. Field-adjust self-sustaining water closet seats to self-sustain in any position.

C. Provide anchors and supports for flush valve supply piping behind walls and chases.

D. Mount manual override button on the wide side of the toilet stall. Verify correct side.

E. Conform to ADA Accessibility Guidelines concerning location of flush valve trip lever. Mount flush valve trip lever on the wide side of the toilet stall. Verify correct side.

3.4 INSTALLATION — URINALS

A. Mount wall-mounted urinals at the following heights or according to Manufacturer's recommendations, unless noted or directed otherwise:

Fixture	**Height**
Urinal	24 in. to lip.
ADA-Compliant Urinal	17 in. to lip. Flush valve at 44 in. maximum, 38 in. minimum.

B. Install P-trap below floor for stall urinals.

C. Provide anchors and supports for flush valve supply piping behind walls and chases.

3.5 INSTALLATION — LAVATORIES

A. Coordinate location of prefabricated counter/lavatory and rough-in with the Lead Contractor before roughing in.

A. Before ordering countertop lavatories, coordinate countertop fixture selection with cabinet sizes and the Lead Contractor.

B. Coordinate countertop openings with the Lead Contractor and the A/E. Furnish templates and locate. Lead Contractor shall cut countertop openings.

C. Mount wall-mounted lavatories at the following heights or according to Manufacturer's recommendations, unless noted or directed otherwise:

Fixture	**Height**
Lavatory	31 in. to rim, unless noted otherwise.
ADA-Compliant Lavatory	29 in. to bottom of apron. Maximum height to rim 34 in.
Juvenile Lavatory	21 in. to bottom of apron. Maximum height to rim 28 in.

D. Adjust self-closing lavatory faucets for closing time of (8) seconds.

E. Provide chrome cast brass tailpiece, trap, and chrome 17-gauge drain to wall.

3.6 INSTALLATION — SINKS

A. Before ordering countertop sinks, coordinate countertop fixture selection with cabinet sizes and the Lead Contractor.

B. Coordinate countertop openings with the Lead Contractor and the A/E. Furnish templates and locate. Lead Contractor shall cut countertop openings.

C. Provide chrome cast brass tailpiece, trap, and chrome 17-gauge drain to wall.

3.7 INSTALLATION — PLUMBING FIXTURE CONTROLS

A. Water Closet Automatic Flush Valve Systems:
   1. Sensor-operated flush valves:
      a. Coordinate location and electrical requirements with the Electrical Work.
      b. Electrical Contractor shall install and wire low-voltage transformers.
      c. Electrical Contractor shall provide all low-voltage wiring, except for low-voltage pre-wired plug-in wiring from solenoid valve to module.

B. Urinal Automatic Flush Valve Systems:
   1. Sensor-operated flush valves:
      a. Coordinate location and electrical requirements with the Electrical Work.
      b. Electrical Contractor shall install and wire low-voltage transformers.
      c. Electrical Contractor shall provide all low-voltage wiring, except for low-voltage pre-wired plug-in wiring from solenoid valve to module.

C. Electrical Contractor shall provide all 120-volt power and low-voltage control wiring for automatic flush valve systems.

D. Lavatory Automatic Electronic Faucet Control Module Systems:
   1. Sensor-operated faucets:
      a. Coordinate location and electrical requirements with the Electrical Work.
      b. Plug in low-voltage faucet sensor and solenoid valve wiring to control modules.
      c. Electrical Contractor shall install and wire low-voltage transformers.

d. Electrical Contractor shall provide all low-voltage wiring, except for low-voltage pre-wired plug-in wiring from faucet and solenoid valve to module.

2. Electrical Contractor shall provide low-voltage wiring and terminations.
3. Electrical Contractor shall provide ground-fault circuit interrupter (GFCI) wall receptacle for plug-in transformer.

E. Sink Faucets:
1. Sensor-operated faucets:
a. Coordinate location and electrical requirements with the Electrical Work.
b. Electrical Contractor shall install and wire low-voltage transformers.
c. Electrical Contractor shall provide all low-voltage wiring, except for low-voltage pre-wired plug-in wiring from faucet and solenoid valve to module.

3.8 INSTALLATION — WATER COOLERS

A. Coordinate location and electrical requirements with the Electrical Work.

B. Mount wall-mounted electric water coolers at the following heights or according to Manufacturer's recommendations, unless noted or directed otherwise:

Fixture	**Height**
Electric Water Cooler	35 in. to rim.
ADA-Compliant Electric Water Cooler: LOW	36 in. from floor to bubbler outlet. 27 in. minimum clearance from floor to underside of fixture.
ADA-Compliant Electric Water Cooler: HIGH	40 in. from floor to bubbler outlet.

C. Caulk top and side of basin.

D. Provide water cooler with cord and plug, and plug in.

E. Adjust flow for correct operation and temperature of 50 degrees F. outlet.

F. Electrical Contractor shall provide:
1. Ground-fault circuit interrupter (GFCI) circuit breaker or receptacle.
2. Power wiring.

END OF SECTION 22 40 00

SECTION 22 05 00.45

TESTING AND INSPECTING SERVICES FOR PLUMBING

PART 1 - GENERAL

1.1 INSPECTIONS, TESTS, AND APPROVALS

A. The Contract Documents, Laws, Ordinances, Rules, Regulations, or Orders of any AHJ may require the Work to be inspected, tested, or approved.

B. Contractor shall bear all costs of such inspections, tests, or approvals.

C. Contractor shall pay all professional engineering fees involved in required testing of equipment.

D. Contractor shall arrange and pay for all inspections required to obtain a Certificate of Occupancy. Contractor shall include this cost in its bid.

E. Arrange for inspection of the Work by the AHJ.

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION

3.1 TESTS AND INSPECTIONS

A. Notify the A/E of all scheduled tests and adjustments at least (48) hours before they are scheduled, so that the A/E may witness same. If the Contractor performs any test or adjustment without the A/E present, or without proper notification, the Contractor shall perform the test or adjustment a second time, in the presence of the A/E. Coordinate all test schedules with the Owner to minimize inconvenience.

B. Provide all required testing and obtain approvals. Secure required certificates of inspection, testing, or approval, and include them in the Operating and Maintenance Manual.

C. After Work has been completed, but before pipe covering has been applied, test each system in accordance with the requirements of other Sections of this Specification. At the test pressures, the circulation shall be free and the piping shall be proven free of leaks.

D. Concealed lines shall be tested and approved before being concealed. If a leak appears during the final test, repair the line and any damage resulting from the leak.

E. Coordinate the enclosure or concealment of the Work with the required inspections and tests so as to minimize the necessity of uncovering work for that purpose.

F. Should any of the Work be covered up or enclosed prior to completion of all required inspections, tests, and approvals, uncover the Work and, after it has been completely inspected, tested, and approved, make all repairs and replacements with such materials and workmanship as are necessary to secure the approval of the A/E, and at no additional cost to the Owner.

G. Furnish all test pumps, gauges, equipment, and personnel required, and test to demonstrate the integrity of the finished installation to the approval of the AHJ and the A/E.

H. Check each piece of equipment for defects and verify that all parts are properly furnished and installed, that all items function properly, and that all adjustments have been made.

I. Conduct such tests and adjustments of equipment to verify performance requirements or to meet the requirements of the A/E or AHJ. Submit data taken during such tests to the A/E.

J. Test and check all control valves, drain valves, gauges, alarm devices, and waterflow and supervisory switches for proper operation. Submit a written record of these tests to the A/E.

K. Demonstrate to the Owner that all Plumbing systems are operating properly.

3.2 FINAL OPERATING TESTS AND PROCEDURES

A. Prior to Contract completion, conduct system operational tests for a period of at least (5) days, not necessarily consecutive, as scheduled by the Owner, to demonstrate fulfillment of the requirements of the Contract. During this time, adjust equipment so that it will perform as the Manufacturer intended, and so that systems will function as designed.

B. Operate each system in every mode of operation, and check the position of valves, switches, and other devices for proper closure, operation, and switching.

3.3 CERTIFICATE

A. Furnish approved Certificate of Final Inspection.

3.4 FOLLOW-UP INSPECTIONS

A. Make an inspection within (90) days after occupancy of the building to make minor adjustments as needed to ensure that all equipment is operating properly and that satisfactory conditions are being maintained throughout, and to satisfy any unusual conditions. Schedule with the A/E. Consult with the Owner.

B. A minimum of (1) month before the end of the guarantee period, contact the A/E and Owner to discuss system operation, and to plan for the future care and maintenance of the system.

C. (1) month before the end of the guarantee period, contact the Owner and perform an inspection to review any items needing correction.

END OF SECTION 22 05 00.45

SECTION 22 05 00.31

PROJECT COORDINATION FOR PLUMBING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Division 26, “Electrical.”

B. Section 26 05 00.31, “Project Coordination for Electrical.”

1.2 DESCRIPTION

A. Provide plumbing work associated with equipment being provided by other Trades.

B. Electrical Contractor shall provide all line-voltage wiring, and all control, interlock, and power wiring and conduit, regardless of voltage, required to power, control, monitor, or interlock plumbing equipment, unless noted otherwise.

1. **Exception:** Provide faucet sensor and solenoid valve low-voltage plug-in connections to control module.

C. Coordinate all wiring requirements for Plumbing Work with the Electrical Contractor.

D. Electrical Contractor shall provide power wiring, rough-in, and final connection, for each piece of plumbing equipment requiring power wiring.

E. Alternative Manufacturer Electrical Requirements: Contractor furnishing the equipment shall compensate the Electrical Contractor for the cost of any additional labor and materials required to wire and hook up equipment other than the Design Base Model and Manufacturer.

F. All electrical equipment shall be UL-listed and furnished in accordance with Division 26 requirements.

1.3 QUALITY ASSURANCE

A. Standards:

1. National Electrical Manufacturers Association (NEMA).
2. National Fire Protection Association (NFPA): 2017 NFPA 70, “National Electrical Code® (NEC).”
3. Underwriters Laboratories, Inc. (UL).

PART 2 - PRODUCTS

2.1 DISCONNECT SWITCHES

A. Factory-Installed Disconnect Switches: NEMA Type 3R, heavy-duty, disconnect switch within the housing of the equipment, for exterior equipment or other NEMA Type required for wet and dusty environments.

PART 3 - EXECUTION

3.1 PREPARATION

A. Consult Drawings that may affect location of equipment, conduit, or wiring, and make minor adjustments in locations to secure coordination.

3.2 INSTALLATION

A. Installation shall comply with NEC and shall be inspected and approved by the AHJ.

B. Assist in the check-out and start-up operations for plumbing equipment.

C. Plumbing Contractor is responsible for the final operation of all equipment furnished under its Work.

D. Electrical Contractor shall complete the applicable sections of start-up checklists for all Plumbing equipment.

E. Provide the Electrical Contractor with a full detailed set of all required wiring diagrams for equipment furnished under the Plumbing Work.

END OF SECTION 22 05 00.31

SECTION 22 05 00.33

SHOP DRAWING SUBMITTALS FOR PLUMBING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Division 01, "General Requirements."

B. Section 22 05 00, "Common Work Results for Plumbing."

1.2 DESCRIPTION

A. Submittal dates:
   1. Within (14) calendar days after the Award of Contract, submit complete materials list of all items proposed to be provided on this Project.
   2. Submit shop drawings within (28) days after the Award of Contract.

B. Materials and equipment installed under the Plumbing Work shall meet all the requirements of the Contract Documents. Do not order or install materials or equipment until submittals are reviewed by the A/E.

C. Submit shop drawings for the installation of the Plumbing Work for review by the A/E before any Plumbing Work is installed, enlarged, or extended. Under **NO** circumstances shall any Plumbing Work be performed prior to receiving shop drawings reviewed by the A/E.

D. The A/E's review is **ONLY** for conformance with the design concept of the Project and with the Contract Documents.

E. Catalog data for equipment reviewed by the A/E shall not take precedence over the requirements of the Contract Documents. Review by the A/E shall not relieve the Contractor from the responsibility for deviations from Drawings or Specifications, nor from the responsibility for providing proper clearance and coordination with other Contractors.

F. Color Selections: The A/E shall approve all color selections for plumbing equipment, including fixtures, faucets, and trim.

1.3 SHOP DRAWINGS

A. Submit shop drawings for each manufactured item of equipment and all components to be used in the Work. Refer to the Shop Drawing Log attached to this Section and to the Sections listed in Section 22 05 00, Article 1.03, for items.

B. Submit shop drawings electronically in Portable Document Format (PDF). Submit number of copies indicated in Division 01. Contractor shall be responsible for making all copies for distribution and file.

C. Include the following information:
   1. Complete original PDF or first-generation scanned PDF copies of the Manufacturer's catalog sheets, brochures, diagrams, schedules, performance charts, illustrations, and other standard descriptive product data.
   2. Brand name.
   3. Catalog number.
   4. Specific performance data.
   5. Material description.
   6. Characteristics.

7. Ratings.
8. Capacities.
9. Working pressure.
10. Dimensional data.
11. Material gauge or thickness.
12. Wiring diagrams and control diagrams.
13. Arrangement of component parts, physical dimensions, clearances, materials, service requirements, colors (where required), controls, and accessories.

D. Clearly mark or highlight each shop drawing copy to identify pertinent materials, products, models, and colors (where appropriate).

E. Coordinate each submittal with requirements of the Work and the Contract Documents.

F. When (2) or more items of the same material or equipment are required, they shall be of the same Manufacturer.

G. Completely review shop drawings, product data, and samples prior to submission.

H. When submitted for review, all shop drawings shall bear the Contractor's stamped and signed certification of the following:
1. Contractor has reviewed, checked, and approved the shop drawings.
2. Contractor has coordinated shop drawings with the requirements of the Project and with the provisions of the Contract Documents.
3. Contractor has ensured that the equipment shown on the shop drawings meets all the requirements of the Contract Documents.
4. Contractor has determined and verified all of the following:
   a. Materials.
   b. Field measurements.
   c. Field construction criteria.
   d. Catalog numbers and similar data.
   e. Conformance with Specifications.
   f. Hands of equipment.
   g. Quantities and sizes.

I. **UNSIGNED COPIES WILL NOT BE REVIEWED.**

J. Notify the A/E, in writing, at the time of submission, of any deviations in the submittals from the requirements of the Contract Documents.

K. Provide the following certifications information:
1. Test Agency results verifying capacities, operating conditions, and power requirements at design conditions.
2. Manufacturer's statement of compliance with Standards discussed in individual Specification Sections.
3. Equipment labels indicating Certification requirements.
4. Quality standard designations on each unit piece, e.g., each pipe length, pressure vessel, or valve.
5. Typed verification that noted mixes, chemical compositions, and testing procedures were complied with.
6. Other Certifications listed in other Sections of the Specifications.

L. Contractor shall make submittals promptly in accordance with the approved schedule, and in such sequence as to cause no delay either in its Work or in the work of any other Contractor.

M. If a submittal is rejected, immediately make any corrections or changes required by the A/E. Resubmit until accepted.

N. If the Contractor orders equipment or materials, or begins installation, fabrication, or work prior to the return of approved submittals, it shall be “at the Contractor’s own risk.”

O. Incorporate Shop Drawings into the Operating and Maintenance Manuals.

1.4 REQUIRED SUBMITTAL INFORMATION

A. The form attached to this section contains a list of required submittals. This list may not be a complete list of all required submittals. Submit for approval all items to be provided, whether listed or not.

END OF SECTION 22 05 00.33

Roger D. Fields Associates, Inc.
580 N. 4th ST., Suite 240
Columbus, Ohio 43215
614-451-2248

SHOP DRAWING LOG FOR PLUMBING

PROJECT NAME: _____

PROJECT NUMBER: _____

SUBMITTAL KEY

A	Catalog Cuts/Shop Drawings	G	Completed start-up test forms
B	Installation instructions	H	Coordination Drawings / Studies
C	Color samples	I	Calculations
D	Product samples	J	Schedule
E	Typed statement of material to be furnished	K	Sample of finish
F	Typed verification of compliance with certification requirements		

STATUS KEY

APP	Approved (conforms)
CAN	Corrections Are Noted (conforms as noted)
ICN	Incorporate Corrections Noted
R&R	Revise & Resubmit
R	Rejected

Plumbing Submittals Required	Specification Section	Submittal Key	Contractor	Original Submittal			Re-submittal			Remarks / Reviewed by
				Date A/E Received	Date A/E Returned	Status Key	Date A/E Received	Date A/E Returned	Status Key	
Division 22										
Access Panels	22 05 00.73	A								
Valves	22 05 23	A								
Hangers, Piping	22 05 29	A								
Pipe-Coding Materials	22 05 53	D								
Valve-Tagging Chart	22 05 53	D								
Valve-Tagging Materials	22 05 53	D								
Cleanouts	22 05 76	A								
Insulation, Lavatory Trap/Supply	22 07 00	A								
Insulation, Pipe and Fittings	22 07 00	A								
Pipe and Fittings	22 10 00	E								
Certificate of Completion of Water Line Chlorination	22 11 16	F								
Lead-Free Solder Certificate	22 11 16	F								
Pipe and Fittings, Domestic Water	22 11 16	E								
Shock Absorbers	22 11 19	A								
Thermostatic Mixing Valves	22 11 19	A								
Pipe and Fittings, Sanitary Waste	22 13 00	E								
Flush Valves	22 40 00	A								
Lavatories	22 40 00	A								
Lavatory Carriers	22 40 00	A								
Lavatory Faucets	22 40 00	A								
Sink Faucets	22 40 00	A								

Plumbing Submittals Required	Specification Section	Submittal Key	Contractor	Original Submittal			Re-submittal			Remarks / Reviewed by
				Date A/E Received	Date A/E Returned	Status Key	Date A/E Received	Date A/E Returned	Status Key	
Sinks	22 40 00	A								
Traps, Plumbing Fixtures	22 40 00	A								
Urinal Carriers	22 40 00	A								
Urinal Flush Valves	22 40 00	A								
Urinals	22 40 00	A								
Water Closet Carriers	22 40 00	A								
Water Closet Flush Valves	22 40 00	A								
Water Closet Seats	22 40 00	A								
Water Closets	22 40 00	A								
Water Cooler Carriers	22 40 00	A								
Water Coolers	22 40 00	A, C								

SECTION 22 05 00.35

SPECIAL PROCEDURES FOR PLUMBING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Division 02, “Existing Conditions.”

1.2 QUALITY ASSURANCE

A. Standard: Occupational Safety and Health Administration (OSHA), including 29 CFR 1910.147.

1.3 SAFETY

A. Contractor shall be solely responsible for safety precautions and programs in connection with the Work. The Owner or A/E will not be responsible for the Contractor’s failure to employ proper safety procedures.

B. Maintain the Project in accordance with Federal, State, and Local Safety and Insurance Standards. All procedures shall comply with the latest OSHA regulations.

C. Contractor shall provide head, eye, and ear protection for each of its employees in accordance with OSHA regulations.

D. Exercise precaution for the protection of persons and property.
   1. Provide guard rails, barricades, enclosures, canopies, passageways, lanterns, warning lights, and other protective safety devices required by the AHJ, and required to protect persons and property against accidentally dropped materials or other construction hazards.
   2. Provide guard lights at all barricades, railings, obstructions in the streets or sidewalks, trenches, or pits.

E. Provide protection as may be required to prevent glass breakage. Replace broken glass at no cost to the Owner.

F. **DO NOT USE POWDER-ACTUATED ANCHORS OR FASTENERS.**

1.4 ENVIRONMENTAL PROCEDURES

A. Hazards Control:

B. Asbestos Abatement:
   1. During the course of Work, if any suspected asbestos is encountered, cease working in the area, and immediately notify the Owner and A/E. Do not remove or disturb any material suspected of, or identified as, containing asbestos.
   2. Do not drill, cut, sand, penetrate with nails, screws, or other fasteners, or otherwise disturb asbestos or asbestos-containing material, insulation, structure, or ceiling or floor covering.
   3. Immediately notify the Owner of the presence, or suspected presence, of asbestos or asbestos-containing materials. The Owner shall remove or encapsulate such materials **PRIOR** to any work under this Contract.
   4. Refer to Division 02 for additional requirements.

END OF SECTION 22 05 00.35

SECTION 22 05 00.40

QUALITY REQUIREMENTS FOR PLUMBING

PART 1 - GENERAL

1.1 DESCRIPTION

A. Provide Work of the highest quality, complete in every respect and conforming to the accepted practices and standards of the Trades involved.

B. Further definition of quality is given by reference to various Laws, Codes, Standards, and Regulations.

1.2 REGULATORY REQUIREMENTS

A. All work on this Project shall conform to the currently enforced Edition of all applicable National, Federal, State, and Local Laws, Rules, Regulations, Standards, and Building Codes, and any local ordinances and requirements pertaining to this work, unless otherwise noted.

B. Any Law, Regulation, Standard, or Code referred to in other Sections of Division 22 is included in its entirety as a part of these Specifications.

C. Give notice and comply with all Laws, Rules, Regulations, Ordinances, and lawful orders of the AHJ bearing on the performance of the Plumbing Work.
   1. If the Contractor observes that any of the Contract Documents are at variance therewith in any respect, it shall promptly notify the A/E in writing, and any necessary changes will be arranged by the A/E.
   2. If the Contractor performs any Work knowing it to be contrary to such Laws, Rules, Regulations, and Ordinances and fails to give prior notice to the A/E, the Contractor shall assume full responsibility for, and shall bear all costs associated with, correcting the Work.

D. Only a Contractor and craftsmen licensed by the AHJ shall provide this Plumbing Work.

E. Methods and materials shall be certified where noted in the individual Specification Sections.

F. All equipment and appliances installed on this Project shall bear the label of an Approved Testing Agency, and shall be installed in accordance with the Manufacturer’s instructions for the labeled equipment and appliances.

G. All structural steel used on this Project shall be manufactured in the United States, in accordance with Ohio Revised Code 153.011, unless specifically approved otherwise by the Owner.

1.3 APPLICABLE PERMITS, FEES, BONDS, LICENSES, AND CERTIFICATIONS

A. The A/E will obtain all permits, licenses, and certifications required by the AHJ.

B. The Owner will pay plan approval fees for this Project. **CONTRACTOR SHALL NOT INCLUDE THIS COST IN ITS BID.**

C. The A/E will submit all Contract Drawings and Specifications and the plan approval application to the AHJ, pay the application fees, and obtain plan approval.

D. Contractor shall secure and pay for any **ADDITIONAL** permits, governmental fees, bonds, and licenses required for the proper execution and completion of the Plumbing Work.

E. Contractor shall pay for all other fees and other charges related to Plumbing Work and payable to Utility Companies or Code Enforcement Agencies.

1.4 REFERENCES

A. Titles, Abbreviations, and Symbols: Titles and abbreviations may be used in these Specifications. Abbreviations may be shown on the Plumbing Drawings. Refer to the list of abbreviations attached to this Section. Refer also to the symbols lists shown on the Drawings for further abbreviations. All titles and abbreviations may not necessarily apply to this Work.

B. Definitions:
1. Provide: To furnish, install, and connect to make completely ready for regular operation.
2. Furnish: To supply or deliver to site complete with all required accessories and installation instructions.
3. Install: To mount, erect, hang, or fasten in place, and connect to make ready for regular operation.
4. Concealed: Either embedded in masonry or other construction, or installed below floor slab, behind wall furring, within chases or soffits, within walls, within double partitions, above ceilings, in trenches, in tunnels, or within crawl spaces.
5. Exposed: In full or partial view; not “Concealed” as defined above.
6. Accessible Ceiling: Lay-in ceiling with removable ceiling tiles.
7. Piping: Pipe, fitting, flanges, valves, controls, specialties, hangers, bracing, insulation, and other items required or necessary.
8. Refer to additional Definitions in Division 01 and in the AHJ’s Building and Mechanical Codes.

TITLES, ABBREVIATIONS, AND SYMBOLS

#	Number
&	And
∠	Angle
@	At
Ø	Diameter
Ø	Round OR Phase
A.	Compressed air
A.D.	Access door OR Area drain
A.F.D.	Acid floor drain
A.F.F.	Above finished floor
A.P.	Access panel
A.W.C.O.	Acid wall cleanout
A/E	Architect/Engineer
AABC	Associated Air Balance Council
AB.	Above
ACI	American Concrete Institute
ACPA	American Concrete Pipe Association
ADA-AG	Americans with Disabilities Act — Accessibility Guidelines
ADC	Air Diffusion Council
AFCI	Arc-fault circuit interrupter
AH	Air handler
AHJ	Authority Having Jurisdiction
AHRI	Air-Conditioning, Heating, and Refrigeration Institute
ALT.	Alternate
ALUM.	Aluminum
AMCA	Air Movement and Control Association
amp	ampere
ANSI	American National Standards Institute
APPROX.	Approximately
ARCH.	Architect
ARR'T.	Arrangement
ASA	Acoustical Society of America
ASHRAE	American Society of Heating, Refrigerating, and Air Conditioning Engineers
ASME	American Society of Mechanical Engineers
ASPE	American Society of Plumbing Engineers
ASSE	American Society of Sanitary Engineering
ASTM	American Society for Testing & Materials
AUTO.	Automatic
AV	Acid vent
AW	Acid waste
AWG	American wire gauge
AWS	American Welding Society
AWWA	American Water Works Association
B.D.D.	Backdraft damper
B.T.	Bathtub
B.V.	Backwater valve
BAL.	Balancing
BFP	Backflow preventer
BHP	Brake horsepower
BICSI	Building Industry Consulting Services International
BLDG.	Building
BSBD.RAD.	Baseboard radiation
BSMT.	Basement
BTM.	Bottom
BTU	British thermal unit
c.	Conduit
C.B.	Catch basin
C.I.	Cast iron
C.O.	Clean out
C/C	Center to center
C/L	Center line
CAB.	Cabinet
CAP.	Capacity
CEIL./CLG.	Ceiling
CFC	Chlorofluorocarbon
CFH	Cubic feet per hour
CFM	Cubic feet per minute
CFR	Code of Federal Regulations
CGA	Compressed Gas Association
CHEM.	Chemical
CISPI	Cast Iron Soil Pipe Institute
CMA	Construction Manager Agent/Advisor
CMR	Construction Manager at Risk
COL.	Column
COMB.	Combination
CONC.	Concrete
COND.	Condensate OR Condenser
CONN.	Connection OR Connect
CONST.	Construction
CONTR.	Contractor
CONV.	Convector OR Converter
COORD.	Coordinate
CSA	CSA Group (formerly the Canadian Standards Association).
CSI	Construction Specifications Institute
CT	Current transformer
CU IN.	Cubic inch
CU. FT.	Cubic feet
CUH	Cabinet unit heater
Cx	Commissioning Agent
D.	Deep
D.F.	Drinking fountain
D.L.	Door louver
D.M.	Damper motor
D.S.	Downspout
D-B	Design-Build OR Design-Builder
DB	Dry bulb
DBL.	Double
DCW	Domestic cold water
DET.	Detail
DHW	Domestic hot water
DHWR	Domestic hot water return
DIA. / Ø	Diameter
DIFF.	Diffuser
DIM.	Dimension
DISCH.	Discharge
DN.	Down
DOE	United States Department of Energy
DPR.	Damper
DR.	Door
DW	Distilled water
DWG.	Drawing
DWH	Domestic water heater
DWV	Drain, waste and vent
E.A.T.	Entering air temperature
E.C.	Electrical Contractor
E.S.P.	External static pressure
E.T.	Expansion tank

E.W.T.	Entering water temperature
EA.	Each
EFF.	Efficiency
EIA	Electronic Industries Alliance
ELEC.	Electric OR Electrical
ELEM.	Element
ELEV.	Elevation
ENGR.	Engineer
ENT.	Entering
EPA	Environmental Protection Agency
EQUIP.	Equipment
ETL	Electrical Testing Laboratories
EW	Eye wash
EWC	Electric water cooler
EX.	Existing
EXH.	Exhaust
EXIST.	Existing
EXT.	Exterior
F & T	Float and thermostatic
F.	Fan OR Fire
F.D.	Fire damper
F.E.	Fire extinguisher
F.E.C.	Fire extinguisher cabinet OR Food Service Equipment Contractor
F.H.	Fire hydrant
F.H.C.	Fire hose cabinet
F.H.E.C.	Fire hose/extinguisher cabinet
F.V.	Flush valve
FCC	Federal Communications Commission
FD	Floor drain
FDA	Food and Drug Administration
FHA	Federal Housing Administration
FIG.	Figure
FIN.	Finish
FIN.RAD.	Finned radiation
FLEX.	Flexible
FLR. / FL.	Floor
FMG	Factory Mutual Global
FOR	Fuel oil return
FOS	Fuel oil supply
FPC / FSC	Fire Protection / Fire Suppression Contractor
FPM	Feet per minute
FT.	Feet
FT.HD.	Feet of head
FURN.	Furnish(ed)
G	Gas
G.C.	General Contracting OR General Contractor
G.I.	Grease interceptor
G.T.C.	General Trades Contractor
gal.	Gallon
GALV.	Galvanized
GEN.	General
GFI / GFCI	Ground-fault circuit interrupter
GPM	Gallons per minute
GR	Grille
GRAV.	Gravity
Grd.	Ground
H./HT.	Height
H.P.	High pressure
H.S.	Hair strainer
H'STAT	Humidistat
HAC	Heating and air conditioning
HB	Hose bibb
HCFC	Hydrochlorofluorocarbon
HHS	United States Department of Health and Human Services
HORIZ.	Horizontal
HP	Horsepower
HPC	High pressure steam condensate
HPS	High pressure steam
hr.	Hour
HTG.	Heating
HTR.	Heater
HUD	United States Department of Housing and Urban Development
HV	Heating and ventilating OR High velocity
HVAC	Heating, ventilating, and air conditioning
I.D.	Inside diameter
IAQ	Indoor air quality
IBC	International Building Code
ICC	International Code Council
ICEA	Insulated Cable Engineers Association, Inc.
IDF	Intermediate distribution frame
IEC	International Electrotechnical Commission
IEEE	Institute of Electrical and Electronics Engineers, Inc.
IESNA	Illuminating Engineering Society of North America
IN.	Inside OR Inches
IND.	Indirect
IND. U.	Induction unit
INSUL.	Insulation
INT.	Interior
INV.	Invert
INV. ELEV.	Invert elevation
IPS	Iron pipe size
ISO	International Organization for Standardization
J.R.	Janitor's receptor
JCAH	Joint Commission for Accreditation of Hospitals
kVA	Kilovolt-ampere
L.	Length
L.A.T.	Leaving air temperature
L.W.T.	Leaving water temperature
LAB	Laboratory
LAV	Lavatory
lb.	pound
LEED	Leadership in Energy and Environmental Design
LH	Left hand
LP	Liquefied petroleum
LPC	Low pressure steam condensate
LPS	Low pressure steam
LV'G.	Leaving
M.A.	Mixed air
M.O.	Motor operated
MAN. DPR.	Manual damper
MAT.	Material
MAX.	Maximum
MBH	1,000 British thermal units/hour
MECH.	Mechanical
MERV	Minimum efficiency reporting value
MET./MTL.	Metal
MEZZ.	Mezzanine
MFR.	Manufacturer
MH	Manhole
MIN.	Minimum
MISC.	Miscellaneous
MP	Multiple Prime
MPS	Medium pressure steam

MS	Motor starter
MSS	Manufacturers Standardization Society of the Valve and Fittings Industry Inc.
MTD./MT.	Mounted OR Mount
N.I.C.	Not in contract
N.T.S.	Not to scale
N2	Nitrogen
N2O	Nitrous oxide
NADCA	National Air Duct Cleaners Association
NAECA	National Appliance Energy Conservation Act
NB	National Board of Boiler and Pressure Vessel Inspectors
NCPI	National Clay Pipe Institute
NEBB	National Environmental Balancing Bureau
NEC	National Electrical Code
NECA	National Electrical Contractors Association
NEMA	National Electrical Manufacturers Association
NESHAPs	National Emissions Standards for Hazardous Air Pollutants
NFPA	National Fire Protection Association
NIOSH	National Institute for Occupational Safety and Health
NIST	National Institute of Standards and Technology
NO. OR #	Number
NOM.	Nominal
NP	Not permitted
NPT	National Pipe Thread Tapered
NSF	National Sanitation Foundation
NSPE	National Society of Professional Engineers
O.	Oxygen
O.A.	Outside air
O.D.	Outside diameter
O.I.	Oil interceptor
O.V.	Outlet velocity
O/C	On center
OAC	Ohio Administrative Code
ODH	Ohio Department of Health
ODOE	Ohio Department of Energy
ODOT	Ohio Department of Transportation
OPG.	Opening
OPP.	Opposite
ORC	Ohio Revised Code
OSHA	Occupational Safety and Health Administration
OU./OZ.	Ounce
P.D.	Pressure drop
P.I.V.	Post indicator valve
P/L	Property line
PDI	Plumbing & Drainage Institute
PEI	Petroleum Equipment Institute
PLBG.	Plumbing
PNEU.	Pneumatic
PRESS.	Pressure
PROP.	Propeller
PRV	Pressure-reducing valve
PSF	Pounds per square foot
PSI	Pound-force per square inch
PSIG	Pound-force per square inch gauge
PT	Plaster trap OR Potential transformer
PVC	Polyvinyl chloride
R	Register
R.A.	Return air
R.D.	Roof drain
R/W	Right of way
RAD.	Radius OR Radiation OR Radiator
RECIRC.	Recirculating
REG.	Register
REINF.	Reinforced
REL.	Relief
REQ'D.	Required
RH	Right hand
RHC	Reheat coil
RM.	Room
RPM	Revolutions per minute
RTA/C	Rooftop air-conditioning unit
RW	Raw water
RWC	Rainwater conductor
S	Sink
S & R	Supply and return
S. DPR.	Smoke damper
S.A.	Shock absorber OR Supply air
S.F.	Square feet
S.M., S/M	Sheet metal
S.P.	Static pressure
S.S.	Service sink OR Storm sewer
S.S., S/S	Stainless steel
SAN.	Sanitary sewer
SB	Shampoo bowl
SD	Shower drain OR Smoke detector
SECT.	Section
SHR.	Shower
SHT.	Sheet
SHT. MT'L.	Sheet metal
SMACNA	Sheet Metal and Air Conditioning Contractors National Association
SPD	Surge protection device
SPEC.	Specification
SQ.	Square
SQ. FT.	Square feet
SQ. IN.	Square inch
ST	Sound trap
STAT	Thermostat
STD.	Standard
STL.	Steel
STM.	Storm
SUCT./S	Suction
SW	Softened water
SW.	Switch
T.W.	Tempered water
T'STAT	Thermostat
TD	Temperature difference
TEMP.	Temperature
THERM.	Thermometer OR Thermostat
TIA	Telecommunications Industry Association
TYP.	Typical
UC	Undercut
UH	Unit heater
UL	Underwriters Laboratories, Inc.
UR	Urinal
USGBC	United States Green Building Council
UV	Unit ventilator
V.	Vent
V.T.R.	Vent through roof
VAC.	Vacuum
VC	Vacuum cleaning
VCP	Vitrified clay pipe
VERT.	Vertical
VIB. ISO.	Vibration isolator
VOC	Volatile organic compound

VSP	Vitrified sewer pipe
W.	Width OR Water
W.G.	Water gauge
W/	With
W/O	Without
W/W	Wall to wall
WAT.	Water
WB	Wet bulb
WC	Water closet OR Water column
WH	Wall hydrant OR Water heater
WO	Waste oil
WOG	Water/oil/gas
XFMR	Transformer
YD.	Yard
YH	Yard hydrant

END OF SECTION 22 05 00.40

SECTION 22 05 00.50

TEMPORARY FACILITIES AND CONTROLS FOR PLUMBING

PART 1 - GENERAL

1.1 DESCRIPTION

A. Provide and maintain temporary facilities and controls required for construction as long as needed for the safe and proper completion of the Work and remove upon completion of the Work.

1.2 QUALITY ASSURANCE

A. Standards: Comply with the provisions of the following Codes:
   1. United States Department of Labor, Occupational Safety and Health Administration, Part 1926, “Safety and Health Regulations for Construction.”
   2. Applicable Local Building Codes.

1.3 TEMPORARY CONSTRUCTION

A. Materials shall be adequate in capacity for the required usage, shall not create unsafe conditions, and shall not violate applicable Codes and Standards.

B. Contractor shall be solely responsible for the structural design of all temporary items that it uses in the construction of the building, or that become a permanent part of the building, including, but not limited to:
   1. Hoisting.
   2. Temporary bracing for structural steel.
   3. Shoring for concrete and masonry work.
   4. Shoring for cut earth banks.
   5. Suspended ceilings, equipment, walls, etc.

C. Provide hoists, staging, rigging, scaffolding, runways, and necessary appurtenances required for the performance of the Work.

D. Provide necessary tarps or other appropriate cover material to protect openings.

E. Provide effective means of dust control. Dust enclosures shall extend tight to the structure and extend around all pipes, ducts, and similar items. Enclosures shall confine dust and dirt to the area of construction and completely seal off and isolate the area of construction from adjacent Owner-occupied areas.

F. Completely remove temporary materials and equipment when their use is no longer required.

G. Clean and repair damage caused by temporary installation or use of temporary facilities.

H. Restore existing facilities used for temporary services to original condition.

END OF SECTION 22 05 00.50

SECTION 22 05 00.60

PRODUCT REQUIREMENTS FOR PLUMBING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Division 00, “Procurement and Contracting Requirements.”

1.2 DESIGN BASE MANUFACTURER STANDARD

A. The Drawings and Specifications reflect a design based on the specific equipment requirements and configuration for a Design Base Manufacturer. Design coordination of equipment with the building and with other Trades has been made for this specific Model and Manufacturer of equipment. Where several Manufacturers are listed for an item of equipment or material, the first-named shall be considered the Design Base Manufacturer Standard.

1.3 OTHER ACCEPTABLE COMPONENTS (MANUFACTURERS)

A. Other Manufacturers listed in the Specifications shall be acceptable; however, whenever the Contractor elects to furnish specified equipment or material manufactured by other than the Design Base Manufacturer, the Contractor shall be responsible for the cost and coordination of all modifications required to accommodate the selected equipment or material, including any Work of other Trades that might be affected. Where changes to other Trades’ Work are required, the Contractor shall include the additional costs of all such Work in its bid.

B. Any specified Equipment Manufacturer furnished by the Contractor, other than the Design Base Manufacturer, shall be, in the opinion of the A/E, equivalent in quality, design, features, performance, arrangement, and appearance to that of the Design Base equipment or material, including any special features or requirements.

C. The inclusion of other Manufacturers in these Specifications shall not be construed to infer that each Manufacturer’s product has been reviewed by the A/E for this application, or that it will provide all the features or capabilities required, or that its physical dimensions can be accommodated in the available space. Verify that the proposed equipment will provide all features and accommodations provided by the Design Base Manufacturer, and that it will fit in the available space.

D. The A/E will not give consideration to any Manufacturer that the Contractor proposes as a Substitution, unless the A/E approves the Manufacturer during the bid period and specifically names the Manufacturer in the Contract Documents or Addenda thereto.

E. Where deemed necessary by the A/E, the Contractor shall, at no additional cost to the Owner, prepare layouts for these other brands of equipment that may have different dimensional or service requirements from the Design Base Manufacturer Standard. Submit these layouts to the A/E for review.

F. Contractor shall reimburse the Owner for the cost of any design changes incurred by the A/E in the preparation of revised Drawings or Specifications to accommodate the use of any Manufacturer other than the Design Base Manufacturer.

1.4 SUBSTITUTIONS

A. Refer to the Bid Documents for substitution requirements. If this Specification Section conflicts with the Bid Documents, comply with the Bid Documents.

B. Contractor shall submit information for review no later than (10) days prior to the bid opening to the A/E on any other proposed equipment or material that the Contractor desires to use.

C. Contractor shall be responsible for the same costs of coordination and modifications, etc., listed above in Article 1.03, "Other Acceptable Components (Manufacturers)."

D. If the A/E determines that the proposed Manufacturer is acceptable, the A/E will issue an Addendum adding that Manufacturer to the Specifications and/or the Drawings prior to the bid opening.

1.5 EQUIPMENT SUITABILITY

A. All equipment provided shall perform as intended. All items listed shall function properly, and as the Manufacturer intended. Install equipment according to the Manufacturer's recommendations. Properly attach equipment to the floor, wall, or structure. Each item of equipment shall be compatible with all other accessories or hook-ups, including piping, controls, wiring, and other equipment not furnished by the equipment Manufacturer, but required to achieve the intended function.

1.6 MISCELLANEOUS ACCESSORIES

A. Provide any additional adapters, fittings, trim, structural steel angles, channels, strut channels, brackets, or other appurtenances to securely install all items of equipment specified or shown on the Drawings.

B. All steel installed outside or exposed to moisture shall be hot-dipped galvanized.

C. These accessories are required even though they may not be shown or detailed on the Drawings.

D. Installation shall be compatible with the building construction on which the item is to be located.

E. Verify the type of construction prior to ordering the equipment item, so that all required accessories are included.

1.7 QUANTITIES

A. Equipment may be referred to in these Specifications, or on the Drawings, as either singular or plural; the Contractor shall verify the exact number of items required to complete its Work.

END OF SECTION 22 05 00.60

SECTION 22 05 00.71

EXAMINATION AND PREPARATION FOR PLUMBING

PART 1 - GENERAL

1.1 EXAMINATION OF SITE

A. Certain existing conditions may affect the manner or sequence of the performance of the Work.

B. Before submitting its Bid, it is recommended that the Contractor visit the site of the proposed Project.

C. After receipt of Bids, no adjustments to Bids will be permitted for lack of knowledge of Project conditions.

D. Verify and reconcile Work required by the Contract Documents with existing conditions at the Site.

E. Should the Contractor note any discrepancies during the Bidding Period, it shall notify the A/E immediately, in writing, to permit issuance of an Addendum to prevent misunderstandings at a later date.

F. Existing services, structures, and operating schedules may need to be reviewed, prior to bidding, to facilitate the installation of the Work without disrupting the normal operation of the facility.

1.2 PREPARATION

A. Provide a Superintendent, on site, whose duties include the directing and supervising of work. Inform the A/E of the Superintendent's name and phone number, and the method of contact when the Superintendent is not at the site.

B. As soon as possible after the Award of the Contract and the approval of shop drawings, the Contractor shall place orders for materials and equipment required for its Work. Immediately inform the A/E in writing as to any materials and equipment that cannot be obtained within the required time period, either due to conditions of the market or other governing factors.

C. Inspect each item of materials or equipment immediately prior to installation. Reject damaged and defective items.

D. Contractor shall determine erection procedures and sequence the construction to keep its work on schedule and to ensure the safety of the building and its occupants. This includes supplying any temporary bracing, guys, or tie-downs that might be required. Such materials shall remain the Contractor's property after completion of the Project.

E. Provide attachment and connection devices and methods for securing work. Secure all work true to line and level and within recognized industry tolerances. Allow for expansion and building movement.

F. Recheck measurements and dimensions of the Work as an integral step of starting each installation.

G. Where mounting heights are not indicated, individual units generally can be mounted at industry-recognized standard mounting heights for the particular application indicated. However, all mounting heights shall be approved by the A/E.

1.3 COORDINATION OF WORK

A. Contractor shall coordinate its Work carefully with all other Contractors.

B. Do not install work without first coordinating the layout, routing, etc., with other Contractors whose work may be affected.

C. Coordinate location of all work with other Contractors and equipment.

D. Consult all Contract Drawings that may affect the location of any equipment, apparatus, and piping, and make any other adjustments in location to secure coordination.

E. Coordinate locations of all Plumbing Work with hangers, sprinklers, piping, ductwork, diffusers, grilles, registers, cable trays, occupancy/vacancy sensors, bus ducts, luminaires, speakers, smoke and heat detectors, conduits, and other equipment, and with ceilings, soffits, structural members, joists, purlins, metal decks, bracing, etc.

F. Notify the A/E immediately of any changes in location or other conflicts that may affect the work of other Contractors.

G. Contractor shall be responsible for the cost of additional engineering work required for changes to the work as shown or described, due to the relocation of items requested by the Contractor.

H. Review all equipment nameplate ratings and advise the A/E immediately of any system design changes required to wire the equipment properly.

END OF SECTION 22 05 00.71

SECTION 22 05 00.73

EXECUTION OF PLUMBING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Division 00, “Procurement and Contracting Requirements.”

B. Division 01, “General Requirements.”

C. Division 09, “Finishes.”

1.2 DESCRIPTION

A. Contractor shall be solely responsible for construction means, methods, techniques, sequences, and procedures in connection with the Work.

1.3 QUALITY ASSURANCE

A. Standard: National Fire Protection Association (NFPA). 2023 NFPA 262, “Standard Method of Test for Flame Travel and Smoke of Wires and Cables for Use in Air-Handling Spaces.”

1.4 CONTRACT DOCUMENTS

A. The Contract Drawings are schematic and show approximate locations, general arrangement, and general extent of Work. Not all items of work required for a complete and operating system are shown on the Drawings. Refer also to the Specifications for additional work that shall be provided. If a conflict occurs, the Contractor is responsible for the more restrictive requirement.

B. The Contract Drawings are not intended to show every vertical or horizontal offset that may be necessary to complete the systems. Having piping and fittings fabricated and delivered in advance of making actual measurements shall not be sufficient cause to avoid making offsets or other changes as may be necessary to install piping and equipment.

C. Verify exact locations in the field, and coordinate with all other Contractors.

D. The A/E shall approve, in writing, significant deviations from the Drawings.

E. The A/E reserves the right to make minor changes in location that do not require additional labor or material, up to the time of roughing-in, without additional cost. The A/E reserves the right to determine what is “significant” and what is “minor.”

F. If a conflict occurs between the Drawings and Specifications, or an overlap of work among the Trades become evident, immediately submit a written request for an interpretation or clarification from the A/E, who shall determine which interpretation has precedence. Refer to Division 00 General Conditions. In such event, none of the Contractors shall assume that it is relieved of the Work that is specified under its branch unless instructions are received, in writing, from the A/E.

1.5 UTILITIES AND OUTAGES

A. Locate and identify all existing utilities prior to construction.

B. Where necessary, make minor relocations to permit installation of the Plumbing Work.

C. Advise the A/E immediately of major conflicts to permit modification of the Contract Documents prior to bidding.

D. Conform to all Utility Company requirements.

E. Closely coordinate any utility service shutdowns or outages, interruptions, or downtime with the A/E and Owner.

F. Provide temporary service during the curtailment, if required by the A/E.

G. Avoid inconveniencing the Owner.

H. Notify the Owner at least (10) full working days in advance of commencing work in the area of existing utilities.

I. Contractor shall alert occupants of nearby premises of any emergency conditions that arise as a result of its work in connection with existing utilities.

1.6 PROTECTION

A. Unless equipment and material can be protectively stored in a manner acceptable to the A/E, they shall not be delivered to the site until the Work is ready to receive them.

B. Protect all equipment and materials during construction from damage by weather, water, dirt, paint droppings, welding and cutting spatters, and other construction activities.

C. All materials or equipment stored outside shall be elevated and protectively covered in a secured and locked area.

D. Store materials and equipment sensitive to weather or construction conditions inside. Where necessary, store sensitive equipment in a heated area.

E. During construction, cover all equipment and other items that are susceptible to damage until they can be installed in place.

F. Immediately repair or replace damaged equipment or materials to the satisfaction of the A/E and at no additional cost to the Owner.

G. Contractor shall protect the building and other Contractors' material and equipment from damage caused by its Work. Protect floors from cutting oil and chips.

H. Use all means necessary to protect materials before, during, and after installation.

I. Refer also to individual Specification Sections for specialized protection.

1.7 PLUMBING LUBRICATION AND PACKING

A. Contractor shall lubricate all the equipment that it furnishes with the correct grade, type, and quantity of lubrication before placing equipment and valves in service.

B. Refer to the Equipment Manufacturer's recommended lubricants. Furnish equal lubricants as supplied by Castrol, Mobil, Shell, or the Owner's present supplier.

C. Follow the Equipment Manufacturer's recommendations for specific lubricants and application schedule.

D. Check each shaft or valve stem containing a packing gland for condition and examine for proper packing.

E. When filling systems initially for hydrostatic pressure tests, adjust valve packing glands to finger-tight and allow packing to absorb water for (5) minutes prior to tightening packing nuts.

F. Maintain lubrication and packing seals during construction and ensure that, at the time of final acceptance, all are operating properly.

G. Contractor shall repair any damage caused by improper lubrication of the equipment that it furnished, at no expense to the Owner.

H. Incorporate lubrication instructions in the Operating and Maintenance Manual.

1.8 EQUIPMENT ACCESS

A. Locate all equipment to provide sufficient access to operate equipment or to service items requiring periodic maintenance. Coordinate with the structure and with all other Contractors' work.

1.9 PLUMBING ROUGH-IN AND FINAL CONNECTIONS

A. Provide service rough-ins.

B. Provide piping, valves, and specialties as specified under other Sections of these Specifications.

C. Provide stops on supply connections to equipment not otherwise furnished with integral stops.

D. Provide line-size indirect connections from sterilizers to hub drain. Coordinate sizes of drains with equipment installed.

E. Refer to approved equipment drawings for exact rough-in sizes and locations.

F. Coordinate rough-in locations with other Contractors and the Owner.

G. Coordinate rough-in with all items of equipment.

1.10 ACCESS PANELS

A. Lead Contractor shall be responsible, unless otherwise noted, for all access panels shown on the Drawings, or where otherwise required, to permit convenient access to concealed plumbing equipment, boxes, connections, controls, or other devices requiring service, adjustment, or maintenance. Refer to the Architectural Drawings for location.

B. Acceptable Manufacturers: Inryco-Milcor, Babcock-Davis, Bilco, Boico, Cesco, Inland-Ryerson, JL, Milco, Karp, Larsen's Manufacturing Co., Mifab, Mitco, or Zurn.
   1. Manufacturer and Model Number listed below shall be considered to be the Design Base Manufacturer and Model Number. Other Acceptable Manufacturers will be permitted, unless specifically excluded.

C. Access Panels:
   1. Panels shall be 18 in. x 18 in., unless larger panels are shown or required. Panels shall be steel construction (except where aluminum or stainless steel is specified) with overlapping edges and concealed hinge door with screwdriver lock. Mounting frames shall be compatible with the building construction material in which they are installed. Each access panel in fire-rated shaft walls and in fire-rated ceilings shall be B Label.
   2. Ceiling access panels:
      a. Gypsum: Inryco-Milcor Style DW. Prime-painted for finish painting with ceiling.
      b. Plaster:
         1) Inryco-Milcor Style AP. With finish material same as ceiling material.
         2) Inryco-Milcor Style K. Prime-painted for finish painting with ceiling.

c. Acoustical concealed spline: Inryco-Milcor Style AT.
d. Fire-rated: Inryco-Milcor Style ATR.

3. Wall access panels:
   a. Gypsum: Inryco-Milcor Style DW. Prime-painted for finish painting with wall.
   b. Plaster: Inryco-Milcor Style K. Prime-painted for finish painting with wall.
   c. Masonry and tile:
      1) Inryco-Milcor Style M Standard. Prime-painted for finish painting with wall.
      2) Inryco-Milcor Style M. Stainless steel.
   d. Fire-rated: Inryco-Milcor. Fire-rated access door, prime-painted for finish painting with wall.
4. Floor access panels:
   a. Finished: Babcock-Davis Type FT. Edging shall accommodate type floor covering required. Refer to Room Finish Schedule.
   b. Interior, bare concrete floor: Babcock-Davis Type FC. Checkered plate cover.
   c. Exterior, concrete slab: Babcock-Davis Type GT. Gutter and 1-1/2 in. drainage coupling, checkered plate cover.

D. Coordination:
1. Coordinate closely with other Contractors to ensure that all panels furnished by the various Contractors shall be identical.
2. Coordinate the location and installation of each access panel with the Lead Contractor, other Contractors, and equipment.
3. Advise other Contractors of specific requirements relating to access panel installation, including sizes of openings to receive access panel and frame, as well as locations of supports, inserts, and anchoring devices.

E. Determine specific locations and sizes for access panels needed, but not indicated on the Drawings, to gain access to concealed equipment.

F. Plan panel locations to clear ceiling luminaires, grids, and obstructions, and to allow, wherever possible, full shoulder clearance beside the device to be inspected, adjusted, or repaired.

1.11 CUTTING AND PATCHING

A. All cutting and patching shall be accomplished in a neat and workmanlike manner, acceptable to the A/E.

B. Cutting:
1. Contractor shall perform all cutting required for installing its own Work unless otherwise noted.
2. Cutting shall be done with such tools and methods so as to prevent unnecessary damage to surrounding areas and equipment.
3. Use rotary drills to cut holes through concrete, brick, plaster, or tile.
4. No cutting shall be done that will, in any way, reduce the structural strength of the building. Cutting of structural support beams, joists, plates, or other structural members is strictly prohibited without the specific written consent of the A/E and the Structural Engineer. Should such cutting be necessary, consult the A/E and do not proceed further without written approval of the A/E.

C. Patching:
1. Contractor shall be responsible for patching except as otherwise noted.

2. Only a qualified Finish Tradesman, skilled in the respective craft required, shall perform patching.
3. Patching shall match adjacent surface construction.
4. Materials and equipment used in the patching work shall comply with requirements of other Sections of this Specification.

D. Perform all cutting and patching promptly. Make all repairs to leave the entire Work in good condition, including all cutting, fitting, and drilling of masonry, concrete, metal, wood, plaster, or other materials, as specified for proper assembly, fabrication, installation, and completion of the Work.

E. Coordinate drilling, welding, etc., and method of attachment to columns, joists, beams, purlins, etc., with the Lead Contractor and A/E before proceeding.

F. If a Contractor finds it necessary to cut into the Work of another Contractor, the cutting and patching shall be performed by such other Contractor at this Contractor's expense. With the written consent of the A/E, the Contractor shall be allowed to perform the cutting. Patching shall be similarly executed.

G. Roofing:
1. Lead Contractor shall be responsible for all cutting of roofing, modification of roofing, roof opening framing, or roofing repair work for plumbing items, including, but not limited to, plumbing vents, etc.
2. A qualified Roofing Contractor shall perform all work in a manner such that any existing roof warranties are not voided.

H. Lead Contractor, or other Tradesperson approved by the A/E, shall replace floors, ceilings, roofs, etc., damaged during construction. The cost of repairs shall be borne by the Contractor causing damage.

I. Lead Contractor shall provide openings, with lintels if needed, for sleeves, piping, and other similar openings in new and existing interior masonry walls and floors. Locate and dimension the opening prior to construction. Refer to Plumbing Drawings.

J. Remove and replace masonry, wall tile, drywall, ceilings, and ceiling tiles in order to install Plumbing Work.

K. Contractor shall be responsible for all cutting of the floor slab related to its own Work.

L. Contractor shall be responsible for construction that is disturbed during the installation of piping, fixtures, or equipment.

M. Cutting and patching includes remodeling and repairing of previously graveled or paved areas, walks, curbs, sod, floors, etc. Saw cuts shall be done in neat, straight lines.

N. Contractor shall repair or replace any roads, sidewalks, or other items that its employees may damage during the performance of the Plumbing Work.

O. Cutting and Patching of Existing Work:
1. Remodeling, modifying, patching, and repair of the existing building shall match the existing conditions. Complete all work necessary to achieve this requirement. Quality of workmanship, materials, and finish shall complement appearance of existing construction.
2. Where limits of demolition are exposed in the existing finished work, cutting shall be made with saws, providing an absolutely straight line, plumb, true, and square.
3. Use saws to cut existing plaster or gypsum wall board. Equip power saws with blades designed to cut plaster or gypsum wall board and with dust collection

systems. Operate equipment so as to cause a minimum of damage to plaster or gypsum wall board that is to remain, and so as to keep creation of dust and dirt to a minimum.

4. Fill existing holes where piping is removed.
5. Lead Contractor shall provide lintels and other openings in existing interior walls.

P. Refer to Division 01 for additional requirements.

1.12 PAINTING AND RELATED WORK

A. **ALL PAINTING SHALL BE DONE BY A QUALIFIED TRADESPERSON SKILLED IN THE CRAFT.**

B. Lead Contractor shall be responsible for finish painting of walls, ceilings, and other Architectural items in the areas of construction.

C. Previously Finished Areas: Contractor shall repaint any previously finished areas disturbed by its own cutting and patching. Painting of the patched area shall match the color of the adjacent construction in the general area of the patch. Repaint the entire wall-to-wall and floor-to-ceiling surface if, in the opinion of the A/E, a uniform appearance cannot be accomplished by touch-up.

D. Factory-Finished Equipment: Clean, spot-prime with zinc chromate, and finish, equal to the original quality, any new factory-finished equipment that has rusted, has been damaged, or has deteriorated. Repaint the entire surface if, in the opinion of the A/E, a uniform appearance cannot be accomplished by touch-up.

E. Support Steel / Ferrous Metal: Clean, remove rust from, and paint with zinc-chromate primer any plumbing support steel and bare ferrous metal that is not factory-painted, shop-painted, or galvanized, and that remains exposed to view in the finished areas of the building, including mechanical/electrical rooms and storage rooms. Ensure that the prime coat shall be compatible with the finish coat.

F. Steel Hangers, etc.: Clean, remove rust from, and paint with zinc-chromate primer and aluminum-bronze paint all steel hangers, boxes, straps, and rods furnished under the Plumbing Work, that are not provided with rust-protective finish or are damaged in installation, and that remain exposed to view or are in unfinished and mechanical spaces.

G. Exterior Ferrous Metal: Paint with a prime coat any ferrous metal installed outside the building that is not factory-painted, shop-painted, or galvanized.

H. Paint exposed piping, valves, etc.

I. Clean all new insulation coverings. If pre-sized insulation is not used, insulation coverings shall be sized if finish painting is required.

J. Refer to Division 09 for additional requirements.

END OF SECTION 22 05 00.73

SECTION 22 05 00.74

CLEANING AND WASTE MANAGEMENT FOR PLUMBING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Division 01, “General Requirements.”

1.2 CLEANING AND WASTE MANAGEMENT

A. Contractor shall do its own cleanup, shall move materials that are in the way of constructing its work, shall repair and replace any damage it does, and shall do any other work of a similar nature which shall be done.

1.3 PROGRESS CLEANING

A. Maintain all work areas in a neat and orderly manner, free of debris. Clean up all occupied travel areas at the end of each shift. Clean up material removed immediately after use.

B. Clean up building and site thoroughly every day.

C. Equipment cleaning and touch-up:
1. Use only cleaning materials recommended by the Manufacturer of the surface to be cleaned.
2. Clean interiors of all enclosures of dirt and debris before installing trim or covers.
3. Brush-clean, prime, and paint-in-kind rust spots on any part.
4. Clean galvanized piping in exposed areas with diluted acetic acid.
5. Clean copper piping in exposed areas with fine emery cloth and solvent.
6. Clean all gauges, thermometers, traps, dirt legs, strainers, and fittings.

1.4 CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

A. On-site rubbish collection containers shall be furnished and weekly rubbish removal service shall be provided or all rubbish and debris from the site shall be removed daily. Refer to Division 01.

B. Do **NOT** use the Owner’s dumpster for on-site rubbish and debris.

C. Disposal of material by removal:
1. Prior to the completion of the work, remove from the construction area all material designated to be removed.
2. All material to be removed shall become the property of the Contractor.
3. Conduct cleaning and disposal operations in compliance with local ordinances and anti-pollution laws. Make all necessary arrangements with private parties and with local officials pertinent to locations and regulations for dumping. Contractor shall pay fees or charges required for dumping of materials.
4. Contractor shall be responsible for locating a legal dump site and for all expenses due to length of haul.
5. Do not burn or bury rubbish and waste materials on Project site. Do not dispose of waste into streams or waterways.

D. Prior to completion of the work, remove from the vicinity of the work all temporary structures, unused materials, concrete forms, and other like materials. All work areas shall

be graded and left in a neat manner conforming to the natural appearance of the landscape or as directed elsewhere in the Contract Documents.

1.5 FINAL CLEANING

A. Repair, patch, and touch up all scratched or damaged surfaces to specified finish that matches adjacent surfaces, before final acceptance of the work. Repair dents and marred finishes to the satisfaction of the A/E. Prepare for finish painting, where painting is specified.

B. Thoroughly clean all fixtures; material; finished surfaces of equipment; painted, enameled, or varnished work; and all other exposed finished surfaces. Remove all labels, stickers, marks, stains, fingerprints, spots, rust, oil, grease, dirt, dust, and other foreign materials, so that the Work is presented in a complete and finished condition, ready for acceptance and intended use.

C. Verify that all drains are free of debris.

D. Employ experienced workers or professional cleaners for final cleaning.

E. Expedite the cleaning, washing, waxing, and polishing required within other Sections of these Specifications.

F. Refer to Division 01 for additional requirements.

END OF SECTION 22 05 00.74

SECTION 22 05 00.77

CLOSEOUT PROCEDURES FOR PLUMBING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Division 01, “General Requirements.”

B. Section 22 05 00.33, “Shop Drawings Submittals for Plumbing.”

C. Section 22 05 00.45, “Testing and Inspecting Services for Plumbing.”

D. Section 22 05 00.73, “Execution of Plumbing.”

E. Section 22 05 00.74, “Cleaning and Waste Management for Plumbing.”

F. Section 22 05 00.78, “Closeout Submittals for Plumbing.”

G. Section 22 05 00.79, “Demonstration and Training for Plumbing.”

H. Section 22 05 53, “Identification for Plumbing Piping and Equipment.”

1.2 DESCRIPTION

A. Complete and submit the following items, which is a partial list of the items required prior to Contract Completion:

ITEM	**REFER TO SECTION**
Shop drawing submittals	22 05 00.33
Operational inspection, testing, adjusting, and balancing of all equipment and systems	22 05 00.45, as well as other Sections
Protection	22 05 00.73, as well as other Sections
Painting	22 05 00.73
Cleaning	22 05 00.74
Operating and Maintenance Manuals	22 05 00.78
All required certifications and labels	22 05 00.78, as well as other Sections
Guarantees and equipment warranties	22 05 00.78, as well as other Sections
Spare parts	22 05 00.78, as well as other Sections
As-Built Documents	22 05 00.78
Instruction of the Owner’s personnel	22 05 00.79, as well as other Sections
Equipment and piping identification; valve tagging	22 05 53

B. Provide or perform all of the above items before Contract Completion.

1.3 PUNCH LIST PROCEDURE

A. Refer to Division 01.

END OF SECTION 22 05 00.77

SECTION 22 05 00.78

CLOSEOUT SUBMITTALS FOR PLUMBING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Division 00, "Procurement and Contracting Requirements."

B. Division 01, "General Requirements."

C. Section 22 05 00.77, "Closeout Procedures for Plumbing."

D. Section 22 05 00.79, "Demonstration and Training for Plumbing."

1.2 OPERATING AND MAINTENANCE MANUALS

A. An Operating and Maintenance Manual, approved by the A/E, is required for Contract Completion. Compile and submit a draft of the Operating and Maintenance Manual to the A/E (90) days before Contract Completion.

B. Submit the final corrected Operating and Maintenance Manual (7) days before Contract Completion.

C. Upon approval, provide:
1. (1) Operating and Maintenance Manual in the physical format described below.
2. A Portable Document Format (PDF) file containing a copy of the Operating and Maintenance Manual saved on a Universal Serial Bus (USB) flash drive.

C. The following items, together with any other pertinent data, shall be included in each Operating and Maintenance Manual. This list is not necessarily complete and shall be used only as a guide. Format of manual is to be as follows:
1. Operating and Maintenance Manual binders shall be heavy-duty, loose-leaf, 3-ring, vinyl-covered binders, no larger than 11 in. wide x 12 in. high, with pocket inside the covers to receive folded oversized sheets.
2. Identify each binder on front and spine with the printed title "OPERATION AND MAINTENANCE MANUAL," project name, and subject matter of contents.
3. Material shall be typewritten or printed and shall be fully legible.
4. Inside cover:
   a. Title of Project.
   b. Date of Project completion.
   c. Name and address of the Owner.
   d. Name and address of the Prime Contractor.
   e. Date of submittal.
   f. Name and address of the Contractor.
   g. Name and address of the Architect.
   h. Name and address of the Engineer.
5. Second Page: Index.
6. Each section shall be divided by labeled tabs.
7. First Section: A copy of each shop drawing and approved submittal with an index at the beginning of the section.
8. Second Section:
   a. A list of all equipment used on the job.

b. Complete list of all devices installed and cross-referenced to room number or location.
c. Parts list with numbers of replaceable items, including sources of supply.
d. Model and serial numbers of components of systems installed.
e. Suppliers and Manufacturers List:
1) Typed statement of material to be furnished.
2) Manufacturers' and nearest Factory Representatives' names, addresses, telephone numbers, and e-mail addresses.
3) Routine and 24-hour emergency service/repair information:
a) Name, address, telephone number, and e-mail address of servicing agency.
b) Names of personnel to be contacted for service arrangements.

9. Third Section:
a. Description of systems.
b. Manufacturer's literature describing each piece of equipment, including the following:
1) Operating and maintenance instructions.
2) Lubrication instructions.
3) Start-up and shutdown procedures.
4) Routine and emergency servicing instructions.
c. Valve charts.
d. Special wrenches, keys, etc.
e. Copies of all testing, adjusting, and balancing reports.
f. Prints of all system wiring and control diagrams.
g. All certifications and related information.
1) Typed verification of compliance with certification requirements.
h. Copies of all written warranties.
i. The Owner's receipt of spare parts.
j. The Owner's statement of completion of instruction. Refer to Section 22 05 00.79.

D. Refer to Division 01 for additional requirements.

1.3 GUARANTEES AND WARRANTIES

A. Guarantee: Contractor shall guarantee its equipment, workmanship, and materials for a period of (1) year from the date of Contract Completion. Should defects develop within this period, the Contractor shall, at no cost to the Owner, remedy the defects and reimburse the Owner for all damage to other Work caused either by the defects or as a result of the work of correcting the same.

B. Extended Warranties: The table below contains a list of items with warranty requirements and their specification sections. These extended warranties are over and above the 1-year guarantee specified above. This list may not be a complete list of all required warranties. Include copies of all written warranties in the Operating and Maintenance Manual, whether listed or not.

ITEM WITH WARRANTY REQUIREMENTS	SPECIFICATION SECTION
Water Cooler Compressors	22 40 00

C. Post-Warranty Service:
   1. The products and Manufacturers identified throughout these Specifications represent reputable suppliers that generally have an inventory of spare parts, and a network of authorized service providers that can support the products installed on this Project.
   2. Contractor shall, for a reasonable charge, assist the Owner for a period of (7) years in obtaining parts and service on the products installed.
   3. Once the Contractor's 1-year guarantee has expired, the Owner will pay the cost of these parts and service.
   4. If the item cannot be repaired, the Contractor shall recommend an equivalent replacement item at a reasonable cost to the Owner.

1.4 PROJECT AS-BUILT DOCUMENTS

A. Contractor shall maintain, at the job site, (1) copy of the As-Built Documents, including the following items related to its Trade:
   1. Contract Drawings.
   2. Specifications.
   3. Addenda.
   4. Reviewed Shop Drawings.
   5. Change Orders.
   6. Other modifications to Contract.
   7. Field Test Records and Start-Up Reports.
   8. Minutes of Coordination and Progress Meetings.
   9. (1) set of the Contract Drawings that will be used for As-Built Drawings. This set shall be used exclusively for documenting and recording the exact location of all installed Work.
   10. **Option:** With the approval of the A/E and Owner, As-Built Documents may be made available in an electronic format via an Internet-accessible server.

B. Do not use As-Built Documents for construction purposes.

C. Store As-Built Documents apart from documents used for construction at the Contractor's temporary field office, or in another location readily available to the A/E.

D. Provide files and racks for storage of As-Built Documents, as appropriate, with As-Built Documents identified.

E. Maintain As-Built Documents in clean, dry, legible condition.

F. Use red ballpoint pen for all marking of As-Built Documents.

G. As-Built Documents shall be available at all times for inspection by the A/E and Owner.

H. As-Built Drawings:
   1. As-Built Drawings shall be legibly marked to record actual "as-built" construction with the following information (some of these items may not be applicable):
      a. Horizontal and vertical location of above-ground and underground utilities and appurtenances referenced to permanent surface improvements.
      b. Location of internal utilities and appurtenances concealed in construction referenced to visible and accessible features of structure.
      c. Field changes of dimension and detail.
      d. Changes made by Change Order.
      e. Details not on the original Contract Drawings.

2. Do not permanently conceal any work until the required information has been recorded.
3. Record the location of all concealed utilities on the As-Built Drawings.
4. Record deviations in locations of concealed piping, valves, equipment, and all buried or concealed utility lines and services, etc., dimensioned from a fixed control point, including the following:
   a. Depth of bury.
   b. Invert elevations at start of sanitary line.
   c. At each change of direction.
   d. At each change of slope.
   e. Additional dimensions in order to fully define location.
5. Minor piping variations need not be recorded.
6. Record locations of abandoned piping, including exterior lines.
7. Record deviations made necessary to incorporate equipment different from the Design Base equipment.
8. Record all Addendum Items.
9. Mark locations of access panels on the As-Built Drawings.
10. Add valve tag numbers to the As-Built Drawings.

I. Include a complete list of all devices installed and cross-referenced to room number or location.

J. At completion of project, the Contractor shall deliver (1) printed copy of its As-Built Documents to the A/E.

K. Contractor shall accompany its As-Built Documents with a transmittal letter, in duplicate, containing the following information:
1. Date.
2. Project title and number.
3. Contractor's name and address.
4. Title and number of each As-Built Document.
5. Certification that each As-Built Document as submitted is complete and accurate.
6. Signature of the Contractor or its Authorized Representative.

1.5 SPARE PARTS

A. Provide a receipt, signed by the Owner, for (1) complete set of all the operating appurtenances and loose items related to the operation and maintenance of the completed Project for the Owner's use after the guarantee period expires. Insert the receipt in the Operating and Maintenance Manual. These appurtenances and items include, but not are limited to, the following:
1. Keys to panels, door and window hardware, and other devices not directly provided to the Owner from the Manufacturer.
2. Operating handles, levers, cranks, specialized wrenches or drivers, remote controls, and similar items.
3. Extra materials (e.g., attic stock) listed below. This list may not be a complete list of all spare parts. Provide all spare parts, whether listed or not.

SPARE PART AND QUANTITY	SPECIFICATION SECTION
Division 22 items	
Set of spare mechanical seals — (1) set for each pump	22 14 29
Any other parts mentioned elsewhere	

END OF SECTION 22 05 00.78

SECTION 22 05 00.79

DEMONSTRATION AND TRAINING FOR PLUMBING

PART 1 - GENERAL

1.1 DESCRIPTION

A. Provide training schedule and training outline for approval (45) days prior to Contract Completion.

B. Provide in-service training for the system's operators. Provide all applicable user manuals and related training documentation.

C. After all system operational tests have been completed, schedule an instruction period with the Owner. Schedule well in advance, so that all the Owner's personnel may attend if they desire. Coordinate with the Owner and A/E for date and time of training sessions.

D. Participate in training sessions. Instruct the Owner in the operation and maintenance of all systems and equipment. Use Operating and Maintenance Manuals to familiarize the Owner with equipment and procedures. Allow sufficient time for this instruction.

E. Instruction shall include the following:
   1. Location of equipment and explanation of what it does (function).
   2. Reference to operating instruction manuals for record and clarity.
   3. Coordination of written and verbal instructions, so that the operation of each system is fully understood by operating personnel.
   4. Complete review of items contained in Operating and Maintenance Manuals.
   5. Discussion of maintenance procedures that are required be followed by the Owner, including cleaning procedures and what items to check.
   6. Complete demonstration and explanation of each System.

F. Provide a copy of the Owner's "Certificate of Equipment Demonstration," signed by the Contractor, the Owner, and the A/E, in each Operating and Maintenance Manual. If the Owner does not have a standard demonstration form, the A/E will provide one.

END OF SECTION 22 05 00.79

SECTION 23 05 00

COMMON WORK RESULTS FOR HVAC

PART 1 - GENERAL

1.1 PREFACE

A. The Work shall be performed using the General Contracting (GC) / Single-Prime Contractor project delivery method and the Design-Bid-Build process. References to Work to be performed by different Trades Contractors or Subcontractors are all subject to the Scope of Work by the Prime Contractor. Any conflicts regarding Scope of Work shall be directed to the Prime Contractor for resolution. **THE PRIME CONTRACTOR FOR THIS PROJECT SHALL ALSO BE KNOWN AS THE LEAD CONTRACTOR.**

B. **Terminology:** The terms below will be used throughout Division 23, in accordance with Division 00 and Division 01.
   1. Owner: Mt. Gilead Exempted Village Schools.
   2. Architect/Engineer (A/E): Schorr Architects, Inc. / Roger D. Fields Associates, Inc.
   3. Contractors:
      a. All Trade Contractors listed below are Subcontractors.
      b. General Trades: Refer to Divisions 02 through 14.
      c. Fire Suppression: Refer to Division 21.
      d. Plumbing: Refer to Division 22.
      e. HVAC: Refer to Division 23.
      f. Electrical: Refer to Division 26.
      g. Communications: Refer to Division 27.
      h. Electronic Safety and Security: Refer to Division 28.
      i. Site: Refer to Divisions 31 through 35.
   4. Authority Having Jurisdiction (AHJ) mentioned in Division 22:
      a. Morrow County Health District.
      b. City of Mt. Gilead Fire Department.
      c. State of Ohio Department of Commerce, Division of Industrial Compliance.
      d. State of Ohio Department of Commerce, Division of State Fire Marshal.
      e. State of Ohio Department of Health.

C. Scope of Work Summary for the Contractor Performing HVAC Work on this Project:
   1. Provide complete HVAC systems in the renovated area, as shown on the Drawings.

1.2 RELATED DOCUMENTS

A. Refer to the additional Divisions below for specific requirements, responsibilities, and methods relating to Division 23 Work. If there is a conflict, comply with the more restrictive requirements.
   1. Division 00, “Procurement and Contracting Requirements”: All sections.
      a. The “General Conditions” will provide additional information on the Contractor’s Scope of Work responsibilities.
   2. Division 01, “General Requirements”: All sections.

B. Read the entire Specification covering other branches of the Work. Contractor shall be held responsible for the coordination of its work with the work performed by other Trades.

1.3 DESCRIPTION

A. HVAC Work includes the Work described in Division 23, "Heating, Ventilating, and Air Conditioning (HVAC)," Sections 23 00 00 through 23 99 99 (as included), unless otherwise noted.

B. In the Sections listed above, the term "Contractor" shall mean the Contractor performing HVAC Work on this Project, unless otherwise noted.

C. HVAC Work includes, but is not limited to, the following:
   1. Selective demolition.
   2. Vibration and seismic controls.
   3. Air balancing:
      a. The HVAC air testing, adjusting, and balancing (TAB) is through a separate Contract. The TAB Contractor shall perform air balancing for the renovated portion of the HVAC system.
      b. Coordinate HVAC system balancing with the TAB Contractor.
      c. Support the effort of the TAB Contractor in obtaining measurements, and in making any minor revisions in the duct and piping systems to achieve design flows.
   4. HVAC insulation.
   5. Commissioning.
   6. Temperature controls.
   7. HVAC air distribution:
      a. Ductwork.
      b. Dampers.
      c. Fans.
      d. Air outlets and inlets.
   8. Filters.
   9. Central HVAC equipment:
      a. Dedicated outdoor air system (DOAS) units.
   10. Decentralized HVAC equipment:
      a. Split-system air-conditioners.
      b. Variable refrigerant flow (VRF) systems
      c. Unit heaters, including cabinet, propeller, wall, and ceiling.
      d. Radiant heating units (ceiling panels).

D. Contractor is responsible for the more restrictive requirement between these general provisions and other requirements contained elsewhere in the Contract Documents.

E. Furnish material, labor, tools, accessories, and equipment to complete and leave ready for operation all HVAC systems of this Project as described in these Specifications and as shown on the Drawings.

F. Use sufficient skilled workers and competent supervisors in the execution of this portion of the Work to ensure proper and adequate installation throughout.

G. Refer to Section 23 05 00.31, "Project Coordination for HVAC," regarding final electrical connections.

H. Maintain existing facilities in operation whenever possible. Occupied sections of the building will remain in use throughout construction. Coordinate with the A/E and Owner.

I. Work Sequence:
   1. The Work shall be conducted in one phase.
   2. Complete work in one Area before proceeding to the next Area. Coordinate with all Trades, the Owner, and the A/E.

J. All HVAC systems shall be provided as complete and operational, and shall not be considered complete unless, and until, at a minimum, all Code and Governing Agency requirements are satisfied.

1.4 COORDINATION MEETINGS AND COORDINATION DRAWINGS

A. Terminology:
   1. Coordination Meetings: Coordination Meetings shall be held to identify Coordination Areas and the need for a Coordination Drawing for any Coordination Area. The Lead Contractor shall schedule and conduct the Coordination Meetings.
   2. Coordination Areas: Areas of the project that require special attention, i.e., where there are potential conflicts between Trades.
   3. Coordination Drawings: Drawings and electronic files prepared by the Coordination Participants to demonstrate how multiple-system and interdisciplinary work shall be coordinated.
      a. Clash Detection Reports: Generated by a design authoring process, in which three-dimensional software is used for building information modeling (BIM).
      b. Clash Detection Reports generated by BIM authoring software may be included in the Coordination Drawing submittals if applicable, but Clash Detection Reports do not take the place of Coordination Drawing submittals.
   4. Coordination Participants: All Contractors shall participate in the process of developing the Coordination drawings, including, at a minimum, the following Trades:
      a. General Trades.
      b. Fire Suppression.
      c. Plumbing.
      d. HVAC.
      e. Electrical.
      f. Communications.
      g. Electronic Safety and Security.

B. The Coordination Drawing process includes the following:
   1. The Contractor responsible for HVAC systems and performing HVAC Work on this Project, designated as the HVAC Contractor in this Specification Section, shall prepare the preliminary Coordination Drawings for each Coordination Area, showing all HVAC piping, ductwork, and equipment in plan and elevation. HVAC systems shall be coordinated with General Trades items (floor-to-floor elevations, ceiling heights, shafts, chases, exterior elevations, etc.) to locate all HVAC items above ceilings/concealed, unless noted otherwise on the Contract Drawings.
   2. HVAC Contractor shall provide the preliminary Coordination Drawings to all Coordination Participants and the Lead Contractor for review and comment. HVAC Contractor shall identify Coordination Areas, as well as areas where there appear to be no potential conflicts.
   3. Each Coordination Participant shall use the preliminary Coordination Drawings to develop drawings and illustrate work within each area, and to identify other Coordination Areas.

4. Each Coordination Participant shall mark the preliminary Coordination Drawings to identify conflicts between its Scope of Work and the HVAC Scope of Work, and shall returns its drawing to the HVAC Contractor.
5. HVAC Contractor shall incorporate each Coordination Participant's work and shall meet with all the Coordination Participants to coordinate and agree on the final details. HVAC Contractor shall prepare the final Coordination Drawings for all the Coordination Participants to approve and utilize to sequence and install work.
6. All Coordination Participants shall sign off on the Coordination Drawings, indicating that they agree that the items shown:
   a. Are coordinated with the structure, ceilings, and other items to be concealed.
   b. Are accessible for maintenance.
   c. Can be installed without further adjustment.
7. The Lead Contractor shall review and accept the Coordination Drawings as complete. The Lead Contractor shall forward copies of the Coordination Drawings for comment to the Owner and the A/E, with copies to all Coordination Participants.
8. HVAC Contractor shall submit electronic copies of Coordination Drawings as a shop drawing, following the procedures in Division 01, "General Requirements," and Section 23 0500.33, "Shop Drawing Submittals for HVAC."
9. Discrepancies identified by any Contractor shall be reported, in writing, to the Lead Contractor within (3) business days of receipt. All Contractors shall work together to coordinate systems with the building structure and ceilings. Meetings with the Lead Contractor, the A/E, and the Owner may be required.
10. The A/E shall review the final Coordination Drawings in accordance with the General Conditions. Concerns shall be reported to the Coordination Participants within (10) business days of receipt.
11. The Owner shall approve any changes to the Contract Documents. Any additional costs resulting from Coordination Meetings and resulting Coordination Drawings shall be approved in advance by the Owner following the Change Order process.

1.5 QUALITY ASSURANCE

A. Standards: Refer to individual Specification Sections for additional referenced standards. If a standard is undated, the referenced edition or most recent version of the standard applies.

B. Standards: The following is a list of referenced standards. Not all of these standards necessarily apply to this Project. Refer to individual Specification Sections. If a standard is undated, the referenced edition or most recent version of the standard applies.
   1. American Institute of Architects Committee on Architecture for Health (AIA/CAH), Health Guidelines Revision Committee (HGRC): 2014 Guidelines for Design and Construction of Hospitals and Outpatient Facilities.
   2. American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE):
      a. Standard 62.1, Current Enforced Edition, "Ventilation for Acceptable Indoor Air Quality."
      b. Standard 90.1, Current Enforced Edition, "Energy Standard for Buildings Except Low-Rise Residential Buildings."
   3. American Society of Mechanical Engineers (ASME).
      a. Boiler and Pressure Vessel Code (BPVC), Section IX, "Welding and Brazing Qualifications."
   4. Americans with Disabilities Act (ADA), 2010, Accessibility Guidelines, Code of Federal Regulations (CFR), 36 CFR 1191.

5. National Fire Protection Association (NFPA):
   a. 2023 NFPA 70, "National Electrical Code® (NEC)."
   b. 2021 NFPA 99, "Health Care Facilities Code."
6. United States Department of Housing and Urban Development.
7. United States Department of Labor, 29 CFR 1910.7, Occupational Safety and Health Administration (OSHA), Part 1926, "Safety and Health Regulations for Construction."
8. United States Environmental Protection Agency (EPA).
9. State of Ohio:
   a. Ohio Administrative Code (OAC):
      1) OAC 1301:7-7: 2017 Ohio Fire Code.
      2) OAC 4101:1: 2024 Ohio Building Code.
      3) OAC 4101:2: 2024 Ohio Mechanical Code.
      4) OAC 4101:3: 2024 Ohio Plumbing Code.
      5) OAC 4101:4: 2024 Boiler and Pressure Vessel Rules.
      6) OAC 4101:5: 2024 Elevator Code.
      7) 2024 Ohio Existing Building Code.
   b. Ohio Revised Code 153.011.
   c. Ohio Environmental Protection Agency (EPA).

END OF SECTION 23 05 00

SECTION 23 05 05

SELECTIVE DEMOLITION FOR HVAC

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Division 01, “General Requirements.”

B. Section 23 05 00.35, “Special Procedures for HVAC.”

C. Section 23 05 00.78, “Closeout Submittals for HVAC.”

1.2 DESCRIPTION

A. Provide demolition and renovation work as shown on the HVAC.

B. Provide demolition needed in order to install the new HVAC Work.

C. Remove existing piping and ductwork as shown on the Drawings.

D. Relocate any existing piping, ductwork, equipment, registers, diffusers, and similar items in order to accommodate the installation of the Work. **THE DRAWINGS DO NOT SHOW EVERY ITEM OF DEMOLITION OR RENOVATION REQUIRED TO COMPLETE THE WORK.** Review the existing conditions and plan work accordingly.

E. existing services in areas beyond phase being renovated.

1.3 ENVIRONMENTAL HAZARDS

A. Asbestos Abatement: Refer to Section 23 05 00.35.

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION

3.1 INSPECTION

A. At the beginning of construction, carefully inspect the entire Project and verify with the A/E and Owner all items designated to be removed or to remain.

B. Locate all existing services requiring removal and determine requirements for disconnecting and capping.

C. Locate all existing active services designated to remain. Protect in order to keep in service.

3.2 PREPARATION

A. Notify the A/E and Owner at least 2 full working days in advance of commencing work in a particular area.

B. Schedule all work in a careful manner with full consideration for the Owner and its personnel, avoiding interference with the use of, and passage to and from, adjacent areas and facilities designated to remain in use during demolition.

C. Disconnect, or arrange for the disconnection of, all services or equipment designated to be removed or replaced. Perform all such work in accordance with the requirements of the Owner.

D. Coordinate all demolition, and any disconnection, of services or equipment designated to be removed, with the A/E, Owner, Work of other Contractors, and Utility Company.

E. Coordinate disconnection of electrical service to equipment to be removed and the removal of conduit, wireways, wiring, and other electrical devices with the Electrical Contractor.

F. Maintain, in operating condition, all active services designated to remain. Provide temporary caps as needed (not shown). Provide temporary connections and reconnections as needed (not shown).

G. Provide protection for the Owner's personnel and others.

H. Protect remaining property from damage during demolition and removal of debris.

3.3 DEMOLITION

A. Demolish and remove abandoned piping, ductwork, equipment, equipment foundations and supports, and all other existing items that are designated for removal or that need to be removed for the renovation.

B. Temporarily cap and plug piping and ductwork where demolition begins.

C. Do not use equipment or methods that will cause damage to adjacent construction designated to remain.

D. Protect and maintain all active services. Repair or replace, at no expense to the Owner, all such items disturbed in the execution of Work.

E. Repair or replace surfaces and elements of structures **NOT** scheduled to be demolished, but damaged due to demolition or lack of protection.

F. Items that are completely concealed in existing structure and that will not interfere with new work may remain. Cap and plug at ends.

G. Construct dust barriers to prevent dust and dirt from entering occupied areas or areas outside of general remodeling work.

H. Sprinkle rubbish and debris to keep dust laid.

I. Reroute and relocate any items to permit installation of new work.

3.4 REMOVAL AND SALVAGE

A. Remove all items of piping, ductwork, equipment, and other material as shown on the Drawings and in these Specifications. Unless otherwise noted, all usable items shall be salvaged and reused where possible.

B. Items Being Removed That Are To Be Reused:
   1. Carefully remove and store usable items until reinstallation is to proceed.
   2. Coordinate locations of stored materials with the Lead Contractor, A/E, and Owner.

C. Items Being Removed That Are **NOT** To Be Reused:
   1. The Owner will have first right of refusal.
   2. Carefully remove any items that the Owner wishes to keep and deliver them in good condition to the permanent storage location on site designated by the Owner.

D. Dispose, off-site, of all items not wanted by the Owner.

3.5 HVAC RENOVATION WORK

A. Remove or relocate portions of the existing heating and ventilating system in the building, as noted. Heating and air conditioning systems in other portions of the building are to remain.

B. Items to be removed include, but are not limited to, the following: heating water piping, blower coils, radiators, and control tubing.

C. Recover and properly dispose of refrigerant **BEFORE** disconnecting piping.

D. Disconnect and remove existing equipment that is no longer used.

E. Reuse grilles, registers, and diffusers where indicated. Give any remaining air devices to the Owner.

F. Piping or ductwork below the floors, or concealed in walls or above ceilings, may be abandoned in place if it does not interfere with new construction.

G. Note locations of any piping or ductwork abandoned below floors, in walls, or above ceilings, including exterior lines, on the As-Built Drawings. Refer to Section 23 05 00.78.

3.6 ROOFING RENOVATION WORK

A. Where the Contractor removes items from the roof such that the waterproofing integrity of the roof is affected, it is responsible for proper repair of roof and shall bear the entire expense of repair. Qualified roofing craftsmen shall repair the roof in accordance with Manufacturer's instructions so as not to void the warranty. The Roofer shall be approved by the Owner and A/E before work begins.

END OF SECTION 23 05 05

SECTION 23 05 17

SLEEVES AND SLEEVE SEALS FOR HVAC

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Division 01, "General Requirements."

B. Division 07, "Thermal and Moisture Protection."

1.2 DESCRIPTION

A. Provide sleeves and sleeve seals, including all accessories required for a complete installation, at penetrations of exterior floor and wall assemblies. Sleeve where HVAC work, including piping or ductwork:
   1. Passes through equipment room walls.
   2. Passes exposed through non-fire-rated construction walls.
   3. Passes exposed through non-fire-rated construction above-grade floors.
   4. Passes through smoke-rated or fire-rated separations. Apply firestopping to HVAC penetrations of fire-rated floor and wall assemblies to maintain or restore original fire-resistance rating of assembly according to Division 07.

1.3 TERMINOLOGY

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.

1.4 QUALITY ASSURANCE

A. Standards:
   1. American Society for Testing & Materials (ASTM):
      a. ASTM E 84, Standard Test Method for Surface Burning Characteristics of Building Materials."
      b. ASTM E 814, "Standard Method of Fire Tests of Through Penetration Fire Stops."
   2. Factory Mutual Global (FMG).
   3. National Fire Protection Association (NFPA):
      a. 2023 NFPA 70, "National Electrical Code® (NEC)."
      b. 2021 NFPA 101, "Life Safety Code."
   4. Underwriters Laboratories, Inc. (UL) 1479, "Fire Tests of Through-Penetration Firestops."

1.5 SUBMITTALS

A. Submit Manufacturer's product data, installation instructions, and details for each required product.

PART 2 - PRODUCTS

2.1 SLEEVE SEALS — NON-FIRE-RATED HVAC PENETRATIONS

A. Piping Sleeve Material:
   1. Up to 8 in. diameter: Machine-cut Schedule 40 black steel pipe.

2. 8 in. and larger: Schedule 30 black steel pipe.
3. Bare copper piping: Copper sleeves.
4. **Option:** Schedule 40 plastic pipe may be used for piping sleeves, where adjacent ceiling space is not used for return air plenum. Refer to the Drawings.
5. Sleeves may be split, where used on existing piping through non-bearing walls.

B. Ductwork Sleeve Material: 14-gauge steel.

C. Sizing: Sleeves shall be large enough for insulation to be continuous, or for sleeve seals to be installed. Size to allow 1/2 in. minimum clearance all around piping or piping insulation and ductwork or ductwork insulation.

2.2 SLEEVE SEALS — FIRE-RATED HVAC PENETRATIONS

A. Acceptable Manufacturers: Either provide sleeves and sleeve seals from the Manufacturers listed in Division 07 or provide sleeves and sleeve seals from the following Manufacturers: 3M Fire Barrier caulking or putty, BP Fyre Putty, Carborundum Fibersil, Chase Foam, CSD Sealing Systems "FSP," Dow Corning 3-6548, Hilti Fire Stop, International Protective Coatings Corporation "Flame-Safe," Johns-Manville Cerafiber, KBS Mortar Seal, or Nelson Fire Stop.

B. ASTM E119 and E814 Silicone RTV foam, UL-approved.

C. Sleeves shall be large enough for fire-rated sleeve seals to be installed. Size to allow 1/2 in. minimum clearance all around.

2.3 FIRESTOP PILLOWS

A. Acceptable Manufacturers: KBS or approved equal by 3M or Specified Technologies Inc.

B. KBS SEALBAG™: UL-listed, FMG-approved.

2.4 SLEEVE SEALS — WATERTIGHT HVAC PENETRATIONS

A. Provide sleeves with waterstop anchor flange at midpoint where penetrating structure at or below grade.
1. Acceptable Manufacturers: Calpico, 3M, or Hilti.

B. **Option:** Compression Seals: GPT Industries Link-Seal. Stainless steel bolts and nuts. Provide correct size seal and coordinate with sleeve size.
1. Acceptable Manufacturers: GPT Industries or approved equal by Metraflex, Wayne, Michigan, or Calpico.

C. Sleeves shall be large enough for watertight sleeve seals to be installed. Size to allow 1/2 in. minimum clearance all around.

PART 3 - EXECUTION

3.1 COORDINATION

A. Coordinate location of sleeves, core-drilled holes, and other holes required with the Lead Contractor, Structural Engineer, equipment, and other Trades.

3.2 INSTALLATION — GENERAL

A. Indicated sizes and locations are based on early Project information and should be verified by the Contractor.

B. Chases and constructed openings that are not indicated on the Drawings shall be provided at the expense of the Contractor requiring the chase or constructed opening.

C. If it becomes necessary to cut into the work because of the failure of the Contractor to notify the Lead Contractor, then the Lead Contractor shall do any cutting and patching required later, at the Contractor's expense.

D. Provide dimensions and locations of openings required in walls for sleeves, piping, ductwork, louvers, grilles, and similar items, and deliver sleeves, to the Lead Contractor, so as not to delay construction.

E. **BEFORE CONSTRUCTION OF MASONRY OR CONCRETE WALLS IS STARTED**, give the Lead Contractor locations and sizes of all openings required for the installation of equipment or sleeves.

F. If sleeves are not installed due to the fault of the Contractor, the Lead Contractor shall core-drill holes through masonry or concrete construction at the expense of the Contractor.

G. In New Drywall, Masonry, or Concrete Wall Construction, as applicable to this Project:
   1. Provide sleeves for HVAC items.
   2. Carefully coordinate and check locations of sleeves immediately before and after each concrete pour and/or masonry installation.
   3. **Option** for above ceiling only: Lead Contractor shall omit concrete block(s) where required for penetrations, and shall provide square-finished opening. Do not omit concrete blocks in sound barrier walls, under bearing points, or in fire-rated or smoke-rated walls.
   4. In precast concrete work: In lieu of sleeves, cut holes after erection of concrete.
   5. Coordinate with the Lead Contractor, Structural Engineer, and A/E.

H. In Existing Walls: Contractor shall provide sleeves for its own Work, unless specifically shown otherwise. Perform one of the following for piping and ductwork penetrations and other openings through masonry or concrete walls:
   1. Knock out concrete block(s). Do not knock out concrete blocks under bearing points. Install sleeve. Repair wall. Coordinate with the A/E.
   2. Knock out concrete block(s). Do not knock out concrete blocks under bearing points. Provide a square-finished opening for ductwork No sleeve needed if no fire rating required. Coordinate with the A/E.
   3. Core-drill through walls where required. No sleeve needed if smooth opening and no fire rating required.
   4. Provide own sleeves and all required cutting, drilling, and patching for openings required through below-grade walls, or under interior bearing walls. Install sleeve such that the wall does not bear on the HVAC work.

I. Sleeves are not required in floor slabs on grade or in core-drilled openings not requiring firestopping or watertightness.
   1. **Exception:** Sleeves are required at core-drilling through hollow-core pre-cast concrete slabs and through concrete block walls to facilitate containment of required firestopping material.

J. Provide all piping and ductwork sleeves and caulking for openings in new walls.

K. Lead Contractor shall provide wall openings with lintels for ductwork, grilles, and louvers in new walls

L. Piping and ductwork shall not bear on sleeves. Install sleeves plumb and true to line, grade, and position.

M. Cutting:
   1. Cut off sleeves through walls flush with each surface.

2. Cut off sleeves 1/8 in. above finished floors and 3 in. above floors in kitchens, utility rooms, equipment rooms, and shafts. Cut off bottom of sleeve flush with surface.
3. Refer to Division 01 for specific requirements regarding approved cutting methods.

N. Piping: All piping sleeves and escutcheons shall have ample clearance for pipe and covering and shall have chrome-plated wall and floor escutcheons over the pipe in finished areas. Provide chrome-plated or prime-coated escutcheons in other rooms.

O. Ductwork:
1. Use sleeves where round duct openings are required through exposed walls, fire partitions, or equipment room walls.
2. Close off all spaces around rectangular ducts through exposed walls, fire partitions, or equipment room walls.
3. Install sheet metal escutcheons around ducts passing through walls exposed.
4. Seal between ductwork insulation and sleeve.

P. Close off all spaces around fans, dampers, louvers, or grilles that require rectangular openings.

Q. Unused sleeves shall be plugged and fire-packed. Provide finish that matches finish of adjacent surface.

3.3 INSTALLATION — FIRE-RATED HVAC PENETRATIONS

A. Verify which walls, ceilings, or floors are fire-rated, if any, and provide approved fire-blocking or fire-protective devices.

B. Use approved, UL-listed, fire-retardant sealants, backing, and packing to maintain fire rating of the structure penetrated.

C. Spray UL-listed foam sealant around exposed piping and ductwork entering and leaving fire-rated wall or floor structures.

D. To ensure fire blocking, close space around piping and ductwork and other HVAC items passing through walls and floors. Seal space up to a 1/2 in. gap with sealant or caulking. Close off space greater than a 1/2 in. gap with sheet metal and seal airtight.

E. For larger openings, provide firestop pillows.

F. Pack all fire-rated or sound-rated separation sleeves with glass fiber, high-temperature mineral wool, aluminum-silica fiber, fire-retardant rope, calcium silicate, or other noncombustible material to maintain fire rating of structure, and finish with fire-rated sleeve seals.

G. Fill space around all sleeves extending into exposed areas with material compatible with adjacent construction and finish.

H. All openings shall have been UL-tested utilizing the proper rated penetrations to be equal to, or greater than, the barrier assembly in which the penetration occurs.

I. Install all penetrations and openings in accordance with the Manufacturers' instructions.

J. The fire-blocking assembly shall maintain the required fire-resistance rating of the wall or floor in which it is placed. Apply a further sealant, if necessary, to attain a smoke-tight condition. Close openings without sleeves in the same manner.

K. Refer to Division 07 for additional requirements.

3.4 INSTALLATION — WATERTIGHT HVAC PENETRATIONS

A. Sleeving with absolutely watertight seal is required for HVAC work passing through exterior walls above grade, and underground foundation walls and other below-grade penetrations into building.

B. Piping sleeves penetrating outside wall or slabs on grade shall have welded intermediate flange imbedded in masonry. Space around piping shall be clamped, packed, and caulked to make an absolutely watertight seal within sleeve. Caulk around outside of sleeve.
   1. **Option:** Install compression seals.

END OF SECTION 23 05 17

SECTION 23 05 29

HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Section 23 05 48, “Vibration and Seismic Controls for HVAC.”

B. Section 23 07 00, “HVAC Insulation.”

C. Section 23 31 00, “HVAC Ducts and Casings.”

1.2 DESCRIPTION

A. Hangers and Supports for HVAC Equipment and Systems: Provide for equipment and piping installed under the HVAC Work.

B. Supports for Equipment:
   1. Provide all structural supports between building structural framing members to support major HVAC equipment, including:
      a. Air-handling units.
      b. Condensing units.
      c. Heat pumps.
      d. Large exhaust fans.
      e. Makeup-air units.
      f. Roof curbs.
      g. Roof openings.
      h. Roof ventilators.
      i. Rooftop units.
      j. Supply and return air fans.
   2. Attach all items of equipment securely to structure, floor, or concrete pad. Means of attachment shall be approved by the A/E and shall not degrade the structure.
   3. For any variation in supports needed for equipment actually purchased, Contractor shall bear all costs of modifications, including redesign costs.

C. Support Steel: Attach to building structure to support piping and smaller HVAC equipment items. Provide supports between structural members, except where specifically called out to be provided as part of the General Trades Work. Obtain prior written approval of the A/E.

D. Hangers for Piping: Install all necessary pipe hangers, supports, clamps, wall brackets, and attachments in order to:
   1. Properly support piping from building structure.
   2. Allow controlled thermal movement of piping systems.
   3. Facilitate action of expansion joints, loops, and bends, where used.
   4. Provide slope where indicated.

E. Hangers and Supports for Ductwork; Roof Curbs: Refer to Section 23 31 00.

F. Concrete Work: A qualified Tradesperson shall provide all concrete work.

G. Provide all necessary inserts, expansion shields, beam clamps, piping floor supports, auxiliary steel, angles, clips, mechanical fasteners, reinforcement steel, structure drilling, welding to structure, etc.

H. Components shall be selected and matched to the load imposed on them.

I. Refer to Structural and Architectural Drawings and Specifications to determine what supports are provided as part of the General Trades Work.

1.3 QUALITY ASSURANCE

A. Standards:
1. American Concrete Institute (ACI).
2. American National Standards Institute (ANSI).
3. American Society for Testing and Materials (ASTM).
4. American Society of Mechanical Engineers (ASME), including:
a. ASME B31.1, “Code for Power Piping.”
b. ASME B31.9, “Building Services Piping.”
5. Factory Mutual Global (FMG).
6. Manufacturers Standardization Society of the Valve and Fittings Industry (MSS).
a. Standard Practice 58.
b. Standard Practice 69.
c. Standard Practice 89.
7. National Fire Protection Association (NFPA).
8. Underwriters Laboratories, Inc. (UL).

PART 2 - PRODUCTS

2.1 STRUCTURAL STEEL

A. Steel plates, shapes, and bars; steel beams; strut channels; standard-weight black steel pipe; or steel angle. ASTM A36 / ASTM A36M, black and galvanized, of adequate size and strength to safely carry the weight of equipment item.

2.2 HANGERS FOR PIPING

A. Acceptable Manufacturers: Anvil International, B-Line Systems Inc., Carpenter & Patterson Inc., ERICO, Globe Pipe Hanger Products Inc., Klo-Shure, National Pipe Hanger Corp., or PHD Manufacturing Inc.

B. Uninsulated Piping:
1. Steel, cast iron, or plastic; 1/2 in. to 8 in.: Anvil International Fig. 69. Galvanized carbon steel, adjustable swivel ring.
2. Steel, cast iron, or plastic; 10 in. and larger: Anvil International Fig. 260. Adjustable clevis, carbon steel yoke, U-strap, rod, and hex nuts.
3. Copper, 1/2 in. to 4 in.: Anvil International Fig. CT-65. Copper-plated hangers, adjustable tubing ring, carbon steel ring, and malleable iron adjusting nut.

C. Insulated Piping:
1. Steel, plastic, or copper; all sizes: Anvil International Fig. 260. Adjustable clevis, carbon steel yoke, U-strap, rod, and hex nuts.
2. Cast iron, all sizes: Anvil International Fig. 590. Adjustable clevis, carbon steel yoke, U-strap, rod, and hex nuts.
3. Thermal protector:
a. 2 in. and smaller: 12 in. long segment of rigid pipe insulation supported by Anvil International Fig. 167. 18-gauge galvanized steel protection shield.
b. 2-1/2 in. and larger:
1) Acceptable Manufacturers: Pipe Shields Inc. or approved equal by Insul-Shield.

2) Pipe Shields Model CS or CS-CW, waterproof hydrous calcium silicate.
3) ASTM C552, Type I cellular glass, encased in 360-degree galvanized steel shield, same thickness as adjoining insulation.

D. Insulated Refrigerant Piping: Klo-Shure.
1. Acceptable Manufacturer: Klo-Shure.

E. Piping Indicated to be Installed "Tight to Ceiling or Wall":
1. Uninsulated, 1/2 in. to 4 in.: Anvil International Fig. 262. Carbon steel.
a. **Option:** PowerStrut channels with PowerStrut Model PS 3126 hold-down clamp. Use with rubber cushion for copper pipe.
2. Insulated, 3/4 in. to 8 in.: Anvil International Fig. 103. Carbon steel, offset pipe clamp.

F. Vertical Piping:
1. Anvil International Fig. 261. Friction riser clamp with 2-point bearing.
2. Use Anvil International Fig. CT-121 copper-plated riser clamp for copper pipe.

2.3 HANGER RODS, CLAMPS, AND BRACKETS FOR PIPING

A. Acceptable Manufacturers: Anvil International, B-Line Systems Inc., Carpenter & Patterson Inc., Globe Pipe Hanger Products Inc., ERICO, Miro, National Pipe Hanger Corp., PHD Manufacturing Inc., or Klo-Shure.

B. Lower Attachments: Strap, band, loop, or trapeze hangers in accordance with SMACNA HVAC-DCS.

C. Hanger Rods: Solid steel, threaded ends or all-thread rods of diameter listed below, with double nut attachment to the hanger and at the hanger attachment. Sizes are as follows:

PIPE SIZES	**ROD DIAMETER**
Up to 2 in.	3/8 in.
2-1/2 in. and 3 in.	1/2 in.
4 in. and 5 in.	5/8 in.
6 in.	3/4 in.
8 in. to 12 in.	7/8 in.
(3/8 in. rods are acceptable for plastic vent lines)	

D. Hanger Straps: Straps of sheet metal material compatible with suspended duct material.

E. Hanger Wires: Black annealed steel, bright basic steel, or galvanized steel.

F. Hanger Cables: Twisted wire-strand aircraft cable with adjustable mechanical locking device.

G. Hanger Clamps:
1. Beam clamps (up to 8 in. diameter pipe): Anvil International Fig. 218, Fig. 228, or Fig. 292. Top beam clamp, steel jaw, hook rod with nut, and spring washer steel eye-bolt, with Anvil International Fig. 157 or Fig. 290 extension piece for appropriate rod diameter.
a. **Option:** Anvil International Fig. 86, Fig. 93, or Fig. 94. Malleable iron clamp, hardened steel cup point set screw with Anvil International Fig. 89 steel retaining clip.

H. Hanger Brackets:
1. Acceptable Manufacturers: Anvil International, B-Line Systems Inc., Carpenter & Patterson Inc., Globe Pipe Hanger Products Inc., ERICO, National Pipe Hanger Corp.,

PHD Manufacturing Inc., Klo-Shure, Unistrut Corp., or ABB (Thomas & Betts) Superstrut®.

2. Wall brackets: Carbon steel, back plates, and bolts.
   a. Anvil International Fig. 194. Lightweight 750 lb. load.
   b. Anvil International Fig. 195. Medium-weight 1,500 lb. load.
   c. **Option:** Unistrut or ABB Superstrut® A1200.

2.4 SPRING HANGERS FOR PIPING

A. Acceptable Manufacturers: Anvil International, or Kinetics Noise Control, or approved equal by B-Line Systems Inc., Carpenter & Patterson Inc., ERICO, Globe Pipe Hanger Products Inc., Klo-Shure, National Pipe Hanger Corp., or PHD Manufacturing Inc.

B. Anvil International Fig. B268, Type A or Type B. Steel, adjustable pre-compressed variable spring.

C. Kinetics Noise Control Model SH. Refer to Section 23 05 48.

2.5 TRAPEZE HANGERS FOR PIPING

A. Acceptable Manufacturers: Unistrut Corp., or ABB (Thomas & Betts) Superstrut®, or approved equal by Anvil International, B-Line Systems Inc., ERICO, GS Metals Corp., National Pipe Hanger Corp., Powerstrut, or Wesanco Inc.

B. Unistrut P1000 or ABB Superstrut® A1200. Angle iron, or channel of sufficient length to support pipes and insulation on individual hangers, roller supports, or saddles with insulation protectors.

2.6 HANGER COVERS FOR PIPING

A. Acceptable Manufacturers: Buckaroos Inc. or approved equal by Pipe Shields Inc. or PHS Industries.

B. Buckaroos Wraparoos. 2-piece PVC cover. Snap-on design, adhesive seals, to 205 degrees F. temperature. Includes 18 in. long PVC hanger rod cover. Available in multiple colors. The A/E shall approve all color selections for HVAC equipment.

2.7 PIPE INSULATING SUPPORT

A. Piping 1-1/2 in. and smaller: Anvil International Fig. 167. 12 in. long, 18 gauge galvanized or stainless-steel sheet metal half-round piping shield inside clevis hanger.
   1. Acceptable Manufacturers: Anvil International or approved equal by Buckaroos Inc., Carpenter & Patterson Inc., PHS Industries Inc., Pipe Shields Inc., Rilco Manufacturing Co. Inc., or Value Engineered Products Inc.

B. Piping 2 in. and larger: Insul-Coustic Co. Insul-Shield. Pre-compressed fiberglass load-bearing segment, integral fire-retardant vapor barrier jacket and saddle.
   1. Acceptable Manufacturers: Insul-Coustic Co. or approved equal by Pipe Shields Inc., Buckaroos Inc., or ERICO.

2.8 ROOFTOP SUPPORTS FOR PIPING

A. Acceptable Manufacturer: Miro or Anvil International.

B. 3 in. and smaller diameter pipe: Miro Model 3-R or Anvil International H-Block Roof Supports. Polycarbonate roof deck base, adjustable roller housing, and polycarbonate resin/glass-filled nylon rod.

C. 4 in. and larger diameter pipe: Miro Model 4-R or Anvil International H-Block Roof Supports. Polycarbonate roof deck base, adjustable roller housing, and polycarbonate resin/glass-filled nylon rod.

2.9 PIPE ROLL STANDS

A. Acceptable Manufacturers: Anvil International or approved equal by B-Line Systems Inc., Carpenter & Patterson Inc., Globe Pipe Hanger Products Inc., ERICO, National Pipe Hanger Corp., PHD Manufacturing Inc., or Klo-Shure.

B. Anvil International Figure 271. Cast iron roll, stand with holes for anchoring, sized for use with protection saddle.

2.10 FINISH

A. Unless otherwise noted, all steel hangers and supports shall be standard black.
   1. **Exception:** Hangers and supports for exposed exterior applications shall be galvanized.

2.11 INSERTS

A. In Masonry with Voids: Master-Carr #94255A100. Steel plated with yellow chromated zinc, female threaded toggle.
   1. Acceptable Manufacturers: Master-Carr or approved equal by Vertical Solutions or Hohmann & Barnard.

B. In Poured Concrete: Anvil International Fig. 282. Malleable iron, universal mounting, lateral adjusting.
   1. Acceptable Manufacturers: Anvil International Inc. or approved equal by B-Line Systems Inc., Carpenter & Patterson Inc., Globe Pipe Hanger Products Inc., ERICO, Klo-Shure, National Pipe Hanger Corp., PHD Manufacturing Inc., or Unistrut.

PART 3 - EXECUTION

3.1 INSTALLATION

A. All piping supports, parts, and installation shall conform to the latest requirements of ASME B31.1 and MSS SP-58, SP-69, and SP-89, and shall not exceed the maximum pipe deflections allowed by ASME B31.9, except as supplemented or modified by the requirements of this Specification.

B. Install all piping systems with adequate provisions made for expansion and to prevent stresses on valves and equipment. Provide adequate pipe anchors, guides, and supports from building structure to properly control pipe movement. Method shall suit job conditions. Refer to Section 23 05 16.

C. Provide proper steel angles and channel systems, etc., between structural members for hanger supports where necessary. Weld to steel structural members where noted. Consult with the A/E regarding this procedure.

D. Do **NOT** support hangers from roof deck or floor above. Span from structural members with supplementary steel where direct attachment to structural members is not practical.

E. Install hangers and supports with all necessary inserts, bolts, rods, nuts, washers, and other accessories, according to the Manufacturer's recommendations. Hangers shall be double-nutted.

F. Use a separate hanger for each pipe. Do not hang one pipe from another.

G. Provide additional supports required to maintain piping alignment.

H. Spacing of Piping Supports: Maximum spacing of piping supports shall be as follows:

PIPE SIZE	STEEL PIPE	COPPER PIPE
3/4 in. or smaller	6 ft.	5 ft.
1 in. through 1-1/4 in.	6 ft.	6 ft.
1-1/2 in.	6 ft.	8 ft.
2 in.	10 ft.	8 ft.
2-1/2 in.	10 ft.	9 ft.
3 in. and larger	10 ft.	10 ft.

I. Support piping near elbows, such that the total cantilevered length for both sides of the elbow does not exceed 3 ft.

J. Support piping at pumps and equipment from floor, structure, or walls, so that piping weight is not supported by pumps or by equipment.

K. Structural Steel: Verify size required with the Structural Engineer.

L. Insulated Piping Hangers:
1. Adjust pipe hangers and hanger rods to proper elevation in a plumb position before pipe insulation is installed.
2. Hanger size shall be sufficient to accommodate pipe and insulation without compressing the insulation. Size hangers for outer diameter of insulation so that hangers pass freely around the insulation.
3. Install 12 in. long, 18-gauge half round shields inside clevis pipe hangers at all hangers (regardless of size). Verify method to be used.
4. Install insulating saddles of non-compressible insulation with a continuous vapor barrier on pipes 2 in. and larger during the period that the insulation is being applied.
5. Do not apply insulation to piping until insulation shields and saddles are in place at each pipe hanger.
6. Refrigerant piping: Use insulated couplings.
7. Refer to Section 23 07 00.

M. **Option:** Trapeze hangers may be used where parallel runs of pipe occur.

N. Vertical Piping Hangers:
1. Support vertical risers at the floor with friction riser pipe clamps.
2. Shorten legs to conceal riser clamp within pipe chase and still provide adequate support.

O. Hanger Clamps:
1. **DO NOT USE C-CLAMPS WITHOUT RETAINING CLIPS ON PIPING 1-1/2 IN. AND LARGER.**
2. Beam Clamps: Use top flange beam clamps to avoid burning metal deck.

P. Metal Fabrication:
1. Fit connections together to form hairline joints.
2. Field-weld connections that cannot be shop-welded because of shipping size, space limitations, and field conditions.
3. When field-welding, comply with AWS D1.1 procedures for shielded metal arc welding, appearance and quality of welds, and methods used in correcting welding work.

Q. Roofs:
1. Roof integrity and warranty shall be preserved.
2. Coordinate installation of equipment supports and roof penetrations.
3. Provide pipe supports for piping installed on roof under HVAC Work.
4. Seal all penetrations through roof.
5. Coordinate with the Lead Contractor **BEFORE** cutting.

R. Ceilings:
1. Do **NOT** support piping from ceiling and ceiling grid systems.
2. Piping, and each ceiling and ceiling grid system, shall be a separate installation. Independently support each from the building structure.
3. Where interferences occur, in order to support piping, install trapeze-type hangers or supports. Locate them where they do not interfere with access to fire dampers, valves, and other HVAC equipment items.
4. Install additional ceiling hangers where the ceiling supports grilles, registers, or diffusers, to prevent the ceiling from sagging.

S. Re-Use of Existing Piping Hangers:
1. **Option:** Piping hangers may be reused; however, all components shall meet the same requirements as those specified for new piping hangers.
2. Test existing piping hangers before re-use. Piping hangers shall withstand a drop test using a 25-pound weight dropped from 2 ft.

T. Painting:
1. Touch-up:
a. Clean field welds, bolted connections, and abraded areas of all shop paint.
b. Paint exposed areas immediately after erecting hangers and supports.
c. Use same paint materials as used for shop painting.
d. Apply paint by brush or spray to provide a minimum dry film thickness of 2.0 mils.
2. Galvanized surfaces: Clean and apply galvanizing repair paint to comply with ASTM A780.

3.2 INSTALLATION — SPRING HANGERS FOR PIPING

A. Install on inlet and outlet piping of new pumps. Refer to Section 23 05 48.

3.3 INSTALLATION — TRAPEZE HANGERS FOR PIPING

A. Design support system. Provide support capacity, support spacing, trapeze hanger rod diameter, and quantity to support total piping load.
1. All rods on trapeze hangers shall be 1/2 in. minimum.
2. Clamp each pipe individually.
3. Provide individual U-bolt clamps for insulated pipes.
4. Clamp size shall accommodate insulation and shield.
5. Provide individual piping attachment to each strut channel hanger, angle, or channel.

B. Obtain approval of a Structural Engineer licensed in Ohio. Submit details to the A/E for approval.

3.4 INSTALLATION — INSERTS

A. Avoid cutting concrete or masonry by using inserts.

B. Refer to the Manufacturer’s recommendations for correct selection as to piping size and loading.

C. Confirm with the Lead Contractor that the concrete used is of a sufficient strength to hold the insert.

D. Provide the correct size and type of inserts, along with information on their correct location, to the Lead Contractor, so as not to delay construction.

E. Masonry Construction with Voids: Install appropriately sized all-thread rods within a 2-component polyester resin adhesive used in conjunction with a galvanized metal screen. Install rods in holes drilled with carbide-tipped drill bits.

F. New Poured Concrete: Before pouring, the Contractor shall (provide) (furnish) inserts (when used or required) for its Work.

G. Existing Poured Concrete Installations: Provide insert-type expansion shield anchors with pull-out and shear capacities appropriate for loads to be supported. Install anchors in holes drilled with carbide-tipped drill bits.

END OF SECTION 23 05 29

SECTION 23 05 48

VIBRATION AND SEISMIC CONTROLS FOR HVAC

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Section 23 05 16, “Expansion Fittings and Loops for HVAC Piping.”

B. Section 23 05 29, “Hangers and Supports for HVAC Piping and Equipment.”

C. Section 23 31 00, “HVAC Ducts and Casings.”

1.2 DESCRIPTION

A. Provide a complete vibration isolation system to isolate HVAC motorized equipment, piping, ductwork, and appurtenances from the building structure and ceiling construction.

B. Roof Curbs: Refer to Section 23 31 00.

1.3 QUALITY ASSURANCE

A. Standards:
1. American Society for Testing & Materials (ASTM) B-117.
2. American Society of Heating, Refrigerating, and Air Conditioning Engineers (ASHRAE):
a. 2025 ASHRAE Handbook — Fundamentals, Chapter 8
b. 2023 ASHRAE Handbook — HVAC Applications, Chapter 48
3. International Code Council, Inc. (ICC):
a. International Building Code (IBC).
b. Evaluation Service (ES).
4. National Fire Protection Association (NFPA): 2023 NFPA 70, “National Electrical Code® (NEC).”
5. Occupational Safety and Health Administration (OSHA) 29 CFR 1910.7.

B. Noise levels in various parts of the building shall not exceed the noise criteria recommendations as set forth in the 2025 ASHRAE Handbook — Fundamentals, Chapter 8, and 2023 ASHRAE Handbook — HVAC Applications, Chapter 48. The midpoint of the range of noise criteria curves shall apply to, and become part of, these Specifications.

C. Testing Agency Qualifications: An independent agency, with the experience and capability to conduct the testing indicated, that is a nationally recognized testing laboratory as defined in 29 CFR 1910.7, and that is acceptable to the AHJ.

1.4 SUBMITTALS

A. The Isolator Manufacturer’s submittal shall include drawings showing the complete design for the supplementary bases and a tabulation of the design data on the isolators, including the following:
1. Outside diameter of the springs.
2. Free, operating, and solid heights of the springs.
3. Free and operating heights of the neoprene or fiberglass isolators.
4. Isolation efficiency based on the lowest operating speed of the equipment supported.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Kinetics Noise Control Inc. (KNC) or approved equal by Mason Industries Inc., Vibration Mountings and Controls Inc., Thybar Corp., or Vibro-Acoustics.

B. A single Manufacturer shall design and furnish vibration isolation devices, including auxiliary steel bases and pouring forms.

C. Manufacturer and Model Number listed below shall be considered to be the Design Base Manufacturer and Model Number.

D. Other Acceptable Manufacturers will be permitted, unless specifically excluded.

2.2 ISOLATOR SCHEDULE

A. Furnish isolator types as follows:

EQUIPMENT ITEM	**SPECIFICATION SECTION**	**ISOLATOR**
Air-handling units, suspended	23 73 00	KNC Model FDS or Model SFH
Piping	23 21 13	KNC Model SFH
Ductwork	23 31 13	KNC Model SH
Fans	23 34 00	KNC Model FDS or KNC Model SFH or KNC Model SL
Condensing units	23 81 26	KNC Model LDR-1
Condensing units	23 81 29	KNC Model LDR-1
Heat pumps, rooftop	23 81 29 23 81 43	KNC Model KSCR-2.0
Unit heaters	23 82 39	KNC Model SFH

2.3 VIBRATION ISOLATORS

A. Inertia “I” Bases: KNC Model CIB. Prefabricated base frame with primer steel perimeter members, recessed isolator brackets, and welded in and tied reinforcing bars. Combination spring and neoprene isolation hangers in series with top and bottom load plate assembly.

B. Vibration Isolation Roof Curb and Rail: KNC Model ESR. Extruded aluminum upper and lower sections, cadmium-plated steel springs with 1 in. static deflection and continuous flexible neoprene gasket riveted, and bonded to top and bottom surfaces. Fully assembled 1-piece base unit shall be installed on roof curb.

C. Spring “S” Mounts: KNC Model FDS. Freestanding, unhoused stable spring mounts incorporating leveling bolts, and a means of bolting to the support. Mounts shall have 1/2 in. neoprene-jacketed fiberglass noise isolation pads bonded to the bottom of the spring mounts. To ensure stability, springs shall be sized in accordance with ASHRAE recommendations or Manufacturer requirements. The springs shall have a minimum additional travel of 50% between the design height and the solid height.

D. Spring “S” Mounts: KNC Model FHS. Seismic control restrained spring isolators, incorporating a single vibration isolator.
   1. Freestanding, unhoused stable spring mounts incorporating leveling bolts, and a means of bolting to the support. Mounts shall have 1/2 in. neoprene-jacketed

fiberglass noise isolation pads bonded to the bottom of the spring mounts. To ensure stability, springs shall be sized in accordance with ASHRAE recommendations or Manufacturer requirements. The springs shall have a minimum additional travel of 50% between the design height and the solid height.

2. Springs shall be restrained using a housing engineered to limit both lateral and vertical movement of the supported equipment during an earthquake without degrading the vibration isolation of the spring during normal equipment operating conditions. Vibration isolators shall incorporate a steel housing and snubbing grommet system designed to limit motion to approximately 0.2 in. in any direction and to prevent any direct metal-to-metal contact between the supported member and the fixed housing. The restraining system shall be designed to withstand a force equivalent to 1.0 g in any lateral or vertical direction without yield or failure. Where the capacity of the anchorage hardware in concrete is inadequate for the required seismic loadings, an adapter plate to allow the addition of more or larger anchors will be fitted to fulfill these requirements. To facilitate servicing, the isolator will be designed in such a way that it can be removed without the requirement to lift or otherwise disturb the supported equipment.

E. Spring Limit "L" Mounts: KNC Model FLS. Similar to "S" spring mounts, but including neoprene and steel vertical limit stops to ensure a constant spring mount. Provisions shall be made to isolate the limit stops to prevent mechanical short-circuiting.

F. Pad "F" Mounts: KNC Model KIP. Pre-compressed molded fiberglass isolation pads, neoprene-jacketed and stabilized during manufacture. Pads shall be sized for loading from 40 PSI to 60 PSI.

G. Vibration Isolation Rail: KNC Model KSR-2.0. Full-perimeter rail type isolator.
   1. Springs: 1 in. deflection, freestanding, un-housed, laterally stable steel springs. Lateral stiffness greater than 1.0 times the rated vertical stiffness. Designed for typical 50% overload to solid. Polyester powder-coated finish. Color-coded to indicate load capacity.
   2. Rail assembly: Extruded aluminum top and bottom members connected by spring isolators and a continuous air-tight and water-tight seal. Incorporates means for attachment to building and supported equipment and additional stiffening members as needed to ensure stability.
      a. Rails: Provide continuous support for rooftop equipment. Designed to provide isolation against casing-radiated vibration in rooftop equipment housing and structure-borne vibration from rotating and mechanical equipment in rooftop package. Fitted with wind-restraint devices suitable for prevailing wind conditions. Such devices shall **NOT** impose loads on curb walls at 90 degrees to their long axis.
      b. Seal: Beaded elastomeric material retained in a keyway along the top extrusion.
      c. Weather strip: Sealed along the bottom with an aluminum fascia strip.
   3. Vibration isolators shall be selected by the Manufacturer for each specific application to comply with deflection requirements as shown on the Vibration Isolation Schedule or as specified in the Project Documents.

H. Roof Curb and Vibration Isolation Rail: KNC Model KSCR-2.0.
   1. Acceptable Manufacturers: KNC or approved equal by Pate or Vibro-Acoustics.
   2. The Manufacturer shall select vibration isolators for each specific application to comply with deflection requirements as shown on the Vibration Isolation Schedule or as specified in the Project Documents.

3. 18-gauge galvanized steel, with 2 in. fiberglass insulation, continuous counterflashing, wood nailer strip, minimum 12 in. high. Structural steel vibration eliminator section on adjustable spring isolators shall provide 90% isolation efficiency. Base shall be designed to be re-roofed without disturbing the rooftop unit.
4. Vibration isolation curb assemblies: Fully enclosed air-tight and weather-tight system shall resiliently support equipment at specified elevation.
5. Isolation curb:
    a. Upper support rail with supply and return flexible connector supports on which equipment and duct openings rest. Extruded aluminum structural shape with a minimum height of 4.75 in. above the spring. Includes a continuous keyway to accommodate beaded elastomeric weather seal and a channel to maintain proper spring alignment. Provides continuous structural support for rooftop equipment. Designed to provide isolation against casing-radiated vibration in rooftop equipment housing and structure-borne vibration from rotating and mechanical equipment in rooftop package.
    b. Lower support curb attached to roof structure, separated by freestanding, un-housed, laterally stable steel springs and lateral seismic and/or wind load restraints. Formed channel fabricated of heavy-gauge galvanized steel with a continuous 1-1/2 in. x 1-1/2 in. nominal wood nailer. Minimum elevation of 14 in. Curb base plate: 1 in. wide; welded, bolted, or screwed to building support steel.
    c. Springs: 1 in. deflection, freestanding, un-housed, laterally stable steel springs resting on a neoprene noise pad. Lateral stiffness greater than 1.0 times the rated vertical stiffness. Designed for typical 50% overload to solid. Polyester powder-coated finish. Color-coded to indicate load capacity. Springs and noise pad shall be captured in a retainer cap secured to the lower support curb.
    d. Restraint: Lateral stabilizers of stainless-steel spring assemblies factory-located and factory -installed to provide seismic and/or wind load restraint. Standard units: Designed to withstand 43/sq. ft. horizontal and 25/sq. ft. vertical wind load.
6. Weather seal: Runs continuously around curb perimeter of the curb. Field-joined with (1) seam using double-faced elastomeric adhesive. Fastened to wood nailer of lower support curb using screws and an aluminum fascia strip.
7. Supply and return flexible connector support hardware: Cut-to-length galvanized steel channels supported and connected with stamped and punched galvanized steel duct support hangers. Support hangers shall allow duct support elevation to be equal to or lower than equipment rail elevation. Supply and field-install hardware.
8. Flexibly attach supply and return air duct to prevent transmission of vibration to the building structure.
9. Isolation curb assembly shall include a troubleshooting kit for leveling or adjusting isolation system loading immediately after placement of rooftop equipment.
10. Provide gasketing on both sides of isolating roof curb.

I. Spring Rail Assembly Mounts: KNC Model LDR-1. (2) independent support rails with adjustable equipment-mounting clips, each supported by (2) seismic- and wind-resistant housed spring isolators.
    1. Isolators: Single, laterally stable, free-standing, steel coil spring isolators assembled into steel housings designed to limit movement of supported equipment in all directions.
    2. Housing assembly: Steel; zinc-plated for outdoor corrosion resistance. Provides constant free and operating height within 1/8 in. Includes provisions for attachment

to structural or elevated roof island elements. Interfaces with a coil spring leveling assembly and a 3-axis restraint snubbing element that bolts directly to the underside of the equipment support rail. Fitted with integral non-skid isolation pads and holes to anchor housing to supporting structure. Withstands project design seismic forces in all directions.

3. Coil spring elements: Lateral stiffness greater than 1.1 times the rated vertical stiffness. Designed to retain a minimum of 0.75 in. travel beyond rated capacity. Color-coded or otherwise easily identified. Provide static deflections of either 1 in. or 2 in. as shown on the Vibration Isolation Schedule or required in the Project Documents. Non-welded spring elements shall be epoxy powder-coated and shall have a minimum of a 1,000-hour rating when tested in accordance with ASTM B-117.

J. Hanger "H" Mounts: KNC Model SFH. Combination spring and fiberglass isolation hangers incorporating 2 in. thick neoprene-jacketed fiberglass inserts in series with spring, all encased in welded steel brackets. The spring shall have a minimum additional travel of 50% between the design height and the solid height.

K. Hanger "H" Mounts: KNC Model SH. Spring hangers, encased in welded steel brackets.

L. Spring "SL" Vibration Isolators: KNC Model SL. High deflection stable springs assembled into plated, telescoping cast iron or aluminum housings with isolation pad bonded to lower surface, and adjusting and leveling bolt.

PART 3 - EXECUTION

3.1 PREPARATION

A. Steel components shall be phosphatized and painted. All nuts, bolts, and washers shall be zinc-electroplated.

B. Structural steel bases shall be thoroughly cleaned of welding slag and primed with zinc-chromate or metal etching primer.

C. All isolators exposed to the weather shall have steel parts PVC-coated or hot-dip-galvanized.

D. Aluminum components shall be etched and painted.

3.2 INSTALLATION — ISOLATORS

A. Coordinate installation with the Lead Contractor.

B. Equipment: Mount on, or suspend with, vibration isolators, the following equipment:
1. All ductwork.
2. Motorized heating and air conditioning equipment.
3. Motors, pumps, fans, and other motorized equipment.

C. Piping:
1. Isolate all piping, within 50 ft. of mechanical equipment mounted on vibration isolators, from the structure via vibration and noise isolators. Isolate suspended piping by incorporating combination spring and fiberglass hangers in the supporting rods. Install hangers at regular intervals. Refer to Section 23 05 29.
2. Isolate vertical pipe risers from the structure via vibration-isolating and noise-isolating expansion hangers. The hangers shall have a minimum rated deflection of

(4) times the anticipated pipe expansion and shall be enclosed in a housing for fail-safe operation.

3. Provide acoustic seals at wall openings through which piping runs from the equipment room into adjoining spaces.

D. Ductwork: Isolate all ductwork, within 50 ft. of mechanical equipment mounted on vibration isolators, from the structure via vibration and noise isolators. Install hangers at regular intervals. Refer to Section 23 31 00.

E. Concrete Fill for Inertia Base Frames: Refer to Section 23 05 29.

END OF SECTION 23 05 48

SECTION 23 05 53

IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 DESCRIPTION

A. Identify the following HVAC items by labels, tags, or stencils:
   1. New equipment: Air-handling units, pumps, chiller, boilers, furnaces, heat pumps, fans, condensing units, control cabinets, and similar items.
   2. New equipment located above an accessible ceiling: Every location of a variable-air-volume box, reheat coil, fan coil, variable-refrigerant-flow branch selector box, exhaust fan, valve, etc.
   3. New piping:
      a. Exposed in equipment rooms, trenches, crawl spaces, tunnels, accessible service areas, or accessible chases.
      b. Running above accessible ceiling construction.
   4. All new valves, including control valves.
   5. New ductwork:
      a. Exposed.
      b. In equipment rooms or accessible shafts.
      c. Running above accessible ceiling construction.

B. Do **NOT** use “Dymo” or similar tape type labels.

1.2 QUALITY ASSURANCE

A. Standards:
   1. American National Standards Institute / American Society of Mechanical Engineers (ANSI/ASME):
      a. ANSI/ASME A13.1, “Scheme for the Identification of Piping Systems.”
      b. ANSI Z535.1, “Safety Color Code.”
   2. Occupational Safety and Health Administration (OSHA).

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Seton, Brady, Emedco, or MSI.

2.2 EQUIPMENT IDENTIFICATION

A. Label: Aluminum, brass, laminated multi-color rigid plastic, or stainless steel, with holes for attachment to equipment.
   1. Size: Sufficient for text, minimum 2-1/2 in. wide by 3/4 in. high.
   2. Text characters: Engraved or stamped. Equipment tag text characters sized for normal viewing distance, minimum 1/4 in. high, maximum 3/4 in. high. Equipment specification number text characters approximately 3/4 size of tag characters.
   3. For laminated plastic labels, match background and character colors in system identification schedules in Part 3. If exact matches are not available, match background colors from schedules, and provide character colors in contrasting white or black.

B. Location Identification for Equipment Located above Accessible Ceilings: Multi-color, pressure-sensitive-adhesive labels, or pressure-sensitive-adhesive equipment tag.

2.3 PIPING IDENTIFICATION

A. Labels: Preprinted, color-coded plastic, with text characters indicating pipe service and arrows indicating flow direction. Include pressure rating where applicable.
   1. Pre-tensioned: Pre-coiled and semi-rigid label formed to cover full circumference of pipe (including insulation and jacket) and to adhere to pipe without fasteners or adhesives.
   2. Self-adhesive: Flexible label long enough to cover full circumference of pipe (including insulation and jacket) with permanent contact adhesive backing.

2.4 VALVE IDENTIFICATION

A. Tags: Aluminum, brass, laminated multi-color rigid plastic, or stainless steel, with hole for attachment to valve.
   1. Size: Minimum 2 in. diameter round or 1-1/2 in. square.
   2. Text characters: Engraved or stamped. 1/4 in. high indicating pipe service and 1/2 in. high indicating valve number.
   3. Fasteners: Metal bead chain, metal “S” hook, or nylon tie.

2.5 DUCTWORK IDENTIFICATION

A. Labels: Laminated multi-color rigid plastic, with holes for attachment to duct.
   1. Size: Sufficient for text, minimum 2-1/2 in. wide by 3/4 in. high.
   2. Text Characters: Engraved, sized for normal viewing distance, minimum 1/4 in. high, maximum 3/4 in. high. Indicate system designation (e.g., AHU-1, EF-1, etc.) and duct service (e.g., SA, RA, etc.). Include flow direction arrow.
   3. Fasteners: Stainless steel rivets or self-tapping screws.

2.6 STENCILS

A. Card stock or metal pre-cut stencil with equipment tag, or piping or ductwork service and flow direction arrow.

B. Paint: Exterior grade, gloss alkyd enamel. Colors in accordance with schedules listed in Part 3.

PART 3 - EXECUTION

3.1 PREPARATION

A. Clean surfaces of substances which could impair bond of identification device adhesive, where applicable.

3.2 COORDINATION

A. Coordinate to ensure that the identification used by all Trades is uniform in type, style, and appearance.

B. Equipment: Coordinate the exact nomenclature to be used on labels with the Owner and A/E.

C. Equipment Located above Accessible Ceilings: Coordinate with the Owner regarding color-coded equipment location identification system. If color-coded equipment system does not exist, refer to Identification Schedule.

D. Piping: Coordinate with the Owner regarding piping identification system. If piping identification system does not exist, refer to Identification Schedule.

E. Valves: Coordinate with the Owner regarding valve numbering system. If valve-tagging system does not exist, refer to Identification Schedule.

F. Ductwork: Coordinate with the Owner regarding ductwork identification system. If ductwork identification system does not exist, refer to Identification Schedule.

G. Coordinate label, tag, and fastener materials with expected conditions. Do not use plastic materials in locations where expected temperatures are outside of the Manufacturer's recommended limits.

3.3 INSTALLATION

A. Equipment:
1. Provide a label for each equipment item that has a unique tag. Do not provide a label if multiple items of equipment have the same tag.
2. Locate equipment label where it will be accessible and visible when project is complete. For equipment that is installed exposed in finished space, locate tag in an accessible concealed location, such as behind an access door.
3. Attach label with stainless steel screws.
   a. **Exception:** Use compatible adhesive where screws might damage equipment.

B. Equipment Located above Accessible Ceilings:
1. In addition to attaching identification on the equipment, attach equipment location identification to the accessible ceiling grid at the point of equipment access.
2. Apply pressure-sensitive adhesive labels or tags to a clean, dry surface.
3. Provide schedule.

C. Piping:
1. Apply piping identification only after any finish painting is completed.
2. Provide labels for piping at **MAXIMUM 25 FT.** intervals.
3. Identify piping at connections to equipment, at valves, at branches from main, and at each riser.
4. Where a pipe passes through a wall, label the pipe where it enters and exits the wall.
5. **Option:** Stencils may be used instead of manufactured labels. Apply stencil over background, in colors indicated. When paint is dry, provide a clear coat finish over stencil. Stencils shall be legible from a standing position.

D. Valves:
1. Provide a unique tag on each valve. Tags shall be stamped with service designation and numbered consecutively for each service. Attach tags to valves in such a manner that valve shall be operable without removing or damaging tag. Tags shall be readable from a standing position when valve is in normal position. Add valve tag numbers to As-Built Drawings.
2. Prepare a valve tag directory with charts showing locations, designations, and sizes of valves. Laminate under plastic and mount as directed by the A/E. Include additional copies of valve charts in the Operating and Maintenance Manuals.

E. Ductwork:
1. In mechanical spaces, provide labels at **MAXIMUM** 25 FT. intervals.
2. Above accessible ceilings: Provide labels at **MAXIMUM** 50 FT. intervals and on both sides of wall penetrations.

3. Stencils may be used instead of manufactured labels at the Contractor's option. If stencils are used, apply stencil over background, in colors indicated. When paint is dry, provide a clear coat finish over stencil. Stencils shall be legible from a standing position.

3.4 PIPING IDENTIFICATION SCHEDULE

A. Text character size shall be as follows:

Overall Pipe/Insulation Size	Minimum Character Height
Up to 1-1/4 in. diameter	1/2 in. high
1-1/2 in. to 2 in. diameter	3/4 in. high
2-1/2 in. to 6 in. diameter	1-1/4 in. high
8 in. to 10 in. diameter	2-1/2 in. high
12 in. and larger diameter	3-1/2 in. high

B. Identify piping as follows:

Type of Service	Background Color	Character Color	Designation
Heating Water Supply	Yellow	Black	HS
Heating Water Return	Yellow	Black	HR
Heat Pump Water Supply	Yellow	Black	HPS
Heat Pump Water Return	Yellow	Black	HPR
Low-Pressure Steam	Yellow	Black	LPS
Medium-Pressure Steam	Yellow	Black	MPS
High-Pressure Steam	Orange	Black	HPS
Low-Pressure Condensate Return	Yellow	Black	LPC
Medium-Pressure Condensate Return	Yellow	Black	MPC
High-Pressure Condensate Return	Yellow	Black	HPC
Condensate Pumped Discharge	Yellow	Black	CPD
Boiler Feedwater	Yellow	Black	BFW
Chilled Water Supply	Green	White	CHS
Chilled Water Return	Green	White	CHR
Condenser Water Supply	Green	White	CWS
Condenser Water Return	Green	White	CWR
Primary Condensate Drain Secondary Condensate Drain	Black Black	Black Black	PCond SCond
Air Conditioner Condensate	Green	White	COND
Refrigerant Hot Gas	Orange	Black	HG
Refrigerant Liquid	Orange	Black	L
Refrigerant Suction	Orange	Black	S
Process Cooling Water Supply	Green	White	PROCESS CWS
Process Cooling Water Return	Green	White	PROCESS CWR

3.5 VALVE IDENTIFICATION SCHEDULE

A. Identify valves as follows:

Type of Service	Valve Tag Designation
Heating Water Supply	HS

Type of Service	Valve Tag Designation
Heating Water Return	HR
Heat Pump Water Supply	HPS
Heat Pump Water Return	HPR
Low-Pressure Steam	LPS
Medium-Pressure Steam	MPS
High-Pressure Steam	HPS
Low-Pressure Condensate Return	LPC
Medium-Pressure Condensate Return	MPC
High-Pressure Condensate Return	HPC
Condensate Pumped Discharge	CPD
Boiler Feedwater	BFW
Chilled Water Supply	CHS
Chilled Water Return	CHR
Condenser Water Supply	CWS
Condenser Water Return	CWR
Air Conditioner Condensate	COND
Refrigerant Hot Gas	HG
Refrigerant Liquid	L
Refrigerant Suction	S
Process Cooling Water Supply	PROCESS CWS
Process Cooling Water Return	PROCESS CWR

3.6 DUCTWORK IDENTIFICATION SCHEDULE

A. Identify ductwork as follows:

Type of Service	Background Color	Character Color	Designation
Supply Air	Green	White	SUPPLY
Return Air	Green	White	RETURN
Outside Air	Green	White	O.A.
Relief Air	Green	White	RELIEF
Exhaust Air	Blue	White	EXH.
Kitchen Hood Grease Exhaust	Yellow	Black	GREASE EXH.
Fume Exhaust	Yellow	Black	FUME EXH.
Carbon Monoxide Exhaust	Yellow	Black	CO EXH.

END OF SECTION 23 05 53

SECTION 23 05 93

TESTING, ADJUSTING, AND BALANCING FOR HVAC

PART 1 - GENERAL

1.1 DESCRIPTION

A. Testing, Adjusting, and Balancing (TAB) Contractor shall provide all labor, materials, and tools for complete testing, adjusting, and balancing of the following HVAC systems:
   1. Air flows.
   2. Air temperature difference across all coils and heat exchangers.
   3. Outside air dampers.

B. TAB Contractor shall be employed by an independent TAB agency. The TAB agency shall specialize in, and limit its business to, the testing, adjusting, and balancing of HVAC systems.

C. HVAC Contractor shall employ and pay for the services of the TAB Contractor, approved by the A/E and Owner
   1. **Option:** HVAC Contractor may perform its own testing, adjusting, and balancing in lieu of employing an independent TAB Contractor. If the HVAC Contractor chooses to use this option, all requirements of this Section shall be met and all references in this Section to the TAB Contractor shall apply to the HVAC Contractor.

D. TAB Contractor shall comply with all requirements of this Section and all other Sections of these Specifications.

1.2 QUALITY ASSURANCE

A. Standards:
   1. Associated Air Balance Council (AABC) National Standards for Field Measurement and Instrumentation.
   2. National Environmental Balancing Bureau (NEBB).
   3. Testing, Adjusting and Balancing Bureau (TABB).

B. The TAB agency shall:
   1. Be fully certified by AABC, NEBB, or TABB.
   2. Have at least (1) member certified by the National Examining Boards of the United States and Canada.

C. Instruments that are used for testing, adjusting, and balancing air systems shall have been calibrated within a period of (6) months and checked for accuracy prior to start of work on this Project.

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION

3.1 TESTING, ADJUSTING, AND BALANCING

A. TAB Contractor shall inspect the installation of all HVAC systems, including equipment, sheet metal work, temperature controls, and other components. This inspection work shall be performed periodically as the HVAC work progresses.

B. TAB Contractor shall perform testing, adjusting, and balancing in complete accordance with AABC National Standards for Field Measurement and Instrumentation, Form #81266, Volume 1.

C. TAB Contractor shall balance all HVAC items, except for individual room packaged terminal air-conditioners (PTACs), ductless split systems, and other equipment serving only (1) room and/or with only (1) supply device.

D. HVAC Contractor's scope of work shall include, but not be limited to, cooperation, coordination, and scheduling of the TAB process with the TAB Contractor.

E. HVAC Contractor shall demonstrate to the TAB Contractor that the following provisions are complete and operable prior to the start of the balancing work:
   1. Completion of system-readiness checks and preparation of reports.
   2. Verification of the following:
      a. Permanent electrical power wiring is complete.
      b. Automatic temperature-control systems are operational.
      c. Equipment and duct access doors are securely closed.
      d. Balance, smoke, and fire dampers are open.
      e. Isolating and balancing valves are open and control valves are operational.
      f. Ceilings are installed in critical areas where air-pattern adjustments are required and access to balancing devices is provided.
      g. Windows and doors can be closed so indicated conditions for system operations can be met.

F. HVAC Contractor shall provide fan curves, and shop drawings of operating equipment to the TAB Contractor.

G. TAB Contractor shall rebalance any existing items adversely affected by any renovation work.

3.2 AIR SYSTEMS

A. TAB Contractor shall inspect the HVAC air system(s) and determine if there are any adverse air flows (positive or negative) in the building. TAB Contractor shall report findings to the A/E.

B. TAB Contractor shall put into operation the various air systems, with all accessories, filters, and diffusers in place, before the air balancing.

C. TAB Contractor shall inspect air leakage in ducts and shall report any excessive leakage to the A/E.

D. TAB Contractor shall measure:
   1. Air velocities with an anemometer, a velometer, or a pitot tube and manometer.
   2. Static pressures and total pressures with a velometer, or a pitot tube and manometer.
   3. Fan RPM with a tachometer or a revolution counter.
   4. Motor amperage with a multimeter or similar device.
   5. Voltages with a voltmeter.

E. In measuring velocities in ducts or at outlets, the TAB Contractor shall traverse the duct or outlet so that (1) reading is taken for each 80 sq. in. maximum of flow area. TAB Contractor shall take a minimum of (6) readings for each duct or outlet regardless of size.

F. TAB Contractor shall adjust supply air systems as follows:
   1. Adjust all fans to deliver the design air quantities at system design static pressure.
   2. Adjust all duct-balancing dampers and extractors for initial balance.

3. Adjust dampers at individual diffusers and registers for the design air quantities.
4. Adjust dampers and register or grille bars to provide uniform draft-less air distribution in all areas of rooms.
5. Readjust duct-balancing dampers if diffuser dampers are noisy.
6. Repeat any or all of the above procedures until air quantities at individual registers or diffusers are within 5% of quantities shown on the Drawings and total air quantity handled by each system is within 5% of the quantity shown or specified.
7. Take all readings with all doors closed and all equipment operating in occupied mode.

A. TAB Contractor shall include the following data and information in the air balance report:
8. Average of final velocity readings taken at each individual supply air outlet or exhaust register, size of outlet, free area of outlet, and air quantity delivered or exhausted.
9. Average of final velocity readings taken at each fan or air-handling unit, size of the duct or plenum, and total air quantity delivered or exhausted by the fan or unit.
10. Final static pressure at each fan outlet and at each fan inlet. TAB Contractor shall review the Manufacturer's literature and unit schedule to determine whether to measure static pressure across the fan only, or across the entire unit.
11. Measurement of static pressure across each coil, filter, heat recovery ventilator, and fan for each air handling unit.
12. Final fan speed for each fan.
13. Manufacturer's fan curve for each fan or air handling unit, with balance position plotted.
14. For each motor: Final running amperage, actual voltage, motor horsepower and nameplate amperage, and starter element sizes and amperage ratings. If starter elements amperage rating is more than 10% greater than motor nameplate amperage, the TAB Contractor shall provide proper size elements.
15. Air temperature rise or drop across all heat exchangers and coils (entering dry bulb, entering wet bulb, leaving dry bulb, leaving wet bulb), including all cooling coils. TAB Contractor shall check readings after compressors have run sufficiently to obtain full capacity.

G. TAB Contractor shall balance the air system to the quantities specified, mark the dial positions, and then increase the percentage of outside air for initial occupancy in order to remove noxious gasses emitted by new furniture, carpet, etc. TAB Contractor shall discuss procedure and percentage of outside air with the A/E. After (6) months, TAB Contractor shall readjust the outside air to the originally specified amounts.

H. Fan Sheaves: Where necessary, or when directed by the A/E, the TAB Contractor shall provide larger or smaller fan pulleys at no additional cost to the Owner, sized to drive the fans so that the motor is a full-rated horsepower at variable-frequency drive (VFD) speed of 100% to give the indicated airflow.

3.3 REPORTS

A. TAB Contractor shall submit the report(s) listed below indicating the performance of fans, , motors, and air distribution devices.

B. Initial Construction Phase Report, based on examination of the Contract Documents, on the adequacy of design for systems balancing devices.

C. Status Reports: Provided as Work progresses.

D. Draft "Pencil Copy" Report: Draft air balance report, provided when the balancing is complete, to the A/E and Commissioning Authority for review before the final report.

E. Commissioning Verification Report: The Commissioning Authority will randomly verify TAB work and produce a report. TAB Contractor shall make corrections based on this report.

F. Final Report:
   1. TAB Contractor shall provide a final balance report with certification sheet; content and format shall follow AABC or NEBB standard forms.
   2. At time of final inspection, the TAB Contractor shall recheck, in the presence of the Owner, specific and random selections of data recorded in the Certified Report. If random tests indicate a measured flow deviation 5% greater than that recorded in the Certified Report, the report shall be automatically rejected. In the event the report is rejected, the TAB Contractor shall readjust and test the system, submit new reports, and reinspect at no cost to the Owner.
   3. A Certified Test and Balance Engineer shall stamp and sign the final report.
   4. Following acceptance of Certified Report by the Owner, the TAB Contractor shall permanently mark the settings of all valves, splitters, dampers, and other adjustment devices, so that adjustment can be reestablished if disturbed. TAB Contractor shall **NOT** mark devices until after final acceptance.

G. Seasonal Testing:
   1. If the initial TAB procedures were not performed during near peak summer and winter conditions, the TAB Contractor shall perform additional testing, inspecting, and adjusting during near peak summer or winter conditions.
   2. TAB Contractor shall inspect the HVAC system during the opposite season from that in which the initial adjustments were made. TAB Contractor shall make any modifications to the initial adjustments of equipment required to produce the proper operation and conditions in each conditioned space.

H. 11-Month Warranty Walk: TAB Contractor shall perform additional testing and balancing to verify that balanced conditions are being maintained throughout and to report unusual conditions with recommendation of adjustments. TAB Contractor shall allow (2) days for this work.

END OF SECTION 23 05 93

SECTION 23 07 00 — HVAC INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Section 23 05 29, “Hangers and Supports for HVAC Piping and Equipment.”

B. Section 23 31 13, “Metal Ducts (Low-Velocity).”

C. Section 23 31 13.03, “Metal Ducts (High-Velocity, Medium-Pressure).”

1.2 DESCRIPTION

A. Provide insulation for new work. Insulate the following items:
   1. Piping:
      a. Indoor air conditioning condensation drain.
      b. Refrigerant suction.
      c. Refrigerant liquid.
      d. Refrigerant hot gas.
      e. All exterior piping.
   2. Equipment:
      a. Air conditioning condensation drain.
      b. Cold surfaces subject to sweating inside packaged equipment.
   3. Ductwork:
      a. Round:
         1) Above-ceiling supply.
         2) Exposed supply.
         3) Return.
         4) Outside air.
      b. Rectangular:
         1) Above-ceiling supply.
         2) Exposed supply.
         3) Return.
         4) Outside air.

B. Piping:
   1. All exposed insulated piping and fittings, from floor up to 7 ft.-6 in. above floor, shall have a polyvinyl chloride (PVC) cover applied over pipe insulation and solvent welded together. Material shall be same as PVC fitting covers.
   2. All exposed exterior refrigerant piping shall have PVC cover applied over pipe insulation and solvent welded together.

C. Equipment: The following equipment shall be factory-insulated to comply with the State Energy Code.
   1. Rooftop HVAC units.

D. Ductwork: Insulation is not required on exhaust ducts or relief air ducts.

1.3 DEFINITIONS

A. “Concealed” insulation: Either embedded in masonry or other construction, or installed above ceilings, below floor slab, behind wall furring, in trenches or tunnels, or within chases, soffits, walls, double partitions, or crawl spaces.

B. "Exposed" insulation: In full or partial view; not "Concealed" as defined above (i.e., insulation in mechanical rooms, gymnasiums, etc.).

1.4 QUALITY ASSURANCE

A. Standards:
1. International Code Council (ICC): 2012 International Energy Conservation Code (IECC).
2. Sheet Metal and Air Conditioning Contractors National Association (SMACNA).
3. Underwriters Laboratories, Inc. (UL), including UL 723/ASTM E84, "Test for Surface Burning Characteristics of Building Materials."
4. American Society for Testing and Materials (ASTM) E84, C 534, C 916, and C 1071.
5. American Society of Heating, Refrigerating, and Air Conditioning Engineers (ASHRAE):
   a. Applicable requirements in ASHRAE 62.1-2010.
   b. Applicable requirements in ASHRAE/IESNA 90.1-2010:
      1) Section 6.4.4, "HVAC System Construction and Insulation."
      2) Table "Minimum Duct Insulation R-Value, Cooling and Heating Only Supply Ducts and Return Ducts."
      3) Table "Minimum Duct Insulation R-Values, Combined Heating and Cooling Supply Ducts and Return Ducts."
6. Code of Federal Regulations (CFR) Title 40, "Protection of Environment," Part 59, "National Volatile Organic Compound Emission Standards for Consumer and Commercial Products," Subpart D, "National Volatile Organic Compound Emission Standards for Architectural Coatings."
7. Illuminating Engineering Society of North America (IESNA).
8. Leadership in Energy and Environmental Design (LEED).
9. National Fire Protection Association (NFPA):
   a. 2015 NFPA 90A, "Standard for the Installation of Air-Conditioning and Ventilating Systems."
   b. 2015 NFPA 90B, "Standard for the Installation of Warm Air Heating and Air-Conditioning Systems."
10. North American Insulation Manufacturers Association (NAIMA) AH124, "Fibrous Glass Duct Liner Standard."
11. U.S. Environmental Protection Agency (EPA).
12. U.S. Military Standards (MIL).
13. Ohio Administrative Code (OAC) 4101:2, 2017 Ohio Mechanical Code.

B. Insulation shall be in accordance with IECC, LEED, and OAC 4101:2.

C. Fire and Smoke Hazard Ratings: Insulation and related components, such as coverings, coatings, tapes, and cloths, shall not exceed 25 Flame Spread, 50 Smoke Developed, and 50 Fuel Contributed on above ground insulation, according to ASTM E84 test. Insulation materials and installation shall be in accordance with UL 723/ASTM E84.

D. Installation shall be done by Tradesmen specializing in insulation work in strict accordance with Manufacturer's recommendations.

1.5 PERFORMANCE REQUIREMENTS

A. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1-2010.

1.6 SUBMITTALS

A. Product Data for LEED:
   1. For adhesives and sealants, including printed statement of volatile organic compound (VOC) content.
   2. Documentation indicating that duct systems comply with ASHRAE/IESNA 90.1-2010, Section 6.4.4.

PART 2 - PRODUCTS

2.1 MANUFACTURERS AND MODEL NUMBERS

A. Manufacturer and Model Number listed below shall be considered to be the Design Base Manufacturer and Model Number.

B. Other Acceptable Manufacturers will be permitted, unless specifically excluded.

2.2 PIPING INSULATION

A. Fiberglass, Exterior and Interior: Owens Corning Fiberglas 25 ASJ/SSL/II. 1-piece, heavy-duty, fiberglass insulation with all-purpose vapor barrier jacket of white kraft bonded to aluminum foil and reinforced with fiberglass yarn, longitudinal pressure-sensitive tape for sealing of lap joint, 0 deg. F. to 800 deg. F. temperature rating.
   1. Other Acceptable Manufacturers: Approved equal by Johns-Manville, Certainteed, Manson, or Knauf.

B. Foam:
   1. Shall only be used for air conditioning condensation drain piping, and refrigerant hot gas, liquid, and suction piping.
   2. Obtain approval from the Code Authority having Jurisdiction for use of this insulation type. If not approved, use fiberglass insulation as specified in Paragraph A above.
   3. Closed cell, elastomeric foam, tubular, 1/2 in. minimum wall thickness, fire-rated, 220 deg. F. temperature rating. Pipe and joints shall be sealed with Manufacturer's approved adhesive.
      a. Acceptable Manufacturers: Armacell fire-rated "Armaflex" or approved equal by Rubatex or Imcoa.
   4. Refrigerant piping:
      a. Closed cell, fiber-free EPDM flexible elastomeric thermal insulation, 3/4 in. wall thickness, fire-rated, 300 deg. F. temperature rating, 25/50 rated fire and smoke, UL-listed.
      b. Acceptable Manufacturers: Armacell "UT Solarflex" or approved equal by Rubatex or Imcoa.
      c. **PROVIDE HIGH-TEMPERATURE INSULATION ON ALL REFRIGERANT PIPING.**

C. Pipe Fittings Insulation: Owens Corning TIW-1. Wrapped 1 lb. density fiberglass blanket with reinforced foil and kraft vapor barrier facing or molded fiberglass segments with pre-molded, 1-piece PVC plastic covers. Wrapped fiberglass blanket shall be installed to same thickness as pipe insulation.
   1. Other Acceptable Manufacturers: Approved equal by Johns-Manville, Certainteed, Manson, or Knauf.

D. Pipe Fittings Insulation Covers: Pre-molded, 1-piece PVC plastic covers, with maximum 25 Flame Spread and 50 Smoke Developed ratings. Shall be listed and certified for installation in ceiling plenum spaces.
   1. Acceptable Manufacturers: Ceelco, Zeston, Johns-Manville, Knauf, Speedline, or Proto.

2.3 PVC JACKET OVER PIPING INSULATION

A. Ceelco 25/50. UL-approved PVC molded plastic 1-piece jacket covers, solvent weld joints, minimum 20 mil thickness. UV-resistant for outdoor applications.

B. Other Acceptable Manufacturers: Zeston, Johns-Manville, Knauf, Speedline, or Proto.

2.4 PIPE-INSULATING SUPPORT

A. Refer to Section 23 05 29.

2.5 EQUIPMENT INSULATION

A. Flexible sheet, 3/4 in. thick, closed cell, foamed plastic, smooth outer skin, 220 deg. F. temperature rating.
   1. Acceptable Manufacturers: Armacell, Rubatex, or Imcoa.

B. Owens Corning Series 703. Flexible 3 lb. density fiberglass sheet with all-purpose jacket of white kraft bonded to aluminum foil and reinforced with fiberglass yarn, 450 deg. F. temperature rating.
   1. Other Acceptable Manufacturers: Approved equal by Johns-Manville, Certainteed, Manson, or Knauf.

2.6 DUCTWORK INSULATION

A. HVAC Ductwork:
   1. Concealed rectangular and round ducts: Owens Corning All Service Wrap. 2 in. thick, 1 lb. density flexible fiberglass blanket, with reinforced foil and kraft vapor barrier facing, 250 deg. F. temperature rating. (R=7.4 out of package; R=6.0 installed.)
   2. Outside air intake ducts: Owens Corning Fiberglas. 2 in. thick, 1.5 lb. density, fiberglass, with reinforced foil and kraft vapor barrier facing, 250 deg. F. temperature rating. (R=6.4 installed.)

B. Other Acceptable Manufacturers: Approved equal by Johns-Manville, Certainteed, Manson, or Knauf.

2.7 MASTICS, ADHESIVES, SEALANTS, AND FINISHES

A. Mastics, adhesives, sealants, and finishes shall be approved for their intended use by the Insulation Manufacturers. Manufacturer shall confirm that an LEED VOC's requirements are met. Piping

B. Acceptable Manufacturers: Benjamin-Foster, Vimasco, ICC, or Aerobol.

C. Do **NOT** use vegetable or wheat paste.

D. Mastics: Materials shall be compatible with insulation materials, jackets, and substrates. Comply with MIL-C-19565C, Type II. For indoor applications, use mastics with an acceptable VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

E. Adhesives:
1. Calcium silicate: Fibrous, sodium-silicate-based adhesive with a service temperature range of 50 deg. F. to 800 deg. F. For indoor applications, use adhesive with a VOC content of 80 grams/liter or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
2. Cellular-glass, phenolic, polyisocyanurate, and polystyrene: Solvent-based resin adhesive, with a service temperature range of -75 deg. F. to +300 deg. F. For indoor applications, use adhesive with a VOC content of 50 grams/liter or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
3. Flexible elastomeric and polyolefin: Comply with MIL-A-24179A, Type II, Class I. For indoor applications, use adhesive with a VOC content of 50 grams/liter or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24)
4. Mineral-fiber: Comply with MIL-A-3316C, Class 2, Grade A. For indoor applications, use adhesive with a VOC content of 80 grams/liter or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
5. All-service jacket (ASJ) adhesive, and foil/scrim/kraft (FSK) and polyvinylidene chloride (PVDC) jacket adhesive: Comply with MIL-A-3316C, Class 2, Grade A for bonding insulation jacket lap seams and joints. For indoor applications, use adhesive with a VOC content of 50 grams/liter or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
6. PVC jacket adhesive: Compatible with PVC jacket. For indoor applications, use adhesive with a VOC content of 50 grams/liter or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

F. Lagging Adhesives: Comply with MIL-A-3316C Class I, Grade A. Shall be compatible with insulation materials, jackets, and substrates. For indoor applications, use lagging adhesives with an acceptable VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

G. Sealants:
1. Joint sealants for polystyrene products: For indoor applications, use sealants with a VOC content of 250 grams/liter or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
2. Foil/scrim/kraft (FSK) and metal jacket flashing sealants: For indoor applications, use sealants with a VOC content of 250 grams/liter or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
3. All-service jacket (ASJ) flashing sealants, and vinyl, polyvinylidene chloride (PVDC), and polyvinyl chloride (PVC) jacket flashing sealants: For indoor applications, use sealants with a VOC content of 250 grams/liter or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

PART 3 - EXECUTION

3.1 DELIVERY, STORAGE, AND HANDLING

A. Protection: Leave insulation boxed and stored until time for use. Elevate and cover material to avoid moisture condensation and physical abuse.

3.2 INSTALLATION — PIPING INSULATION

A. Coordinate installation of insulation with pressure testing of piping.

B. Do not use damaged or water-soaked insulation.

C. Insulate piping where concealed in walls or chases.

D. Insulate piping located in walls with 1/2 in. thick fire-rated foam insulation, or indoor pipe insulation, as specified above.

E. Install insulating saddles of non-compressible insulation with a continuous vapor barrier on pipes 2 in. and larger. Install 12 in. long, 18 ga. half round shields inside clevis pipe hangers at all hangers (regardless of size), unless insulating-type hangers are furnished by the pipe installer. Verify method to be used.

F. Set all hangers perpendicular before any insulation is applied. Do not apply insulation until insulation saddles are in place.

G. Insulation shall be continuous through sleeves and hangers and through walls where no sleeves are required.

H. Insulate any pipe hanger, hanger rod, or pipe support that has direct contact with any hot or cold piping, or any item that is subject to sweating. Refer to Section 23 05 29 for additional information on pipe hangers, insulation shields, and insulating saddles.

I. Do not install foam insulation in air handling plenum spaces.

J. Leave no “raw” ends on insulation. Bevel insulation terminations, seal with insulating cement or mastic, and cover ends same as pipe insulation covering. PVC caps over straight-cut ends that have been vapor-sealed may be used in lieu of beveling.

K. Exposed insulation shall be finished smooth, sized if required, and left ready for painting.

L. Where piping is installed above the ceiling, and below ceiling insulation, ensure that ceiling insulation has no insulation voids above piping.

M. Piping shall be pressure-tested and accepted before piping insulation is installed.

N. Install plenum-rated PVC plastic fitting covers in all air handling ceiling plenum spaces, and on all piping fittings.

O. Insulate any exposed coil return bend piping. Verify type of insulation to be used.

P. Make application on clean, dry pipes with all joints butted firmly together.

Q. Complete installation of insulation and sealing shall be in strict accordance with the Manufacturer’s recommendations.

R. Contractor shall replace all damaged insulation at its own expense.

S. Maintain continuity of all insulation. No voids in insulation or vapor barriers shall be permitted.

3.3 INSTALLATION — PVC JACKET

A. In addition to insulation jacketing and fitting covers specified above, install PVC jacket over all exposed insulation below 7 ft.-6 in. above floor. Jacket shall have overlapping joints and shall be sealed with suitable adhesive. Butt joints shall be sealed with matching 3 in. wide all-service jacket (ASJ) pressure-sensitive tape.

3.4 PIPING INSULATION THICKNESSES

A. Refrigerant Suction Piping: Cover all supply and return mains, branches, and risers, and valves, including those inside equipment.

Fluid Operating Temperature Range	**Insulation Conductivity**		**Nominal Pipe or Tube Size**				
	Insulation Conductivity Range, BTU-in./hr-ft2, deg. F.	**Mean Temperature Rating**	**Less than 1 in.**	**1 to less than 1-1/2 in.**	**1-1/2 in. to less than 4 in.**	**4 in. to less than 8 in.**	**Greater than 8 in.**
			Insulation Thickness				
40 deg F. to 60 deg. F.	0.21 - 0.27	75 deg. F.	0.5 in.	0.5 in.	1.0 in.	1.0 in.	1.0 in.
Less than 40 deg. F.	0.20 - 0.26	50 deg. F.	0.5 in.	1.0 in.	1.0 in.	1.0 in.	1.0 in.

B. Condensation Drain Piping:
1. 1 in. and smaller: 1/2 in. thick, minimum.
2. 1-1/4 in. and larger: 3/4 in. thick, minimum.
3. Cover all piping and valves. Do not cover unions or flanges initially. Bevel insulation and apply cement. Then add insulation over these items, such that it can be removed without disturbing adjacent piping insulation.
4. Fittings and valves shall be wrapped with blanket insulation to the same thickness as adjacent pipe insulation and covered with PVC jacket.

C. Refrigerant Liquid Lines: 1/2 in. minimum.

D. Refrigerant Hot Gas Lines: 1 in. minimum.

3.5 WEATHERPROOFING OF EXTERIOR (ABOVE GRADE) REFRIGERANT PIPING INSULATION

A. In addition to the requirements of “Piping Insulation Thicknesses” above, install PVC jacket over all exterior exposed refrigerant piping

3.6 INSTALLATION — DUCTWORK INSULATION

A. Leave no “raw” ends on any insulation. Seal joints with 2 in. wide application of adhesive.

B. Use adhesive and welded pins with washers for attaching liner and rigid board insulation to ductwork. Seal joints with a 2 in. wide application of adhesive.

C. Provide sheet metal nosings on leading and trailing edges at liner transitions.

D. All duct sizes shown are **INSIDE CLEAR DIMENSIONS**.

E. Tape and seal all exterior joints.

F. Install insulation so as not to interfere with the operation of sprinklers.

G. Concealed Ductwork Insulation: Duct wrap installation. Use 3 in. wide pressure-sensitive tape on all joints, screws, exposed pins, terminations, and breaks.

H. Exposed Ductwork Insulation:
1. Install insulation on the outside on stick clips, or welded pins.

2. Duct wrap installation: Install 3 in. wide pressure-sensitive tape on all joints, screws, exposed pins, terminations, and breaks.

END OF SECTION 23 07 00

SECTION 23 09 23 — DIRECT-DIGITAL CONTROL SYSTEM FOR HVAC

PART 1 - GENERAL

1.1 PREFACE

A. **Terminology:** Temperature Controls Subcontractor is responsible for the Work described in this Section. In this Section, the term "Subcontractor" shall mean the Temperature Controls Subcontractor performing Work on this Project, unless otherwise noted.

1.2 RELATED DOCUMENTS

A. Section 23 05 00, "Common Work Results for HVAC."

B. Section 23 05 06, "HVAC Submittals."

C. Section 23 05 93, "Testing, Adjusting, and Balancing for HVAC."

D. Section 23 09 93, "Sequence of Operations for HVAC Controls."

E. Section 23 33 13, "Dampers."

F. Section 26 05 19, "Low-Voltage Electrical Power Conductors and Cables."

G. Section 26 05 33, "Raceway and Boxes for Electrical Systems."

H. Section 26 29 23, "Variable-Frequency Motor Controllers."

1.3 ABBREVIATIONS AND SYMBOLS

A. Refer to the list of abbreviations at the end of this Section. Refer also to Section 23 05 00. All abbreviations may not necessarily apply to this Work.

1.4 DESCRIPTION

A. Subcontractor shall have a local office within a 50-mile radius of the job site, staffed with factory-trained engineers fully capable of providing instruction, routine maintenance, and 24-hour emergency maintenance service on all system components. Subcontractor shall have a 3-year experience record in the design and installation of computerized buildings systems similar in scope and performance to that specified herein, and shall be prepared to provide, to the Engineer, evidence of this history, as a condition of acceptance and approval, prior to Bidding.

B. Provide a complete, operating electronic control system utilizing DDC technology for control of temperature, outside air, and all HVAC systems as indicated on the points list in Section 23 09 93.

C. Control system shall meet the requirements of ASHRAE Standard 90.1.

D. Subcontractor shall base its Bid on the systems as specified, the sequence of operations, and the points list.

E. Subcontractor shall submit for review by the Engineer, as part of the Subcontractor's Proposal, a written description of its proposed TCSs, including block diagrams showing all major components and panels, printers and other processing devices, and required cabling between each.
   1. Diagrams shall show, schematically, the entire building system with all major components identified.
   2. Include environmental and space requirements for panels, and other major devices.

3. Include Manufacturer's literature for each type of panel, controller, or device shown on the block diagram.
4. Include system points list.

F. Submit a technical proposal, through the HVAC Contractor, to the Owner within (1) week after the notice of Award of Contract. In general, the proposal for the new work shall be based on a completely electronic system, including a full DDC system using new valves, dampers, and operators. Equipment and labor that are not specifically referred to herein or on the plans, but that are required to meeting the functional intent, shall be provided at no additional cost to the Owner. Also address any differences between the Base Manufacturer and Alternative Manufacturer.

G. BAS shall be comprised of a network of various independent DCPs, UCMs, and VTCs, together with CS as specified, to provide centralized access and facility-wide control functions.

H. BAS shall be an integrated, distributed processing network of stand-alone controllers that incorporate DDC technology. BAS will network DCPs for the following equipment: Heat pumps and related mechanical equipment. See point list located in Section 23 09 93 for more detail.

I. Provide the engineering, installation, calibration, software programming, and checkout necessary for complete and fully operational TCSs as specified herein in their entirety.

J. Each microprocessor-based digital controller shall maintain its programmed memory in a non-volatile state. This non-volatile memory shall "keep" its programmed information without the use of a battery when power is unavailable.

K. Provide satisfactory operation without damage at 10% above and 5% below rated voltage and at 3 hertz variation in line frequency. Provide static, transient, and short circuit protection on all inputs and outputs. Protect communication lines against incorrect wiring, static transients, and induced magnetic interference. All bus-connected devices shall be AC coupled, or equivalent, so that any single device failure will not disrupt or halt bus communication.

L. Coordinate all controls and wiring, regardless of who furnishes the item.

M. Subcontractor is responsible for all wiring diagrams, and for writing the sequence of operations.

N. Mount control components.

O. Trained employees of the Subcontractor shall install and adjust all controls.

P. Installed control system shall operate individual systems as described in Section 23 09 93.

Q. No revisions that change the described operation or end results will be permitted.

1.5 DOCUMENTATION

A. Provide proper and adequate documentation, including the items listed below.

B. Technical specification sheets.

C. Submittals: Submit shop drawings for approval showing the information listed below. Refer to Section 23 05 06.
1. Copies of all data and control drawings.
2. Complete written description of sequence of operations.

3. Control system drawings, including all pertinent data to provide a functional operating system and a complete wiring diagram.
4. Damper operator schedules showing size, configuration, capacity, and location of all equipment.
5. Airflow monitoring stations.
6. Data sheets for all hardware and software control components.
7. Description of the installation materials, including conduit, wire, flex, etc.
8. Complete floor plans showing thermostat/sensor locations, VAV boxes, major equipment locations, and control panel locations.
9. All control schemes.
10. Terminal-to-terminal wiring diagrams. Number all terminals.
11. After initial system commission and final calibration, provide copy of all block programming and sequences.
12. Supply the Owner with CD copy of HOST software per license agreement by control supplier.

D. Signed Software License Agreement: The Owner will be required to sign a copy of the Manufacturer's standard software and firmware licensing agreement as a condition of this Contract. Such license shall grant use of all programs and application software to the Owner, but shall protect Manufacturer's rights to disclosure of trade secrets contained within such software.

E. Operator Manuals: Provide (2) copies of an operator's manual describing all operating and routine maintenance service procedures used with the supplied TCS during the start-up and test period.

F. Statement of Service and Guarantee:
1. TCS shall be free from defects in workmanship and material under normal use and service. After completion of the installation, the Subcontractor shall regulate and adjust all sensors, thermostats, control valves, control motors, and other equipment provided under its Contract. If within (12) months from the date of acceptance, any of the equipment described is proved to be defective in workmanship or materials, the Subcontractor will replace it free of charge, including 24-hour emergency service, unless due to misuse or abuse.
2. All temperature control devices and installation shall be warranted to be free from defects in workmanship and material for a period of (1) year from the date of job acceptance by the Owner. Repair or replace any equipment, software, or labor found to be defective during this period, including 24-hour emergency service, without expense to the Owner. Factory-authorized warranty service shall be available within (50) miles of job site.
3. Return and make adjustments during guarantee period, at no charge.

G. In-Warranty Service Proposal.

H. Record Drawings: Upon completion of the work, provide a complete set of accurate as-built drawings and sequences, and application software and programming, submitted in hard-copy and on a jump drive. Drawings shall be AutoCad-compatible files.

1.6 WORK BY OTHERS

A. Electrical Contractor shall provide all duct smoke detectors and associated wiring.

B. HVAC Contractor shall:
1. Install automatic valves and separable wells furnished by the Subcontractor.
2. Install all automatic dampers furnished by the Subcontractor.

3. Provide all necessary piping connections, taps, and wells required for flow-sensing, pressure-sensing, or temperature-sensing devices.
4. Provide dampers, if so indicated under HVAC Equipment Specifications.
5. Provide thermostats, if so indicated under equipment specifications.
6. Provide controls, if so indicated under equipment specifications.

1.7 QUALITY ASSURANCE

A. Standards:
1. American National Standards Institute (ANSI).
2. American Society of Heating, Refrigerating, and Air Conditioning Engineers (ASHRAE) 90.1-2010.
3. Federal Communications Commission (FCC) Part 15, Section 15.
4. Institute of Electrical and Electronic Engineers (IEEE) 472, 587, and 802.3.
5. International Organization for Standardization (ISO) 9001.
6. National Fire Protection Association (NFPA):
a. 2017 NFPA 70, "National Electrical Code® (NEC)."
b. 2015 NFPA 90A, "Standard for the Installation of Air-Conditioning and Ventilating Systems, Chapter 10."
c. 2015 NFPA 90B, "Standard for the Installation of Warm Air Heating and Air-Conditioning Systems."
7. Underwriters Laboratories, Inc. (UL).

B. All electronic equipment shall conform to the requirements of FCC Part 15, Section 15, governing radio frequency electromagnetic interference, and be so labeled.

C. All devices designed for, or used in, line voltage applications shall be UL-listed. All microprocessor-based remote and central devices connecting onto the primary bus (including link devices) shall be UL 864-listed.

D. BAS shall be designed and manufactured to ISO 9001 standard. Complete BAS installation shall be in strict accordance with 2017 NEC, State and Local Electrical Codes, and Division 26, "Electrical," of these Specifications.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. The Basis of Design shall be Vykon / Siemens Talon by ASA Controls. Inclusion on this list does not guarantee acceptance of products or installation. Control systems shall comply with the terms of this Specification.

B. Acceptable Manufacturers:
1. Vykon / Siemens Talon by ASA Controls.
2. Schneider Electric I/A Series by IES.
3. Automated Logic by Limbach.

C. Temperature Controls Subcontractor shall use only operator workstation software, controller software, custom application programming language, and controllers from the corresponding Manufacturer and product line unless the Owner approves use of multiple Manufacturers.

D. Other products specified herein (such as sensors, valves, dampers, and actuators) need not be manufactured by the above Manufacturers. Refer to Article 1.12.

E. Installer and Manufacturer Qualifications:
   1. Installer shall have an established contractual working relationship with Control System Manufacturer.
   2. Installer shall have successfully completed Control System Manufacturer's control system training. Upon request, Installer shall present record of completed training including course outlines.
   3. The Control System Manufacturer shall have a full service facility that is staffed with engineers trained in integrating interoperable systems and technicians fully capable of providing BACNet instructions and routine emergency maintenance service on all system components. The service facility shall stock spare parts inventory and all necessary test and diagnostic equipment.

2.2 GENERAL REMARKS

A. All controls to be fully proportioning, fail-safe, relay type capable of maintaining ±2 deg. F. Provide verification that this was provided.

B. Engraved laminated plastic nameplates to be provided for all control items, inside or outside of panels, 1/4 in. high letters minimum; no PUNCHTAPE will be permitted.

C. Place copy of Temperature Controls Schematic Diagram and Sequence of Operation for a given piece of equipment, in a plastic binder, and hang it on the wall inside the equipment room housing that piece of equipment.

D. Temperature control schematics are to incorporate motor control diagrams.

E. All thermostat or control devices are to have adjustable set points.

F. The CS shall manage the Energy and Building Management capabilities of the automation system as well as facilitate remote communications and central monitoring.

G. UCMs shall provide distributed, pre-engineered control, specific to the mechanical equipment specified.

H. Custom-made UCMs with distributed custom programming capability shall provide control for nonstandard control sequences.

I. The data communications capability shall allow data to be shared between the various controllers.

J. The system software shall include system software for global application functions, application software for distributed controllers, and operator interface software.

2.3 OPERATOR INTERFACE SOFTWARE, WEB-BROWSER, MULTIPROTOCOL

A. The intent of this specification is to provide a peer-to-peer networked, stand-alone, distributed control system with the capability to integrate both the ANSI/ASHRAE Standard 135-1995 BACnet and LonWorks technology communication protocols in one open, interoperable system.

B. 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. Peer-to-peer controller communications shall be via a three-conductor cable with shield. EIA Standard RS-485 Communications protocol shall be employed.

C. The Peer–to-peer Communications network shall be capable of having multiple system elements connected. Each Communications network shall allow for the use of modules as an interface to secondary Buses.

D. Whenever the Communications Bus enters or leaves a building, the Bus shall be provided with adequate lightning suppression devices.

E. The Communications Bus shall be capable of communicating through a telephone modem to a remote building. This interface shall allow the Energy Management PC operator's station to communicate with any other remotely located, compatible, Communications Bus.

F. The time clocks in all controllers shall be automatically synchronized daily via the network.

G. The supplied system must incorporate the ability to access all data using Java enabled browsers without requiring proprietary operator interface and configuration programs. 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 a supplier-installed server for all database access. Systems requiring proprietary database and user interface programs shall not be acceptable.

H. 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.

I. 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.

J. 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.

2.4 LOCAL AREA NETWORKS (LAN)

A. The LAN shall utilize packetized transmissions, error checking, and distributed error recovery. Single or multiple DCP failures shall not cause loss of communication between other LAN-connected DCPs still active.

B. LAN-connected DCPs shall be provided with a communications watchdog to ensure that an individual DCP cannot permanently occupy the LAN. If a DCP is determined to be monopolizing communications, it shall be automatically shut down, and an exception reported to annunciate this fact.

C. Trunk Wiring Practices: The distributed communication network system shall consist of a multi-drop RS-485 bus architecture connecting DCPs, UCMs, and VTCs. The truck shall consist of a twisted pair of wires (minimum 24 AWG) completely encased in continuous metallic conduit or a plenum-rated twisted shielded pair of wires (24 AWG) with the shield grounded in accordance with the Manufacturer's wiring practices. There shall be no power wiring run in conduit with communication trunk wiring.

D. RS-485 Communication Transient Protection: The Manufacturer's catalog data sheet shall provide evidence that the Manufacturer's DCP, UCM, and VTC products are tested and comply with IEEE-587 Categories A and B (ANSI C62.41) standard for Transient Surge withstand capabilities for electrical devices. Such testing shall have included power and communication trunk wiring. Compliance with IEEE-587 shall imply conformance with IEEE-472 transient standards, as IEEE-587 is a higher energy level test.

E. RS-485 Trunk Distance and Topology: The Manufacturer's RS-485 trunk shall provide operation over end-to-end linear distances of 3,000 ft. without repeaters at communication data rates of up to 64 kbps. Each end of the trunk shall be terminated with a 120 ohm end-of-line termination resistor.

F. Provide devices that are of DCP controller Manufacturer's design.

G. It shall be possible for the trunk to be "T"eed or split at any location using a repeater to facilitate the installation of trunk spurs in campus or large building applications. Systems that do not provide this capability shall provide a trunk riser diagram showing end-to-end distances and locations of all repeaters necessary to meet the trunk diagram shown on the plans.

2.5 DIGITAL CONTROL PANEL (DCP) (TEMPERATURE CONTROL PANEL)

A. The BAS shall be composed of independent, stand-alone, microprocessor-based DCPs to manage the global strategies described in application software section.

B. The DCPs shall have ample memory to support operating system, database, and programming requirements.

C. The operating system of the DCP shall manage the input and output communications signals to allow distributed controllers to share real and virtual point information and allow central monitoring and alarms.

D. Data shall be shared automatically between DCPs when they are not worked together.

E. The database and custom programming routines of a remote DCP shall allow editing from a single operator station.

F. The DCP shall have the capability of being remotely monitored over a telephone modem. Additional capabilities shall include automatically dialing alarms, gathering alarms, reports and logs, programming and downloading databases, current operating conditions, override control, and schedule changes.

G. The controller shall continually check the status of all processor and memory circuits. If a failure is detected, the controller shall:
1. Assume a predetermined failure mode.
2. Emit an alarm.
3. Display card failure identification.

H. The DCP will be complete with an alphanumeric LED display; point names will be displayed in a minimum of (8) characters, user-defined format for easy identification. Control parameters shall dynamically update on the display.

I. The DCP must be able to support dial-in and dial-out communications via an industry standard modem. It shall be possible to have a printer connected to the DCP for hard-copy recording of trends, Maintenance Time Reminder reports, Energy Management reports, and alarms. Each serial communications port will have an internal switch so that the same cable can be used to communicate to a printer or a modem.

J. The DCP shall have multiple access levels that are password protected. A high level of access will allow the operator to select overrides and change the database. The DCP will contain 25% spare memory capacity and be based around an 8- or 16-bit CPU. All programming in the DCP shall be maintained in non-volatile EEPROM-type of memory. Each DCP shall have an accurate real-time clock that can be synchronized from the central host computer or any DCP on the LAN.

K. Service Ports: DCP controllers shall be equipped with a minimum of (1) operator service port for the connection of a Portable Programmer Terminal (PPT) or Portable Operator Terminal (POT). The service port shall be either a built-in RS-232 data terminal port or RJ-11-type jack that connects to Manufacturer's standard PPT/POT. Connection of a service device to a service port shall not cause the controller to lose communications with

its peers or other networked device controllers. The service port shall allow utilization of the same PPT/POT from any location. Systems that utilize more than (1) variety of PPT/POT shall be designed such that only (1) type is used. Other designs incorporating more than (1) type of PPT/POT shall not be acceptable.

L. The DCP will count multiple pulse type inputs such as KW meters, GPM meters, etc., and convert those pulse signals into engineered values for control and read-out.
   1. Inputs may be:
      a. RTD (100 ohm platinum, Balco, or copper).
      b. 4-20 mA.
      c. 0-12 vdc.
      d. Contact open/closed.
   2. Outputs may be:
      a. O-5 VDC or 0-12 VDC analog output.
      b. Pulse-width modulation.
      c. Maintained/momentary on/off.
      d. 0-20 mA or 4-20 mA available through a separate transducer.

M. For greater accuracy, the Analog-to-Digital converter in the DCP must be 8-bit (minimum) and the DCPs CPU must read all (8) bits. The conversion must be a true (8) bits on all inputs and outputs.

N. The entire DCP database shall be capable of being programmed from the unit-mounted keypad, or from any other DCP on the network, or from a CS, or via modem. All of these programs shall reside in a non-volatile type of memory (capable of [6] months of protection from power loss) so that there is no need for a battery to back up this programming. Programming shall include: point names, attributes, descriptors, sequences, set points, schedules, alarm limits, engineering units, etc.

O. The software shall be menu-driven with English language descriptors, allowing single keystroke penetration via the keypad.

P. Standard programs within each DCP shall include:
   1. Optimum start/stop.
   2. Timed program commands.
   3. Electric demand limiting.
   4. Calendar scheduling.
   5. Holiday scheduling.
   6. Duty cycle.
   7. Enthalpy optimization.
   8. Overrides.

Q. To assist an operator in analyzing the database, every output (Analog and Digital) shall be programmed to provide a “sequence analysis.” This sequence analysis will point the operator to the portions of the sequence that is controlling the output at any particular time. For example, the FAN on/off output may be controlled by a time schedule or an override, or it may be turned off by a smoke detector or low-limit. The sequence analysis must point the operator backward through the sequence so that an operator can easily determine why an output is at its current state.

R. A PID control loop algorithm will provide accurate control of the sensed variable.

S. Standard preformatted reports within each DCP shall include:
   1. Energy reports:
      a. Monthly.

b. Daily.

2. Trend reports.

T. Energy Reports will include: KWH, KW peak, time of peak, outdoor air conditions at time of peak, and degree-days. Each of these parameters will be logged on a per-day basis with complete reports for the day and/or month. Each DCP will support multiple energy reports.

U. Variables may be trended on an individual or grouped basis. The sampling rate of these variables is user definable. The Trend Report will have a user-defined title, the time of each sample, and the values of the points that are being trended. Multiple trend reports must be supported by each DCP.

V. Event-Initiated Trend Logs shall be programmed into the database to begin trending predefined variable(s) when a specific event occurs. Event-Initiated Trend Logs will only sample when the event has taken place. The event could be any change of state — from "on" to "off" and vice versa — or the event may be that a "high" or "low" limit has been reached. These Trends will allow the operator to define trends to occur only when a certain event takes place.

W. Reports/alarms shall log automatically or manually to an optional printer. (1) printer shall log reports from all connected DCPs, or each DCP may have its own printer.

X. A log will be maintained in each DCP for recall of recent changes in the database, so that it will be possible to see what points have been changed, when they were changed, and who changed them.

Y. Each DCP will support remote communications via a modem. The DCP may dial up or receive calls. The DCP must store at least (6) separate telephone numbers, and allow selection of a dialing sequence causing all numbers to be called, or allow setting a priority chain of numbers to be called.

Z. Surge protection shall be installed in the DCP to protect the CPU and related circuitry from high voltage spikes and noise. The DCP shall be designed to comply with transient protection in accordance with IEEE standard 587 as a Category B device.

2.6 UNIT CONTROL MODULE (UCM) (AIR HANDLING UNITS)

A. Controllers shall be stand-alone, minimum 8- or 16-bit microprocessor-based Direct Digital Controllers with sufficient memory to handle operating system, database, and programming requirements. Provide (1) stand-alone module for each rooftop unit.

B. The controller shall be programmed and tested to ensure reliability. Each controller shall be programmed and tested prior to shipment to the job site. The controller shall be clearly labeled as to controller type, where it is to be installed, and software address (if applicable). The controller shall be fully tested upon installation to ensure that it is properly matched to the equipment it is controlling.

C. The controller shall communicate with other devices on the communication network, shall be fully integrated with the other system components, and shall interface with the CS.

D. Where specified in the sequence of operations or points list, the controller shall have a display and keypad for local interface with the mechanical equipment.

1. A keypad shall be provided for interrogating and editing data and the display shall be LCD.
2. An optional system security password shall be available to prevent unauthorized use of the keypad and display.

E. The hardware shall be suitable for the anticipated ambient conditions. Controller used in conditioned ambient shall be mounted in dust-proof enclosures, and shall be rated for operation at 32 deg. F. to 120 deg. F.

F. Outputs may also be defined to modulate an economizer section of a unit to maintain mixed air set point with a low limit override. Mixed air temperature shall be selectively reset from room temperature or return air temperature to supply the minimum energy required to satisfy zone requirements.

G. Inputs monitored include space temperature, fan status, set point, mixed air, and water temperature. (Refer to points list in Section 23 09 93.)

H. From the CS, it shall be possible to:
1. Reset heating set point.
2. Reset cooling set point.
3. Assign daily occupied/unoccupied times.
4. Override day or night operation.
5. Read/log discharge air sensor.
6. Read/log space temp and set points.
7. Read unit type, i.e., 2-stage cool with 1-stage heat, etc.
8. Read position of outputs (heating water valves).

I. Controller shall be UL component recognized.

J. From the CS, it will be possible to access any Controller connected on the communications bus. Should this communication fail, the controller will have its standalone configuration in non-volatile memory to maintain the room set point.

K. All output/input signals shall be directly hard wired to the UCM.

2.7 INPUT/OUTPUT INTERFACE

A. Hardwired inputs and outputs may tie into the system through DCPs or UCMs. Slave devices are also acceptable. Any critical points requiring immediate reaction shall be tied directly into the controller hosting the control software algorithm for the critical function.

B. Binary inputs shall allow the monitoring of on/off signals from remote devices. The binary inputs shall be compatible with commonly available control devices. All status points shown on the point list shall be positive proof differential pressure or current-sensing binary switches.

C. Analog inputs shall allow the monitoring of low voltage, current, or resistance signals and shall have a minimum resolution of 0.1% of the sensing range. Analog inputs shall be compatible with, and field configurable to, commonly available sensing devices.

D. Binary outputs shall provide a continuous low voltage signal for on/off control of remote devices. Where specified in the sequence of operations or indicated on the points list, binary outputs shall have 3-position (on/off/auto) override switches, and status lights, and shall be selectable for either normally open or normally closed position.

E. Analog outputs shall provide a modulating signal for the control or end devices. Outputs shall provide either a 0 to 10 VDC or a 4 to 20 milliampere signal as required to provide proper control of the output device.

F. System architecture shall allow for point expansion in (1) of the following ways:
1. The addition of input/output cards to a DCP.
2. A slave controller may be used to expand point capacity.

2.8 AUXILIARY CONTROL DEVICES

A. Damper Operators (24 volt):
1. Damper operators shall be spring return, and shall be properly sized so as to stroke the damper smoothly and efficiently throughout its range. Actuator response shall be linear in response to sensed load.
2. Damper operators shall be capable of driving twice the damper square footage indicated on the Drawings. Provide a maximum of 40 sq. ft. per damper motor.

B. Damper Operators:
1. All operators shall be of the molded rubber diaphragm piston type and shall be fully proportioning, unless otherwise specified. They shall be sized to overcome friction of either the damper linkage or air or water pressure. The damper operator mounting arrangement shall be outside the airstream wherever possible. The operators shall be capable of operating at varying rates of speed to match the controllers and variable load requirements. The operators shall be capable of operating in sequence when required by the sequence of operation. The operators shall have external adjustable stops to limit the stroke in either direction.
2. The damper operator linkage arrangement shall be such as to permit normally open or normally closed positions of the dampers as required. Damper operators on modulating dampers that are to be sequenced shall be operated by a pilot positioner of the full relay type with an inter-connecting linkage to provide mechanical feedback so as to provide accurate positioning and control.
3. Temperature Controls Subcontractor shall furnish, and turn over to the HVAC Contractor for installation, all operators sized and suitable for the application.

C. Temperature Sensors (verify with the Owner that all sensors are reading correctly):
1. Temperature sensors shall be Resistance Temperature Detector (RTD) or Thermistor type as required.
2. Duct sensors shall be rigid or averaging as specified in Section 23 09 93. Averaging sensors shall be a minimum of 5 ft. in length.
3. Immersion sensors shall be provided with a separable stainless steel well.
4. Area space sensors shall be equipped with concealed set point adjustment and override switch. Others shall have blank covers.
5. Optional: Each sensor shall be provided with a plug-in RJ-11 jack for a PPT. This jack shall be concealed under the cover to prevent tampering.
6. Optional: The connection of a PPT device at a wall sensor location shall permit the service terminal to communicate with all other devices on the local communications network.
7. Sensors used for mixed air application shall be the averaging type and have an accuracy of $\pm$1 deg. F.
8. Duct sensors shall protrude into the air stream a minimum of 9 in.
9. Outside air temperature sensors shall have a minimum range of -52 deg. F. to 152 deg. F. and an accuracy of within 1 deg. F. in this temperature range.
10. Room temperature sensors shall have an accuracy of $\pm$0.25 deg. F. in the range of 45 deg. F. to 96 deg. F.
11. Hot water temperature sensors shall have an accuracy of $\pm$0.75 deg. F. over the range of their application.

D. Differential and Static Pressure Switches:
1. Differential pressure switches shall be furnished as indicated for status purposes in air and water applications. Provide single-pole double-throw switch with fully adjustable differential pressure settings.

2. Fan proof-of-flow switches shall be adjustable set point and differential pressure type. Switches shall be piped to fan discharge except, where fans operate at less than 1 in. WC, they shall be piped across the fan. For fractional horsepower and non-ducted fans, relays or auxiliary contacts may be used. Maximum pressure rating shall be at least 10 in. WC.
3. Air flow and duct static pressure analog sensors shall be high accuracy suitable for the low pressures to be encountered, be selected for approximately 50% over-range, and have a 4 to 20 ma output. These differential pressure sensors shall be provided with valved lines for testing and calibration, and shall have adjustments for zero and span. For airflow measuring stations, use Ebtron. **SUBCONTRACTOR SHALL PROVIDE ALL NECESSARY OUTSIDE AIR, RETURN AIR, AND EXHAUST AIR MONITORS.**
4. Water flow analog sensors shall be provided complete with flow element and shall be an all solid-state precision industrial type with stainless steel meter body, maximum error of no more than .5% of span, and 4 to 20 ma output. Sensor shall be rated for 250 PSI minimum and installed in strict accordance to the Manufacturer's instructions complete with 3-valve manifold for calibration and maintenance.

E. Low Temperature Detection (Freeze-Stat): Electric low temperature thermostats shall have 20 ft. low vapor point tension sensitive elements (not averaging type) installed to serpentine the entire coil face area. Each of these thermostats shall be 2-position, manual reset type. Where coils are multiple banks, multiple low limit thermostats ([1] for each 20 sq. ft. of coil surface), wired in series, shall be provided and wired to shut down the supply fan.

F. Flow Switches: Flow switch shall have a repetitive accuracy of $\pm$1% of its operating range. Switch actuation shall be adjustable over the operating flow range. The switch shall have snap-acting Form C contacts rated for the specific electrical application.

G. Watt-hour Transducers: Watt-hour transducers shall have an accuracy of 0.25% for KW and KWH outputs from full lag to full lead power factor. Input ranges for KW and KWH transducers shall be selectable without requiring the changing of current or potential transformers. Provide dry contact pulse accumulation.

H. Voltage-to-Digital Alarm Relays: Relays shall monitor status of boiler safeties and overloads and shall be sized and connected so as not to impede the function of the monitored contacts. Switch shall have self-wiping, snap-acting Form C contacts rated for the application.

I. Current-Sensing Relays: Relays shall monitor status of motor loads. Switch shall have self-wiping, snap-acting Form C contacts rated for the application. The set point of the contact operation shall be field adjustable.

J. Control Relays: Control relay contacts shall be rated for 150% of the loading application, with self-wiping, snap-acting Form C contacts, enclosed in dust-proof enclosure. Relays shall have silver cadmium contacts. Relays shall be equipped with coil transient suppression devices.

K. Reed Relays: Reed relays shall be encapsulated in a glass-type duct-tight enclosure and plugged into a plastic or epoxy case. Contacts shall be rated for 150% of the loading applications. Operating and release time shall be 1 millisecond or less. Reed relays shall have a minimum life span rating of 10 million operations and shall be equipped with coil transient suppression devices.

L. Solid State Relays (SSR): Input/output insolation shall be greater than 10 billion ohms with a breakdown voltage of 15 V RMS, or greater, at 60 Hz. The contact operating life shall be 10 million operations or greater. The ambient temperature range of SSRs shall be 20 deg. F. to 140 deg. F. Input impedance shall be greater than 500 ohms. Relays shall be rated for the application. Operating and release time shall be 10 milliseconds or less. Transient suppression shall be provided as an integral part of the relays.

2.9 OPERATOR INTERFACE SOFTWARE

A. System Security:
1. User access shall be secured using individual security passwords for a minimum of (8) users.
2. Passwords shall have at least (5) levels of user access with data entry restrictions being assignable by password.
3. User logon/logoff attempts shall be recorded.
4. The system shall protect itself from unauthorized use by automatically logging off following the last keystroke. The delay time shall be user definable.

B. Alarms:
1. The Temperature Control System shall provide audio, visual, contact closure, and remote telephone annunciation for:
   a. Remote equipment failure.
   b. Equipment run time.
   c. Number of start/stops.
   d. Program failure.
   e. Card failure.
   f. Sensor failure.
2. Each analog sensor and binary point shall be individually alarmed for values in excess of individual high/low limits or status.
3. When an alarm state is detected, the alarm automatically shall be stored and the user notified by printing the alarm message, sounding an audible tone, and flashing an alarm message on the CRT.
4. An “After Hours” alarm-processing function shall transfer the alarm message to an alternate location equipped with a terminal device and an auto-answer modem. The telephone number, and the time of day to start and stop “After Hours” processing, shall be user-designated.

C. Dial-Up Communications: An auto dial-up and auto-answer communications utility shall allow capability for stand-alone DCPs to communicate with up to (250) remote operator stations over voice-grade phone lines. Remote Alarming/Reporting:
1. Controllers shall automatically call operator stations to report alarms, and upload historical data and reports.
2. In the event that the controller is unable to connect with the remote station, it shall continue to attempt communication on a predetermined interval until communication is successful. The capability shall exist to automatically switch to a backup phone number in the event communications is unsuccessful with the first number.
3. A separate night number capability shall also exist to allow alarms to be directed to separate printer, CRT, or Personal Computer during off hours.

2.10 LOCAL AREA NETWORK (LAN) SOFTWARE AND OPERATIONS

A. The BAS LANs shall provide for the sharing of calculated and control point variable values throughout the BAS network. Provide all network software links as necessary to provide a complete and functioning system in accordance with the sequences of operation.

B. The CS shall provide software utilities to determine the on-line status of all network-connected panels.

C. If a DCP, VTC, or UCM drops off-line, the network software shall detect and annunciate such conditions to the proper output devices.

D. The BAS communication networks shall provide end-to-end data transmission of all necessary control point values at a minimum rate of that established by standard NFPA-90A for smoke-control operation.

E. The nominal network response speed for a data request entered at a man-machine interface for data contained in another panel shall not be greater than 10 seconds.

F. Network failures (i.e., device on/off line) shall be self-recovering and not require a manual initiation of the network.

G. The network shall support the segregation of messages by class of data to groups of output devices. The network control software shall provide a minimum of (5) classes of segregation. Any (1) class of information may be sent to a group of multiple input/output devices.

H. The network control software shall support the simultaneous operation of the BAS by multiple users (minimum of 3). Data requests from any operator shall be automatically routed and responded to using the token-passing control methods of IEEE Standard 802.3.

I. DCPs that originate alarm, maintenance, or other information shall automatically have their messages routed to the appropriate device without operator intervention.

J. LAN-connected DCPs shall provide facility-wide access to locally connected operators. Access shall be supported through the integral operator device and the locally connected compatible CRTs.

K. LCMs shall include integral operator devices with full alphanumeric display and a keypad for password-controlled access, to full programmability of LCM functions.

PART 3 - EXECUTION

3.1 INSTALLATION REQUIREMENTS

A. All electrical work performed in the installation of the temperature control system as described in this specification shall be per the National Electrical Code (NEC) and per applicable State Codes. Where exposed, all wiring to be run in conduit, regardless of voltage. Conduit shall be run parallel to building lines properly supported and sized at a maximum of 40% fill (minimum 3/4 in. conduit).

B. Low voltage wiring may be run exposed ONLY above accessible lay-in ceilings. All wiring run in air-handling plenums shall be U.L. 910 listed. Wiring shall be run neatly; perpendicular to walls; away from piping, ductwork, or other construction likely to damage the insulation; and run in bridle rings or otherwise securely clipped or fastened directly to the building structure. Do not run data wiring parallel or within 3 ft. of power wiring. Unless otherwise noted, all low voltage wiring shall be installed in conduit at the following locations:
   1. Where wiring rises up inside walls.
   2. Where wiring is run below floor.
   3. Where wiring is run through or above inaccessible ceilings or in chases.
   4. Where wiring is run below ceilings or in equipment rooms.
   5. Where run exposed.

6. Where run in attics having accessible walkways.

C. All wiring installed in air-handling plenums shall be either U.L. 910 listed, Teflon coated, with plenum rated ties, or entirely in conduit.

D. Wiring installation shall be acceptable to the Local Code Authority having jurisdiction.

E. Wiring and conduit to meet all requirements of Division 26.

3.2 OWNER TRAINING

A. Temperature Controls Subcontractor shall provide (2) copies of an operator's manual describing all operating and routine maintenance service procedures to be used with the Temperature Control system supplied. Subcontractor shall instruct the Owner's Designated Representatives in these procedures during the startup and test period.

B. Provide (20) hours of in-house training for BAS operators. This training shall be "hands-on" type. A mutual agreement on the scheduling of this training class will be made between the Owner and the ATC Contractor. The intent of the training is that this will occur before the Owner has accepted beneficial use. The training class will use the actual Operator manual that will be submitted for this project.

3.3 DOCUMENTATION

A. Proper and adequate documentation must be provided; this documentation shall include:
1. Accurate as-built drawings and sequences, and programming submitted in hardcopy and on a compact disc (CD).
2. Technical specification sheets.
3. Signed software license agreement.
4. Operator manuals.
5. Warranty statement.
6. In-warranty service proposal.

3.4 CALIBRATION AND ADJUSTMENTS

A. After completion of the installation, perform final calibrations and adjustments of the equipment provided under this Contract, and supply services incidental to the proper performance of the temperature control system under warranty described below.

3.5 ACCEPTANCE PROCEDURE

A. Upon completion of the calibration, the Temperature Controls Subcontractor shall start up the system and perform all necessary testing and run diagnostic tests to ensure proper operation. Temperature Controls Subcontractor shall be responsible for generating all software and entering all databases necessary to perform the sequence of control and specified software routines. An acceptance test in the presence of the Owner and Engineer shall be performed.

B. The warranty acceptance test shall be of (7) days duration, and the system shall perform as follows:
During the (7) days, the BAS shall not report any system diagnostics from the subsystem under test.

C. The subsystem shall be performance verified as operational using temporary trends of each control loop located in the DCP.

D. During the occupied periods, BAS control loops under test shall maintain control of the process variable within the following scales:

Duct Static Pressure	±0.03 in. WC
Pump Head Pressure	±10% of control range.
Duct Temperature Loops	±2 deg. F.
Room Temperature Loops	±1 deg. F.
Pipe Temperature Loops	±2 deg. F.
Duct Humidity	±2x rated error of Humidity Transmitter.
Room Humidity	±2x rated error of Humidity Transmitter.

E. Temperature Controls Subcontractor shall provide a hard-copy printout of the process variable, process variable set point, and control loop output % for the period of (2) hours prior to occupancy to (2) hours after occupancy, with samples taken every (15) minutes.

3.6 WARRANTY

A. All temperature control equipment and installation shall be warranted to be free from defects in workmanship and material for a period of (2) years after the issuance of Substantial Completion. Any equipment, software, or labor found to be defective during this period, including 24-hour emergency service, shall be repaired or replaced without expense to the Owner. Factory-authorized warranty service shall be available within (50) miles of job site.

B. Temperature Control Contractor shall provide support for operation of the system and improvements to energy usage to the Owner throughout the first (15) months of operation.

3.7 INSTALLATION

A. Mount room sensors at same locations as existing sensors, unless shown otherwise.

B. Install temperature control cabinet where shown.

C. Only controls that must be mounted outside the temperature control cabinet, such as flow switches, damper motors, and outdoor sensors, will be allowed to do so. All other controls are to be mounted inside the temperature control cabinet.

D. Label all control components to match diagrams. Label temperature control panel.

3.8 WIRING INSTALLATION

A. Temperature Controls Subcontractor shall provide and install the temperature control cabinet with power terminal strips and all wiring inside of cabinet. Temperature Controls Subcontractor shall oversee all final control connections to all equipment and controls.

B. All temperature control and interlock wiring shall be installed in conduit or exposed above ceilings with UL 910 plenum-rated wire. Power and interlock wiring shall be run in separate conduit from sensor wiring.

3.9 COORDINATION

A. Temperature Controls Subcontractor shall coordinate all power wiring requirements with the Electrical Contractor.

3.10 CHECKOUT

A. Check the function of each item. Make sure each item starts and functions properly.

3.11 ADJUSTMENT

A. Calibrate all controls.

B. Return and make adjustments during guarantee period, at no charge.

3.12 SEQUENCE OF OPERATIONS

A. Refer to Section 23 09 93.

TITLES, ABBREVIATIONS, AND SYMBOLS

AAC/AACs	advanced application controller(s)
AH/AHs	air handler(s)
AHU/AHUs	air handling unit(s)
AO	analog output
ASC/ASCs	application-specific controller(s)
BAS/BASs	building automation system(s)
BC/BCs	building controller(s)
CAD	computer aided drafting
CAV	constant air volume
CD/CDs	compact disc(s)
CPU/CPUs	central processing unit(s)
CRT/CRTs	cathode ray tube(s)
CS/CSs	central station(s)
DCP/DCPs	digital control panel(s)
DD	dual duct
DDC/DDCs	direct digital control(s)
DDU/DDUs	digital display unit(s)
EEPROM/ EPROM/ PROM	(electrically) (erasable) programmable read-only memory
EF/EFs	exhaust fan(s)
EMS/EMSs	environmental management system(s)
EP/EPs	electric to pneumatic (units)
HWR	heating water return
HWS	heating water setpoint
I/O	Input/output
IAT/IATs	indoor air transmitter(s)
IP	Internet protocol
LAN/LANs	local area network(s)
LCD/LCDs	liquid crystal display(s)
LED/LEDs	light-emitting diode(s)
OS/OSs	operating system(s)
OWS/OWSs	operator workstation(s)
PC/PCs	personal computer(s)
PE/PEs	pneumatic to electric (units)
PI/PID	proportional plus integral (plus derivative)
POT/POTs	portable operator terminal(s)
PPT/PPTs	portable programmer terminal(s)
RH	relative humidity
ROS/ROSs	remote operation station(s)
RTD/RTDs	resistance temperature detector(s)
RTS/RTSs	room temperature sensor(s)
SCADA	supervisory control and data acquisition
TCS/TCSs	temperature control system(s)
TCU/TCUs	terminal control unit(s)
UCM/UCMS	unit control module(s)
UPS/UPSs	uninterruptible power supply(ies)
VAV	variable air volume
VFD/VFDs	variable frequency drive(s)
VTC/VTCS	variable air volume terminal controller(s)

END OF SECTION 23 09 23

SECTION 23 09 93 — SEQUENCE OF OPERATIONS FOR HVAC CONTROLS

PART 1 - GENERAL

1.1 PREFACE

A. **Terminology:** Temperature Controls Subcontractor is responsible for the Work described in this Section. In this Section, the term "Subcontractor" shall mean the Temperature Controls Subcontractor performing Work on this Project, unless otherwise noted.

1.2 RELATED DOCUMENTS

A. Section 23 05 00, "Common Work Results For HVAC."

B. Section 23 34 00, "HVAC Fans."

1.3 ABBREVIATIONS AND SYMBOLS

A. Refer to the list of abbreviations at the end of this Section. Refer also to Section 23 05 00. All abbreviations may not necessarily apply to this Work.

1.4 DESCRIPTION

A. A complete sequence of operations shall be developed for all Mechanical Equipment.

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION

3.1 SEQUENCES OF OPERATION

A. Refer to Section 23 74 00 and 23 74 13 for rooftop unit factory supplied sequence of operation.
   1. Central BMS System shall monitor and control each unit for scheduling and maintenance.

B. New VRF System Heat Pumps and Fan Coils: Refer to Section 23 81 26 and 21 81 29 for Split system and VRF factory supplied sequence of operation.
   1. Unit manufacturer shall provide packaged factory-mounted unit controls, which shall sequence the DX cooling and heating to maintain a space temperature setpoint.
   2. Unit manufacturer shall provide a building automation system (BAS) BACnet communications interface.
      a. Provide wiring and termination of the BAS to the interface.
      b. Unit manufacturer's representative shall verify final terminations prior to start-up.
      c. Unit manufacturer shall provide standard BACnet objects as required by the Contractor for monitoring and control from direct digital control (DDC) system. Contractor shall provide all programming required for the DDC system to fully monitor, adjust, and control these objects.
   3. The following points shall be monitored and alarmed for each indoor fan coil and/or outdoor heat pump, through the DDC system:
      a. Fan coil start/stop status.
      b. Compressor start/stop status.
      c. System alarm.
      d. Room temperature.

e. Thermostat status.
f. Air conditioning mode (heat/cool).
g. Malfunction code.
h. Filter status.
i. Accumulated power of fan coil.

4. The following points shall be operator-adjustable and/or automatically reset by a DDC program.
   a. Heat pump start/stop operation.
   b. Fan coil start/stop operation.
   c. Air conditioning mode setting (heat/cool).
   d. Room temperature setting.
   e. Filter status reset.
   f. Air flow rate setting.

TITLES, ABBREVIATIONS, AND SYMBOLS

AAC/AACs	advanced application controller(s)
AH/AHs	air handler(s)
AHU/AHUs	air handling unit(s)
AO	analog output
ASC/ASCs	application-specific controller(s)
BAS/BASs	building automation system(s)
BC/BCs	building controller(s)
CAD	computer aided drafting
CAV	constant air volume
CD/CDs	compact disc(s)
CPU/CPUs	central processing unit(s)
CRT/CRTs	cathode ray tube(s)
CS/CSs	central station(s)
DCP/DCPs	digital control panel(s)
DD	dual duct
DDC/DDCs	direct digital control(s)
DDU/DDUs	digital display unit(s)
EEPROM/ EPROM/ PROM	(electrically) (erasable) programmable read-only memory
EF/EFs	exhaust fan(s)
EMS/EMSs	environmental management system(s)
EP/EPs	electric to pneumatic (units)
HWR	heating water return
HWS	heating water setpoint
I/O	Input/output
IAT/IATs	indoor air transmitter(s)
IP	Internet protocol
LAN/LANs	local area network(s)
LCD/LCDs	liquid crystal display(s)
LED/LEDs	light-emitting diode(s)
OS/OSs	operating system(s)
OWS/OWSs	operator workstation(s)
PC/PCs	personal computer(s)
PE/PEs	pneumatic to electric (units)
PI/PID	proportional plus integral (plus derivative)
POT/POTs	portable operator terminal(s)
PPT/PPTs	portable programmer terminal(s)
RH	relative humidity
ROS/ROSs	remote operation station(s)
RTD/RTDs	resistance temperature detector(s)
RTS/RTSs	room temperature sensor(s)
SCADA	supervisory control and data acquisition
TCS/TCSs	temperature control system(s)
TCU/TCUs	terminal control unit(s)
UCM/UCMS	unit control module(s)
UPS/UPSs	uninterruptible power supply(ies)
VAV	variable air volume
VFD/VFDs	variable frequency drive(s)
VTC/VTCS	variable air volume terminal controller(s)

END OF SECTION 23 09 93

SECTION 23 23 00 — REFRIGERANT PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Section 23 05 53, “Identification for HVAC Piping and Equipment.”

B. Section 23 07 00, “HVAC Insulation.”

C. Section 23 81 29, “Variable Refrigerant Flow HVAC Systems.”

1.2 DESCRIPTION

A. Provide refrigerant piping between the indoor evaporator units and outdoor condensing units. Size refrigerant piping according to Manufacturer’s recommendations. Install oil and refrigerant charge.

B. Valves:
   1. Provide valves for the refrigerant piping:
      a. In locations accessible to qualified personnel for operation, removal, maintenance, or servicing.
      b. As indicated on the Drawings and as discussed in other Sections of these Specifications.
      c. As required to facilitate the maintenance, operation, and servicing of all refrigerant piping.
   2. Coordinate with structure, and mechanical and electrical equipment.
   3. All valves of the same type used on the Project shall be by the same Manufacturer.

C. Insulation: Refer to Section 23 07 00.

D. Test system.

1.3 QUALITY ASSURANCE

A. Standards:
   1. American National Standards Institute (ANSI).
   2. American Society for Testing and Materials (ASTM).
   3. Manufacturer’s Standardization Society of the Valve and Fittings Industry (MSS).
   4. American Society of Mechanical Engineers (ASME) B31.5, Refrigeration Piping, latest edition.
   5. Underwriters Laboratories, Inc. (UL) 207, Refrigerant Containing Components and Accessories.

PART 2 - PRODUCTS

2.1 PIPING

A. Hard drawn, Type “ACR” copper tubing (ASTM B88), cleaned, and capped.
   1. **Option:** Pre-charged, pre-insulated line set. **Note:** Do not exceed the maximum developed length for line sets, as recommended by the Manufacturer.

2.2 FITTINGS

A. Wrought copper or wrought bronze fittings (ANSI B16.22) with joints brazed.

2.3 BRAZING ALLOYS

A. 45% silver/phosphorous or silver/zinc alloys with a melting point greater than 1,000 deg. F.

B. Acceptable Manufacturers: Sil-Fos by Handy Harmon, Aircosil by Airco Welding Products, or ESAB Allstate.

2.4 SERVICE VALVES

A. Henry Technologies Type 203.

B. Other Acceptable Manufacturers: Approved equal by Mueller, Sporlan, Hyspan Precision Products, or Parker Hannifan.

2.5 FLEXIBLE CONNECTORS

A. Corrugated stainless inner tube with braided outer shield, 500 lb. maximum working pressure, sweat connections.

B. Acceptable Manufacturers: Metraflex, Flexonics, Flexicraft, or Hyspan Precision Products.

2.6 ACCESSSORIES

A. Liquid line dryers, expansion valves, sight glasses, charging valves, etc., if not packaged with units. Refer to Section 23 62 00.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install refrigerant piping and refrigerant specialties according to recommendations of Manufacturer of evaporator coils and condensing units.

B. Clean ends immediately before brazing joints. Maintain a continual flow of inert gas (nitrogen) through the tubing while brazing joints. Plug ends to exclude dirt and foreign matter during construction.

C. Valves:
1. Coordinate all access panel locations, if required, with the General Trades Contractor.
2. **DO NOT INSTALL** any valves where the fluid operating pressure exceeds 80% of the valve's pressure rating.
3. Open up valves fully before brazing to piping.
4. During brazing, remove valve internals and protect the remaining element of sweat end valves against heat damage.
5. Test-operate all valves at least once from closed-to-open-to-closed positions while valve is under pressure.
6. Tag all valves as required in Section 23 05 53.

3.2 TESTING

A. All testing shall be performed in strict accordance with the Equipment Manufacturer's guidelines. Schedule well in advance with the Owner.

B. Do not perform any tests when outside air temperature is below 65 deg. F.

C. After refrigerant piping system is completed, but before insulation is applied, thoroughly test the system for leaks. Inert gas at 450 PSIG may be used for initial test.

D. After system is tight, evacuate all inert gas. During evacuation, all Schrader valves shall be capped, rate not to exceed 2 in. Hg. per second. Perform triple evacuation procedure in accordance with trade standard. Leave 20 PSIG minimum static charge of nitrogen in refrigeration system for layover period, until properly charged.

E. Provide full refrigerant charge in the system for proper operation. Test system for leaks with halide leak detector after installation of refrigerant. Replace all defective materials. Completely redo leaking joints. Perform entire testing procedure again.

F. Test shall be witnessed by the Manufacturer's Representative and the A/E.

END OF SECTION 23 23 00

SECTION 23 31 00 — HVAC DUCTS AND CASINGS (HANGERS AND SUPPORTS)

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Section 23 05 16, “Expansion Fittings and Loops for HVAC Piping.”

B. Section 23 05 29, “Hangers and Supports for HVAC Piping and Equipment.”

C. Section 23 05 48, “Vibration and Seismic Controls for HVAC.”

1.2 DESCRIPTION

A. Provide support steel, attached to building structure to support ductwork. Provide supports between structural members, such as steel angles, channels, strut channels, etc. Obtain prior written approval of the A/E.

B. For any variation in supports needed for equipment actually purchased, Contractor shall bear all costs of modifications, including redesign costs.

C. Provide angles, clips, mechanical fasteners, reinforcement steel, drilling of structure, welding to structure, etc. as needed. Means of attachment shall be approved by the A/E and shall not degrade the structure.

D. Provide hangers and supports required for ductwork and equipment installed under the HVAC Contract.

E. Provide all necessary inserts, expansion shields, beam clamps, and auxiliary steel.

F. Provide roof curbs.

1.3 QUALITY ASSURANCE

A. Standards:
1. American National Standards Institute (ANSI).
2. American Society for Testing and Materials (ASTM).
3. American Society of Mechanical Engineers (ASME).
4. Factory Mutual Global (FMG).
5. National Fire Protection Association (NFPA).
6. Sheet Metal and Air Conditioning Contractors National Association (SMACNA).
7. Underwriters Laboratories, Inc. (UL).

B. For ductwork supports, refer to SMACNA’s “HVAC Duct Construction Standards — Metal and Flexible” (Latest Edition), as applicable.

C. Components shall be selected and matched to the load imposed on them.

PART 2 - PRODUCTS

2.1 PIPING AND EQUIPMENT HANGERS AND SUPPORTS

A. Refer to Section 23 05 29.

2.2 TRAPEZE HANGERS

A. Unistrut P1000 or Superstrut A1200. Angle iron, or channel of sufficient length to support ductwork, trapeze hanger rod diameter, and quantity as required to support total duct load.

B. Design support system and obtain approval of a Structural Engineer licensed in Ohio. Submit details to the A/E for approval.

C. Acceptable Manufacturers: B-Line Systems, Inc., GS Metals Corp., Erico, National Pipe Hanger Corp., Unistrut Corp., Wesanco, Inc., or Powerstrut.

2.3 SUPPORTS

A. Hanger rods shall be solid steel, threaded ends or all-thread rods, with double nut attachment to the hanger and at the hanger attachment.

B. Beam Clamps:
1. Anvil International Fig. 227. Top beam clamp, steel jaw, hook rod with nut, and spring washer steel eye-bolt, with Anvil International Fig. 157 for appropriate rod diameter.
2. **Option:** Anvil International Fig. 86. Malleable iron clamp, hardened steel cup point set screw with Fig. 89 steel retaining clip. **DO NOT USE C-CLAMPS WITHOUT RETAINING CLIPS.**

C. Wall Brackets: Carbon steel, back plates, and bolts.
1. Anvil International Fig. 194. Lightweight 750 lb. load.
2. Anvil International Fig. 195. Medium-weight 1,500 lb. load.
3. **Option:** Unistrut Superstrut A1200.

D. Acceptable Manufacturers: Anvil International, Inc., B-Line Systems, Inc., Carpenter & Patterson, Inc., Globe Pipe Hanger Products, Inc., Erico, National Pipe Hanger Corp., PHD Manufacturing, Inc., or Klo-Shure.

2.4 ROOF CURBS

A. Prefabricated curb, 18 ga. galvanized steel, welded seams, mitered corners. 2 in. thick rigid fiberglass insulation, treated wood nailer strip, damper flanges, minimum 13 in. high.
1. Acceptable Manufacturers: Pate Co. or approved equal by ThyCurb, Vent Products Co., Inc. or MicroMetl.

B. Duct Penetrations: Prefabricated curb, 18 ga. galvanized steel, welded seams, mitered corners, 1-1/2 in. thick, minimum 12 in. high, 3 lb. density rigid fiberglass insulation, treated wood nailer strip, damper flange.
1. Acceptable Manufacturers: Pate Co. or approved equal by ThyCurb Vent Products Co., Inc. or MicroMetl.

C. Condensing Units: Prefabricated, 18 ga. galvanized steel, integral base plate, continuous welded corner seams, wood nailer, counterflashing with lag screws, internal reinforcing as required to support equipment load, minimum 13 in. high.
1. Acceptable Manufacturers: Pate Co. or approved equal by ThyCurb Vent Products Co., Inc. or MicroMetl.

D. Prefabricated roof curbs for rooftop HVAC units are specified with the equipment.

2.5 STRUCTURAL STEEL

A. Provide ASTM A36 / ASTM A36M, black and galvanized, steel plates, shapes, and bars, steel beams, strut channels, standard-weight black steel pipe, or steel angle of adequate size and strength to safely carry the weight of equipment item. Verify size required with the Structural Engineer.

2.6 FINISH

A. Unless otherwise noted, all steel hangers and supports shall be standard black.
   1. **Exception:** Hangers and supports for exposed exterior applications shall be galvanized.

PART 3 - EXECUTION

3.1 INSTALLATION — DUCTWORK HANGERS

A. Attach all ductwork securely to structure, floor, or concrete pad.

B. Install all necessary duct hangers, supports, clamps, wall brackets, and attachments as required to properly support ductwork from building structure.

C. Install necessary hanger rods and angle iron support brackets to properly support ductwork, flue vent, insulation, reinforcing, and external loads.

D. Install hangers and supports with all necessary inserts, bolts, rods, nuts, washers, and other accessories, according to Manufacturer's recommendations. Hangers shall be double-nutted.

E. Use a pair of rods, (1) on each side of ductwork. Rods shall be zinc coated steel.

F. Use sheet metal screws to attach hanger bracket to ductwork.

G. **Option:** 1 in. wide solid sheet metal straps may be used as per SMACNA's "HVAC Duct Construction Standards — Metal and Flexible" (Latest Edition).

H. **DO NOT USE POWDER-ACTUATED ANCHORS OR FASTENERS.**

I. **DO NOT USE C-CLAMPS WITHOUT RETAINING CLIPS.**

J. Maximum spacing of supports shall be as follows:

RECTANGULAR DUCTS

1/2 X DUCT PERIMETER	ROD DIAMETER	SPACING
Less than 72 in.	1/4 in.	10 ft.
72 in. to 120 in.	3/8 in.	8 ft.
120 in. to 192 in.	1/2 in.	5 ft.

ROUND DUCTS

DUCT DIAMETER	ROD DIAMETER	SPACING
Up through 26 in.	1/4 in.	12 ft.
27 in. through 36 in.	3/8 in.	12 ft.
37 in. through 50 in.	1/2 in.	12 ft.

K. Provide proper angles or channels between structural members for hanger supports where necessary. Weld to steel structural members. Consult with the A/E regarding this procedure.

L. Trapeze Hangers:
   1. All rods on trapeze hangers shall be 1/2 in. minimum.
   2. Clamp each duct individually.
   3. Provide individual duct attachment to each strut channel hanger, angle, or channel.

M. Do not support hangers from roof deck or floor above. Span from structural members with supplementary steel where direct attachment to structural members is not practical.

N. Ceilings:
   1. Do not support ductwork, or any other utility lines, from ceiling and ceiling grid systems.
   2. Ductwork, and each ceiling and ceiling grid system, shall be a separate installation. Independently support each from the building structure.
   3. Where interferences occur, in order to support ductwork or flue vents, install trapeze-type hangers or supports. Locate them where they do not interfere with access to fire dampers, valves, and other HVAC equipment items.
   4. Install additional ceiling hangers where the ceiling supports grilles, registers, or diffusers, as required to prevent the ceiling from sagging.

O. Use top flange beam clamps to avoid burning metal deck.

P. Painting:
   1. Touch-up:
      a. Clean field welds, bolted connections, and abraded areas of all shop paint.
      b. Paint exposed areas immediately after erecting hangers and supports.
      c. Use same paint materials as used for shop painting.
      d. Apply paint by brush or spray to provide a minimum dry film thickness of 2.0 mils.
   2. Galvanized surfaces: Clean and apply galvanizing repair paint to comply with ASTM A780.

3.2 INSTALLATION — ROOF CURBS

A. Verify roof slope and type before ordering curbs.

B. Provide all necessary dimensions of HVAC equipment unit.

C. Coordinate installation with the other Contractors.

D. Furnish curbs and deliver on roof.

E. Cut and frame openings, provide reinforcing of structure as needed to support loads, provide blocking under curbs, set roof curbs in place, shim to level, secure to roof deck, provide flashing, and “roof in” as required.

F. Provide weathertight curb caps if units cannot be set in place immediately.

G. Counterflash roof curbs as required to make absolutely watertight.

END OF SECTION 23 31 00

SECTION 23 31 13 — METAL DUCTS (LOW-VELOCITY)

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Section 00 72 16, “General Conditions.”

B. Section 23 05 17, “Sleeves and Sleeve Seals for HVAC.”

C. Section 23 05 48, “Vibration and Seismic Controls for HVAC.”

D. Section 23 07 00, “HVAC Insulation.”

E. Section 23 31 00, “HVAC Ducts and Casings (Hangers and Supports).”

F. Section 23 33 00, “Air Duct Accessories.”

G. Section 23 33 13, “Dampers.”

H. Section 23 37 00, “Air Outlets and Inlets.”

1.2 DESCRIPTION

A. Provide low-velocity ductwork, including turning vanes, extractors, splitter-dampers, volume dampers, access doors, and flex connections, for the following:
   1. Outside air.
   2. Supply air.
   3. Return air.

B. Duct Dimensions:
   1. The dimensions indicated on the Drawings are the **NET INSIDE CLEAR DIMENSIONS** available for air flow.
   2. Allow for external insulation thickness.

C. Ductwork layout is schematic; provide duct risers, drops, offsets around obstructions, flattened sections, etc., and all fittings as necessary to install the ductwork.

1.3 QUALITY ASSURANCE

A. Standards:
   1. National Fire Protection Association (NFPA):
      a. 2017 NFPA 70, “National Electrical Code® (NEC),” Articles 110 and 408.
      b. 2015 NFPA 90A, “Standard for the Installation of Air-Conditioning and Ventilating Systems.”
      c. 2015 NFPA 90B, “Standard for the Installation of Warm Air Heating and Air-Conditioning Systems.”
      d. 2014 NFPA 96, “Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations.”
   2. Sheet Metal and Air Conditioning Contractors National Association (SMACNA), including “HVAC Air Duct Leakage Test Manual,” and “HVAC Duct Construction Standards — Metal & Flexible” (Latest Edition). These are absolute **MINIMUM STANDARDS;** some requirements listed herein may be greater than these. Duct construction shall meet or exceed the more stringent standards.
   3. Underwriters Laboratories, Inc. (UL).

4. American Society of Heating, Refrigerating, and Air Conditioning Engineers (ASHRAE)
   a. Applicable requirements in ASHRAE 62.1-2010, Section 5, "Systems and Equipment," and Section 7, "Construction and System Start-Up," including Section 7.2.4, "Ventilation System Start-Up."
   b. Applicable requirements in ASHRAE/IESNA 90.1-2010, Section 6.4.4, "HVAC System Construction and Insulation," including Section 6.4.4.2.1, "Duct Sealing," and Section 6.4.4.2.2, "Duct Leakage Tests."
5. American Society for Testing & Materials (ASTM) A 653, A 653/M, C 920, G90 (Z275).
6. Code of Federal Regulations (CFR) Title 40, "Protection of Environment," Part 59, "National Volatile Organic Compound Emission Standards for Consumer and Commercial Products," Subpart D, "National Volatile Organic Compound Emission Standards for Architectural Coatings."
7. Illuminating Engineering Society of North America (IESNA).
8. Leadership in Energy and Environmental Design (LEED):
   a. Indoor Environmental Quality (EQ):
      1) Prerequisite 1, "Minimum Indoor Air Quality (IAQ) Performance."
      2) Credit 4, "Low-Emitting Materials."
   b. Energy and Atmosphere (EA) Prerequisite 2, "Minimum Energy Performance."
9. U.S. Environmental Protection Agency (EPA).

1.4 PERFORMANCE REQUIREMENTS

A. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1-2010.

1.5 SUBMITTALS

A. If any changes are made from the duct layout shown, submit ductwork layout shop drawings to the A/E for review. Coordinate size and location of ductwork and insulation with structure, piping, lighting, equipment, conduit, bus ducts, cable trays, ceiling construction and clear height above, and other items that may present a potential conflict.

B. Layout drawings shall be at 1/4 in. = 1 ft.-0 in. scale, or larger, if Contract Drawings are larger, with enlarged sections and elevations as necessary.

C. All Contractors shall use these drawings as a basic coordination tool.

D. During the bidding period, notify the A/E of any conflicts observed between the ductwork and the work of any other Trade.

E. The electronic version of the A/E's HVAC Drawings may be obtained from the A/E by the Contractor, at its option, upon completion of the Electronic Data Release Form and payment of a nominal processing fee to the A/E. Processing fee shall consist of a base charge of $ 50.00, plus $ 10.00 per sheet.

F. Refer to Section 00 72 16 for additional requirements.

G. Product Data: Documentation indicating that duct systems comply with ASHRAE 62.1-2010, Section 5, and with ASHRAE/IESNA 90.1-2010, Section 6.4.4.

H. Product Data: For adhesives and sealants, including printed statement of volatile organic compound (VOC) content.

I. Leakage Test Report: Documentation of work performed for compliance with ASHRAE/IESNA 90.1-2010, Section 6.4.4.2.2.

J. Duct-Cleaning Test Report: Documentation of work performed for compliance with ASHRAE 62.1-2010, Section 7.2.4.

PART 2 - PRODUCTS

2.1 DUCTWORK — STEEL

A. SMACNA Section I. Galvanized steel, 24 ga. through 16 ga., intermediate reinforcing bracing, slip joints, mechanical formed seams, beaded, and cross-broken.

B. Elbows, Branches, Transitions, Offsets: SMACNA Section II. Round duct fittings shall be conical with scoops at branch takeoffs. Round elbows shall be 3-piece type.

C. Turning Vanes: SMACNA Section II, Fig. 2-3. Tuttle & Bailey “Duct-Turns.” Double-thickness airfoil.
1. Other Acceptable Manufacturers: Approved equal by Titus or Anemostat.

D. Equipment Casings, Flexible Connections, Curbs, Plenum Access Doors: SMACNA Section VI.

E. Exterior Ducts and Covers: SMACNA Section V.

F. Hangers, Attachments, and Supports: SMACNA Section IV.

2.2 DUCTWORK — ROUND SPIRAL SEAM

A. SMACNA Section III. United Sheet Metal “Spiral Duct.” Galvanized steel (ASTM A527), 26 ga. through 20 ga., spiral seam, up to 60 in. diameter. Use 16 ga. welded joint, for sizes above 60 in. diameter. Fittings shall be continuously welded, including elbows, tees, laterals, crosses, reducers, offsets, and accessories.

B. Other Acceptable Manufacturers: Approved equal by Semco, Wesco, Lindab, Tangent Air, or Eastern Sheet Metal.

2.3 DUCTWORK — INSULATED DOUBLE-WALL (EXPOSED RTU-1 DUCTWORK)

A. United Sheet Metal Acousti-K27 with Type “P” liner. Refer to SMACNA’s “HVAC Duct Construction Standards — Metal & Flexible” (Latest Edition). Round or flat-oval, with inner and outer shells of galvanized steel (lock-forming quality ASTM A 653/A 653/M, G90 (Z275)) 26 ga. through 16 ga., spiral or longitudinal seam, built-in expansion joints, 1 in. thick fiberglass insulation (“K” factor of 0.27), positive vapor barrier, slip joints or flanged connections, insulated double-wall. Furnish with perforated liner for noise control. Matching double-wall fittings shall include elbows, tees, crosses, conical takeoffs, laterals, reducers, offsets, and accessories.

B. Other Acceptable Manufacturers: Approved equal by Semco, Wesco, Tangent Air, or Eastern Sheet Metal.

2.4 DUCT CONNECTIONS — FLEXIBLE

A. To Diffusers (maximum 5 ft. long): Flexmaster Type 3M. Insulated with a trilaminate of aluminum foil, fiberglass, and aluminized polyester. Fire-retardant-reinforced aluminum outer jacket. 12 in. positive pressure rating.

B. To Motor-Driven Equipment: Ventfabrics "Ventglas." 30 oz. neoprene-coated glass fabric.
   1. Other Acceptable Manufacturers: Approved equal by Flexmaster or Lindab.

2.5 DUCT ACCESS DOORS

A. Ward Industries. 20 ga. steel, UL-listed, reinforced, insulated and fully gasketed, and completely airtight.

B. Motorized Dampers: Provide rectangular door equal to width of duct minus 1 in. in one direction, and at least 12 in. in the other direction. Larger size, if noted.

C. Provide **QUICK-OPENING LATCHES OR WING NUTS.**

2.6 DUCT SEALANTS AND GASKETS

A. Solvent-Based Joint and Seam Sealant:
   1. VOC content: Maximum 395 grams/liter.
   2. For indoor applications, use sealant with a VOC content of 250 grams/liter or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

B. 2-Part Tape Sealing System: For indoor applications, use sealant with a VOC content of 250 grams/liter or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

C. Flanged Joint Sealant: Comply with ASTM C 920. For indoor applications, use sealant with a VOC content of 250 grams/liter or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

D. Acceptable Duct Sealant Manufacturers: United McGill Corporation "United Duct Sealer" or approved equal by Hardcast or Semco.

2.7 PLENUMS AND MIXING BOXES

A. SMACNA Section VI. Galvanized steel. Insulated galvanized steel access doors with Ventlock #206 latches and Ventlock #264 hinges.

2.8 DAMPERS

A. Refer to Section 23 33 13 for motor operators, conical take-off, and extractors, and for balancing, control, backdraft, splitter, and fire dampers.

2.9 DUCTWORK HANGERS AND SUPPORTS

A. Refer to Section 23 31 00.

2.10 FINISHING

A. Coat exposed round or rectangular ductwork in finished spaces with Glidden #5229 galvanized primer, or prime for field painting by the General Trades Contractor. Provide primed sheet metal escutcheons wherever ductwork penetrates a finished wall surface.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install ductwork in compliance with all recommendations of applicable SMACNA Section.

B. Do not install ductwork or flue vent within 36 in. in front of, above, over, or in the immediate vicinity of, electrical panels, electrical switchgear, or other electrical equipment, as described in 2017 NEC Articles 110 and 408.
   1. If compliance with these requirements is not possible, obtain approval in writing from the Authority Having Jurisdiction as well as the A/E to provide a sheet metal drip pan under the piping to prevent water and condensation from running or dripping onto electrical items. Provide drip pan at no additional cost to the Owner.

C. Keep ductwork as tight as possible to underside of structure or floor or roof above. Maintain at least 7 in. clear between duct or duct insulation and suspended acoustical tile ceiling, where recessed can light fixtures occur.
   1. **Option:** Route duct to clear light fixtures. Maintain additional clearance where recessed lights occur. Otherwise, provide 3 in. minimum clearance above bottom of ceiling.

D. Hang, brace, and reinforce all ducts per SMACNA.

E. Install aluminum angles or strut channel to support ductwork from equipment roof supports. Use Neoprene pads to isolate dissimilar metals.

F. Install a minimum 4 in. flexible connection where ductwork connects to motor-driven equipment. Do not bulge or install on a bind.

G. Install sheet metal escutcheon around ducts passing through walls exposed.

H. Install extractors at all rectangular supply branches.

I. Install combination scoop extractors/butterfly dampers at all round supply branches to diffusers.
   1. **Option:** Install 45 deg. or 90 deg. side take-off at all round supply branches.

J. Install turning vanes at all changes of direction in rectangular ducts.
   1. **Option:** Use standard radius turns, with centerline radius a minimum 1-1/2 times duct dimension.

K. Install all dampers and provide blank-off plates to seal frames airtight.

L. Ensure damper quadrant operator is exposed after insulating ductwork. Tape around operator to maintain vapor barrier.

M. Return/Exhaust Ductwork: Make all connections to registers or grilles with proper transitions. Refer to details on the Drawings. Abrupt connections or contractions, such as rectangular to round in the direction of air flow, or large to small duct, are prohibited. All duct transitions shall be smooth and symmetrical, with a maximum 15 deg. pitch to each side of the transition.

N. Make final connections to diffusers in suspended ceilings with insulated flexible duct (5 ft. long maximum).

O. Any risers or drops shall be made with 3-piece or 5-piece elbows per SMACNA.

P. Duct Insulation: Refer to Section 23 07 00.

Q. Duct Cleaning:
   1. Store ductwork in clean, dry locations with limited dust exposure.
   2. Install ductwork in clean, dry work areas, protected from direct exposure to the elements.
   3. Immediately before installation, wipe dust from interior duct surfaces.

4. Seal open ends of ductwork sections that are complete or will not receive further work for (8) hours or more.

R. Seal all outside air, exhaust air, and relief air sheet metal plenums watertight where snow could blow in, melt, and cause moisture damage to ceilings, walls, etc.

S. Duct Sealing:
1. Apply sealer to all joints according to SMACNA Standards.
2. Seal ducts to the seal classes listed below. Comply with SMACNA's "HVAC Duct Construction Standards — Metal & Flexible" (Latest Edition).
a. Outdoor:
1) Supply-air ducts: Seal Class A.
2) Exhaust ducts: Seal Class C.
3) Return-air ducts: Seal Class C.
b. Unconditioned space:
1) Supply-air ducts in pressure classes 2 in. WG and lower: Seal Class B.
2) Supply-air ducts in pressure classes higher than 2 in. WG: Seal Class A.
3) Exhaust ducts: Seal Class C.
4) Return-air ducts: Seal Class B.
c. Conditioned space:
1) Supply-air ducts in pressure classes 2 in. WG and lower: Seal Class C.
2) Supply-air ducts in pressure classes higher than 2 in. WG: Seal Class B.
3) Exhaust ducts: Seal Class B.
4) Return-air ducts: Seal Class C.

T. Duct Access Doors:
1. Install duct access doors on sides of ducts to allow for inspecting, adjusting, and maintaining accessories and equipment at the following locations:
a. At each change in direction and at maximum 50 ft. spacing.
b. Upstream and downstream from turning vanes.
c. Upstream or downstream from duct silencers.
2. Install in accessible, usable locations.
3. Install at each fire damper.
4. Install in return air ducts at 20 ft. intervals.
5. Install on each side of duct-mounted coils, and at each motorized damper.
6. Provide ceiling or wall access panels where necessary.
7. Comply with requirements of Section 23 37 00.

U. Paint flat black the inside of all ductwork behind grilles and registers that will be exposed to view in occupied areas.

3.2 LEAKAGE TESTING

A. Pressurize ductwork to 110% of design working pressure. Air leakage shall be uniformly distributed and shall not exceed 0.5% of the design total cubic feet per minute in any main or branch. The A/E shall witness test. Schedule a minimum of (48) hours in advance.

B. Comply with SMACNA's "HVAC Air Duct Leakage Test Manual." Submit a test report for each test. Comply with ASHRAE 90.1 Duct Sealing requirements.

C. Test the following systems:
1. Ducts with a pressure class higher than 3 in. WG: Test representative duct sections totaling no less than 25% of total installed duct area for each designated pressure class.

2. Exhaust Ducts: Test representative duct section totaling no less than 25% of total installed duct area for each designated pressure class.
3. Outdoor Air Ducts: Test representative duct sections totaling no less than 25% of total installed duct area for each designated pressure class.

3.3 PRESSURE CLASS SCHEDULE

A. Provide ductwork with the following SMACNA pressure classes:
   1. Supply air:
      a. From air-handling units to air terminal units: +6 in.
      b. From air terminal units to supply air outlets: +2 in.
      c. From air-handling units to supply air outlets (for systems without air terminal units): +2 in.
   2. Return air: -2 in.
   3. Relief air: +2 in.
   4. Exhaust air:
      a. From air inlets to exhaust fans: -2 in.
      b. From exhaust fans to discharges to outdoors: +2 in.
   5. Outdoor air: -2 in.

END OF SECTION 23 31 13

SECTION 23 33 13 — DAMPERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Section 23 09 23, “Direct-Digital Control System for HVAC.”

B. Section 23 09 93, “Sequence of Operations for HVAC Controls.”

1.2 DESCRIPTION

A. Provide all fixed dampers for adjusting air flow.

B. Install motor-operable control dampers furnished by the Temperature Controls Subcontractor. Temperature Controls Subcontractor shall provide low-voltage transformers as necessary.

C. Provide gravity backdraft dampers where indicated.

1.3 QUALITY ASSURANCE

A. Standards:
   1. Air Movement and Control Association (AMCA) Standard 500 Certified Performance.
   2. National Fire Protection Association (NFPA): 2015 NFPA 90A, “Standard for the Installation of Air-Conditioning and Ventilating Systems.”
   3. Sheet Metal and Air Conditioning Contractors National Association (SMACNA):
      a. SMACNA Publication, “Fire Damper Guide.”
      b. SMACNA Publication, “HVAC Duct Construction Standards — Metal and Flexible” (Latest Edition).
   4. Underwriters Laboratories, Inc. (UL):
      a. UL Standard 555 (7th Edition), “Fire Dampers.”
      b. UL Fire Resistance Directory.

PART 2 - PRODUCTS

2.1 DAMPERS — BALANCING (VOLUME)

A. Ruskin. Galvanized steel, steel blades, molded synthetic bearings, locking quadrant with stand-off bracket.
   1. Rectangular for ducts larger than 12 in.: Type MD35.
   2. Rectangular for ducts 12 in. and smaller: Type MD25, single-blade.
   3. Round: Type MDRS25, single-blade.

B. Other Acceptable Manufacturers: Approved equal by American Warming and Ventilating, Air Balance, Arrow United Industries, National Controlled Air, Inc., Cesco, Flexmaster, Honeywell, Johnson Controls, Louvers and Dampers, Tamco, Vent Products, or Lloyd Industries.

2.2 DAMPERS — CONTROL (OUTSIDE AIR INTAKE)

A. Ruskin Type CD-50, American Warming Type VC-29, or Vent Products Model 5900. Low leakage type, aluminum frame, 6 in. heavy-gauge extruded aluminum airfoil blades, concealed linkage, 1/2 in. hexagonal steel axles, vinyl blade edge seal, molded synthetic

bearings, extended 1/2 in. control shaft, motor operator bracket, maximum leakage less than 4 CFM per sq. ft. at 4 in. W.G.

B. Other Acceptable Manufacturers: Approved equal by Louvers and Dampers.

C. Furnish motor-operable dampers. All linkages for operators shall be furnished with dampers.

D. Outside air damper specified with air handling unit(s).

2.3 DAMPERS — SPLITTER (FABRICATED)

A. Steel frame and adjustable diverting blades, angle bracket, pivot bearing assembly, worm gear operator.

B. Acceptable Manufacturers: Ruskin or approved equal by American Warming and Ventilating, Air Balance, Arrow, National Controlled Air, Inc., Cesco, Flexmaster, Honeywell, Johnson Controls, Louvers and Dampers, Tamco, Vent Products, or Airstream.

2.4 DAMPERS — MOTOR OPERATORS

A. Furnish electric 24 volt AC operators, as specified under Section 23 09 23. Provide all linkage.

B. Acceptable Manufacturers: Belimo, Trane, or approved equal by Johnson Controls, Honeywell, TAC Americas, or Siemens Building Technologies.

2.5 CONICAL TAKE-OFF (FOR ROUND BRANCH DUCTS)

A. Combination Conical Take-Off with Butterfly Damper: Flexmaster Model FLDE. Spin collar 45 deg. scoop, with butterfly damper with adjustable operator.
   1. **Option:** Flexmaster Model CBDE. Conical Bellmouth fitting, with butterfly damper with adjustable operator.

B. Other Acceptable Manufacturers: Approved equal by American Warming and Ventilating, Air Balance, Arrow, National Controlled Air, Inc., Cesco, Ruskin, Honeywell, Johnson Controls, Louvers and Dampers, Tamco, Vent Products, or Airstream.

2.6 EXTRACTORS (FOR RECTANGULAR BRANCH DUCTS)

A. Tuttle & Bailey “Vectrols.” Steel frame and parallel diverting blades, angle bracket, pivot bearing assembly, worm gear operator, and control shaft.

B. Other Acceptable Manufacturer: Approved equal by Titus or Price.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install dampers in ductwork. Provide duct transitions as required to match duct size to damper dimensions. Install dampers and operators in locations where they can be readily inspected, serviced, adjusted, and maintained.

B. Provide mounting angles and duct sleeves. Bolt, screw, or tack weld damper enclosure to sleeve.

C. Provide access panels on **BOTH** sides of ductwork for access to dampers.

D. Provide ceiling access panels where necessary for access to dampers.

E. Ensure balancing damper quadrant operator is exposed after insulating ductwork. Tape insulation around operator to maintain vapor barrier.

F. Provide access for adjustments. Provide stops or adjust the linkage as required to fix and maintain the balance position.

G. Provide stops for the motorized damper for balancing the outside air quantity. If the motorized damper is not capable of being used for balancing, then provide manual balancing damper (not shown) on outside air intake, separate from motorized damper, for balancing.

H. Provide a solid place for installation of motor operators. Coordinate the selection and installation of motor operators furnished by the Temperature Controls Subcontractor. Mount operators furnished under Section 23 09 23.

3.2 CONTROLS CONNECTION

A. Temperature Controls Subcontractor shall provide operators and operator linkage.

B. Temperature Controls Subcontractor shall connect to damper linkage.

C. Temperature Controls Subcontractor shall provide controls.

D. Temperature Controls Subcontractor shall assume full responsibility for the proper operation of motor-operated dampers to provide the required sequence of operation described in Section 23 09 93.

3.3 WIRING

A. Motor-Operated Dampers:
1. Unless noted otherwise, motor-operated dampers shall be 24 volts.
2. Electrical Contractor shall provide HAND/OFF/AUTO switch, (disconnect switches,) control relay, control wiring, interlock wiring, and power wiring.
3. **Exception:** Temperature Controls Subcontractor shall provide all DDC wiring.

B. Electrical Contractor shall provide duct smoke detectors in units indicated. Temperature Controls Subcontractor shall coordinate wiring and final connection with the Electrical Contractor.

END OF SECTION 23 33 13

SECTION 23 37 00 — AIR OUTLETS AND INLETS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Section 23 33 13, “Dampers.”

1.2 DESCRIPTION

A. Provide grilles, registers, and diffusers as indicated on the Drawings. Service shall be for supply, return, or exhaust as noted on the Drawings.

1.3 QUALITY ASSURANCE

A. Standards:
   1. Air Diffusion Council (ADC).
   2. Air Movement and Control Association (AMCA) Standard 500, Certification for Air Performance and Water Penetration.
   3. American Society of Heating, Refrigerating, and Air Conditioning Engineers (ASHRAE) 70.
   4. National Fire Protection Association (NFPA): 2015 NFPA 90A, “Standard for the Installation of Air-Conditioning and Ventilating Systems.”

B. Performance testing shall be in accordance with ASHRAE 70.

1.4 RATINGS AND CAPACITY

A. Size, capacity, arrangements, and location as indicated on the Drawings.

PART 2 - PRODUCTS

2.1 GRILLES, REGISTERS, AND DIFFUSERS

A. Factory-fabricated to evenly distribute design CFM throughout the space without causing noticeable drafts. Steel or aluminum, with white, baked enamel finish.

B. Grilles: Same construction as registers without volume-control damper.

C. Return or Exhaust Grilles or Registers: Only curved blades that have a minimum deflection of 45 deg. will be accepted. No straight blades are permitted.

D. Acceptable Manufacturers: Anemostat or approved equal by Titus, Krueger, Price, Metal-Aire, Nailor, or Tuttle & Bailey.

2.2 DIFFUSER DAMPERS

A. Anemostat Type CU-1, or Titus Type AG-75 with 90 deg. sectorizing baffles. Opposed blade, heavy-gauge, steel control.

B. Other Approved Manufacturers: Approved equal by Titus, Krueger, Price, Metal-Aire, Nailor, or Tuttle & Bailey.

2.3 LOUVER DAMPERS

A. Anemostat Type LD. Steel louver blades, flat black finish.

B. Other Approved Manufacturers: Approved equal by Titus, Krueger, Price, Metal-Aire, Nailor, or Tuttle & Bailey.

PART 3 - EXECUTION

3.1 INSTALLATION — GRILLES, REGISTERS, AND DIFFUSERS

A. Installation shall be in accordance with NFPA 90A.

B. Install diffusers on rectangular ducts with a damper at the tap into the rectangular duct. Diffusers supplied by flexible ducts shall be fitted with a louver damper installed in the diffuser neck. This is in addition to the duct balancing dampers shown.

C. Do not install combination diffuser/damper on bottom connection to a continuing supply air main duct.

D. Registers shall be provided with sponge-rubber gasket between flanges and wall or ceiling.

E. In drywall ceilings, cut the holes in the ceiling specifically to fit the diffusers/registers.

F. Install ceiling grille/register blades away from normal line of sight into the ceiling space or duct.

G. Install wall supply registers at least 6 in. below the ceiling, unless otherwise indicated.

H. To prevent ceiling from sagging, provide additional support hangers for diffusers, grilles, or registers mounted in lay-in ceiling tiles.

I. Ensure airtight seal at all connections.

J. Adjust room thermostats for winter and summer conditions.

END OF SECTION 23 37 00

From Rio Grande Wood Hall

SECTION 23 74 33

DEDICATED OUTDOOR-AIR UNITS

(DOAS-1, DOAS-2)

(BASE BID ONLY)

PART 25 - GENERAL

25.1 RELATED DOCUMENTS

A. Section 23 05 60, “Requirements for Completion of HVAC Work.”

25.2 DESCRIPTION

A. Provide a packaged, medium-pressure draw-through, gas heating, refrigerant direct expansion (DX) cooling, air-handling unit (AHU), complete with energy recovery wheel (ERW).

B. Unit shall operate as a 100% dedicated outdoor air system (DOAS) unit to meet the outdoor air requirements for the building.

C. Unit Manufacturer:

1. Shall factory-install and factory-wire refrigerant expansion valve and operator.
2. Shall factory-install and factory-wire outside and return air damper operator, air proving switch, freezestat, low-limit thermostat, mixed air temperature sensor, supply air temperature sensor, and unit control module.
3. Shall arrange with the Temperature Controls Subcontractor, and shall include in the Unit Manufacturer’s quote, all costs involved in providing the above items for field installation.

D. Unit piping shall be performed in field where Unit Manufacturer cannot provide the above items.

25.3 QUALITY ASSURANCE

A. Standards:

1. Air-Conditioning, Heating, and Refrigeration Institute (AHRI):
    a. AHRI 410, Forced-Circulation Air-Cooling and Air-Heating Coils.
    b. AHRI 430, Central-Station Air-Handling Units.
    c. AHRI 435, Application of Central-Station Air-Handling Units.
    d. AHRI 1060, Rating Air-to-Air Heat Exchangers for Energy Recovery Ventilation Equipment.
2. Air Movement and Control Association (AMCA) International, Inc.:
    a. AMCA 99, Standards Handbook.
    b. AMCA 210, Laboratory Methods of Testing Fans for Rating Purposes.
    c. AMCA 300, Test Code for Sound Rating Air Moving Devices.
    d. AMCA 500, Test Methods for Louver, Dampers, and Shutters.
3. American Bearing Manufacturers Association (ABMA) 9, “Load Ratings and Fatigue Life for Ball Bearings.”
4. American National Standards Institute (ANSI).

5. American Society for Testing and Materials (ASTM):
   a. B 88.
   b. B117, "Standard Practice for Operating Salt Spray Apparatus."
   c. C 1071.
   d. D 1785.
6. International Building Code (IBC) 2000 and 2003.
7. National Electrical Manufacturers Association (NEMA): MG1, "Motors and Generators."
8. National Fire Protection Association (NFPA):
   a. 2023 NFPA 70, "National Electrical Code® (NEC)."
   b. 2024 NFPA 90A, "Standard for the Installation of Air-Conditioning and Ventilating Systems."
   c. 2024 NFPA 5000, "Building Construction and Safety Code."
9. Occupational Safety and Health Administration (OSHA).
10. Underwriters Laboratories, Inc., Label, (UL):
    a. UL 94, "Test for Flammability of Plastic Materials for Parts in Devices and Appliances."
    b. UL 723, "Test for Surface Burning Characteristics of Building Materials."
    c. UL 900, "Test Performance of Air Filter Units."
    d. UL 1995, "Standard for Heating and Cooling Equipment."
11. U.S. Energy Policy Act of 1992 (EPAct).
12. U.S. General Services Administration (GSA), 2003 Facilities Standard 5.9, HVAC Systems and Components.
13. Sheet Metal and Air Conditioning Contractors National Association (SMACNA), "HVAC Duct Construction Standards — Metal and Flexible."
14. American Society of Heating, Refrigerating, and Air Conditioning Engineers (ASHRAE):
    a. ASHRAE 15.
    b. ASHRAE 52.1.
    c. ASHRAE 52.2.

B. Safety Agency Listed and Certification:
   1. AHUs shall be cETLus safety-listed to conform with UL 1995 and CAN/CSA Standard C22.2 No. 236.
   2. Air handler furnished with double-width, double-inlet (DWDI) fans shall be certified in accordance with the central station AHUs certification program, which is based on AHRI 430.
3. AHU water heating and cooling coils shall be certified in accordance with the forced circulation air cooling and air heating coils certification program, which is based on AHRI 410.

C. Manufacturer Qualifications: Company specializing in manufacturing air handler products specified in this Section shall show a minimum (5) years documented experience and complete catalog data on total product.

25.4 RATINGS AND CAPACITY

A. Size, capacity, arrangements, and location as indicated on the Drawings.

25.5 SUBMITTALS

A. Shop Drawings:
   1. Indicate assembly, unit dimensions, weight loading, required clearances, construction details, field connection details, and electrical characteristics and connection requirements.
   2. Computer-generated fan curves for each AHU shall be submitted with specific design operating point noted.

3. A computer-generated psychometric chart shall be submitted for each cooling coil with design points and final operating point clearly noted.
4. Sound data for discharge, radiated, and return positions shall be submitted by octave band for each unit.
5. Calculations for required baserail heights to satisfy condensate trapping requirements of cooling coil shall be included.

B. Product Data:
1. Provide literature that indicates dimensions, weights, capacities, ratings, fan performance, finishes of materials, electrical characteristics, and connection requirements.
2. Provide data of filter media, filter performance data, filter assembly, and filter frames.
3. Provide Manufacturer's installation instructions.

PART 26 - PRODUCTS

26.1 AIR HANDLING UNITS (DOAS UNITS)

A. Configuration: Fabricate as detailed on the Drawings.

B. Performance: Conform to AHRI 410 and 430. See Schedules on the Drawings.

C. Unit Construction:
1. Fabricate unit with heavy-gauge channel posts and panels secured with mechanical fasteners. All panels, access doors, and ship sections shall be sealed with permanently applied bulb-type gasket. Shipped loose gasketing is not allowed.
2. Panels and access doors shall be constructed of 18 gauge aluminized steel, internally insulated with 2 in. faced fiberglass, 1-1/2 lb. density, completely encased in 20 gauge galvanized steel liners. Unit will be furnished with solid inner liners.
3. Panel deflection shall not exceed L/240 ratio at 125% of design static pressure, maximum 5 in. of positive, or 6 in. of negative, static pressure. Deflection shall be measured at the panel midpoint.
4. The casing leakage rate shall not exceed 0.5 cfm/sq. ft. of cabinet area at 5 in. of positive, or 6 in. of negative, static pressure.
5. Module-to-module field assembly shall be accomplished with an overlapping, full perimeter internal splice joint that is sealed with bulb type gasketing on both mating modules to minimize on-site labor and meet indoor air quality standards.
6. Access doors shall be flush-mounted to cabinetry, with minimum of (2) 6 in. long stainless steel piano-type hinges, latch and full size handle assembly. Access doors shall swing outward for unit sections under negative pressure. Access doors on positive pressure sections shall have a secondary latch to relieve pressure and prevent injury upon access. Provide 12 in. x 12 in. window in each access door.
7. Unit Manufacturer shall provide a 6 in. formed G60 galvanized steel baserail for structural rigidity and condensate trapping. The base rail shall be constructed with 12 gauge nominal for unit sizes 003 through 035 and 10 gauge nominal for unit sizes 040 through 090. The following calculation shall determine the required height of the baserail to allow for adequate drainage. Use the largest pressure to determine base rail height. [(Negative)(Positive) static pressure (in)] (2) + 4 in. = required baserail height. Should the unit baserail not be factory-supplied at this height, provide a concrete housekeeping pad to make up the difference.

8. Condensate drain pans:
   a. Fabricated of double-wall insulated stainless steel with 2% slope in at least (2) planes to collect condensate from cooling coils (including coil piping connections, coil headers, and return bends) and from humidifiers and to direct water toward drain connection.
   b. Length: Extend drain pan downstream from leaving face to comply with ASHRAE 62.1-2007 or 12 in., whichever is greater.

D. Access section shall be provided for access between components.

E. Motors: Unless otherwise noted, high-efficiency motors shall be NEMA Design B, continuous rated with 1.15 service factor, with Class F insulation and Class B temperature rise, copper windings and leads, 1,750 RPM with the horsepower indicated on the Drawings. All motors shall be equipped with ball bearings.

F. Electrical:
   1. Fan motors shall be provided by the Manufacturer and shall be open drip-proof, high-efficiency (meets EPAct requirements), 1750 RPM, single-speed, 460V/60HZ, 3-phase. Complete electrical characteristics for each fan motor shall be as shown in schedule.
   2. Wiring termination: Provide terminal lugs to match branch circuit conductor quantities, sizes, and materials indicated. Enclosed terminal lugs in terminal box sized to 2023 NFPA 70.
   3. Manufacturer shall provide ASHRAE 90.1 Energy Efficiency equation details for individual equipment to assist Building Engineer for calculating system compliance.
   4. All electrical connection components shall be field-provided and field-mounted.

G. Acoustics: Sound power levels (dB) for the unit shall not exceed the specified levels shown on the unit schedule. The Manufacturer shall provide the necessary sound treatment to meet these levels if required.

H. Acceptable Manufacturers: Modine or approved equal by Carrier or Trane.

26.2 REFRIGERATION SYSTEM

A. Unit shall be factory-charged with R-32 or R-454B refrigerant.

B. Compressors shall be Digital Scroll Compressor™ in tandem arrangement, capable of system capacity modulation from 10% to 100%.

C. Compressors shall be mounted in an isolated compartment to permit operation of the unit without affecting air flow when the compartment door is open.

D. Compressors shall be mounted on the Compressor Manufacturer's recommended rubber vibration isolators to prevent transmission of vibration to the building structure.

E. Compressors shall include internal thermal overload protection.

F. Compressors shall include crankcase heaters to protect against liquid flood-back and the elimination of oil foaming on start-up.

G. Refrigerant circuit shall be equipped with electronic expansion valve with evaporator coil pressure transducer, automatic reset low-pressure and manual reset high-pressure refrigerant controls, Schrader type service fittings on both the high-pressure and low-pressure sides, and refrigerant liquid line filter/drier.

H. The air-cooled condenser section shall have vertical discharge axial flow direct-drive fans with variable frequency drive (VFD) for condenser head pressure control, parallel flow

PF™ micro-channel aluminum fin/tube condenser coils sloped approximately 30 degrees to protect the coils form hail damage.

I. Evaporator coil shall be high-capacity 4-row design with copper tubes and aluminum fins mechanically bonded to the tubes at a spacing of 14 fins/in. The coil shall feature vertical tube headers and galvanized steel end casings with stainless steel lower bracket.

J. The unit shall include a hot gas reheat coil, modulating valves, electronic controller, supply air temperature sensor, and a dehumidification control that shall allow the unit to have a dehumidification mode of operation. The hot gas reheat coil shall be located no less than 6 in. downstream of the evaporator coil to prevent condensate re-evaporation.

K. The unit shall include a double-sloped, 316 stainless steel drain pan for positive drainage of condensate. The drain pan shall include a condensate drain pan float switch to disable the compressors if the pan is not draining properly.

L. Standard refrigerant circuit safety controls and components shall include a 5-minute anti-short cycle delay timer, modulating condenser fan speed control to allow operation down to 35 deg. F., adjustable temperature compressor lockout (default for 45 deg. F.), and liquid line sight glass. An airflow proving switch is monitored to ensure proper airflow before the refrigeration circuit is energized.

26.3 DOAS FAN, DRIVE, AND MOTOR SECTION (SUPPLY AND EXHAUST)

A. Fan Assemblies:
1. Acceptable fan assembly shall be a double-width, double-inlet, Class I, belt-drive type housed backward-inclined airfoil plenum fan dynamically balanced as an assembly, as shown in Schedule. Maximum fan RPM shall be below first critical fan speed.
2. Fan assemblies shall be dynamically balanced by the Manufacturer on all (3) planes and at all bearing supports. Copper lubrication lines shall be provided and extended from the bearings and attached with grease fittings to the fan base assembly near access door. If not supplied at the factory, mount copper lube lines in the field. Fan and motor shall be mounted internally on a steel base. Motor shall be factory-mounted on slide base that can be slid out the side of unit if removal is required. Provide access to motor, drive, and bearings through hinged access door.
3. Fan and motor assembly shall be mounted on 2 in. deflection spring vibration type isolators inside cabinetry.
4. Provide 12 in. x 12 in. window and light with toggle switch.

B. Bearings, Shafts, and Drives:
1. Bearings: Basic load rating computed in accordance with ABMA/ANSI Standards. The bearings shall be designed for service with an L-50 life of 200,000 hours and shall be a heavy-duty pillow block, self-aligning, grease-lubricated ball or spherical roller bearing type.
2. Shafts shall be solid, hot-rolled steel, ground and polished, keyed to shaft, and protectively coated with lubricating oil. Hollow shafts are not acceptable.
3. V-belt drives shall be cast iron or steel sheaves, dynamically balanced, bored to fit shafts and keyed. Fixed sheaves, matched belts, and drive rated based on motor horsepower. Minimum of (2) belts shall be provided on all fans with 10 HP motors and above. Standard drive service factor minimum shall be 1.1 S.F. for 1/4 HP through 7.5 HP, 1.3 S.F. for 10 HP and larger, calculated based on fan brake horsepower.

C. Variable Frequency Drive (VFD):
   1. Shall be installed inside the unit cabinet, mounted, wired, and tested.
   2. Shall contain electromagnetic interference (EMI) frequency protection.
   3. Insulated gate bi-polar transistors (IGBT) used to produce the output pulse width modulated (PWM) waveform, allowing for quiet motor operation.
   4. Self diagnostics with fault and power code LED indicator. Field accessory display kit available for further diagnostics and special setup applications.
   5. RS485 capability standard.
   6. Electronic thermal overload protection.
   7. 5% swinging chokes for harmonic reduction and improved power factor.
   8. All printed circuit boards shall be conformal coated.

26.4 GAS SECTION

A. Heat exchanger: Tubular type with 18 gauge, 409 stainless steel tubes and header. Shall be certified to withstand 5.0 in. W.C. external staic pressure without burner flame disturbance.

B. Burners: In-shot type, directly firing each heat exchanger tube individually and designed for good lighting characteristics without noise of extinction.

C. Solid-state ignition system: Shall directly light gas by means of a direct spark igniter each time on a call for heat. Ignition control shall be 100% shut-off with multi-retry.

D. Thermal efficiency of section shall be a minimum of 94% for all airflow ranges through the use of a secondary recuperative heat exchanger. Secondary heat exchanger shall be constructed of AL29-4C stainless steel to withstand the corrosive environment of condensing gas-fired equipment.

E. Automatic reset high-limit switch mounted on power exhauster housing to shut off gas supply in the event of overheating flue gas temperatures.

F. Condensate drain line overflow switch that senses if condensate line is clogged and shuts furnace down. Switch is factory-mounted inside furnace control cabinet and wired to unit controls.

G. Heating section: Shall be provided with the following:
   1. Electronic modulating gas control valves.
   2. Main combination gas valves/regulators.
   3. Ignition controllers.
   4. Automatic reset high-limit switches.
   5. Airflow proving switch to ensure proper airflow before heating circuit is energized.

H. Gas controls can modulate system gas flow from 20% through 100% of full fire.

26.5 COIL SECTION

A. Evaporator Cooling Coils: Direct expansion refrigerant coil of multiple rows of seamless copper tubes mechanically expanded into aluminum fins. Refrigerant circuits interlaced through coil to maintain entire coil face active. Coil leak-tested with compressed air under water. Thermal expansion valve.

B. Direct Expansion Refrigerant Cooling Coil(s): Provide access to coil(s) for service and cleaning. Enclose coil headers and return bends fully within unit casing. Unit shall be provided with coil connections that extend a minimum of 3 in. beyond unit casing for ease of installation. Coil connections shall be factory-sealed with grommets on interior and exterior panel liners to minimize air leakage and condensation inside panel assembly. If not factory-packaged, provide all coil connection grommets and sleeves. Coils shall be

removable through side or top panels of unit without the need to remove and disassemble the entire section from the unit.

1. Sweat type copper suction headers shall be provided.
2. Fins shall have a minimum thickness of 0.0075 in. aluminum plate construction. Fins shall have full drawn collars to provide a continuous surface cover over the entire tube for maximum heat transfer. Tubes shall be mechanically expanded into the fins to provide a continuous primary to secondary compression bond over the entire finned length for maximum heat transfer rates. Bare copper tubes shall not be visible between fins.
3. Coil tubes shall be 5/8 in. outside seamless copper, 0.020 in. nominal tube wall thickness, expanded into fins on 1-1/2 in. centers, brazed at joints. Soldered U-bends shall be provided to minimize the effects of erosion and premature failure having a minimum tube wall thickness of 0.025 in.
4. Sweat type copper suction connections located at the bottom of the suction headers for gravity oil drainage. Coils shall be uniformly circuited in a counterflow manner for either single circuit, row, face, interlaced, or interlaced face split capacity reduction as shown on unit schedule. Pressure type liquid distributors used. Coils shall be tested with 315 lbs. air pressure under warm water, and suitable for 250 PSIG working pressure.
5. Coil casing shall be a formed channel frame of galvanized steel.

C. Certification: Acceptable refrigerant coils shall be certified in accordance with AHRI 410 and bear the AHRI label. Coils exceeding the scope of the Manufacturer's certification or the range of AHRI's standard rating conditions will be considered provided the Manufacturer is a current member of the AHRI Forced Circulation Air-Cooling and Air-Heating Coils certification programs and that the coils have been rated in accordance with AHRI 410. Manufacturer shall be ISO 9002-certified.

26.6 DOAS ENERGY RECOVERY WHEEL (ERW) SECTION

A. ERW shall be constructed of corrugated synthetic fibrous media, with a desiccant intimately bound and uniformly and permanently dispersed throughout the matrix structure of the media. Rotors with desiccants coated, bonded, or synthesized onto the media are not acceptable due to delaminating or erosion of the desiccant material. Media shall be synthetic to provide corrosion resistance and resistance against attack from laboratory chemicals present in pharmaceutical, hospital, etc., environments as well as attack from external outdoor air conditions. Coated aluminum is not acceptable.

B. Face flatness of the wheel shall be maximized in order to minimize wear on inner seal surfaces and to minimize cross leakage. Rotor shall be constructed of alternating layers of flat and corrugated media. Wheel layers should be uniform in construction forming uniform aperture sizes for airflow. Wheel construction shall be fluted or formed honeycomb geometry so as to eliminate internal wheel bypass. Wheel layers that can be separated or spread apart by airflow are unacceptable due to the possibility of channeling and performance degradation. The minimum acceptable performance shall be as specified in the unit schedule.

C. Desiccant Material: The desiccant material shall be a molecular sieve, and specifically a 4 angstrom or smaller molecular sieve to minimize cross-contamination.

D. Wheel Media Support System: The wheel frames shall consist of evenly spaced steel spokes, galvanized steel outer band and rigid center hub. The wheel construction should allow for post-fabrication wheel alignment.

E. Wheel Seals: The wheel seals shall be full contact nylon brush seals or equivalent. Seals should be easily adjustable.

F. Wheel Cassette: Cassettes shall be fabricated of heavy-duty reinforced galvanized steel or welded structural box tubing. Cassettes shall have a built-in adjustable purge section minimizing cross-contamination of supply air as shown on unit schedule. Bearings shall be inboard, zero maintenance, permanently sealed roller bearings, or, alternatively, external flanged or pillow block bearings. Drive systems shall consist of fractional horsepower AC drive motors with multi-link drive belts.

G. Certification: The wheel shall be AHRI-certified by the ERW Manufacturer to AHRI 1060 and shall bear the AHRI certification stamp. Private independent testing performed "in accordance with" various standards is not a substitute for AHRI certification and shall not be accepted. The wheel shall be listed or recognized by UL or equivalent.

H. The wheel shall contain an economizer wheel bypass.

26.7 DOAS AIR FILTRATION SECTION

A. Furnish angled filter section with 2 in. pleated MERV 8 filter with microbial-resistant Intersept coating. Provide side loading and removal of filters.

B. Furnish combination filter section with 2 in. MERV 10. Provide side loading and removal of filters.

C. Provide filter Magnehelic gauge(s).

26.8 DAMPERS

A. Outside air, ERW bypass, return/exhaust, and unit full 100% return dampers shall be low-leakage type with direct damper-mounted actuator.

B. Dampers shall be extruded aluminum, airfoil blades with edge seal.

PART 27 - EXECUTION

27.1 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, protect, and handle products to site.

B. Accept products on site on factory-furnished shipping skids. Inspect for damage.

C. Store in clean dry place and protect from construction traffic. Handle carefully to avoid damage to components, enclosures, and finish.

27.2 INSTALLATION

A. Install unit on roof curb.

B. Make heating water, DX, and condensation drain piping connections.

C. Make refrigerant and condensation drain piping connections.

D. Connect to inlet and discharge with 4 in. flexible duct connections.

E. Install trapped condensate drain line from drain pan to roof. Provide splash block.

F. Unit Manufacturer shall provide selection of sheaves to the HVAC Contractor for proper balancing.

G. Install a new set of filters in each unit at Contract Completion. Furnish another set of filters for each unit to the College at Contract Completion. Refer to Section 23 05 60.

H. Drive belts shall be properly tensioned using a Browning belt tensioner, and aligned by workmen qualified in this Work. Tension at start-up and re-tension after (1) week of operation.

27.3 EQUIPMENT ACCESS

A. Locate all units to provide sufficient access to change filters, pull coils, or service other items requiring periodic maintenance.

27.4 WIRING

A. Electrical Contractor shall provide a separate power feed to each unit.

B. Temperature Controls Subcontractor shall provide all DDC wiring and freezestat wiring.

END OF SECTION 23 74 33

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SECTION 23 74 33

DEDICATED OUTDOOR-AIR UNITS

PART 28 - GENERAL

28.1 RELATED DOCUMENTS

A. Section 23 05 60, “Requirements for Completion of HVAC Work.”

B. Section 26 29 23, “Variable-Frequency Motor Controllers.”

28.2 DESCRIPTION

A. Provide a packaged, medium-pressure draw-through, hot water heating, refrigerant direct expansion (DX) cooling, air-handling unit (AHU).

B. Unit shall operate as a 100% dedicated outdoor air system (DOAS) unit to meet the outdoor air requirements for the classroom / office wing.

C. Temperature Controls Subcontractor shall install field-installed controls, and shall coordinate all insertion wells for direct digital control (DDC) interface.
   1. **Exception:** HVAC Contractor shall install 3-way control valves, and shall provide all insertion wells for DDC interface.

D. Unit Manufacturer:
   1. Shall factory-install and factory-wire refrigerant expansion valve and operator.
   2. Shall factory-install and factory-wire outside air damper operator, air proving switch, freezestat, low-limit thermostat, mixed air temperature sensor, supply air temperature sensor, and unit control module.
   3. Shall arrange with the Temperature Controls Subcontractor, and shall include in the Unit Manufacturer’s quote, all costs involved in providing the above items for field installation.

28.3 QUALITY ASSURANCE

A. Standards:
   1. Air-Conditioning, Heating, and Refrigeration Institute (AHRI):
      a. AHRI 410, Forced-Circulation Air-Cooling and Air-Heating Coils.
      b. AHRI 430, Central-Station Air-Handling Units.
      c. AHRI 435, Application of Central-Station Air-Handling Units.
   2. Air Movement and Control Association (AMCA) International, Inc.:
      a. AMCA 99, Standards Handbook.
      b. AMCA 210, Laboratory Methods of Testing Fans for Rating Purposes.
      c. AMCA 300, Test Code for Sound Rating Air Moving Devices.
      d. AMCA 500, Test Methods for Louver, Dampers, and Shutters.
   3. American Bearing Manufacturers Association (ABMA) 9, “Load Ratings and Fatigue Life for Ball Bearings.”
   4. American National Standards Institute (ANSI).
   5. American Society for Testing and Materials (ASTM):
      a. B 88.
      b. B117, “Standard Practice for Operating Salt Spray Apparatus.”
      c. C 1071.

d. D 1785.

6. International Building Code (IBC) 2009.
7. National Electrical Manufacturers Association (NEMA): MG1, "Motors and Generators."
8. National Fire Protection Association (NFPA):
   a. 2023 NFPA 70, "National Electrical Code® (NEC)."
   b. 2024 NFPA 90A, "Standard for the Installation of Air-Conditioning and Ventilating Systems."
   c. 2024 NFPA 5000, "Building Construction and Safety Code."
9. Occupational Safety and Health Administration (OSHA).
10. Underwriters Laboratories, Inc., Label, (UL):
    a. UL 94, "Test for Flammability of Plastic Materials for Parts in Devices and Appliances."
    b. UL 723, "Test for Surface Burning Characteristics of Building Materials."
    c. UL 900, "Test Performance of Air Filter Units."
    d. UL 1995, "Standard for Heating and Cooling Equipment."
11. U.S. Energy Policy Act of 1992 (EPAct).
12. U.S. General Services Administration (GSA), 2003 Facilities Standard 5.9, HVAC Systems and Components.
13. Sheet Metal and Air Conditioning Contractors National Association (SMACNA), "HVAC Duct Construction Standards — Metal and Flexible."
14. American Society of Heating, Refrigerating, and Air Conditioning Engineers (ASHRAE):
    a. ASHRAE 15.
    b. ASHRAE 52.1.
    c. ASHRAE 52.2.

B. Safety Agency Listed and Certification:
   1. AHUs shall be cETLus safety-listed to conform with UL 1995 and CAN/CSA Standard C22.2 No. 236.
   2. AHU water heating coils shall be certified in accordance with the forced circulation air cooling and air heating coils certification program, which is based on AHRI 410.

C. Manufacturer Qualifications: Company specializing in manufacturing air handler products specified in this Section shall show a minimum (5) years documented experience and complete catalog data on total product.

28.4 RATINGS AND CAPACITY

A. Size, capacity, arrangements, and location as indicated on the Drawings.

28.5 SUBMITTALS

A. Shop Drawings:
   1. Indicate assembly, unit dimensions, weight loading, required clearances, construction details, field connection details, and electrical characteristics and connection requirements.
   2. Computer-generated fan curves for each AHU shall be submitted with specific design operating point noted.
   3. A computer-generated psychometric chart shall be submitted for each cooling coil with design points and final operating point clearly noted.
   4. Sound data for discharge, radiated, and return positions shall be submitted by octave band for each unit.

5. Calculations for required baserail heights to satisfy condensate trapping requirements of cooling coil shall be included.

B. Product Data:
1. Provide literature that indicates dimensions, weights, capacities, ratings, fan performance, finishes of materials, electrical characteristics, and connection requirements.
2. Provide data of filter media, filter performance data, filter assembly, and filter frames.
3. Provide Manufacturer's installation instructions.

PART 29 - PRODUCTS

29.1 DOAS UNITS

A. Configuration: Fabricate as detailed on the Drawings.

B. Performance: Conform to AHRI 410 and 430. See Schedules on the Drawings.

C. Unit Construction:
1. Fabricate unit with heavy-gauge channel posts and panels secured with mechanical fasteners. All panels, access doors, and ship sections shall be sealed with permanently applied bulb-type gasket. Shipped loose gasketing is not allowed.
2. Panels and access doors shall be constructed as a 2 in. nominal thick; thermally broken double-wall assembly, injected with foam insulation with an R-value of not less than R-13.
   a. The outer panel shall be constructed of G90 galvanized steel.
   b. The inner liner shall be constructed of G90 galvanized steel.
   c. The floor plate shall be constructed as specified for the inner liner.
   d. Unit will be furnished with solid inner liners.
3. Panel deflection shall not exceed L/240 ratio at 125% of design static pressure, maximum 5 in. of positive, or 6 in. of negative, static pressure. Deflection shall be measured at the panel midpoint.
4. The casing leakage rate shall not exceed 0.5 cfm/sq. ft. of cabinet area at 5 in. of positive, or 6 in. of negative, static pressure.
5. Module-to-module field assembly shall be accomplished with an overlapping, full perimeter internal splice joint that is sealed with bulb type gasketing on both mating modules to minimize on-site labor and meet indoor air quality standards.
6. Access doors shall be flush-mounted to cabinetry, with minimum of (2) 6 in. long stainless steel piano-type hinges, latch and full size handle assembly. Access doors shall swing outward for unit sections under negative pressure. Access doors on positive pressure sections shall have a secondary latch to relieve pressure and prevent injury upon access. Provide 12 in. x 12 in. window in each access door.
7. Unit Manufacturer shall provide a 6 in. formed G60 galvanized steel baserail for structural rigidity and condensate trapping. The base rail shall be constructed with 12 gauge steel material. The following calculation shall determine the required height of the baserail to allow for adequate drainage. Use the largest pressure to determine base rail height. [(Negative)(Positive) static pressure (in)] (2) + 4 in. = required baserail height. Should the unit baserail not be factory-supplied at this height, provide a concrete housekeeping pad to make up the difference.
8. Condensate drain pans:
   a. Fabricated of double-wall insulated stainless steel with 2% slope in at least (2) planes to collect condensate from cooling coils (including coil piping

connections, coil headers, and return bends) and from humidifiers and to direct water toward drain connection.

b. Length: Extend drain pan downstream from leaving face to comply with ASHRAE 62.1-2007 or 12 in., whichever is greater.

D. Access section shall be provided for access between components.

E. Motors:

1. Unless otherwise noted, high-efficiency motors shall be NEMA Design B, continuous rated with 1.15 service factor, with Class F insulation and Class B temperature rise, copper windings and leads, 1,750 RPM with the horsepower indicated on the Drawings. All motors shall be equipped with ball bearings.
2. Motors controlled by variable-frequency drives (VFDs) shall be specially insulated for this service.

F. Electrical:

1. Fan motors shall be provided by the Manufacturer and shall be open drip-proof, high-efficiency (meets EPAct requirements), 1750 RPM, single-speed, 460V/60HZ, 3-phase. Complete electrical characteristics for each fan motor shall be as shown in schedule.
2. Wiring termination: Provide terminal lugs to match branch circuit conductor quantities, sizes, and materials indicated. Enclosed terminal lugs in terminal box sized to 2023 NFPA 70.
3. Manufacturer shall provide ASHRAE 90.1 Energy Efficiency equation details for individual equipment to assist Building Engineer for calculating system compliance.
4. All electrical connection components shall be field-provided and field-mounted.

G. Acoustics: Sound power levels (dB) for the unit shall not exceed the specified levels shown on the unit schedule. The Manufacturer shall provide the necessary sound treatment to meet these levels if required.

H. Acceptable Manufacturers: McQuay “Vision” or approved equal by Carrier, Trane, or York.

29.2 DOAS FAN, DRIVE, AND MOTOR SECTION

A. Fan Assemblies:

1. Acceptable fan assembly shall be a plug-type, Class I, belt-drive, un-housed forward-curved plenum fan dynamically balanced as an assembly, as shown in Schedule. Maximum fan RPM shall be below first critical fan speed.
2. Fan assemblies shall be dynamically balanced by the Manufacturer on all (3) planes and at all bearing supports. Copper lubrication lines shall be provided and extended from the bearings and attached with grease fittings to the fan base assembly near access door. If not supplied at the factory, mount copper lube lines in the field. Fan and motor shall be mounted internally on a steel base. Motor shall be factory-mounted on slide base that can be slid out the side of unit if removal is required. Provide access to motor, drive, and bearings through hinged access door.
3. Fan and motor assembly shall be mounted on 2 in. deflection spring vibration type isolators inside cabinetry.
4. Provide 12 in. x 12 in. window and light with toggle switch.

B. Bearings, Shafts, and Drives:

1. Bearings: Basic load rating computed in accordance with ABMA/ANSI Standards. The bearings shall be designed for service with an L-50 life of 200,000 hours and

shall be a heavy-duty pillow block, self-aligning, grease-lubricated ball or spherical roller bearing type.

2. Shafts shall be solid, hot-rolled steel, ground and polished, keyed to shaft, and protectively coated with lubricating oil. Hollow shafts are not acceptable.
3. V-belt drives shall be cast iron or steel sheaves, dynamically balanced, bored to fit shafts and keyed. Fixed sheaves, matched belts, and drive rated based on motor horsepower. Minimum of (2) belts shall be provided on all fans with 10 HP motors and above. Standard drive service factor minimum shall be 1.1 S.F. for 1/4 HP through 7.5 HP, 1.3 S.F. for 10 HP and larger, calculated based on fan brake horsepower.

29.3 DOAS COIL SECTION

A. Water Heating Coil(s):
1. Provide access to coil(s) for service and cleaning. Enclose coil headers and return bends fully within unit casing. Unit shall be provided with coil connections that extend a minimum of 5 in. beyond unit casing for ease of installation. Drain and vent connections shall be provided exterior to unit casing. Coil connections shall be factory-sealed with grommets on interior and exterior panel liners to minimize air leakage and condensation inside panel assembly. If not factory-packaged, provide all coil connection grommets and sleeves. Coils shall be removable through side or top panels of unit without the need to remove and disassemble the entire section from the unit.
2. Headers shall consist of seamless copper tubing to ensure compatibility with primary surface. Headers shall have intruded tube holes to provide maximum brazing surface for tube-to-header joint, strength, and inherent flexibility. Header diameter should vary with fluid flow requirements.
3. Fins shall have a minimum thickness of 0.0075 in. aluminum plate construction. Fins shall have full drawn collars to provide a continuous surface cover over the entire tube for maximum heat transfer. Tubes shall be mechanically expanded into the fins to provide a continuous primary to secondary compression bond over the entire finned length for maximum heat transfer rates. Bare copper tubes shall not be visible between fins.
4. Coil tubes shall be 5/8 in. outside diameter seamless copper, 0.020 in. nominal tube wall thickness, expanded into fins, brazed at joints. Soldered U-bends shall be provided to minimize the effects of erosion and premature failure having a minimum tube wall thickness of 0.025 in.
5. Coil connections shall be carbon steel, threaded connection. Connection size to be determined by Manufacturer based upon the most efficient coil circuiting. Vent and drain fittings shall be furnished on the connections, exterior to AHU. Vent connections provided at the highest point to ensure proper venting. Drain connections shall be provided at the lowest point to ensure complete drainage and prevent freeze-up.
6. Coil shall be furnished as an uncased galvanized steel track to allow for thermal movement and slide into a pitched track for fluid drainage.

B. Evaporator cooling coils: Direct expansion refrigerant coil of multiple rows of seamless copper tubes mechanically expanded into aluminum fins. Refrigerant circuits interlaced through coil to maintain entire coil face active. Coil leak-tested with compressed air under water. Thermal expansion valve.

C. Direct Expansion Refrigerant Cooling Coil(s): Provide access to coil(s) for service and cleaning. Enclose coil headers and return bends fully within unit casing. Unit shall be

provided with coil connections that extend a minimum of 3 in. beyond unit casing for ease of installation. Coil connections shall be factory-sealed with grommets on interior and exterior panel liners to minimize air leakage and condensation inside panel assembly. If not factory-packaged, provide all coil connection grommets and sleeves. Coils shall be removable through side or top panels of unit without the need to remove and disassemble the entire section from the unit.

1. Sweat type copper suction headers shall be provided.
2. Fins shall have a minimum thickness of 0.0075 in. aluminum plate construction. Fins shall have full drawn collars to provide a continuous surface cover over the entire tube for maximum heat transfer. Tubes shall be mechanically expanded into the fins to provide a continuous primary to secondary compression bond over the entire finned length for maximum heat transfer rates. Bare copper tubes shall not be visible between fins.
3. Coil tubes shall be 5/8 in. outside seamless copper, 0.020 in. nominal tube wall thickness, expanded into fins on 1-1/2 in. centers, brazed at joints. Soldered U-bends shall be provided to minimize the effects of erosion and premature failure having a minimum tube wall thickness of 0.025 in.
4. Sweat type copper suction connections located at the bottom of the suction headers for gravity oil drainage. Coils shall be uniformly circuited in a counterflow manner for either single circuit, row, face, interlaced, or interlaced face split capacity reduction as shown on unit schedule. Pressure type liquid distributors used. Coils shall be tested with 315 lbs. air pressure under warm water, and suitable for 250 PSIG working pressure.
5. Coil casing shall be a formed channel frame of galvanized steel.

D. Certification: Acceptable water heating and refrigerant coils shall be certified in accordance with AHRI 410 and bear the AHRI label. Coils exceeding the scope of the Manufacturer's certification or the range of AHRI's standard rating conditions will be considered provided the Manufacturer is a current member of the AHRI Forced Circulation Air-Cooling and Air-Heating Coils certification programs and that the coils have been rated in accordance with AHRI 410. Manufacturer shall be ISO 9002-certified.

29.4 DOAS AIR FILTRATION SECTION

A. Furnish combination filter section with 2 in. flat pre-filter (MERV 8) and 12 in. (Varicel V) cartridge 80% efficient (MERV 13) final filter. Provide side loading and removal of filters.

B. Filter Magnehelic gauge(s) shall be provided by others.

PART 30 - EXECUTION

30.1 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, protect, and handle products to site.

B. Accept products on site on factory-furnished shipping skids. Inspect for damage.

C. Store in clean dry place and protect from construction traffic. Handle carefully to avoid damage to components, enclosures, and finish.

30.2 INSTALLATION

A. Install unit on concrete pad.

B. Make heating water, DX refrigerant, and condensation drain piping connections.

C. Connect to inlet and discharge with 4 in. flexible duct connections.

D. Install trapped condensate drain line from drain pan to floor drain, or as indicated on the Drawings.

E. Unit Manufacturer shall provide selection of sheaves to the HVAC Contractor for proper balancing.

F. Install a new set of filters in unit at Contract Completion. Furnish another set of filters for unit to the Owner at Contract Completion. Refer to Section 23 05 60.

G. Drive belts shall be properly tensioned using a Browning belt tensioner, and aligned by workmen qualified in this Work. Tension at start-up and re-tension after (1) week of operation.

30.3 EQUIPMENT ACCESS

A. Locate all units to provide sufficient access to change filters, pull coils, or service other items requiring periodic maintenance.

30.4 WIRING

A. Electrical Contractor shall provide power wiring.

B. Electrical Contractor shall provide a single separate power feed to unit.

C. Temperature Controls Subcontractor shall provide all DDC wiring and freezestat wiring.

D. HVAC Contractor shall furnish variable-frequency drive (VFD).

E. Electrical Contractor shall install and wire VFD.

END OF SECTION 23 74 33

SECTION 23 81 26 — SPLIT-SYSTEM AIR-CONDITIONERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Section 23 05 00.78, “Closeout Submittals for HVAC.”

B. Section 23 05 29, “Hangers and Supports for HVAC Piping and Equipment.”

1.2 DESCRIPTION

A. Provide split-system air conditioning unit, including indoor “ductless” blower/coil unit, outdoor condensing unit, and controls.

1.3 QUALITY ASSURANCE

A. Standards:
   1. Air-Conditioning, Heating, and Refrigeration Institute (AHRI) 210, 240, 270, and 360.
      a. AHRI 210/240 Rating Conditions for Cooling: 80 degrees F. dry bulb, 67 degrees F. wet bulb air entering indoor coil, 95 degrees F. dry bulb air entering outdoor coil.
      b. AHRI 270 Rating Conditions: Standard Noise Rating at 95 degrees F. outdoor air.
   2. American Society of Heating, Refrigerating, and Air Conditioning Engineers (ASHRAE):
      a. ASHRAE 62.1-2010.
      b. ASHRAE 90.1-2010.
   3. Underwriters Laboratories, Inc. (UL).

1.4 RATINGS AND CAPACITIES

A. Size, capacity, arrangements, and location as indicated on the Drawings.

1.5 WARRANTY

A. 5-year limited warranty on compressor and coil. 1-year warranty on other parts.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Daikin or approved equal by Trane or Mitsubishi.

2.2 INDOOR UNIT

A. Compact cabinet design air conditioner units with blower section and coil section factory-connected for horizontal applications with adjustable discharge air louvers, front return, and blower section and coil section service access on the same side. High-density, impact-resistant plastic casing completely insulated with fire-retardant, permanent, odorless glass fiber material. Provide knockouts for unit electrical power.

B. Coil Section:
   1. Self-contained module, 3/8 in. internally enhanced copper tube, aluminum plate fin coil in a slant configuration, single refrigeration circuit, arranged for draw-through airflow, factory pressure-tested and leak-tested at 375 PSIG.

2. Condensate pump provides up to 21 in. of lift. Pump and plastic condensate drain pan with external connections located low and under the refrigeration connections on front side of unit.

C. Blower Section: Forward curved, centrifugal-type fan with multi-speed direct-drive motor with thermal overload protection. Magnetic evaporator fan contactor, low-voltage terminal strip, time delay relay, and low-voltage transformer. Factory-installed and factory-wired controls.

D. Evaporator-Fan Components:

1. Wall-mounting or ceiling mounted
   a. Cabinet: Enameled steel with removable panels on front and ends in color selected by the A/E. Discharge drain pans with drain connection shall comply with ASHRAE 62.1-2010.
   b. Filters: Disposable, with ASHRAE 52.2 minimum efficiency reporting value (MERV) rating of 6 or higher.

E. Filter: 1 in. replaceable woven glass fiber filter with 1 in. permanent frame.

F. Thermostats: Hard wired wall mounted.

2.3 OUTDOOR UNIT

A. Full coil protection provided by steel cabinet with rust-resistant, corrosion-resistant, silver gray color powder paint finish. Combined top cover/motor mount/grille, horizontal air discharge. Electrical and refrigerant controls separately housed and isolated from air stream. Fast-draining base pan assembly.

B. Compressor: High-efficiency, hermetically sealed, internal overload protection, pressure-relief valve, suction accumulator, mounted on rubber isolators.

C. Air Compressor-Condenser Components: Hermetically sealed with crankcase heater and mounted on vibration isolation. Compressor motor shall have thermal-sensitive and current-sensitive overload devices, start capacitor, relay, and contactor.
1. Refrigerant: R-410A.
2. Refrigerant: R-407C or R-410A.
3. Minimum Energy Efficiency: Comply with ASHRAE/IESNA 90.1-2010.

D. Refrigerant Circuit: Factory-assembled and pre-charged, including brazed refrigerant piping connections, multi-use service valves, capillary tube, and liquid line filter-drier.

E. 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. Minimum insulation thickness: 1 in. thick.

F. Coil: Copper tubing/aluminum fin, brazed refrigerant connections, coil guard.

G. Fan: Propeller type, shaft-mounted to single-speed, ball bearing, thermally protected, totally enclosed motor, fan guard.

H. Controls: Compressor contactor, condenser fan contactor, solid-state electronic demand defrost, compressor-off cycle heat (trickle heat), anti-short-cycle timer, outdoor temperature sensor in conjunction with fan sub-base. Provide low ambient operation down to 0 degrees F.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Mount outdoor unit on roof curbs at location shown on the Drawings.

B. Install pre-charged refrigerant piping and refrigerant between indoor and outdoor units.

C. Install insulated condensate drain from each indoor drain pan as shown on the Drawings.

D. Install a set of filters in each unit for use during construction. Install a new set of filters in each unit at Contract Completion. Furnish a third set of filters for each unit to the Owner at Contract Completion. Refer to Section 23 05 00.78.

E. Initially set up each air conditioning unit and adjust it for operation at 72 degrees F.

F. Owner's personnel shall be able to initiate and adjust each air conditioning unit's start/stop functions, temperature settings, and fan speed controls by using the hand-held remote-control unit.

G. All air conditioning and remote-control units shall be programmed to accept (1) common signal.

3.2 WIRING

A. Electrical Contractor shall provide fused weatherproof disconnect switch, fuses, low-voltage control wiring, and power wiring.

END OF SECTION 23 81 26

SECTION 23 81 29 — VARIABLE REFRIGERANT FLOW HVAC SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Division 01, “General Requirements.”

1.2 DESCRIPTION

A. Provide a variable-capacity, heat-recovery air-conditioning system, including indoor and outdoor units, and controls.

B. Each system by a specific Manufacturer is an engineered system, unique to the Manufacturer’s equipment, pipe sizing, and installation procedures. The basis of design is Daikin AC. A system provided by another Acceptable Manufacturer shall require complete submittal data and drawings specific to that Manufacturer’s system and equipment.

1.3 QUALITY ASSURANCE

A. Standards:
1. National Fire Protection Association (NFPA): 2014 NFPA 70, “National Electrical Code® (NEC).
2. International Standard Organization (ISO).
3. Electrical Laboratories (ETL).

1.4 RATINGS AND CAPACITY

A. Size, capacity, arrangements, and location as indicated on the Drawings.

B. Operating Range:
1. The operating range in cooling will be 23 deg. F. dry bulb to approximately 110 deg. F. dry bulb.
2. The operating range in heating will be 0 deg. F. dry bulb to 64 deg. F. dry bulb, and -4 deg. F. wet bulb to 60 deg. F. wet bulb.
3. Simultaneous cooling/heating operating range will be 22 deg. F. wet bulb to approximately 60 deg. F. wet bulb.

1.5 WARRANTY

A. The system shall the following warranties from date of installation:
1. 10-year Manufacturer’s warranty for units.
2. 1-year limited labor warranty for units.
3. 10-year warranty for compressors.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Daikin AC, Mitsubishi Electric, or Trane.

2.2 VARIABLE CAPACITY AIR CONDITIONING SYSTEM

A. The variable capacity air conditioning system shall be a Variable Refrigerant Volume Series (heat and cool model) split system as specified. The system shall consist of multiple evaporators, joints and headers, a 3-pipe refrigeration distribution system using PID control, and outdoor unit.

B. The system will be produced in an ISO 9001 and ISO 14001 facility. The system shall be factory-tested for safety and function.

C. The units shall be ETL-listed and bear the ETL label.

D. The outdoor unit is a direct expansion (DX), air-cooled heat recovery, multi-zone air-conditioning system with variable speed driven compressors using R-410A refrigerant. The outdoor unit may connect an indoor evaporator capacity up to 200% of the outdoor condensing unit capacity. All zones are each capable of operating separately with individual temperature control.

E. The outdoor unit shall be interconnected to the indoor unit and shall range in capacity from 7,500 Btu/h to 48,000 Btu/h in accordance with the Manufacturer detailing each available indoor unit.

F. The indoor units shall be connected to the outdoor utilizing specified piping joints and headers.

G. Operation of the system shall permit either individual cooling or heating of each fan coil simultaneously or all of the fan coil units associated with one branch cool/heat selector box. Each fan coil or group of fan coils shall be able to provide set temperature independently via a local remote controller, an Intelligent Controller, an Intelligent Manager, or a BMS interface.

2.3 REFRIGERANT PIPING

A. The system shall be capable of refrigerant piping up to 540 actual feet or 620 equivalent feet from the outdoor unit to the furthest indoor unit, a total combined liquid line length of 3,280 ft. of piping between the condensing and fan coil units with 295 ft. maximum vertical difference, without any oil traps.

2.4 OUTDOOR UNIT

A. The outdoor unit will be factory charged with R-410A.

B. The outdoor unit shall perform as indicated below. Performance conditions:
   1. Cooling: Indoor temperature of 80 deg. F. dry bulb, 67 deg. F. wet bulb, and outdoor temperature of 95 deg. F. dry bulb.
   2. Heating: Indoor temperature of 70 deg. F. dry bulb and outdoor temperature of 47 deg. F. dry bulb, 43 deg. F. wet bulb.
   3. Equivalent piping length: 25 ft.

C. The outdoor unit shall be factory-assembled and pre-wired with all necessary electronic and refrigerant controls. The refrigeration circuit of the condensing unit shall consist of scroll compressors, motors, fans, condenser coil, electronic expansion valves, solenoid valves, 4-way valve, distribution headers, capillaries, filters, shut-off valves, oil separators, service ports and refrigerant regulator. High/low pressure gas line, liquid and suction lines shall be individually insulated between the outdoor and indoor units.

D. The connection ratio of indoor units to outdoor unit shall be permitted up to 200%.

E. Each outdoor system shall be able to support the connection of up to (41) indoor units dependant on the model of the outdoor unit.

F. The system will automatically restart operation after a power failure and will not cause any settings to be lost, thus eliminating the need for reprogramming.

G. The unit shall incorporate an auto-charging feature and a refrigerant charge check function.

H. The outdoor unit shall be modular in design and should allow for side-by-side installation with minimum spacing.

I. The following safety devices shall be included on the condensing unit:
   1. High-pressure switch.
   2. Control circuit fuses.
   3. Crankcase heaters.
   4. Fusible plug.
   5. High-pressure switch.
   6. Overload relay.
   7. Inverter overload protector.
   8. Thermal protectors for compressor and fan motors.
   9. Over-current protection for the inverter.
   10. Anti-recycling timers.

J. To ensure the liquid refrigerant does not flash when supplying to the various fan coil units, the circuit shall be provided with a sub-cooling feature.

K. Oil recovery cycle shall be automatic, occurring (2) hours after start of operation, and then every (8) hours of operation.

L. The outdoor unit shall be capable of heating operation at 0 deg. F. dry bulb ambient temperature without additional low ambient controls.

M. The system shall continue to provide heat to the indoor units in heating operation while in the defrost mode.

N. Unit Cabinet: The outdoor unit shall be completely weatherproof and corrosion-resistant. The unit shall be constructed from rust-proofed mild steel panels coated with a baked enamel finish.

O. Fan:
   1. The condensing unit shall consist of one or more propeller type, direct-drive, 350 watt and 750 watt fan motors that have multiple speed operation via a digitally commutating (DC) inverter.
   2. The condensing unit fan motor shall have multiple speed operation of the DC inverter type, shall be of high external static pressure, and shall be factory-set as standard at 0.12 in. WG. A field setting switch to a maximum 0.32 in. WG pressure is available to accommodate field-applied duct for indoor mounting of condensing units.
   3. The fan shall be a vertical discharge configuration with a nominal airflow maximum range of 6,700 CFM to 14,120 CFM, dependent on the model specified.
   4. The fan motor shall have inherent protection and permanently lubricated bearings, and shall be mounted.
   5. The fan motor shall be provided with a fan guard to prevent contact with moving parts.

P. Condenser Coil:
   1. The condenser coil shall be manufactured from copper tubes expanded into aluminum fins to form a mechanical bond.
   2. The heat exchanger coil shall be of a waffle louver fin and rifled bore tube design to ensure high efficiency performance.
   3. The fins are to be covered with an anti-corrosion acrylic resin and hydrophilic film type E1.
   4. The pipe plates shall be treated with powdered polyester resin for corrosion prevention.

Q. Compressor:
1. The inverter scroll compressors shall be variable speed controlled, which is capable of changing the speed to follow the variations in total cooling and heating load as determined by the suction gas pressure as measured in the condensing unit. In addition, samplings of evaporator and condenser temperatures shall be made so that the high/low pressures detected are read every 20 seconds and calculated. With each reading, the compressor capacity (INV frequency or STD ON/OFF) shall be controlled to eliminate deviation from target value.
2. The inverter-driven compressor in each condensing unit shall be of highly efficient reluctance DC, hermetically sealed scroll "G-type" with a maximum speed of 6,480 RPM.
3. Neodymium magnets shall be adopted in the rotor construction to yield a higher torque and efficiency in the compressor instead of the normal ferrite magnet type. At complete stop of the compressor, the neodymium magnets will position the rotor into the optimum position for a low torque start.
4. The capacity control range shall be as low as 6% to 100%.
5. Each non-inverter compressor shall also be of the hermetically sealed scroll type.
6. Each compressor shall be equipped with a crankcase heater, high-pressure safety switch, and internal thermal overload protector.
7. Oil separators shall be standard with the equipment together with an intelligent oil management system.
8. The compressor shall be spring-mounted to avoid the transmission of vibration.
9. Units sized 8 tons to 12 tons shall contain a minimum of (2) compressors.
10. Units sized 14 tons to 16 tons shall contain a minimum of (3) compressors.
11. Units sized 18 tons to 20 tons shall contain a minimum of (4) compressors.
12. In the event of compressor failure, the remaining compressors shall continue to operate and provide heating or cooling as required at a proportionally reduced capacity. The microprocessor and associated controls shall be designed to specifically address this condition.

R. Electrical:
1. The control voltage between the indoor and outdoor unit shall be 16VDC non-shielded, stranded 2-conductor cable.
2. The control wiring shall be a 2-wire multiplex transmission system, making it possible to connect multiple indoor units to (1) outdoor unit with (1) 2-cable wire, thus simplifying the wiring operation.

2.5 INDOOR UNIT

A. The indoor unit model shall be operable with R-410A refrigerant, equipped with an electronic expansion valve. It shall be available from 12,000 Btu/h to 36,000 Btu/h. Computerized PID control shall be used to maintain room temperature within 1 deg. F.

B. The indoor unit shall be completely factory-assembled and factory-tested. Included in the unit is factory wiring, piping, electronic proportional expansion valve, control circuit board, fan motor thermal protector, flare connections, condensate drain pan, condensate drain pump, self-diagnostics, auto-restart function, 3-minute fused time delay, and test run switch.

C. Indoor unit and refrigerant pipes will be charged with dehydrated air prior to shipment from the factory.

D. Both refrigerant lines shall be insulated from the outdoor unit.

E. The indoor units shall be equipped with a condensate pan and condensate pump. The condensate pump provides up to 21 in. of lift.

F. The indoor units shall be equipped with a return air thermistor.

G. Unit Cabinet:
1. The cabinet shall be space-saving.
2. The cabinet shall be constructed with sound-absorbing foamed polystyrene and polyethylene insulation.
3. Optional high-efficiency air filters are available for each model unit.

H. Fan:
1. The fan shall be direct-drive turbo fan type with statically and dynamically balanced impeller with high and low fan speeds available.
2. The air flow rate shall be available in high and low settings.
3. The fan motor shall be thermally protected.

I. Filter: The return air shall be filtered by means of a washable long-life filter with mildew-proof resin.

J. Coil:
1. Coils shall be of the direct expansion type constructed from copper tubes expanded into aluminum fins to form a mechanical bond.
2. The coil shall be a 2-row cross-fin copper evaporator coil with 17 FPI design completely factory-tested.
3. The refrigerant connections shall be flare connections
4. The condensate will be 1-1/4 in. outside diameter PVC.
5. A condensate pan shall be located under the coil.
6. A condensate pump with a 21 in. lift shall be located below the coil in the condensate pan with a built-in safety alarm.
7. A thermistor will be located on the liquid and gas line.

K. Electrical:
1. Transmission (control) wiring between the indoor and outdoor unit shall be a maximum of 3,280 ft. (total 6,560 ft.).
2. Transmission (control) wiring between the indoor and remote controller shall be a maximum distance of 1,640 ft.

L. Control:
1. The unit shall have controls provided by the Manufacturer necessary to operate the system.
2. The unit shall be compatible with interfacing with connection to LonWorks networks or interfacing with connection to BMS system.

M. Accessories:
1. High-efficiency air filter, MERV 8 efficiency.
2. Remote “in-room” sensor kit.

2.6 CONTROLS

A. System shall be equipped with integrated direct digital controls system that communicates amongst all units. System shall be capable of self-troubleshooting and self-commissioning. Provide BacNet interface panel to talk to BAS.

PART 3 - EXECUTION

3.1 DELIVERY, STORAGE AND HANDLING

A. Unit shall be stored and handled according to the Manufacturer's recommendations.

3.2 INSTALLATION

A. Mount outdoor unit on roof curb as shown on the Drawings. Refer to Section 23 05 29.

B. Install trapped and insulated condensate drain from each indoor drain pan to floor drain.

C. Install refrigerant piping and refrigerant between indoor and outdoor unit.

D. Install a set of filters in each unit for use during construction. Install a new set of filters in each unit at Contract Completion. Furnish a third set of filters for each unit to the Owner at Contract Completion. Refer to Division 01.

E. Drive belts shall be properly tensioned using a Browning belt tensioner, and aligned by workmen qualified in this Work. Tension at start-up and re-tension after (1) week of operation.

3.3 EQUIPMENT ACCESS

A. Locate all units to provide sufficient access to change filters, pull coils, or service other items requiring periodic maintenance.

3.4 WIRING

A. All wiring shall comply with 2014 NEC.

B. Provide disconnect switches and power wiring for the heat pump unit(s).

C. Control Wiring: Temperature Controls Subcontractor shall provide all wiring. Wiring shall be concealed with piping. Wiring shall not run exposed under any circumstance.

END OF SECTION 23 81 29

SECTION 23 83 23

RADIANT-HEATING ELECTRIC PANELS

PART 1 - GENERAL

1.1 PREFACE

A. **ALTHOUGH SPECIFIED IN DIVISION 23, THIS WORK IS TO BE A PART OF THE ELECTRICAL WORK.**

B. **Terminology:** In this Section, the term "Contractor" shall mean the Contractor performing Electrical Work on this Project, unless otherwise noted.

C. All provisions and requirements of Division 26, "Electrical," apply to this Section.

1.2 RELATED DOCUMENTS

A. Section 23 05 00.78, "Closeout Submittals for HVAC."

1.3 DESCRIPTION

A. Provide electric radiant ceiling panels.

B. Provide wall thermostats.

1.4 RATINGS, CAPACITIES, CHARACTERISTICS, MOTORS, AND PERFORMANCE REQUIREMENTS

A. Size, capacity, arrangements, and locations as shown on the Drawings.

1.5 QUALITY ASSURANCE

A. Standards:
1. American Society for Testing and Materials (ASTM) E84 Flame Test Procedure.
2. Underwriters Laboratories, Inc., (UL) Label.

1.6 WARRANTY

A. Provide extended 10-year warranty.

1.7 SPARE PARTS

A. Furnish (5) spare silk-screened panels. Turn over to the Owner in original boxes at time of final acceptance. Refer to Section 23 05 00.78.

PART 2 - PRODUCTS

2.1 ELECTRIC RADIANT CEILING PANELS

A. Acceptable Manufacturers: Aztec or approved equal by QMark, Markel, Berko, or Indeeco.

B. Aztec Model ATH. 2 ft. x 4 ft., UL-listed, 750 watt, 120 volt, single-phase. Crystalline surface, baked-on galvanized steel, dielectric insulation, auto-reset thermal temperature, powdered graphite-based heating element, 1 in. thick high-temperature fiberglass insulation backing, 24 gauge galvanized steel back. UL-listed, tamper-resistant line-voltage electric thermostat(s).

C. Provide lay-in panels with hanging clips.

D. Panels shall have a Flame Spread Rating of not more than 15 with 0 Smoke Developed, and shall meet 0-15 optimum range requirements of ASTM E84 Flame Test Procedure.

E. Panels shall be silk-screened that matches ceiling tile. Coordinate finish with the Owner.

F. Manufacturer shall provide finish for radiant panels that matches each acoustical ceiling tile sample provided by the A/E. Within 90 days after receipt of approved acoustical samples, the Manufacturer shall submit (1) sample that matches each type of ceiling panel to the A/E for approval. All panels, with or without heating elements, shall be finished in accordance with the requirements in this Section.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Coordinate location with luminaires, diffusers, sprinklers, speakers, smoke detectors, and other ceiling-mounted devices and equipment.

B. Installation of ceiling radiant panels shall be in strict accordance with the Manufacturer's recommendations and as shown on the Drawings.

C. Do **NOT** support panels from lay-in ceilings. Provide independent support system.

D. Install wall thermostats.

3.2 WIRING

A. Electrical Contractor shall provide power wiring.

B. Wire to wall thermostat.

END OF SECTION 23 83 23

SECTION 23 05 00.31

PROJECT COORDINATION FOR HVAC

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A.

B. Division 26, “Electrical.”

C. Section 26 05 00.31, “Project Coordination for Electrical.”

1.2 DESCRIPTION

A. Provide HVAC work associated with equipment being provided by other Trades.

B. Electrical Contractor shall provide all line-voltage wiring, and all control, interlock, and power wiring and conduit, regardless of voltage, required to power, control, monitor, or interlock HVAC equipment, unless noted otherwise.
   1. **Exception:** Temperature Controls Contractor shall provide direct digital control (DDC) wiring.

C. Coordinate all wiring requirements for HVAC Work with the Electrical Contractor.

D. Electrical Contractor shall provide power wiring, rough-in, and final connection, for each piece of HVAC equipment requiring power or other wiring.

E. Alternative Manufacturer Electrical Requirements: Contractor furnishing the equipment shall compensate the Electrical Contractor for the cost of any additional labor and materials required to wire and hook up equipment other than the Design Base Model and Manufacturer.

F. All electrical equipment shall be UL-listed and furnished in accordance with Division 26 requirements.

1.3 QUALITY ASSURANCE

A. Standards:
   1. National Electrical Manufacturers Association (NEMA).
   2. National Fire Protection Association (NFPA): 2023 NFPA 70, “National Electrical Code® (NEC).”
   3. Underwriters Laboratories, Inc. (UL).

PART 2 - PRODUCTS

2.1 DISCONNECT SWITCHES

A. Factory-Installed Disconnect Switches: NEMA Type 3R, heavy-duty, disconnect switch within the housing of the equipment, for exterior equipment such as roof exhaust fans, or other NEMA Type for wet and dusty environments.

2.2 MOTOR STARTERS

A. Factory-Installed Starters: NEMA Size 0 minimum, manual or magnetic with selector switch or pushbutton as noted, pilot lights where noted, overloads, auxiliary contacts, fuses,

and control power transformer, unless unit being controlled includes integral 24 volt control system.

PART 3 - EXECUTION

3.1 PREPARATION

A. Consult Drawings that may affect location of equipment, conduit, or wiring, and make minor adjustments in locations to secure coordination.

3.2 INSTALLATION

A. Installation shall comply with NEC and shall be inspected and approved by the AHJ.

B. Motor Starters:
   1. Provide factory-installed starters only where specifically listed in Division 23 Specification Sections.
   2. Electrical Contractor shall provide all other starters.
   3. On all starters provided by the HVAC Contractor, if motor starter heater element's designated amperage is more than 110% of the full load current after balancing, the HVAC Contractor shall provide new starter heater elements.

C. Supervise all final connections to HVAC and temperature control equipment and devices.

D. Assist in the check-out and start-up operations for HVAC equipment.

E. HVAC Contractor is responsible for the final operation of all equipment furnished under its Work.

F. Electrical Contractor shall complete the applicable sections of start-up checklists for all HVAC equipment.

G. Provide the Electrical Contractor with a full detailed set of all required wiring diagrams for equipment furnished under the HVAC Work.

END OF SECTION 23 05 00.31

SECTION 23 05 00.33

SHOP DRAWING SUBMITTALS FOR HVAC

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Division 01, "General Requirements."

B. Section 23 05 00, "Common Work Results for HVAC."

1.2 DESCRIPTION

A. Submittal dates:
   1. Within (14) calendar days after the Award of Contract, submit complete materials list of all items proposed to be provided on this Project.
   2. Submit shop drawings within (28) days after the Award of Contract.

B. Materials and equipment installed under the HVAC Work shall meet all the requirements of the Contract Documents. Do not order or install materials or equipment until submittals are reviewed by the A/E.

C. Submit shop drawings for the installation of the HVAC Work for review by the A/E before any HVAC Work is installed, enlarged, or extended. Under **NO** circumstances shall any HVAC Work be performed prior to receiving shop drawings reviewed by the A/E.

D. The A/E's review is **ONLY** for conformance with the design concept of the Project and with the Contract Documents.

E. Catalog data for equipment reviewed by the A/E shall not take precedence over the requirements of the Contract Documents. Review by the A/E shall not relieve the Contractor from the responsibility for deviations from Drawings or Specifications, nor from the responsibility for providing proper clearance and coordination with other Contractors.

F. Color Selections: The A/E shall approve all color selections for HVAC equipment, including nonmetal ductwork, fan parts, power ventilator parts, cyclone separators, grilles, registers, diffusers, louvers, vents, cabinets, unit heaters, paints, and finishes.

1.3 SHOP DRAWINGS

A. Submit shop drawings for each manufactured item of equipment and all components to be used in the Work. Refer to the Shop Drawing Log attached to this Section and to the Sections listed in Section 23 05 00, Article 1.03, for items.

B. Submit shop drawings electronically in Portable Document Format (PDF). Submit number of copies indicated in Division 01. Contractor shall be responsible for making all copies for distribution and file.

C. Include the following information:
   1. Complete original PDF or first-generation scanned PDF copies of the Manufacturer's catalog sheets, brochures, diagrams, schedules, performance charts, illustrations, and other standard descriptive product data.
   2. Brand name.
   3. Catalog number.
   4. Specific performance data.
   5. Material description.

6. Characteristics.
7. Ratings.
8. Capacities.
9. Working pressure.
10. Dimensional data.
11. Material gauge or thickness.
12. Wiring diagrams and control diagrams.
13. Arrangement of component parts, physical dimensions, clearances, materials, service requirements, colors (where required), controls, and accessories.

D. Clearly mark or highlight each shop drawing copy to identify pertinent materials, products, models, and colors (where appropriate).

E. Coordinate each submittal with requirements of the Work and the Contract Documents.

F. When (2) or more items of the same material or equipment are required, they shall be of the same Manufacturer.

G. Completely review shop drawings, product data, and samples prior to submission.

H. When submitted for review, all shop drawings shall bear the Contractor's stamped and signed certification of the following:
1. Contractor has reviewed, checked, and approved the shop drawings.
2. Contractor has coordinated shop drawings with the requirements of the Project and with the provisions of the Contract Documents.
3. Contractor has ensured that the equipment shown on the shop drawings meets all the requirements of the Contract Documents.
4. Contractor has determined and verified all of the following:
   a. Materials.
   b. Field measurements.
   c. Field construction criteria.
   d. Catalog numbers and similar data.
   e. Conformance with Specifications.
   f. Hands of equipment.
   g. Quantities and sizes.

I. **UNSIGNED COPIES WILL NOT BE REVIEWED.**

J. Notify the A/E, in writing, at the time of submission, of any deviations in the submittals from the requirements of the Contract Documents.

K. Provide the following certifications information:
1. Test Agency results verifying capacities, operating conditions, and power requirements at design conditions.
2. Manufacturer's statement of compliance with Standards discussed in individual Specification Sections.
3. Equipment labels indicating Certification requirements.
4. Quality standard designations on each unit piece, e.g., each pipe length, pressure vessel, or valve.
5. Typed verification that noted mixes, chemical compositions, and testing procedures were complied with.
6. Other Certifications listed in other Sections of the Specifications.

L. Contractor shall make submittals promptly in accordance with the approved schedule, and in such sequence as to cause no delay either in its Work or in the work of any other Contractor.

M. If a submittal is rejected, immediately make any corrections or changes required by the A/E. Resubmit until accepted.

N. If the Contractor orders equipment or materials, or begins installation, fabrication, or work prior to the return of approved submittals, it shall be “at the Contractor’s own risk.”

O. Incorporate Shop Drawings into the Operating and Maintenance Manuals.

1.4 REQUIRED SUBMITTAL INFORMATION

A. The form attached to this section contains a list of required submittals. This list may not be a complete list of all required submittals. Submit for approval all items to be provided, whether listed or not.

END OF SECTION 23 05 00.33

Roger D. Fields Associates, Inc.
580 N. 4th Street, Suite 240
Columbus, Ohio 43215-2156
614-451-2248

SHOP DRAWING LOG FOR HVAC

Project Name: _____

Project Number: _____

SUBMITTAL KEY

A	Catalog Cuts/Shop Drawings	G	Completed start-up test forms
B	Installation instructions	H	Coordination Drawings / Studies
C	Color samples	I	Calculations
D	Product samples	J	Schedule
E	Typed statement of material to be furnished	K	Sample of finish
F	Typed verification of compliance with certification requirements		

STATUS KEY

APP	Approved (conforms)
CAN	Corrections Are Noted (conforms as noted)
ICN	Incorporate Corrections Noted
R&R	Revise & Resubmit
R	Rejected

HVAC Submittals Required	Specification Section	Submittal Key	Contractor	Original Submittal			Re-submittal			Remarks / Reviewed by
				Date A/E Received	Date A/E Returned	Status Key	Date A/E Received	Date A/E Returned	Status Key	
Division 23										
Access Panels	23 05 00.73	A								
Hangers, Equipment	23 05 29	E								
Hangers, Piping	23 05 29	E								
Vibration Isolation Rails	23 05 48	A								
Vibration Isolators	23 05 48	E								
Duct-Coding Materials	23 05 53	D								
Equipment-Labeling Materials	23 05 53	D								
Pipe-Coding Materials	23 05 53	D								
Valve-Tagging Chart	23 05 53	D								
Valve-Tagging Materials	23 05 53	D								
Air Balancing Report	23 05 93	A								
Testing, Adjusting, and Balancing (TAB) Contractor	23 05 93	E								
Insulation Contractor	23 07 00	E								
Insulation, Ductwork	23 07 00	E								
Insulation, Equipment	23 07 00	E								
Insulation, Pipe and Fittings	23 07 00	E								
Building Automation Drawings	23 09 23	A								
Building Automation System Contractor	23 09 23	E								
Controls and Instrumentation	23 09 23	A								
Temperature Controls Contractor	23 09 23	E								
Controls and Instrumentation	23 09 33	A								

HVAC Submittals Required	Specification Section	Submittal Key	Contractor	Original Submittal			Re-submittal			Remarks / Reviewed by
				Date A/E Received	Date A/E Returned	Status Key	Date A/E Received	Date A/E Returned	Status Key	
Pipe and Fittings, Refrigerant	23 23 00	E								
Valves, Refrigerant	23 23 00	A								
Hangers, Ductwork	23 31 00	E								
Roof Curbs	23 31 00	A								
Sheet Metal Contractor	23 31 13	E								
Sheet Metal Drawings	23 31 13	A, H								
Dampers	23 33 13	A								
Fire and Smoke Dampers	23 33 13	A								
Duct Access Doors	23 33 33	A								
Duct Connections, Flexible	23 33 43	A								
Ductwork, Flexible	23 33 46	A								
Grilles, Registers, and Diffusers	23 37 00	A, C								
Dedicated Outdoor Air System (DOAS) Units	23 74 33	A								
Split-System Air-Conditioner Units	23 81 26	A								
Copy of Start-Up Services Agreement for Variable Refrigerant Flow HVAC Systems	23 81 29	F								
Variable Refrigerant Flow HVAC Systems	23 81 29	A								
Unit Heaters, Wall, Electric	23 82 39	A, C								
Radiant Heating Electric Panels, Ceiling	23 83 23	A								

SECTION 23 05 00.35

SPECIAL PROCEDURES FOR HVAC

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Division 02, “Existing Conditions.”

B. Section 23 05 93, “Testing, Adjusting, and Balancing for HVAC.”

1.2 QUALITY ASSURANCE

A. Standard: Occupational Safety and Health Administration (OSHA), including 29 CFR 1910.147.

1.3 SAFETY

A. Contractor shall be solely responsible for safety precautions and programs in connection with the Work. The Owner or A/E will not be responsible for the Contractor’s failure to employ proper safety procedures.

B. Maintain the Project in accordance with Federal, State, and Local Safety and Insurance Standards. All procedures shall comply with the latest OSHA regulations.

C. Contractor shall provide head, eye, and ear protection for each of its employees in accordance with OSHA regulations.

D. Exercise precaution for the protection of persons and property.
1. Provide guard rails, barricades, enclosures, canopies, passageways, lanterns, warning lights, and other protective safety devices required by the AHJ, and required to protect persons and property against accidentally dropped materials or other construction hazards.
2. Provide guard lights at all barricades, railings, obstructions in the streets or sidewalks, trenches, or pits.

E. Provide protection as may be required to prevent glass breakage. Replace broken glass at no cost to the Owner.

F. **DO NOT USE POWDER-ACTUATED ANCHORS OR FASTENERS.**

1.4 ENVIRONMENTAL PROCEDURES

A. Hazards Control:

B. Asbestos Abatement:
1. During the course of Work, if any suspected asbestos is encountered, cease working in the area, and immediately notify the Owner and A/E. Do not remove or disturb any material suspected of, or identified as, containing asbestos.
2. Do not drill, cut, sand, penetrate with nails, screws, or other fasteners, or otherwise disturb asbestos or asbestos-containing material, insulation, structure, or ceiling or floor covering.
3. Immediately notify the Owner of the presence, or suspected presence, of asbestos or asbestos-containing materials. The Owner shall remove or encapsulate such materials **PRIOR** to any work under this Contract.

4. Refer to Division 02 for additional requirements.

END OF SECTION 23 05 00.35

SECTION 23 05 00.40

QUALITY REQUIREMENTS FOR HVAC

PART 1 - GENERAL

1.1 DESCRIPTION

A. Provide Work of the highest quality, complete in every respect and conforming to the accepted practices and standards of the Trades involved.

B. Further definition of quality is given by reference to various Laws, Codes, Standards, and Regulations.

1.2 REGULATORY REQUIREMENTS

A. All work on this Project shall conform to the currently enforced Edition of all applicable National, Federal, State, and Local Laws, Rules, Regulations, Standards, and Building Codes, and any local ordinances and requirements pertaining to this work, unless otherwise noted.

B. Any Law, Regulation, Standard, or Code referred to in other Sections of Division 23 is included in its entirety as a part of these Specifications.

C. Give notice and comply with all Laws, Rules, Regulations, Ordinances, and lawful orders of the AHJ bearing on the performance of the HVAC Work.
   1. If the Contractor observes that any of the Contract Documents are at variance therewith in any respect, it shall promptly notify the A/E in writing, and any necessary changes will be arranged by the A/E.
   2. If the Contractor performs any Work knowing it to be contrary to such Laws, Rules, Regulations, and Ordinances and fails to give prior notice to the A/E, the Contractor shall assume full responsibility for, and shall bear all costs associated with, correcting the Work.

D. Only a Contractor and craftsmen licensed by the AHJ shall provide this HVAC Work.

E. Methods and materials shall be certified where noted in the individual Specification Sections.

F. All equipment and appliances installed on this Project shall bear the label of an Approved Testing Agency and shall be installed in accordance with the Manufacturer’s instructions for the labeled equipment and appliances.

G. All structural steel used on this Project shall be manufactured in the United States, in accordance with Ohio Revised Code 153.011, unless specifically approved otherwise by the Owner.

1.3 APPLICABLE PERMITS, FEES, BONDS, LICENSES, AND CERTIFICATIONS

A. The A/E will submit all Contract Drawings and Specifications and the plan approval application to the AHJ, pay the application fees, and obtain plan approval.

B. Contractor shall secure and pay for any **ADDITIONAL** permits, governmental fees, bonds, and licenses required for the proper execution and completion of the HVAC Work.

C. Contractor shall pay for all other fees and other charges related to HVAC Work and payable to Utility Companies or Code Enforcement Agencies.

1.4 REFERENCES

A. Titles, Abbreviations, and Symbols: Titles and abbreviations may be used in these Specifications. Abbreviations may be shown on the HVAC Drawings. Refer to the list of abbreviations attached to this Section. Refer also to the symbols lists shown on the Drawings, and to the American Society of Heating, Refrigerating, and Air Conditioning Engineers 2017 ASHRAE Handbook — Fundamentals, Chapter 38, for further abbreviations. All titles and abbreviations may not necessarily apply to this Work.

B. Definitions:
   1. Provide: To furnish, install, and connect to make completely ready for regular operation.
   2. Furnish: To supply or deliver to site complete with all required accessories and installation instructions.
   3. Install: To mount, erect, hang, or fasten in place, and connect to make ready for regular operation.
   4. Concealed: Either embedded in masonry or other construction, or installed below floor slab, behind wall furring, within chases or soffits, within walls, within double partitions, above ceilings, in trenches, in tunnels, or within crawl spaces.
   5. Exposed: In full or partial view; not “Concealed” as defined above.
   6. Accessible Ceiling: Lay-in ceiling with removable ceiling tiles.
   7. Piping: Pipe, fitting, flanges, valves, controls, specialties, hangers, bracing, insulation, and other items required or necessary.
   8. Ductwork: Ducts, fittings, dampers, vanes, controls, hangers, bracing, insulation, and other items required or necessary.
   9. Refer to additional Definitions in Division 01 and in the AHJ’s Building and Mechanical Codes.

TITLES, ABBREVIATIONS, AND SYMBOLS

#	Number
&	And
∠	Angle
@	At
Ø	Diameter
Ø	Round OR Phase
A.	Compressed air
A.D.	Access door OR Area drain
A.F.D.	Acid floor drain
A.F.F.	Above finished floor
A.P.	Access panel
A.W.C.O.	Acid wall cleanout
A/E	Architect/Engineer
AABC	Associated Air Balance Council
AB.	Above
ACI	American Concrete Institute
ACPA	American Concrete Pipe Association
ADA-AG	Americans with Disabilities Act — Accessibility Guidelines
ADC	Air Diffusion Council
AFCI	Arc-fault circuit interrupter
AH	Air handler
AHJ	Authority Having Jurisdiction
AHRI	Air-Conditioning, Heating, and Refrigeration Institute
ALT.	Alternate
ALUM.	Aluminum
AMCA	Air Movement and Control Association
amp	ampere
ANSI	American National Standards Institute
APPROX.	Approximately
ARCH.	Architect
ARR'T.	Arrangement
ASA	Acoustical Society of America
ASHRAE	American Society of Heating, Refrigerating, and Air Conditioning Engineers
ASME	American Society of Mechanical Engineers
ASPE	American Society of Plumbing Engineers
ASSE	American Society of Sanitary Engineering
ASTM	American Society for Testing & Materials
AUTO.	Automatic
AV	Acid vent
AW	Acid waste
AWG	American wire gauge
AWS	American Welding Society
AWWA	American Water Works Association
B.D.D.	Backdraft damper
B.T.	Bathtub
B.V.	Backwater valve
BAL.	Balancing
BFP	Backflow preventer
BHP	Brake horsepower
BICSI	Building Industry Consulting Services International
BLDG.	Building
BSBD.RAD.	Baseboard radiation
BSMT.	Basement
BTM.	Bottom
BTU	British thermal unit
c.	Conduit
C.B.	Catch basin
C.I.	Cast iron
C.O.	Clean out
C/C	Center to center
C/L	Center line
CAB.	Cabinet
CAP.	Capacity
CEIL./CLG.	Ceiling
CFC	Chlorofluorocarbon
CFH	Cubic feet per hour
CFM	Cubic feet per minute
CFR	Code of Federal Regulations
CGA	Compressed Gas Association
CHEM.	Chemical
CISPI	Cast Iron Soil Pipe Institute
CMA	Construction Manager Agent/Advisor
CMR	Construction Manager at Risk
COL.	Column
COMB.	Combination
CONC.	Concrete
COND.	Condensate OR Condenser
CONN.	Connection OR Connect
CONST.	Construction
CONTR.	Contractor
CONV.	Convector OR Converter
COORD.	Coordinate
CSA	CSA Group (formerly the Canadian Standards Association).
CSI	Construction Specifications Institute
CT	Current transformer
CU IN.	Cubic inch
CU. FT.	Cubic feet
CUH	Cabinet unit heater
Cx	Commissioning Agent
D.	Deep
D.F.	Drinking fountain
D.L.	Door louver
D.M.	Damper motor
D.S.	Downspout
D-B	Design-Build OR Design-Builder
DB	Dry bulb
DBL.	Double
DCW	Domestic cold water
DET.	Detail
DHW	Domestic hot water
DHWR	Domestic hot water return
DIA. / Ø	Diameter
DIFF.	Diffuser
DIM.	Dimension
DISCH.	Discharge
DN.	Down
DOE	United States Department of Energy
DPR.	Damper
DR.	Door
DW	Distilled water
DWG.	Drawing
DWH	Domestic water heater
DWV	Drain, waste and vent
E.A.T.	Entering air temperature
E.C.	Electrical Contractor
E.S.P.	External static pressure
E.T.	Expansion tank

E.W.T.	Entering water temperature
EA.	Each
EFF.	Efficiency
EIA	Electronic Industries Alliance
ELEC.	Electric OR Electrical
ELEM.	Element
ELEV.	Elevation
ENGR.	Engineer
ENT.	Entering
EPA	Environmental Protection Agency
EQUIP.	Equipment
ETL	Electrical Testing Laboratories
EW	Eye wash
EWC	Electric water cooler
EX.	Existing
EXH.	Exhaust
EXIST.	Existing
EXT.	Exterior
F & T	Float and thermostatic
F.	Fan OR Fire
F.D.	Fire damper
F.E.	Fire extinguisher
F.E.C.	Fire extinguisher cabinet OR Food Service Equipment Contractor
F.H.	Fire hydrant
F.H.C.	Fire hose cabinet
F.H.E.C.	Fire hose/extinguisher cabinet
F.V.	Flush valve
FCC	Federal Communications Commission
FD	Floor drain
FDA	Food and Drug Administration
FHA	Federal Housing Administration
FIG.	Figure
FIN.	Finish
FIN.RAD.	Finned radiation
FLEX.	Flexible
FLR. / FL.	Floor
FMG	Factory Mutual Global
FOR	Fuel oil return
FOS	Fuel oil supply
FPC / FSC	Fire Protection / Fire Suppression Contractor
FPM	Feet per minute
FT.	Feet
FT.HD.	Feet of head
FURN.	Furnish(ed)
G	Gas
G.C.	General Contracting OR General Contractor
G.I.	Grease interceptor
G.T.C.	General Trades Contractor
gal.	Gallon
GALV.	Galvanized
GEN.	General
GFI / GFCI	Ground-fault circuit interrupter
GPM	Gallons per minute
GR	Grille
GRAV.	Gravity
Grd.	Ground
H./HT.	Height
H.P.	High pressure
H.S.	Hair strainer
H'STAT	Humidistat
HAC	Heating and air conditioning
HB	Hose bibb
HCFC	Hydrochlorofluorocarbon
HHS	United States Department of Health and Human Services
HORIZ.	Horizontal
HP	Horsepower
HPC	High pressure steam condensate
HPS	High pressure steam
hr.	Hour
HTG.	Heating
HTR.	Heater
HUD	United States Department of Housing and Urban Development
HV	Heating and ventilating OR High velocity
HVAC	Heating, ventilating, and air conditioning
I.D.	Inside diameter
IAQ	Indoor air quality
IBC	International Building Code
ICC	International Code Council
ICEA	Insulated Cable Engineers Association, Inc.
IDF	Intermediate distribution frame
IEC	International Electrotechnical Commission
IEEE	Institute of Electrical and Electronics Engineers, Inc.
IESNA	Illuminating Engineering Society of North America
IN.	Inside OR Inches
IND.	Indirect
IND. U.	Induction unit
INSUL.	Insulation
INT.	Interior
INV.	Invert
INV. ELEV.	Invert elevation
IPS	Iron pipe size
ISO	International Organization for Standardization
J.R.	Janitor's receptor
JCAH	Joint Commission for Accreditation of Hospitals
kVA	Kilovolt-ampere
L.	Length
L.A.T.	Leaving air temperature
L.W.T.	Leaving water temperature
LAB	Laboratory
LAV	Lavatory
lb.	pound
LEED	Leadership in Energy and Environmental Design
LH	Left hand
LP	Liquefied petroleum
LPC	Low pressure steam condensate
LPS	Low pressure steam
LV'G.	Leaving
M.A.	Mixed air
M.O.	Motor operated
MAN. DPR.	Manual damper
MAT.	Material
MAX.	Maximum
MBH	1,000 British thermal units/hour
MECH.	Mechanical
MERV	Minimum efficiency reporting value
MET./MTL.	Metal
MEZZ.	Mezzanine
MFR.	Manufacturer
MH	Manhole
MIN.	Minimum
MISC.	Miscellaneous
MP	Multiple Prime
MPS	Medium pressure steam

MS	Motor starter
MSS	Manufacturers Standardization Society of the Valve and Fittings Industry Inc.
MTD./MT.	Mounted OR Mount
N.I.C.	Not in contract
N.T.S.	Not to scale
N2	Nitrogen
N2O	Nitrous oxide
NADCA	National Air Duct Cleaners Association
NAECA	National Appliance Energy Conservation Act
NB	National Board of Boiler and Pressure Vessel Inspectors
NCPI	National Clay Pipe Institute
NEBB	National Environmental Balancing Bureau
NEC	National Electrical Code
NECA	National Electrical Contractors Association
NEMA	National Electrical Manufacturers Association
NESHAPs	National Emissions Standards for Hazardous Air Pollutants
NFPA	National Fire Protection Association
NIOSH	National Institute for Occupational Safety and Health
NIST	National Institute of Standards and Technology
NO. OR #	Number
NOM.	Nominal
NP	Not permitted
NPT	National Pipe Thread Tapered
NSF	National Sanitation Foundation
NSPE	National Society of Professional Engineers
O.	Oxygen
O.A.	Outside air
O.D.	Outside diameter
O.I.	Oil interceptor
O.V.	Outlet velocity
O/C	On center
OAC	Ohio Administrative Code
ODH	Ohio Department of Health
ODOE	Ohio Department of Energy
ODOT	Ohio Department of Transportation
OPG.	Opening
OPP.	Opposite
ORC	Ohio Revised Code
OSHA	Occupational Safety and Health Administration
OU./OZ.	Ounce
P.D.	Pressure drop
P.I.V.	Post indicator valve
P/L	Property line
PDI	Plumbing & Drainage Institute
PEI	Petroleum Equipment Institute
PLBG.	Plumbing
PNEU.	Pneumatic
PRESS.	Pressure
PROP.	Propeller
PRV	Pressure-reducing valve
PSF	Pounds per square foot
PSI	Pound-force per square inch
PSIG	Pound-force per square inch gauge
PT	Plaster trap OR Potential transformer
PVC	Polyvinyl chloride
R	Register
R.A.	Return air
R.D.	Roof drain
R/W	Right of way
RAD.	Radius OR Radiation OR Radiator
RECIRC.	Recirculating
REG.	Register
REINF.	Reinforced
REL.	Relief
REQ'D.	Required
RH	Right hand
RHC	Reheat coil
RM.	Room
RPM	Revolutions per minute
RTA/C	Rooftop air-conditioning unit
RW	Raw water
RWC	Rainwater conductor
S	Sink
S & R	Supply and return
S. DPR.	Smoke damper
S.A.	Shock absorber OR Supply air
S.F.	Square feet
S.M., S/M	Sheet metal
S.P.	Static pressure
S.S.	Service sink OR Storm sewer
S.S., S/S	Stainless steel
SAN.	Sanitary sewer
SB	Shampoo bowl
SD	Shower drain OR Smoke detector
SECT.	Section
SHR.	Shower
SHT.	Sheet
SHT. MT'L.	Sheet metal
SMACNA	Sheet Metal and Air Conditioning Contractors National Association
SPD	Surge protection device
SPEC.	Specification
SQ.	Square
SQ. FT.	Square feet
SQ. IN.	Square inch
ST	Sound trap
STAT	Thermostat
STD.	Standard
STL.	Steel
STM.	Storm
SUCT./S	Suction
SW	Softened water
SW.	Switch
T.W.	Tempered water
T'STAT	Thermostat
TD	Temperature difference
TEMP.	Temperature
THERM.	Thermometer OR Thermostat
TIA	Telecommunications Industry Association
TYP.	Typical
UC	Undercut
UH	Unit heater
UL	Underwriters Laboratories, Inc.
UR	Urinal
USGBC	United States Green Building Council
UV	Unit ventilator
V.	Vent
V.T.R.	Vent through roof
VAC.	Vacuum
VC	Vacuum cleaning
VCP	Vitrified clay pipe
VERT.	Vertical
VIB. ISO.	Vibration isolator
VOC	Volatile organic compound

VSP	Vitrified sewer pipe
W.	Width OR Water
W.G.	Water gauge
W/	With
W/O	Without
W/W	Wall to wall
WAT.	Water
WB	Wet bulb
WC	Water closet OR Water column
WH	Wall hydrant OR Water heater
WO	Waste oil
WOG	Water/oil/gas
XFMR	Transformer
YD.	Yard
YH	Yard hydrant

END OF SECTION 23 05 00.40

SECTION 23 05 00.45

TESTING AND INSPECTING SERVICES FOR HVAC

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Section 23 05 93, “Testing, Adjusting, and Balancing for HVAC.”

1.2 INSPECTIONS, TESTS, AND APPROVALS

A. The Contract Documents, Laws, Ordinances, Rules, Regulations, or Orders of any AHJ may require the Work to be inspected, tested, or approved.

B. Contractor shall bear all costs of such inspections, tests, or approvals.

C. Contractor shall pay all professional engineering fees involved in required testing of equipment.

D. Contractor shall arrange and pay for all inspections required to obtain a Certificate of Occupancy. Contractor shall include this cost in its bid.

E. Arrange for inspection of the Work by the AHJ.

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION

3.1 TESTS AND INSPECTIONS

A. Notify the A/E of all scheduled tests and adjustments at least (48) hours before they are scheduled, so that the A/E may witness same. If the Contractor performs any test or adjustment without the A/E present, or without proper notification, the Contractor shall perform the test or adjustment a second time, in the presence of the A/E. Coordinate all test schedules with the Owner to minimize inconvenience.

B. Provide all required testing and obtain approvals. Secure required certificates of inspection, testing, or approval, and include them in the Operating and Maintenance Manual.

C. After Work has been completed, but before pipe covering has been applied, test each system in accordance with the requirements of other Sections of this Specification. At the test pressures, the circulation shall be free and the piping shall be proven free of leaks.

D. Concealed lines shall be tested and approved before being concealed. If a leak appears during the final test, repair the line and any damage resulting from the leak.

E. Coordinate the enclosure or concealment of the Work with the required inspections and tests in order to minimize the necessity of uncovering work for that purpose.

F. Should any of the Work be covered up or enclosed prior to completion of all required inspections, tests, and approvals, uncover the Work and, after it has been completely inspected, tested, and approved, make all repairs and replacements with such materials and workmanship as are necessary to secure the approval of the A/E, and at no additional cost to the Owner.

G. Furnish all test pumps, gauges, equipment, and personnel required, and test to demonstrate the integrity of the finished installation to the approval of the AHJ and the A/E.

H. Check each piece of equipment for defects and verify that all parts are properly furnished and installed, that all items function properly, and that all adjustments have been made.

I. Conduct such tests and adjustments of equipment to verify performance requirements or to meet the requirements of the A/E or AHJ. Submit data taken during such tests to the A/E.

J. Demonstrate to the Owner that all HVAC systems are operating properly.

K. Refer to Section 23 05 93 for additional requirements.

3.2 FACTORY INSTALLATION AND START-UP

A. For those items of equipment that are to be installed, tested, started up, and certified by a factory-trained Representative, furnish a letter from the Manufacturer to the A/E stating that this service shall be provided for this Project, describing the scope of services to be provided, and disclosing the name of the Representative assigned to provide the required services.

3.3 FINAL OPERATING TESTS AND PROCEDURES

A. Prior to Contract completion, conduct system operational tests for a period of at least (5) days, not necessarily consecutive, as scheduled by the Owner, to demonstrate fulfillment of the requirements of the Contract. During this time, adjust equipment so that it will perform as the Manufacturer intended, and so that systems will function as designed.

B. Operate each system in every mode of operation, and check the position of valves, dampers, switches, and other devices for proper closure, operation, and switching.

3.4 CERTIFICATE

A. Furnish approved Certificate of Final Inspection.

3.5 FOLLOW-UP INSPECTIONS

A. Make an inspection within (90) days after occupancy of the building to make minor adjustments as needed to ensure that all equipment is operating properly and that satisfactory conditions are being maintained throughout, and to satisfy any unusual conditions. Schedule with the A/E. Consult with the Owner.

B. A minimum of (1) month before the end of the guarantee period, contact the A/E and Owner to discuss system operation, and to plan for the future care and maintenance of the system.

C. (1) month before the end of the guarantee period, contact the Owner and perform an inspection to review any items needing correction.

D. Refer to Section 23 05 93 for additional requirements.

END OF SECTION 23 05 00.45

SECTION 23 05 00.50

TEMPORARY FACILITIES AND CONTROLS FOR HVAC

PART 1 - GENERAL

1.1 DESCRIPTION

A. Provide and maintain temporary facilities and controls required for construction as long as needed for the safe and proper completion of the Work, and remove upon completion of the Work.

1.2 QUALITY ASSURANCE

A. Standards: Comply with the provisions of the following Codes:
   1. United States Department of Labor, Occupational Safety and Health Administration, Part 1926, “Safety and Health Regulations for Construction.”
   2. Applicable Local Building Codes.

1.3 TEMPORARY CONSTRUCTION

A. Materials shall be adequate in capacity for the required usage, shall not create unsafe conditions, and shall not violate applicable Codes and Standards.

B. Contractor shall be solely responsible for the structural design of all temporary items that it uses in the construction of the building, or that become a permanent part of the building, including, but not limited to:
   1. Hoisting.
   2. Temporary bracing for structural steel.
   3. Shoring for concrete and masonry work.
   4. Shoring for cut earth banks.
   5. Suspended ceilings, equipment, walls, etc.

C. Provide hoists, staging, rigging, scaffolding, runways, and necessary appurtenances required for the performance of the Work.

D. Provide necessary tarps or other appropriate cover material to protect openings.

E. Provide effective means of dust control. Dust enclosures shall extend tight to the structure and extend around all pipes, ducts, and similar items. Enclosures shall confine dust and dirt to the area of construction and completely seal off and isolate the area of construction from adjacent Owner-occupied areas.

F. Completely remove temporary materials and equipment when their use is no longer required.

G. Clean and repair damage caused by temporary installation or use of temporary facilities.

H. Restore existing facilities used for temporary services to original condition.

END OF SECTION 23 05 00.50

SECTION 23 05 00.60

PRODUCT REQUIREMENTS FOR HVAC

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Division 00, “Procurement and Contracting Requirements.”

1.2 DESIGN BASE MANUFACTURER STANDARD

A. The Drawings and Specifications reflect a design based on the specific equipment requirements and configuration for a Design Base Manufacturer. Design coordination of equipment with the building and with other Trades has been made for this specific Model and Manufacturer of equipment. Where several Manufacturers are listed for an item of equipment or material, the first-named shall be considered the Design Base Manufacturer Standard.

1.3 OTHER ACCEPTABLE COMPONENTS (MANUFACTURERS)

A. Other Manufacturers listed in the Specifications shall be acceptable; however, whenever the Contractor elects to furnish specified equipment or material manufactured by other than the Design Base Manufacturer, the Contractor shall be responsible for the cost and coordination of all modifications required to accommodate the selected equipment or material, including any Work of other Trades that might be affected. Where changes to other Trades’ Work are required, the Contractor shall include the additional costs of all such Work in its bid.

B. Any specified Equipment Manufacturer furnished by the Contractor, other than the Design Base Manufacturer, shall be, in the opinion of the A/E, equivalent in quality, design, features, performance, arrangement, and appearance to that of the Design Base equipment or material, including any special features or requirements.

C. The inclusion of other Manufacturers in these Specifications shall not be construed to infer that each Manufacturer’s product has been reviewed by the A/E for this application, or that it will provide all the features or capabilities required, or that its physical dimensions can be accommodated in the available space. Verify that the proposed equipment will provide all features and accommodations provided by the Design Base Manufacturer, and that it will fit in the available space.

D. The A/E will not give consideration to any Manufacturer that the Contractor proposes as a Substitution, unless the A/E approves the Manufacturer during the bid period and specifically names the Manufacturer in the Contract Documents or Addenda thereto.

E. Where deemed necessary by the A/E, the Contractor shall, at no additional cost to the Owner, prepare layouts for these other brands of equipment that may have different dimensional or service requirements from the Design Base Manufacturer Standard. Submit these layouts to the A/E for review.

F. Contractor shall reimburse the Owner for the cost of any design changes incurred by the A/E in the preparation of revised Drawings or Specifications to accommodate the use of any Manufacturer other than the Design Base Manufacturer.

1.4 SUBSTITUTIONS

A. Refer to the Bid Documents for substitution requirements. If this Specification Section conflicts with the Bid Documents, comply with the Bid Documents.

B. Contractor shall submit information for review no later than (10) days prior to the bid opening to the A/E on any other proposed equipment or material that the Contractor desires to use.

C. Contractor shall be responsible for the same costs of coordination and modifications, etc., listed above in Article 1.03, "Other Acceptable Components (Manufacturers)."

D. If the A/E determines that the proposed Manufacturer is acceptable, the A/E will issue an Addendum adding that Manufacturer to the Specifications and/or the Drawings prior to the bid opening.

1.5 EQUIPMENT SUITABILITY

A. All equipment provided shall perform as intended. All items listed shall function properly, and as the Manufacturer intended. Install equipment according to the Manufacturer's recommendations. Properly attach equipment to the floor, wall, or structure. Each item of equipment shall be compatible with all other accessories or hook-ups, including piping, ductwork, flues, controls, wiring, and other equipment not furnished by the equipment Manufacturer, but required to achieve the intended function.

1.6 MISCELLANEOUS ACCESSORIES

A. Provide any additional adapters, fittings, trim, structural steel angles, channels, strut channels, brackets, or other appurtenances to securely install all items of equipment specified or shown on the Drawings.

B. All steel installed outside or exposed to moisture shall be hot-dipped galvanized.

C. These accessories are required even though they may not be shown or detailed on the Drawings.

D. Installation shall be compatible with the building construction on which the item is to be located.

E. Verify the type of construction prior to ordering the equipment item, so that all required accessories are included.

1.7 QUANTITIES

A. Equipment may be referred to in these Specifications, or on the Drawings, as either singular or plural; the Contractor shall verify the exact number of items required to complete its Work.

END OF SECTION 23 05 00.60

SECTION 23 05 00.71

EXAMINATION AND PREPARATION FOR HVAC

PART 1 - GENERAL

1.1 EXAMINATION OF SITE

A. Certain existing conditions may affect the manner or sequence of the performance of the Work.

B. Before submitting its Bid, it is recommended that the Contractor visit the site of the proposed Project.

C. After receipt of Bids, no adjustments to Bids will be permitted for lack of knowledge of Project conditions.

D. Verify and reconcile Work required by the Contract Documents with existing conditions at the Site.

E. Should the Contractor note any discrepancies during the Bidding Period, it shall notify the A/E immediately, in writing, to permit issuance of an Addendum to prevent misunderstandings at a later date.

F. Existing services, structures, and operating schedules may need to be reviewed, prior to bidding, to facilitate the installation of the Work without disrupting the normal operation of the facility.

1.2 PREPARATION

A. Provide a Superintendent, on site, whose duties include the directing and supervising of work. Inform the A/E of the Superintendent's name and phone number, and the method of contact when the Superintendent is not at the site.

B. As soon as possible after the Award of the Contract and the approval of shop drawings, the Contractor shall place orders for materials and equipment required for its Work. Immediately inform the A/E in writing as to any materials and equipment that cannot be obtained within the required time period, either due to conditions of the market or other governing factors.

C. Inspect each item of materials or equipment immediately prior to installation. Reject damaged and defective items.

D. Contractor shall determine erection procedures and sequence the construction to keep its work on schedule and to ensure the safety of the building and its occupants. This includes supplying any temporary bracing, guys, or tie-downs that might be required. Such materials shall remain the Contractor's property after completion of the Project.

E. Provide attachment and connection devices and methods for securing work. Secure all work true to line and level and within recognized industry tolerances. Allow for expansion and building movement.

F. Recheck measurements and dimensions of the Work as an integral step of starting each installation.

G. Where mounting heights are not indicated, individual units generally can be mounted at industry-recognized standard mounting heights for the particular application indicated. However, all mounting heights shall be approved by the A/E.

1.3 COORDINATION OF WORK

A. Contractor shall coordinate its Work carefully with all other Contractors.

B. Do not install work without first coordinating the layout, routing, etc., with other Contractors whose work may be affected.

C. Coordinate location of all work with other Contractors and equipment.

D. Consult all Contract Drawings that may affect the location of any equipment, apparatus, piping, and ductwork, and make any other adjustments in location to secure coordination.

E. Coordinate locations of all HVAC Work with hangers, sprinklers, piping, cable trays, occupancy/vacancy sensors, bus ducts, luminaires, speakers, smoke and heat detectors, conduits, and other equipment, and with ceilings, soffits, structural members, joists, purlins, metal decks, bracing, etc.

F. Notify the A/E immediately of any changes in location or other conflicts that may affect the work of other Contractors.

G. Contractor shall be responsible for the cost of additional engineering work required for changes to the work as shown or described, due to the relocation of items requested by the Contractor.

H. Review all equipment nameplate ratings and advise the A/E immediately of any system design changes required to wire the equipment properly.

END OF SECTION 23 05 00.71

SECTION 23 05 00.73

EXECUTION OF HVAC

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Division 00, “Procurement and Contracting Requirements.”

B. Division 01, “General Requirements.”

C. Division 09, “Finishes.”

D. Section 23 31 00, “HVAC Ducts and Casings.”

1.2 DESCRIPTION

A. Contractor shall be solely responsible for construction means, methods, techniques, sequences, and procedures in connection with the Work.

1.3 QUALITY ASSURANCE

A. Standard: National Fire Protection Association (NFPA). 2023 NFPA 262, “Standard Method of Test for Flame Travel and Smoke of Wires and Cables for Use in Air-Handling Spaces.”

1.4 CONTRACT DOCUMENTS

A. The Contract Drawings are schematic and show approximate locations, general arrangement, and general extent of Work. Not all items of work required for a complete and operating system are shown on the Drawings. Refer also to the Specifications for additional work that shall be provided. If a conflict occurs, the Contractor is responsible for the more restrictive requirement.

B. The Contract Drawings are not intended to show every vertical or horizontal offset that may be necessary to complete the systems. Having piping, fittings, and ductwork fabricated and delivered in advance of making actual measurements shall not be sufficient cause to avoid making offsets or other changes as may be necessary to install piping, ductwork, and equipment.

C. Verify exact locations in the field, and coordinate with all other Contractors.

D. The A/E shall approve, in writing, significant deviations from the Drawings.

E. The A/E reserves the right to make minor changes in location that do not require additional labor or material, up to the time of roughing-in, without additional cost. The A/E reserves the right to determine what is “significant” and what is “minor.”

F. If a conflict occurs between the Drawings and Specifications, or an overlap of work among the Trades become evident, immediately submit a written request for an interpretation or clarification from the A/E, who shall determine which interpretation has precedence. Refer to Division 00 General Conditions. In such event, none of the Contractors shall assume that it is relieved of the Work that is specified under its branch unless instructions are received, in writing, from the A/E.

1.5 UTILITIES AND OUTAGES

A. Locate and identify all existing utilities prior to construction.

B. Where necessary, make minor relocations to permit installation of the HVAC Work.

C. Advise the A/E immediately of major conflicts to permit modification of the Contract Documents prior to bidding.

D. Conform to all Utility Company requirements.

E. Closely coordinate any utility service shutdowns or outages, interruptions, or downtime with the A/E and Owner.

F. Provide temporary service during the curtailment, if required by the A/E.

G. Avoid inconveniencing the Owner.

H. Notify the Owner at least (10) full working days in advance of commencing work in the area of existing utilities.

I. Contractor shall alert occupants of nearby premises of any emergency conditions that arise as a result of its work in connection with existing utilities.

1.6 PROTECTION

A. Unless equipment and material can be protectively stored in a manner acceptable to the A/E, they shall not be delivered to the site until the Work is ready to receive them.

B. Protect all equipment and materials during construction from damage by weather, water, dirt, paint droppings, welding and cutting spatters, and other construction activities.

C. All materials or equipment stored outside shall be elevated and protectively covered in a secured and locked area.

D. Store materials and equipment sensitive to weather or construction conditions inside. Where necessary, store sensitive equipment in a heated area.

E. During construction, cover all motors, bearings, controls, equipment, and other items that are susceptible to damage until they can be installed in place.

F. Immediately repair or replace damaged equipment or materials to the satisfaction of the A/E and at no additional cost to the Owner.

G. Contractor shall protect the building and other Contractors' material and equipment from damage caused by its Work. Protect floors from cutting oil and chips.

H. Use all means necessary to protect materials before, during, and after installation.

I. Refer also to individual Specification Sections for specialized protection.

1.7 HVAC LUBRICATION AND PACKING

A. Contractor shall lubricate all the equipment that it furnishes with the correct grade, type, and quantity of lubrication before placing equipment and valves in service.

B. Refer to the Equipment Manufacturer's recommended lubricants. Furnish equal lubricants as supplied by Castrol, Mobil, Shell, or the Owner's present supplier.

C. Follow the Equipment Manufacturer's recommendations for specific lubricants and application schedule.

D. Check each shaft or valve stem containing a packing gland for condition and examine for proper packing.

E. When filling systems initially for hydrostatic pressure tests, adjust valve packing glands to finger-tight and allow packing to absorb water for (5) minutes prior to tightening packing nuts.

F. Maintain lubrication and packing seals during construction and ensure that, at the time of final acceptance, all are operating properly.

G. Contractor shall repair any damage caused by improper lubrication of the equipment that it furnished, at no expense to the Owner.

H. Incorporate lubrication instructions in the Operating and Maintenance Manual.

1.8 EQUIPMENT ACCESS

A. Locate all equipment to provide sufficient access to operate equipment, change filters, pull coils, or service other items requiring periodic maintenance.

B. Coordinate with the structure and with all other Contractors' work.

C. Maintain Code-required setbacks from the edge of the roof, minimum 10 ft., for equipment.

1.9 HVAC ROUGH-IN AND FINAL CONNECTIONS

A. Provide service rough-ins.

B. Provide piping, valves, ductwork, and specialties as specified under other Sections of these Specifications.

C. Refer to approved equipment drawings for exact rough-in sizes and locations.

D. Coordinate rough-in locations with other Contractors and the Owner.

E. Coordinate rough-in with all items of equipment.

1.10 ACCESS PANELS

A. Lead Contractor shall be responsible, unless otherwise noted, for all access panels in ceilings, walls, and floors shown on the Drawings, or where otherwise required, to permit convenient access to concealed HVAC equipment, boxes, connections, dampers, controls, or other devices requiring service, adjustment, or maintenance. Refer to the Architectural Drawings for location.

B. Acceptable Manufacturers: Inryco-Milcor, Babcock-Davis, Bilco, Boico, Cesco, Inland-Ryerson, JL, Milco, Karp, Larsen's Manufacturing Co., Mifab, Mitco, or Zurn.
   1. Manufacturer and Model Number listed below shall be considered to be the Design Base Manufacturer and Model Number. Other Acceptable Manufacturers will be permitted, unless specifically excluded.

C. Access Panels:
   1. Panels shall be a minimum size of 18 in. x 18 in. unless larger panels are shown or required. 8 in. x 8 in. size is acceptable for access to damper adjustments only. Panels shall be steel construction (except where aluminum or stainless steel is specified) with overlapping edges and concealed hinge door with screwdriver lock. Mounting frames shall be compatible with the building construction material in which they are installed. Each access panel in fire-rated shaft walls and in fire-rated ceilings shall be B Label.
   2. Ceiling access panels:
      a. Gypsum: Inryco-Milcor Style DW. Prime-painted for finish painting with ceiling.

b. Plaster:
1) Inryco-Milcor Style AP. With finish material same as ceiling material.
2) Inryco-Milcor Style K. Prime-painted for finish painting with ceiling.
c. Acoustical concealed spline: Inryco-Milcor Style AT.
d. Fire-rated: Inryco-Milcor Style ATR.

3. Wall access panels:
a. Gypsum: Inryco-Milcor Style DW. Prime-painted for finish painting with wall.
b. Plaster: Inryco-Milcor Style K. Prime-painted for finish painting with wall.
c. Masonry and tile:
1) Inryco-Milcor Style M Standard. Prime-painted for finish painting with wall.
2) Inryco-Milcor Style M. Stainless steel.
d. Fire-rated: Inryco-Milcor. Fire-rated access door, prime-painted for finish painting with wall.

4. Floor access panels:
a. Finished: Babcock-Davis Type FT. Edging shall accommodate type floor covering required. Refer to Room Finish Schedule.
b. Interior, bare concrete floor: Babcock-Davis Type FC. Checkered plate cover.
c. Exterior, concrete slab: Babcock-Davis Type GT. Gutter and 1-1/2 in. drainage coupling, checkered plate cover.

D. Coordination:
1. Coordinate closely with other Contractors to ensure that all panels furnished by the various Contractors shall be identical.
2. Coordinate the location and installation of each access panel with equipment, the Lead Contractor, and other Contractors.
3. Advise other Contractors of specific requirements relating to access panel installation, including sizes of openings to receive access panel and frame, as well as locations of supports, inserts, and anchoring devices.

E. Determine specific locations and sizes for access panels needed, but not indicated on the Drawings, to gain access to concealed equipment.

F. Plan panel locations to clear ceiling luminaires, grids, and obstructions, and to allow, wherever possible, full shoulder clearance beside the device to be inspected, adjusted, or repaired.

1.11 BLOCK COURSE COORDINATION

A. Mounting heights are called out on the Drawings for many items. Adjust equipment mounting heights to accommodate brick or block coursing.

B. Coordinate installation of all items in a masonry wall with the Lead Contractor and A/E.

1.12 CUTTING AND PATCHING

A. All cutting and patching shall be accomplished in a neat and workmanlike manner, acceptable to the A/E.

B. Cutting:
1. Contractor shall perform all cutting required for installing its own Work unless otherwise noted.
2. Cutting shall be done with such tools and methods so as to prevent unnecessary damage to surrounding areas and equipment.

3. Use rotary drills to cut holes through concrete, brick, plaster, or tile.
4. No cutting shall be done that will, in any way, reduce the structural strength of the building. Cutting of structural support beams, joists, plates, or other structural members is strictly prohibited without the specific written consent of the A/E and the Structural Engineer. Should such cutting be necessary, consult the A/E and do not proceed further without written approval of the A/E.

C. Patching:
1. Lead Contractor shall be responsible for patching except as otherwise noted.
2. Only a qualified Finish Tradesperson, skilled in the respective craft required, shall perform patching.
3. Patching shall match adjacent surface construction.
4. Materials and equipment used in the patching work shall comply with requirements of other Sections of this Specification.

D. Perform all cutting and patching promptly. Make all repairs to leave the entire Work in good condition, including all cutting, fitting, and drilling of masonry, concrete, metal, wood, plaster, or other materials, as specified for proper assembly, fabrication, installation, and completion of the Work.

E. Coordinate drilling, welding, etc., and method of attachment to columns, joists, beams, purlins, etc., with the Lead Contractor and A/E before proceeding.

F. If a Contractor finds it necessary to cut into the Work of another Contractor, the cutting and patching shall be performed by such other Contractor at this Contractor's expense. With the written consent of the A/E, the Contractor shall be allowed to perform the cutting. Patching shall be similarly executed.

G. Roofing:
1. Lead Contractor shall be responsible for all cutting of roofing, modification of roofing, roof opening framing, or roofing repair work for HVAC items.
2. Lead Contractor shall provide insulated cap and flashing for HVAC items, including, but not limited to, air intakes, reliefs, exhaust fans, flue vent piping, refrigerant piping, etc.
3. A qualified Roofing Contractor shall perform all work in a manner such that any existing roof warranties are not voided.
4. Pipe boots: Refer to Section 23 21 16.
5. Roof curbs: Refer to Section 23 31 00.

H. Lead Contractor shall cut and frame all roof and exterior wall openings in new and existing construction required for HVAC items, including, but not limited to, refrigerant piping, ducts, exhaust fans, louvers, air intakes, reliefs, flue vent piping, rooftop units, etc.

I. Lead Contractor, or other Tradesperson approved by the A/E, shall replace floors, ceilings, roofs, etc., damaged during construction. The cost of repairs shall be borne by the Contractor causing damage.

J. Lead Contractor shall provide openings, with lintels if needed, for sleeves, piping, ducts, louvers, grilles, panels, and other similar openings in new and existing interior masonry walls and floors. Locate and dimension the opening for the Lead Contractor prior to construction. Refer to HVAC Drawings.

K. Remove and replace masonry, wall tile, drywall, ceilings, and ceiling tiles in order to install HVAC Work.

L. Contractor shall be responsible for all cutting of the floor slab related to its own Work.

M. Contractor shall be responsible for construction that is disturbed during the installation of piping, ductwork, or equipment.

N. Cutting and patching includes remodeling and repairing of previously graveled or paved areas, walks, curbs, sod, floors, etc. Saw cuts shall be done in neat, straight lines.

O. Contractor shall repair or replace any roads, sidewalks, or other items that its employees may damage during the performance of the HVAC Work.

P. Cutting and Patching of Existing Work:
1. Remodeling, modifying, patching, and repair of the existing building shall be done so as to match the existing conditions. Complete all work necessary to achieve this requirement. Quality of workmanship, materials, and finish shall complement appearance of existing construction.
2. Where limits of demolition are exposed in the existing finished work, cutting shall be made with saws, providing an absolutely straight line, plumb, true, and square.
3. Use saws to cut existing plaster or gypsum wall board. Equip power saws with blades designed to cut plaster or gypsum wall board and with dust collection systems. Operate equipment so as to cause a minimum of damage to plaster or gypsum wall board that is to remain, and so as to keep creation of dust and dirt to a minimum.
4. Fill existing holes where piping or ductwork is removed.
5. Lead Contractor shall provide lintels and other openings in existing interior walls.

Q. Refer to Division 01 for additional requirements.

1.13 PAINTING AND RELATED WORK

A. **ALL PAINTING SHALL BE DONE BY A QUALIFIED TRADESPERSON SKILLED IN THE CRAFT.**

B. Lead Contractor shall be responsible for finish painting of walls, ceilings, and other Architectural items in the areas of construction.

C. Previously Finished Areas: Contractor shall repaint any previously finished areas disturbed by its own cutting and patching. Painting of the patched area shall match the color of the adjacent construction in the general area of the patch. Repaint the entire wall-to-wall and floor-to-ceiling surface if, in the opinion of the A/E, a uniform appearance cannot be accomplished by touch-up.

D. Factory-Finished Equipment: Clean, spot-prime with zinc chromate, and finish, equal to the original quality, any new factory-finished equipment that has rusted, has been damaged, or has deteriorated. Repaint the entire surface if, in the opinion of the A/E, a uniform appearance cannot be accomplished by touch-up.

E. Support Steel / Ferrous Metal: Clean, remove rust from, and paint with zinc-chromate primer any HVAC support steel and bare ferrous metal that is not factory-painted, shop-painted, or galvanized, and that remains exposed to view in the finished areas of the building, including mechanical/electrical rooms and storage rooms. Ensure that the prime coat shall be compatible with the finish coat.

F. Steel Hangers, etc.: Clean, remove rust from, and paint with zinc-chromate primer and aluminum-bronze paint all steel hangers, boxes, straps, and rods furnished under HVAC Work, that are not provided with rust-protective finish or are damaged in installation, and that remain exposed to view or are in unfinished and mechanical spaces.

G. Exterior Ferrous Metal: Paint with a prime coat any ferrous metal installed outside the building that is not factory-painted, shop-painted, or galvanized.

H. Paint exposed piping, valves, etc.

I. Etch the surfaces of new roof-mounted exhaust fans and roof ventilators to prepare for priming and painting by the Lead Contractor.

J. Clean all new insulation coverings. If pre-sized insulation is not used, insulation coverings shall be sized if finish painting is required.

K. Refer to Division 09 for additional requirements.

END OF SECTION 23 05 00.73

SECTION 23 05 00.74

CLEANING AND WASTE MANAGEMENT FOR HVAC

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Division 01, “General Requirements.”

1.2 CLEANING AND WASTE MANAGEMENT

A. Contractor shall do its own cleanup, shall move materials that are in the way of constructing its work, shall repair and replace any damage it does, and shall do any other work of a similar nature which shall be done.

1.3 PROGRESS CLEANING

A. Maintain all work areas in a neat and orderly manner, free of debris. Clean up all occupied travel areas at the end of each shift. Clean up material removed immediately after use.

B. Clean up building and site thoroughly every day.

C. Equipment cleaning and touch-up:
1. Use only cleaning materials recommended by the Manufacturer of the surface to be cleaned.
2. Clean interiors of all enclosures of dirt and debris before installing trim or covers.
3. Brush-clean, prime, and paint-in-kind rust spots on any part.
4. Clean galvanized piping and ductwork in exposed areas with diluted acetic acid.
5. Clean copper piping in exposed areas with fine emery cloth and solvent.
6. Clean all gauges, thermometers, traps, dirt legs, strainers, and fittings.

1.4 CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

A. On-site rubbish collection containers shall be furnished and weekly rubbish removal service shall be provided or all rubbish and debris from the site shall be removed daily. Refer to Division 01.

B. Do **NOT** use the Owner’s dumpster for on-site rubbish and debris.

C. Disposal of material by removal:
1. Prior to the completion of the work, remove from the construction area all material designated to be removed.
2. All material to be removed shall become the property of the Contractor.
3. Conduct cleaning and disposal operations in compliance with local ordinances and anti-pollution laws. Make all necessary arrangements with private parties and with local officials pertinent to locations and regulations for dumping. Contractor shall pay fees or charges required for dumping of materials.
4. Contractor shall be responsible for locating a legal dump site and for all expenses due to length of haul.
5. Do not burn or bury rubbish and waste materials on Project site. Do not dispose of waste into streams or waterways.

D. Prior to completion of the work, remove from the vicinity of the work all temporary structures, unused materials, concrete forms, and other like materials. All work areas shall

be graded and left in a neat manner conforming to the natural appearance of the landscape or as directed elsewhere in the Contract Documents.

1.5 FINAL CLEANING

A. Repair, patch, and touch up all scratched or damaged surfaces to specified finish that matches adjacent surfaces, before final acceptance of the work. Repair dents and marred finishes to the satisfaction of the A/E. Prepare for finish painting, where painting is specified.

B. Thoroughly clean all material; finished surfaces of equipment; painted, enameled, or varnished work; and all other exposed finished surfaces. Remove all labels, stickers, marks, stains, fingerprints, spots, rust, oil, grease, dirt, dust, and other foreign materials, so that the Work is presented in a complete and finished condition, ready for acceptance and intended use.

C. Verify that all drains are free of debris.

D. Employ experienced workers or professional cleaners for final cleaning.

E. Expedite the cleaning, washing, waxing, and polishing required within other Sections of these Specifications.

F. Refer to Division 01 for additional requirements.

END OF SECTION 23 05 00.74

SECTION 23 05 00.77

CLOSEOUT PROCEDURES FOR HVAC

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Division 01, “General Requirements.”

B. Section 23 05 00.33, “Shop Drawings Submittals for HVAC.”

C. Section 23 05 00.45, “Testing and Inspecting Services for HVAC.”

D. Section 23 05 00.73, “Execution of HVAC.”

E. Section 23 05 00.74, “Cleaning and Waste Management for HVAC.”

F. Section 23 05 00.78, “Closeout Submittals for HVAC.”

G. Section 23 05 00.79, “Demonstration and Training for HVAC.”

H. Section 23 05 53, “Identification for HVAC Piping and Equipment.”

I. Section 23 05 93, “Testing, Adjusting, and Balancing for HVAC.”

J. Section 23 08 00, “Commissioning of HVAC.”

1.2 DESCRIPTION

A. Complete and submit the following items, which is a partial list of the items required prior to Contract Completion:

ITEM	**REFER TO SECTION**
Shop drawing submittals	23 05 00.33
Operational inspection, testing, adjusting, and balancing of all equipment and systems	23 05 00.45, 23 05 93, as well as other Sections
Protection	23 05 00.73, as well as other Sections
Painting	23 05 00.73
Cleaning	23 05 00.74
Operating and Maintenance Manuals	23 05 00.78
All required certifications and labels	23 05 00.78, as well as other Sections
Guarantees and equipment warranties	23 05 00.78, as well as other Sections
Spare parts	23 05 00.78, as well as other Sections
As-Built Documents	23 05 00.78
Instruction of the Owner’s personnel	23 05 00.79, as well as other Sections
Equipment, piping, and ductwork identification; valve tagging	23 05 53

B. Provide or perform all of the above items before Contract Completion.

1.3 PUNCH LIST PROCEDURE

A. Refer to Division 01.

END OF SECTION 23 05 00.77

SECTION 23 05 00.78

CLOSEOUT SUBMITTALS FOR HVAC

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Division 00, "Procurement and Contracting Requirements."

B. Division 01, "General Requirements."

C. Section 23 05 00.77, "Closeout Procedures for HVAC."

D. Section 23 05 00.79, "Demonstration and Training for HVAC."

1.2 OPERATING AND MAINTENANCE MANUALS

A. An Operating and Maintenance Manual, approved by the A/E, is required for Contract Completion. Compile and submit a draft of the Operating and Maintenance Manual to the A/E (90) days before Contract Completion.

B. Submit the final corrected Operating and Maintenance Manual (7) days before Contract Completion.

C. Upon approval, provide:
1. (1) Operating and Maintenance Manual in the physical format described below.
2. A Portable Document Format (PDF) file containing a copy of the Operating and Maintenance Manual saved on a Universal Serial Bus (USB) flash drive.

C. The following items, together with any other pertinent data, shall be included in each Operating and Maintenance Manual. This list is not necessarily complete and shall be used only as a guide. Format of manual is to be as follows:
1. Operating and Maintenance Manual binders shall be heavy-duty, loose-leaf, 3-ring, vinyl-covered binders, no larger than 11 in. wide x 12 in. high, with pocket inside the covers to receive folded oversized sheets.
2. Identify each binder on front and spine with the printed title "OPERATION AND MAINTENANCE MANUAL," project name, and subject matter of contents.
3. Material shall be typewritten or printed and shall be fully legible.
4. Inside cover:
   a. Title of Project.
   b. Date of Project completion.
   c. Name and address of the Owner.
   d. Name and address of the Prime Contractor.
   e. Date of submittal.
   f. Name and address of the Contractor.
   g. Name and address of the Architect.
   h. Name and address of the Engineer.
5. Second Page: Index.
6. Each section shall be divided by labeled tabs.
7. First Section: A copy of each shop drawing and approved submittal with an index at the beginning of the section.
8. Second Section:
   a. A list of all equipment used on the job.

b. Complete list of all devices installed and cross-referenced to room number or location.
c. Parts list with numbers of replaceable items, including sources of supply.
d. Model and serial numbers of components of systems installed.
e. Suppliers and Manufacturers List:
1) Typed statement of material to be furnished.
2) Manufacturers' and nearest Factory Representatives' names, addresses, telephone numbers, and e-mail addresses.
3) Routine and 24-hour emergency service/repair information:
a) Name, address, telephone number, and e-mail address of servicing agency.
b) Names of personnel to be contacted for service arrangements.

9. Third Section:
a. Description of systems.
b. Manufacturer's literature describing each piece of equipment, including the following:
1) Operating and maintenance instructions.
2) Lubrication instructions.
3) Start-up and shutdown procedures.
4) Routine and emergency servicing instructions.
c. Valve charts.
d. Special wrenches, keys, etc.
e. Temperature control diagrams.
f. Prints of all system wiring and control diagrams.
g. List of belt sizes, types, and lengths.
h. List of filter sizes and types.
i. Copies of all testing, adjusting, and balancing reports.
j. All certifications and related information.
k. Copies of all written warranties.
l. The Owner's receipt of spare parts.
m. The Owner's statement of completion of instruction. Refer to Section 23 05 00.79.

D. Refer to Division 01 for additional requirements.

1.3 GUARANTEES AND WARRANTIES

A. Guarantee: Contractor shall guarantee its equipment, workmanship, and materials for a period of (1) year from the date of Contract Completion. Should defects develop within this period, the Contractor shall, at no cost to the Owner, remedy the defects and reimburse the Owner for all damage to other Work caused either by the defects or as a result of the work of correcting the same.

B. Extended Warranties: The table below contains a list of items with warranty requirements and their specification sections. These extended warranties are over and above the 1-year guarantee specified above. This list may not be a complete list of all required warranties. Include copies of all written warranties in the Operating and Maintenance Manual, whether listed or not.

ITEM WITH WARRANTY REQUIREMENTS	**SPECIFICATION SECTION**
Division 11 items	
Division 23 items	

ITEM WITH WARRANTY REQUIREMENTS	SPECIFICATION SECTION
Direct-Digital Controls	23 09 23
Diffusers, Variable-Air-Volume	23 37 00
Compressors, Coils	23 81 26
Electric Radiant Ceiling Panels	23 83 23

C. Post-Warranty Service:
   1. The products and Manufacturers identified throughout these Specifications represent reputable suppliers that generally have an inventory of spare parts, and a network of authorized service providers that can support the products installed on this Project.
   2. Contractor shall, for a reasonable charge, assist the Owner for a period of (7) years in obtaining parts and service on the products installed.
   3. Once the Contractor's 1-year guarantee has expired, the Owner will pay the cost of these parts and service.
   4. If the item cannot be repaired, the Contractor shall recommend an equivalent replacement item at a reasonable cost to the Owner.

1.4 PROJECT AS-BUILT DOCUMENTS

A. Contractor shall maintain, at the job site, (1) copy of the As-Built Documents, including the following items related to its Trade:
   1. Contract Drawings.
   2. Specifications.
   3. Addenda.
   4. Reviewed Shop Drawings.
   5. Change Orders.
   6. Other modifications to Contract.
   7. Field Test Records and Start-Up Reports.
   8. Minutes of Coordination and Progress Meetings.
   9. (1) set of the Contract Drawings that will be used for As-Built Drawings. This set shall be used exclusively for documenting and recording the exact location of all installed Work.
   10. **Option:** With the approval of the A/E and Owner, As-Built Documents may be made available in an electronic format via an Internet-accessible server.

B. Do not use As-Built Documents for construction purposes.

C. Store As-Built Documents apart from documents used for construction at the Contractor's temporary field office, or in another location readily available to the A/E.

D. Provide files and racks for storage of As-Built Documents, as appropriate, with As-Built Documents identified.

E. Maintain As-Built Documents in clean, dry, legible condition.

F. Use red ballpoint pen for all marking of As-Built Documents.

G. As-Built Documents shall be available at all times for inspection by the A/E and Owner.

H. As-Built Drawings:
   1. As-Built Drawings shall be legibly marked to record actual "as-built" construction with the following information (some of these items may not be applicable):
      a. Horizontal and vertical location of above-ground and underground utilities and appurtenances referenced to permanent surface improvements.
      b. Location of internal utilities and appurtenances concealed in construction referenced to visible and accessible features of structure.
      c. Field changes of dimension and detail.
      d. Changes made by Change Order.
      e. Details not on the original Contract Drawings.
   2. Do not permanently conceal any work until the required information has been recorded.
   3. Record the location of all concealed utilities on the As-Built Drawings.
   4. Record deviations in locations of concealed piping, valves, ductwork, equipment, and all buried or concealed utility lines and services, etc., dimensioned from a fixed control point, including the following:
      a. Depth of bury.
      b. At each change of direction.
      c. At each change of slope.
      d. Additional dimensions in order to fully define location.
   5. Minor piping or ductwork variations need not be recorded.
   6. Record locations of abandoned piping or ductwork, including exterior lines.
   7. Record deviations made necessary to incorporate equipment different from the Design Base equipment.
   8. Record all Addendum Items.
   9. Mark locations of access panels on the As-Built Drawings.
   10. Add valve tag numbers to the As-Built Drawings.

I. Include a complete list of all devices installed and cross-referenced to room number or location.

J. At completion of project, the Contractor shall deliver (1) printed copy of its As-Built Documents to the A/E.

K. Contractor shall accompany its As-Built Documents with a transmittal letter, in duplicate, containing the following information:
   1. Date.
   2. Project title and number.
   3. Contractor's name and address.
   4. Title and number of each As-Built Document.
   5. Certification that each As-Built Document as submitted is complete and accurate.
   6. Signature of the Contractor or its Authorized Representative.

1.5 SPARE PARTS

A. Provide a receipt, signed by the Owner, for (1) complete set of all the operating appurtenances and loose items related to the operation and maintenance of the completed Project for the Owner's use after the guarantee period expires. Insert the receipt in the Operating and Maintenance Manual. These appurtenances and items include, but not are limited to, the following:
   1. Keys to panels, door and window hardware, and other devices not directly provided to the Owner from the Manufacturer.

2. Operating handles, levers, cranks, specialized wrenches or drivers, remote controls, and similar items.
3. Extra materials (e.g., attic stock) listed below. This list may not be a complete list of all spare parts. Provide all spare parts, whether listed or not.

SPARE PART AND QUANTITY	**SPECIFICATION SECTION**
Division 23 items	
Spare set of belts — (1) set for each fan	23 34 00
Set of filters — (1) spare set for each unit	23 74 33
Set of filters — (1) spare set for each unit	23 81 26
Set of filters — (1) spare set for each unit	23 81 29
Spare silk-screened panels — (5)	23 83 23
Any other parts mentioned elsewhere	

END OF SECTION 23 05 00.78

SECTION 23 05 00.79

DEMONSTRATION AND TRAINING FOR HVAC

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Section 23 05 93, “Testing, Adjusting, and Balancing for HVAC.”

1.2 DESCRIPTION

A. Provide training schedule and training outline for approval (45) days prior to Contract Completion.

B. Provide in-service training for the system’s operators. Provide all applicable user manuals and related training documentation.

C. After all system operational tests have been completed, schedule an instruction period with the Owner. Schedule well in advance, so that all the Owner’s personnel may attend if they desire. Coordinate with the Owner and A/E for date and time of training sessions.

D. Participate in training sessions. Instruct the Owner in the operation and maintenance of all systems and equipment. Use Operating and Maintenance Manuals to familiarize the Owner with equipment and procedures. Allow sufficient time for this instruction.

E. Instruction shall include the following:
   1. Location of equipment and explanation of what it does (function).
   2. Reference to operating instruction manuals for record and clarity.
   3. Coordination of written and verbal instructions, so that the operation of each system is fully understood by operating personnel.
   4. Complete review of items contained in Operating and Maintenance Manuals.
   5. Discussion of maintenance procedures that are required to be followed by the Owner, including cleaning procedures and what items to check.
   6. Complete demonstration and explanation of each System.
   7. Performance of specific and random flow tests by the Testing, Adjusting, and Balancing (TAB) Contractor. Refer to Section 23 05 93.
   8. Complete explanation of temperature control system.

F. Provide a copy of the Owner's "Certificate of Equipment Demonstration," signed by the Contractor, the Owner, and the A/E, in each Operating and Maintenance Manual. If the Owner does not have a standard demonstration form, the A/E will provide one.

END OF SECTION 23 05 00.79

SECTION 23 82 39.19

WALL AND CEILING UNIT HEATERS

PART 1 - GENERAL

1.1 DESCRIPTION

A. Provide electric wall and ceiling heaters.

1.2 QUALITY ASSURANCE

A. Standard: Underwriters Laboratories, Inc., (UL) Label.

1.3 RATINGS AND CAPACITY

A. Size, capacity, arrangements, and location as indicated on the Drawings.

B. Wattage and voltage ratings shall be as indicated on the Drawings.

PART 2 - PRODUCTS

2.1 ELECTRIC WALL HEATERS

A. Q-Mark Type AWH. UL-listed, semi-recessed, heavy-duty, fan-forced, totally enclosed fan-cooled motor, built-in disconnect switch, nickel-chrome heating elements, high temperature cutouts, tamper-resistant integral thermostat, 16 ga. steel housing, baked enamel finish, satin aluminum trim. The A/E will select the finish.

B. Other Acceptable Manufacturers: Approved equal by Markel, Berko, Nutone, Raywall, or Indeeco.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Mount unit no closer than 12 in. to the floor or adjacent wall surface. Recess in wall using adjustable mounting strap. CMR shall provide the wall recess.

B. Mount unit in ceiling no closer than 12 in. to adjacent wall surface.

C. Install thermostat on wall where shown on Drawings.

3.2 WIRING

A. Electrical Contractor shall provide disconnect switches, control wiring, and power wiring.

END OF SECTION 23 82 39.19

SECTION 26 05 00 – COMMON WORK RESULTS FOR ELECTRICAL

PART 1 - GENERAL

1.1 PREFACE

A. The Work shall be performed under the General Contracting (GC) / Single-Prime Contractor project delivery method and the process. References to Work to be performed by different Trades Contractors or Subcontractors are all subject to the Scope of Work by the Prime Contractor. Any conflicts regarding Scope of Work shall be directed to the Prime Contractor for resolution. **THE PRIME CONTRACTOR FOR THIS PROJECT SHALL ALSO BE KNOWN AS THE LEAD CONTRACTOR.**

B. **Terminology:** The terms below will be used throughout Division 26, in accordance with Division 00 and Division 01.
   1. Owner: Mount Gilead Exempted Village Schools.
      a. Contracting Authority: [illegible].
      b. Using Agency (Facility): Mount Gilead Preschool.
      c. Owner's Agent: [illegible].
   2. Architect/Engineer (A/E): Schorr Architects, Inc. / Roger D. Fields Associates, Inc.
   3. Contractors:
      a. All Trade Contractors listed below, other than the Lead Contractor, are Subcontractors.
      b. General Trades: Refer to Divisions 02 through 14.
      c. Fire Suppression: Refer to Division 21.
      d. Plumbing: Refer to Division 22.
      e. HVAC: Refer to Division 23.
      f. Electrical: Refer to Division 26.
      g. Communications: Refer to Division 27.
      h. Electronic Safety and Security: Refer to Division 28.
      i. Site: Refer to Divisions 31 through 35.
   4. Authority Having Jurisdiction (AHJ) mentioned in Division 26:
      a. Village of Mount Gilead Building Department.
      b. Mount Gilead Fire Department.
      c. Morrow County Health Department.

C. Scope of Work Summary for the Contractor Performing Electrical Work on this Project:
   1. Preschool Expansion.
   2. District Office Renovation.

1.2 RELATED DOCUMENTS

A. Refer to the additional Divisions below for specific requirements, responsibilities, and methods relating to Division 26 Work. If there is a conflict, comply with the more restrictive requirements.
   1. Division 00, "Procurement and Contracting Requirements": All sections.
      a. The "General Conditions" will provide additional information on the Contractor's Scope of Work responsibilities.
   2. Division 01, "General Requirements": All sections.

B. Read the entire Specification covering other branches of the Work. Contractor shall be held responsible for the coordination of its work with the work performed by other Trades.

1.3 DESCRIPTION

A. Electrical Work includes the Work described in Division 26, "Electrical," Sections 26 00 00 through 26 99 99 (as included), unless otherwise noted.

B. Electrical Work also includes the Work described in the following Sections:
   1. Division 13, "Special Construction," Section 13 46 13, "Lightning Protection for Structures."
   2. Division 21, "Fire Suppression," Section 21 05 33, "Heat Tracing for Fire Suppression Piping."
   3. Division 22, "Plumbing," Section 22 05 33, "Heat Tracing for Plumbing Piping."
   4. Division 23, "Heating, Ventilating, and Air Conditioning":
      a. Section 23 05 13, "Common Motor Requirements for HVAC Equipment."
      b. Section 23 82 39, "Unit Heaters," including cabinet, propeller, wall, and ceiling.
      c. Section 23 83 23, "Radiant-Heating Panels (Ceiling Panels)."
      d. Division 27, "Communications," Section 27 05 28, "Pathways for Communications Systems."
   5. Section 28 46 13.02, "Conventional Fire-Alarm Systems."

C. In the Sections listed above, the term "Contractor" shall mean the Contractor performing Electrical Work on this Project, unless otherwise noted.

D. Electrical Work includes, but is not limited to, the following:
   1. Allowances, or Alternates, as shown, if any.
   2. Control wiring. Refer to Division 23.
   3. Selective demolition.
   4. Grounding and bonding.
   5. Concrete work.
   6. Underground electrical systems.
   7. Lighting controls.
   8. Low-voltage electrical transmission:
      a. Panelboards.
      b. Distribution equipment (receptacles, switches, etc.).
      c. Circuit protective devices.
   9. Electrical protection: Surge protective devices.
   10. Lighting systems:
      a. LED interior lighting.
      b. Emergency and exit lighting.
      c. LED exterior lighting.
   11. Pathways for communications systems. Refer to Section 27 05 28.
   12. Electronic safety and security systems. Division 28.
   13. Fire-alarm systems. Refer to Section 28 46 13.02.

E. Contractor is responsible for the more restrictive requirement between these general provisions and other requirements contained elsewhere in the Contract Documents.

F. Furnish material, labor, tools, accessories, and equipment to complete and leave ready for operation all electrical systems of this Project as described in these Specifications and as shown on the Drawings.

G. Use sufficient skilled journeymen electricians and competent supervisors in the execution of this portion of the Work to ensure proper and adequate installation throughout.

H. Refer to Section 26 05 00.31, "Project Coordination for Electrical," regarding final electrical connections to items provided by others.

I. Maintain existing facilities in operation whenever possible. Occupied sections of the building will remain in use throughout construction. Coordinate with the A/E and Owner.

J. All electrical systems shall be provided as complete and operational, and shall not be considered complete unless, and until, at a minimum, all Code and Governing Agency requirements are satisfied.

1.4 COORDINATION MEETINGS AND COORDINATION DRAWINGS

A. Terminology:
1. Coordination Meetings: Coordination Meetings shall be held to identify Coordination Areas and the need for a Coordination Drawing for any Coordination Area. The Lead Contractor shall schedule and conduct the Coordination Meetings.
2. Coordination Areas: Areas of the project that require special attention, i.e., where there are potential conflicts between Trades.
3. Coordination Drawings: Drawings and electronic files prepared by the Coordination Participants to demonstrate how multiple-system and interdisciplinary work shall be coordinated.
4. Coordination Participants: All Contractors shall participate in the process of developing the Coordination drawings, including, at a minimum, the following Trades:
a. General Trades.
b. Fire Suppression.
c. Plumbing.
d. HVAC.
e. Electrical.
f. Technology.
g. Electronic Safety and Security.

B. Refer to Section 23 05 00, "Common Work Results for HVAC," for additional requirements.

1.5 QUALITY ASSURANCE

A. Standards: The following is a list of referenced standards. Not all of these standards necessarily apply to this Project. Refer to individual Specification Sections. If a standard is undated, the referenced edition or most recent version of the standard applies.
1. American Institute of Architects Committee on Architecture for Health (AIA/CAH), Health Guidelines Revision Committee (HGRC): 2022 Guidelines for Design and Construction of Hospitals and Outpatient Facilities, Residential Health, Care, and Support Facilities.
2. American Concrete Institute (ACI).
3. American National Standards Institute (ANSI):
a. ANSI C33.38.
b. ANSI C57.12.22.
c. ANSI C57.12.26.
d. ANSI C80 Specification.
e. ANSI/IEEE C62.1.
f. ANSI/IEEE C62.11.
g. ANSI/IEEE C62.41.2-2002, IEEE Recommended Practice for Surge Voltages in Low-Voltage AC Power Circuits.

h. ANSI/IEEE C62.45.
i. ANSI/NETA MTS 2023 "Standard for Maintenance Testing Specifications for Electrical Power Equipment and Systems."

4. American Society for Testing and Materials (ASTM).
   a. ASTM A446.
   b. ASTM A570.
   c. ASTM A661.
5. American Society of Civil Engineers (ASCE) / Structural Engineering Institute (SEI): 2016 Standard 7, "Minimum Design Loads and Associated Criteria for Buildings and Other Structures."
6. American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE):
   a. 2022 Standard 62.1, "Ventilation and Acceptable Indoor Air Quality."
   b. 2019 Standard 90.1, "Energy Standard for Buildings Except Low-Rise Residential Buildings."
      1) Section 9, "Lighting."
7. American Society of Mechanical Engineers (ASME).
8. Americans with Disabilities Act (ADA), 2010, Accessibility Guidelines, Code of Federal Regulations (CFR), 36 CFR 1191.
9. Building Industry Consulting Services International (BICSI).
10. DesignLights Consortium® (DLC).
11. Electrical Testing Laboratories (ETL).
12. Electronic Industries Alliance (EIA) Recommended Standards (RSs).
13. ENERGY STAR® Program developed by the U.S. Environmental Protection Agency (EPA) and the U.S. Department of Energy (DOE).
14. Energy Policy Act (EPAct) of 2005.
15. Factory Mutual Global (FMG).
16. Federal Communications Commission (FCC), Title 47 CFR Part 15 Class A.
17. Federal Specifications:
   a. W-C375B.
   b. W-P-115b.
   c. W-P-115C, Type I Class 1.
18. Green Lights Guidelines of the U.S. EPA.
19. Illuminating Engineering Society of North America (IESNA).
20. Institute of Electrical and Electronics Engineers, Inc. (IEEE).
   a. IEEE "National Electrical Safety Code®."
   b. IEEE 262.
   c. IEEE 344-2013, "Standard for Seismic Qualification of Equipment for Nuclear Power Generating Stations."
   d. IEEE 462.
   e. IEEE 519 (harmonic generation).
   f. IEEE 802.
   g. IEEE 929.
   h. IEEE 1584.
21. Insulated Cable Engineers Association, Inc. (ICEA).
22. Insulated Power Cable Engineers Association (IPCEA).
23. International Agency for Research on Cancer (IARC).
24. International Code Council, Inc. (ICC):
   a. International Building Code (IBC).
   b. 2021 International Existing Building Code® (IEBC).
   c. 2021 International Energy Conservation Code (IECC).

d. Evaluation Service (ES) Acceptance Criteria (AC) 156, Seismic Certification by Shake-table Testing of Nonstructural Components.

25. International Electrical Testing Association (NETA).
26. International Electrotechnical Commission (IEC)
    a. IEC 61000-4-2:2009, "Electrostatic Discharge Testing Standard."
    b. IEC Parts 34.7 and 146.
27. International Green Construction Code®: Standard for the Design of High-Performance Green Buildings.
28. International Organization for Standardization (ISO):
    a. ISO 8528-5, Level G-3.
    b. ISO 9001:2000, "Quality Management Systems."
29. International Performance Measurement & Verification Protocol (IPMVP), Volume III, "Concepts and Options for Determining Energy Savings in New Construction," 2006, including Chapter 4, "Measurement & Verification (M&V) Methods for Energy Conservation Measure Isolation" (Option B) or "Whole Building Calibrated Simulation" (Option D).
30. Leadership in Energy and Environmental Design (LEED).
31. National Electrical Contractors Association (NECA) "Standard of Installation."
32. National Electrical Manufacturers Association (NEMA):
    a. NEMA ICS 2-322.
    b. NEMA ICS 2-324.
    c. NEMA ICS 2-447.
    d. NEMA ICS 7.0.
    e. NEMA MG 1-16.40.
    f. NEMA MG 1-22.40.
    g. NEMA PB 1-2023, "Panelboards."
    h. NEMA PB 2, "Standards for Switchboards," including PB 2.1, "Proper Handling, Installation, Operation and Maintenance of Dead Front Switchboards Rated 600 Volts or Less."
    i. NEMA PE-1-2012 (R2017), "Uninterruptible Power Systems (UPS)—Specification and Performance Verification."
    j. NEMA ST 20-2021, "Dry Type Transformers for General Applications."
    k. NEMA WC 70, "Metal-Clad Cables."
    l. NEMA WD 1 (R2015), "General Color Requirements for Wiring Devices."
    m. NEMA WD 7-2011 (R2021) Occupancy Motion Sensor Standard.
33. National Fire Protection Association (NFPA):
    a. 2021 NFPA 30, "Flammable and Combustible Liquids Code."
    b. 2023 NFPA 70, "National Electrical Code® (NEC)."
    c. 2024 NFPA 70E, "Standard for Electrical Safety in the Workplace."
    d. 2022 NFPA 72, "National Fire Alarm and Signaling Code"
    e. 2021 NFPA 99, "Health Care Facilities Code."
    f. 2022 NFPA 110, "Standard for Emergency and Standby Power Systems."
    g. 2023 NFPA 262, "Standard Method of Test for Flame Travel and Smoke of Wires and Cables for Use in Air-Handling Spaces."
34. National Institute for Certification in Engineering Technologies (NICET).
35. North American Board of Certified Energy Professionals (NABCEP).
36. The Joint Commission.
37. Underwriters Laboratories, Inc. (UL).
    a. UL 5, "Standard for Surface Metal Raceways and Fittings."
    b. UL 5A, "Non-Metallic Surface Raceways and Fittings."
    c. UL 6, "Electrical Rigid Metal Conduit — Steel."

d. UL 6A, “Electrical Rigid Metal Conduit — Aluminum, Bronze, and Stainless Steel.”
e. UL 50, “Enclosures for Electrical Equipment, Environmental Considerations.”
f. UL 67, “Standard for Panelboards.”
g. UL 94, “Standard for Safety of Flammability of Plastic Materials for Parts in Devices and Appliances.”
h. UL 96A, “Requirements for a Master Label System.”
i. UL 347, “Medium-Voltage AC Contactors, Controllers, and Control Centers.”
j. UL 360, “Standard for Liquid-Tight Flexible Metal Conduit.”
k. UL 467, “Grounding and Bonding Equipment.”
l. UL 486A–486B, “Wire Connectors.”
m. UL 489, “Standard for Molded-Case Circuit Breakers, Molded-Case Switches, and Circuit-Breaker Enclosures.”
n. UL 506, “Standard for Specialty Transformers.”
o. UL 508C, “Standard for Power Conversion Equipment.”
p. UL 514A, “Standard for Metallic Outlet Boxes.”
q. UL 514B, “Standard for Fittings for Cable and Conduit.”
r. UL 514C, “Standard for Nonmetallic Outlet Boxes, Flush-Device Boxes, and Covers.”
s. UL 651, “Standard for Schedule 40, 80, Type EB and A Rigid PVC Conduit and Fittings.”
t. UL 651A, “Schedule 40 and 80 High Density Polyethylene (HDPE) Conduit.”
u. UL 797, “Standard for Safety Electrical Metallic Tubing – Steel.”
v. UL 845, “Standard for Safety Motor Control Centers.”
w. UL 870, “Standard for Wireways, Auxiliary Gutters, and Associated Fittings.”
x. UL 891, “Standards for Switchboards.”
y. UL 916, “Standard for Energy Management Equipment.”
z. UL 1008, “Standard for Safety Transfer Switch Equipment.”
aa. UL 1022, “Standard for Line Isolation Monitors.”
bb. UL 1047, “Isolated Power Systems Equipment.”
cc. UL 1242, “Standard for Electrical Intermediate Metal Conduit – Steel.”
dd. UL 1449, “Standard for Surge Protective Devices.”
ee. UL 1561, “Standard for Dry-Type General Purpose and Power Transformers.”
ff. UL 1653, “Standard for Electrical Nonmetallic Tubing.”
gg. UL 1660, “Standard for Liquid-Tight Flexible Nonmetallic Conduit.”
hh. UL 1741, “Standard for Inverters, Converters, Controllers and Interconnection System Equipment for Use with Distributed Energy Resources.”
ii. UL 1773, “Standard for Termination Boxes.”
jj. UL 1778, “Standard for Uninterruptible Power Systems.”
kk. UL 2196, “Standard for Fire Test for Circuit Integrity of Fire-Resistive Power, Instrumentation, Control, and Data Cables.”
ll. UL 2200, “Standard for Safety of Stationary Engine Generators.”

38. WELL Building Standard™, International WELL Building Institute™ (IWBI).
39. United States Department of Energy (DOE), CFR, Title 10, Chapter II, Part 431, DOE 2016 efficiency levels.
40. United States Department of Housing and Urban Development.
41. United States Department of Labor, 29 CFR 1910.7, Occupational Safety and Health Administration (OSHA), Part 1926, “Safety and Health Regulations for Construction.”
42. United States Environmental Protection Agency (EPA).
43. United States Green Building Council (USGBC).

44. State of Ohio:
    a. Ohio Administrative Code (OAC):
        1) OAC 1301:7-7: 2017 Ohio Fire Code, including Chapter 34.
        2) OAC 4101:1: 2024 Ohio Building Code.
        3) OAC 4101:5: 2024 Elevator Code.
        4) 2024 Ohio Existing Building Code.
    b. Ohio Revised Code 153.011.
    c. Ohio Department of Transportation (ODOT), including "Construction and Material Specifications."
    d. Ohio Environmental Protection Agency (EPA).

1.6 ALLOWANCES

A. The contractor shall include in its bid a lump sum for the following Electrical Work:
    1. Section 26 05 43, Allowance No. 2: Contractor shall include in its bid an allowance of $11,000.00 to be used for paying the Power Company for the cost of electrical service for the facility.

B. Refer to Section 01 21 00, "Allowances," for additional bidding information.

END OF SECTION 26 05 00

SECTION 26 05 19 – LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Section 26 05 00.45, “Testing and Inspecting Services for Electrical.”

B. Section 26 05 29, “Hangers and Supports for Electrical Systems.”

C. Section 26 05 33, “Raceways and Boxes for Electrical Systems.”

D. Section 26 05 43, “Underground Ducts and Raceways for Electrical Systems.”

E. Section 26 05 44, “Sleeves and Sleeve Seals for Electrical Raceways and Cabling.”

F. Section 26 05 53, “Identification for Electrical Systems.”

G. Division 28, “Electronic Safety and Security.”

1.2 DESCRIPTION

A. Provide conductor wires and cables, connectors, splices, and terminations rated 600 volts or less.

B. Refer to Division 28 for special system wiring.

1.3 TERMINOLOGY

A. This Section applies to the following:
1. Conductors insulated for operation at 600 volts, and used for 120-volt, 208-volt, 240-volt, 277-volt, 480-volt, and other “line” voltages.
2. Conductors insulated for operation at 300 volts and used for low-voltage systems operating at less than 48 volts.

1.4 QUALITY ASSURANCE

A. Standards:
1. InterNational Electrical Testing Association (NETA).
2. National Electrical Manufacturers Association (NEMA) WC 70, “Metal-Clad Cables.”
3. National Fire Protection Association (NFPA):
   a. 2023 NFPA 70, “National Electrical Code® (NEC),” Articles 310, 320, 330, and 334.
   b. 2023 NFPA 262, “Standard Method of Test for Flame Travel and Smoke of Wires and Cables for Use in Air-Handling Spaces.”
4. National Institute for Certification in Engineering Technologies (NICET).
5. Occupational Safety and Health Administration (OSHA) 29 CFR 1910.7.
6. Underwriters Laboratories, Inc. (UL):
   a. UL 486A–486B, “Wire Connectors.”
   b. UL 2196, “Standard for Fire Test for Circuit Integrity of Fire-Resistive Power, Instrumentation, Control, and Data Cables.”

PART 2 - PRODUCTS

2.1 CONDUCTORS AND CABLES

A. Acceptable Manufacturers: Service Wire, Cerrowire, Houston Wire & Cable, Encore Wire, Southwire, Omni Cable, Alan Wire, or Superior Essex.

B. Types of Conductor Wires and Cables:
   1. Type XHHW, single conductors in raceway.
   2. Type THHN-THWN, single conductors in raceway.

C. Conductor Insulation: Comply with NEMA WC 70 for Types XHHW, THHN-THWN.

D. Service Entrance Feeders shall be as follows:
   1. Secondary electrical service feeders shall be copper, Type XHHW, 600-volt insulation, 75 degrees C.
      a. Secondary lug connectors: NEMA standard 2-hole compression connectors with 1-3/4 in. hole spacing. Compatible with Kearney™ Type "O" or Type "WH2" compression tools.
      b. All electrical service feeder conductor sizes indicated on the Drawings shall have an ampacity equal to that listed in 2023 NEC Table 310.16 for conductors.

E. Branch Circuit Wiring:
   1. Branch circuit wiring size #10 AWG and smaller may be stranded or solid copper.
   2. Branch circuit wiring size #8 AWG and larger shall be stranded copper.
   3. All branch circuit conductor sizes indicated on the Drawings shall have an ampacity equal to that listed in 2023 NEC Table 310.16 for conductors.
      a. Conductors for elevators and HVAC equipment: Copper.
   4. Power branch circuits:
      a. Minimum size: 12 AWG Cu.
   5. Lighting branch circuits:
      a. Minimum size: 12 AWG Cu.
      b. Conductors for Luminaires: Type THHN 90 degrees C.
      c. **Option** for Lighting Circuits **ONLY**: UL-listed, flexible wiring system in lieu of conduit.
         1) Acceptable Manufacturers: Reloc Wiring Solutions or approved equal by America Cable Systems, Cooper or Hubbell.

F. Exposed Conduits on Roof: Conductors shall follow sizing requirements in 2023 NEC

G. Line-Voltage (120 volts and higher) Conductors: 600-volt insulation, Type THHN or THWN for dry environments, or Type XHHW for moist/wet environments, 75 degrees C., and color-coded as specified in Part 3.
   1. #12 AWG and #10 AWG: Stranded or solid copper.
   2. Larger than #10 AWG: Stranded copper.

2.2 PULLING LUBRICANTS

A. Acceptable Manufacturers: Ideal Company "Yellow 77" or approved equal by Klein, or Buchanan.

B. UL-listed.

2.3 CONNECTORS AND SPLICES

A. Acceptable Manufacturers: 3M Company insulated "Scotchlok," Ideal Company "Wing-Nut," Polaris, ILSCO, Greaves, Easy-Twist, Arlington Industries, Buchanan, or Thomas & Betts Type "PT."

B. Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated.

2.4 MECHANICALLY CRIMPED SLEEVES

A. Acceptable Manufacturers: Thomas & Betts, Ideal Company, or Utilitech.

2.5 PRESSURE-SENSITIVE ELECTRICAL TAPE

A. Acceptable Manufacturer: 3M Company “Scotch® 33+” or “Scotch® 88,” Utilitech, Easy-Wrap, or Morris.

2.6 ADHESIVE TAPES

A. Acceptable Manufacturers: Thomas & Betts “WM,” Panduit, or 3M Company.

PART 3 - EXECUTION

3.1 INSTALLATION — CONDUCTORS AND CABLES

A. Wiring installation shall be acceptable to the AHJ.

B. Use new wiring. Do not re-use existing wiring, unless otherwise noted on the Drawings.

C. Conceal cables in finished walls, ceilings, and floors, wherever possible.

D. Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.

E. Support cables according to Section 26 05 29.

F. Enclose all conductors in a continuous, grounded raceway system, unless otherwise noted.

G.

H. Branch Circuit Wiring:
1. Replace branch circuit wiring to luminaires, switch legs, and all new receptacles.
2. If the conductor carrying power from the main circuit breaker panel to the first connection point on that branch circuit (i.e., a “home run”) is more than 75 ft. long, increase the branch circuit wiring shown on the Drawings by (1) size.
3. Increase branch circuit wiring by an additional (1) size every 75 ft. thereafter.
4. Conductors for elevators and HVAC equipment shall be copper.

I. Multiple home runs shall be permitted in any conduit run. Provide a full-size neutral for each home run. De-rate all multiple wiring installations in accordance with 2023 NEC Table 310.15(B)(3)(a) or install larger conductors. Provide a neutral conductor for each circuit. **NEUTRAL SHARING SHALL NOT BE PERMITTED.**

J. Leave at least 6 in. of free conductor at all outlets, except where conductors are intended to loop without splices through outlets for luminaires or wiring devices.

K. Push free ends and loops at boxes and enclosures back in box. Use blank covers or other means to protect free ends and loops until interior painting and decorating work is completed.

3.2 PULLING WIRE

A. Swab all conduits clean and dry before pulling wire.

B. Use Manufacturer-approved pulling compound or lubricant where necessary; compound used shall not deteriorate conductor or insulation. Do not exceed the Manufacturer’s recommended maximum pulling tensions and sidewall pressure values.

C. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.

D. Hand-pull wires #8 AWG and smaller.

3.3 INSTALLATION — CONNECTORS AND SPLICES

A. Use deoxidant cleaner on all wiring connections.

B. Connectors:
1. Tighten electrical connectors and terminals according to the Manufacturer's published torque-tightening values. If the Manufacturer's torque values are not indicated, use those specified in UL 486A–486B.
2. Conductors #8 AWG and larger: Make joints with pressure-type mechanical connectors. Insulate with plastic electric tape.
3. Conductors #10 AWG and smaller: Make connections with threaded-on plastic or nylon insulated wire nuts.
4. Do **NOT** use crimp connectors, except butt connectors.

C. Splices:
1. Make splices and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.
2. Conductors #8 AWG and larger: Make splices in wire with pressure-type mechanical connectors. Insulate with (2) layers of insulating putty and (2) layers of "Scotch® 88" tape.
3. Conductors #10 AWG and smaller: Make splices in wire with connectors, or with mechanically crimped sleeves. Insulate with pressure-sensitive "Scotch® 33+" electrical tape.
4. Use oxide inhibitor in each splice and tap conductor for aluminum conductors.

3.4 IDENTIFICATION

A. Identify and color-code conductors and cables according to Section 26 05 53.

B. Use the following wire color codes for this Project:

WIRE	**120/208-VOLT**
Phase A	Black
Phase B	Red
Phase C	Blue
Neutral	White
Ground	Green
Isolated Ground	Green/Yellow

C. Test and permanently tag each conductor wire, except neutrals, in panelboard gutter, by circuit number, before connecting to panelboard. Wrap adhesive tapes around the wire and form into a flag.

D. Tag and identify all conductors entering or leaving terminal wiring strips.

3.5 TESTING AND ON-SITE SERVICES

A. Testing Agency:
1. Engage a qualified testing agency to perform tests and inspections and prepare test reports.
2. Qualifications: An independent agency, with the experience and capability to conduct the testing indicated, that is a member company of the NETA or is a nationally recognized testing laboratory as defined by OSHA in 29 CFR 1910.7, and that is acceptable to AHJ.

3. Testing agency's field supervisor: Person currently certified by NETA or NICET to supervise on-site testing.

B. Perform tests and inspections.
   1. After installing conductors and cables and before electrical circuitry has been energized, test service-entrance conductors, feeder conductors, and branch circuit #3 AWG and larger for compliance with requirements.
   2. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
   3. Infrared scanning: After Substantial Completion, but not more than (60) days after Final Acceptance, perform an infrared scan of each splice in cables and conductors #3 AWG and larger. Remove box and equipment covers so splices are accessible to portable scanner. Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.
   4. Record of Infrared Scanning: Prepare a certified report that identifies splices checked and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

C. Test Reports: Prepare a written report to record the following:
   1. Test procedures used.
   2. Test results that comply with requirements.
   3. Test results that do not comply with requirements and corrective action taken to achieve compliance with requirements.
   4. Include copy of test report in the Operating and Maintenance Manuals.

D. Remove and replace malfunctioning connections and units. Retest as specified above.

E. Refer to Section 26 05 00.45 for additional information.

END OF SECTION 26 05 19

SECTION 26 05 26 – GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 DESCRIPTION

A. Provide grounding and bonding of systems and equipment for this project.

1.2 QUALITY ASSURANCE

A. Standards:
   1. National Fire Protection Association (NFPA): 2023 NFPA 70, "National Electrical Code® (NEC)," Article 250.
   2. Underwriters Laboratories, Inc. (UL) 467, "Grounding and Bonding Equipment."

PART 2 - PRODUCTS

2.1 GROUNDING ELECTRODES

A. Acceptable Manufacturers: ERICO, East Coast Lightning Equipment, Galvan Electrical, Nehring Electrical Works, or Harger.

B. Rod-Type Grounding Electrodes (Ground Rod): 5/8 in. diameter x 10 ft. long copper-clad steel.

2.2 GROUNDING CONDUCTORS

A. Insulated: Copper wire or cable insulated for 600 volts.

B. Bare Copper:
   1. Solid.
   2. Stranded.

2.3 GROUNDING CONNECTIONS

A. Acceptable Manufacturers for All Grounding Connections in Main Service Equipment and Buried Grounding Electrodes: ERICO "CADWELD," Burndy "Thermoweld," or Harger "Ultraweld."

B. Acceptable Clamp Manufacturers for Grounding Connections to Pipes or Conduits: Arlington Industries, Galvan, Burndy "GAR," Penn-Union "GPL," O-Z Gedney "ABG" or "CG," Anderson GC-111, or ILSCO "GPL."

C. Acceptable Manufacturers for Exothermic Weld Grounding Connections: ERICO "CADWELD" or approved equal by Harger or Burndy.

D. Acceptable Manufacturers for Bonding Bushings: O-Z Gedney "BLG" Type or approved equal by Eaton or Thomas & Betts.

PART 3 - EXECUTION

3.1 GROUNDING ELECTRODES

A. For Building Electrical Service:
   1. Provide ground rods at location indicated on the Drawings.
   2. Provide parallel ground rods to achieve a ground impedance less than 5 ohms.
   3. Extend grounding conductor to main service equipment grounding bar.

3.2 GROUNDING CONDUCTORS

A. Run main service grounding conductors in rigid non-metallic conduit (RNC).

B. For Electrical Equipment: Include an equipment grounding conductor (green ground wire) with all circuit conductors over 100 volts. Size in accordance with 2023 NEC Table 250.122.
   1. **Exception:** Not smaller than #12 AWG for power circuits.
   2. **Exception:** Not smaller than #12 AWG for lighting circuits.
   3. **Exception:** Not smaller than #14 AWG for control circuits.

3.3 GROUNDING CONNECTIONS

A. Exothermic Weld Grounding Connections:
   1. Driven ground rods: Make exothermic connections to columns on the web of the column.

B. Bond conduits that enter a switchboard or panelboard or that enter a similar enclosure through concrete, or that require a ground bond. Use bonding bushings and the same size grounding conductor as the equipment grounding conductor.

C. Make all other connections to pipes or conduits using clamps.

3.4 GROUNDING — EQUIPMENT

A. Provide a grounding system that includes the items below and bond all of these items together.
   1. Railings, ladders, and other metal structures and equipment attached to the building.
   2. Metal piping:
      a. Exposed exterior piping.
      b. Water service piping: Bond to grounding system.
      c. Natural gas piping within the building: Bond to grounding system.
   3. HVAC equipment:
      a. Rooftop HVAC units.
   4. Motors.
   5. Electrical service for main building, as shown on the site plan. Use ground rods.
   6. Electrical equipment:
      a. Grounding conductors.
      b. Grounding connections.
      c. Grounding electrodes.
      d. Metering equipment and base, in accordance with the requirements of the Power Company.
      e. Secondary electrical distribution systems
      f. Raceways.

3.5 GROUNDING — CONDUIT AND RACEWAY SYSTEM

A. Conduit and/or raceway is not an allowable means of grounding.

B. To Ground a Conduit/Raceway System: The entire metallic conduit system shall be electrically continuous with locknuts on enclosures. Bonding bushings shall be required where reducing washers are used and where concentric or eccentric knockouts are not completely removed.

3.6 NEUTRAL CONNECTION

A. Bond the neutral of the service entrance conductors to the panelboard enclosure by a main bonding jumper.

3.7 WIRED GROUND CONNECTIONS

A. Because the conduit system can provide a lower impedance path than the wired equipment grounding system, the wired equipment grounding system shall connect to the metallic conduit ground system in **EVERY** accessible panel, junction box, pull box, luminaire housing, motor terminal box, and other metallic enclosures, as specified below.

B. Enclosures:
   1. Enclosure with grounding assembly: Connect all ground wires to the assembly. Provide connection lugs or terminals for the ultimate number of wires to be connected to the assembly. Use a separate connection for each wire.
   2. Enclosure not requiring a grounding assembly: Connect together all grounding conductors entering the enclosure. Bond a pigtail that is the size of the largest grounding conductor to the enclosure with an attachment used for no other purpose.

C. Panelboards: Shall have a grounding assembly that has the same number, size, and type of anti-turn solderless lugs as the neutral assembly. Grounding assembly shall be factory-bonded to the panel tub and shall have the screwdriver slots facing the front of the panel.

D. Motor Terminal Boxes: Ground using a ground lug supplied by the Manufacturer or by drilling and tapping a hole for a ground screw.

E. Junction Boxes and Pull Boxes: Bond using UL-listed grounding screws or lugs. If there are more than (4) ground wires entering a box, bond a listed grounding assembly securely to the enclosure.
   1. **Note:** 2023 NEC requires that an equipment grounding conductor passing through any accessible location be bonded to that enclosure. Do **NOT** use self-tapping sheet-metal screws.

F. General-Use Outlet Boxes: Bond using a ground screw in the threaded ground tap.

G. Convenience Outlet Boxes: Use equipment grounding conductors. Do **NOT** ground with outlet box attachment screws.

H. Luminaires: Ground using a pigtail fastened on bare metal.

I. Remove paint and any other foreign material from all ground connections so that the connection is metal-to-metal.

END OF SECTION 26 05 26

SECTION 26 05 29 – HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Section 26 05 33, “Raceway and Boxes for Electrical Systems.”

B. Section 26 05 43, “Underground Ducts and Raceways for Electrical Systems.”

1.2 DESCRIPTION

A. Hangers and Supports for Electrical Equipment and Systems: Provide equipment and conduit installed under the Electrical Work.
   1. Equipment supports:
      a. Provide all structural supports between building structural framing members to support electrical equipment, etc.
      b. Attach all items of equipment securely to structure, floor, or concrete pad. Means of attachment shall be approved by the A/E and shall not degrade the structure.
      c. For any variation in supports needed for equipment actually purchased, Contractor shall bear all costs of modifications, including redesign costs.
   2. Conduit supports, including J-hooks and bridle rings.
   3. Support steel: Attach to building structure to support conduit and smaller electrical equipment items. Provide supports between existing structural members. Obtain prior written approval of the A/E.

B. Provide all necessary inserts, expansion shields, beam clamps, conduit floor supports, auxiliary steel, angles, clips, mechanical fasteners, reinforcement steel, structure drilling, etc.

C. Components shall be selected and matched to the load imposed on them.

1.3 QUALITY ASSURANCE

A. Standards:
   1. American National Standards Institute (ANSI).
   2. American Society for Testing and Materials (ASTM).
   3. American Society of Civil Engineers (ASCE) / Structural Engineering Institute (SEI): 2016 Standard 7, “Minimum Design Loads and Associated Criteria for Buildings and Other Structures.”
   4. American Society of Mechanical Engineers (ASME).
   5. Factory Mutual Global (FMG).
   6. National Fire Protection Association (NFPA).
   7. Underwriters Laboratories, Inc. (UL).

PART 2 - PRODUCTS

2.1 STRUCTURAL STEEL

A. Steel plates, shapes, and bars; steel beams; strut channels; standard-weight black steel pipe; or steel angle. ASTM A36 / ASTM A36M, black and galvanized, of adequate size and strength to safely carry the weight of equipment item.

2.2 ROOFTOP CONDUIT SUPPORTS

A. Acceptable Manufacturers: ERICO or approved equal by Pate, Arlington Industries, Cablofil, Dura-Blok, or B-Line Systems.

B. ERICO "Pyramid" ST Series with rubber mat. Ultraviolet-rated, thermoplastic fixed strut supports for rooftop conduits.

2.3 FINISH

A. Unless otherwise noted, all steel hangers and supports shall be standard black.
   1. **Exception:** Hangers and supports for exposed exterior applications shall be galvanized.

2.4 INSERTS

A. In Masonry with Voids: Master-Carr #94255A100. Steel plated with yellow chromated zinc, female threaded toggle.
   1. Acceptable Manufacturers: Master-Carr or approved equal by Vertical Solutions or Hohmann & Barnard.

PART 3 - EXECUTION

3.1 INSTALLATION — HANGERS AND SUPPORTS

A. Provide proper steel angles and channel systems, etc., between existing structural members for hanger supports where necessary. Weld to steel structural members where noted. Consult with the A/E regarding this procedure.

B. Do not support hangers from roof deck or floor above. Span from structural members with supplementary steel where direct attachment to structural members is not practical.

C. Install hangers and supports with all necessary inserts, bolts, rods, nuts, washers, and other accessories, according to Manufacturer's recommendations. Hangers shall be double-nutted.

D. **DO NOT USE C-CLAMPS WITHOUT RETAINING CLIPS ON CONDUIT 1-1/2 IN. AND LARGER.**

E. Beam Clamps: Use top flange beam clamps to avoid burning metal deck.

F. Roofs:
   1. Roof integrity and warranty shall be preserved.
   2. Coordinate installation of equipment supports and roof penetrations.
   3. Seal all penetrations through roof.
   4. Coordinate with the Lead Contractor **BEFORE** cutting.

G. Equipment: Install additional ceiling hangers where the ceiling supports electrical equipment, such as luminaires, etc., to prevent the ceiling from sagging.

H. Conduit:
   1. Install all necessary conduit hangers, supports, clamps, wall brackets, and attachments to properly support conduit from building structure.
   2. Use a separate hanger for each conduit. Do not hang one conduit from another.
   3. Provide any additional supports needed to maintain conduit alignment.
   4. Ceilings:
      a. Do not support conduit from ceiling and ceiling grid systems.
      b. Conduit, and each ceiling and ceiling grid system, shall be a separate installation. Independently support each from the building structure.

c. Where interferences occur, in order to support conduit, install trapeze-type hangers or supports. Locate them where they do not interfere with access to other electrical equipment items, fire dampers, and valves.
d. Provide J-hooks or steel bridle rings to support low-voltage cable above accessible ceilings.

5. Refer to Section 26 05 33.

I. Re-Use of Existing Conduit Hangers:
1. **Option:** Conduit hangers may be reused; however, all components shall meet the same requirements as specified for new conduit hangers.
2. Test existing conduit hangers before re-use; conduit hangers shall withstand a drop test using a 25 lb. weight dropped from 2 ft.

J. Painting, Touch-up:
1. Paint exposed areas immediately after erecting hangers and supports.
2. Use same paint materials as used for shop painting.
3. Apply paint by brush or spray to provide a minimum dry film thickness of 2.0 mils.

3.2 INSTALLATION — INSERTS

A. Avoid cutting masonry by using inserts.

B. Refer to Manufacturer's recommendations for correct selection as to conduit size and loading.

C. Provide the correct size and type of inserts, along with information on their correct location, to the Lead Contractor, so as not to delay construction.

D. Masonry Construction with Voids: Install appropriately sized all-thread rods within a 2-component polyester resin adhesive used in conjunction with a galvanized metal screen. Install rods in holes drilled with carbide-tipped drill bits.

END OF SECTION 26 05 29

SECTION 26 05 33 – RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Section 26 05 19, “Low-Voltage Electrical Power Conductors and Cables.”

B. Section 26 05 29, “Hangers and Supports for Electrical Systems.”

C. Section 26 05 43, “Underground Ducts and Raceways for Electrical Systems.”

D. Section 26 27 00, “Low-Voltage Distribution Equipment.”

E. Division 27, “Communications.”

F. Division 28, “Electronic Safety and Security.”

1.2 DESCRIPTION

A. Provide the following raceways and boxes in order to complete all Electrical Work.
   1. Metal conduits, tubing, and fittings:
      a. Rigid metal conduit (RMC).
      b. Intermediate metal conduit (IMC).
      c. Electrical metal tubing (EMT).
   2. Non-metal conduits, tubing, and fittings:
      a. Rigid non-metal conduit: Polyvinyl chloride (PVC) conduit.
   3. Flexible conduits, tubing, and fittings:
      a. Liquid-tight flexible metal conduit (LFMC).
      b. Flexible metal conduit (FMC).
   4. Boxes:
      a. Outlet boxes.
      b. Device boxes.
      c. Pull boxes.
      d. Outdoor pull boxes.
      e. Junction boxes.
      f. Cast-metal access boxes.
   5. Technology boxes.
   6. Life Safety boxes.
   7. Security boxes.

B. Refer to Section 26 05 43 for underground service conduits.

1.3 QUALITY ASSURANCE

A. Standards:
   1. American Society for Testing and Materials (ASTM) D3485, “Standard Specification for Coilable High Density Polyethylene (HDPE) Cable in Conduit (CIC).”
   2. American National Standards Institute (ANSI):
      a. ANSI C80.1, “Electric Rigid Steel Conduit.”
      b. ANSI C80.3, “Electrical Metallic Tubing (EMT).”
      c. ANSI C80.5, “Electrical Rigid Aluminum Conduit.”
      d. ANSI C80.6, “Intermediate Metal Conduit (IMC).”
   3. National Electrical Contractors Association (NECA):
      a. NECA 1-2015, “Standard for Good Workmanship in Electrical Construction.”
      b. NECA 101-2013, “Standard for Installing Steel Conduits (RMC, IMC, EMT).”

c. NECA 102-2004, "Standard for Installing Aluminum Rigid Metal Conduit."

4. National Electrical Manufacturers Association (NEMA):
   a. NEMA FB 1-2014, "Fittings, Cast Metal Boxes and Conduit Bodies for Conduit, Electrical Metallic Tubing (EMT) and Cable."
   b. NEMA FB 2.20-2014, "Selection and Installation Guidelines for Fittings for Use with Flexible Electrical Conduit and Cable."
   c. NEMA OS 1-2013, "Sheet-Steel Outlet Boxes, Device Boxes, Covers and Box Supports."
   d. NEMA OS 2-2013, "Nonmetallic Outlet Boxes, Device Boxes, Covers and Box Supports."
   e. NEMA TC 2-2013, "Electrical Polyvinyl Chloride (PVC) Tubing and Conduit."
   f. NEMA TC 3-2016, "Polyvinyl Chloride (PVC) Fittings for Use with Rigid PVC Conduit and Tubing."
   g. NEMA TC 13-2014, "Electrical Nonmetallic Tubing (ENT)."
   h. NEMA 250-2018, "Enclosures for Electrical Equipment (1,000 Volts Maximum)."
5. National Fire Protection Association (NFPA): 2023 NFPA 70, "National Electrical Code® (NEC)," Articles 250, 314, and 501.15.
6. Underwriters Laboratories, Inc., (UL):
   a. UL 1, "Standard for Flexible Metal Conduit."
   b. UL 5, "Standard for Surface Metal Raceways and Fittings."
   c. UL 5A, "Non-Metallic Surface Raceways and Fittings."
   d. UL 6, "Electrical Rigid Metal Conduit (RMC) — Steel."
   e. UL 6A, "Electrical Rigid Metal Conduit (RMC) — Aluminum, Bronze, and Stainless Steel."
   f. UL 94, "Standard for Safety of Flammability of Plastic Materials for Parts in Devices and Appliances."
   g. UL 360, "Standard for Liquid-Tight Flexible Metal Conduit (LFMC)."
   h. UL 514A, "Standard for Metallic Outlet Boxes."
   i. UL 514B, "Standard for Fittings for Cable and Conduit."
   j. UL 514C, "Standard for Nonmetallic Outlet Boxes, Flush-Device Boxes, and Covers."
   k. UL 651, "Standard for Schedule 40, 80, Type EB and A Rigid PVC Conduit and Fittings."
   l. UL 651A, "Schedule 40 and 80 High Density Polyethylene (HDPE) Conduit."
   m. UL 797, "Standard for Safety Electrical Metallic Tubing (EMT) – Steel."
   n. UL 870, "Standard for Wireways, Auxiliary Gutters, and Associated Fittings."
   o. UL 1242, "Standard for Electrical Intermediate Metal Conduit (IMC) – Steel."
   p. UL 1653, "Standard for Electrical Nonmetallic Tubing (ENT)."
   q. UL 1660, "Standard for Liquid-Tight Flexible Nonmetallic Conduit (LFNC)."
   r. UL 1773, "Standard for Termination Boxes."
7. 40 Code of Federal Regulations (CFR) 59, Subpart D (EPA Method 24).

PART 2 - PRODUCTS

2.1 METAL CONDUITS, TUBING, AND FITTINGS

A. RMC: Thick-walled threaded coated steel, or tubing.
   1. Acceptable Manufacturers: Republic Conduit, Allied, Steel Duct, Shamrock Steel, Omega, Western Tube, Nucor Tubular Products, or Wheatland.

2. Fittings for RMC: Comply with NEMA FB 1 and UL 514B. Malleable iron bodies, threaded for heavy-wall conduit, with cadmium finish and cadmium-plated sheet-steel covers.
   a. Acceptable Manufacturer: American Fittings Inc., Arlington Industries, Bridgeport, O-Z Gedney, Thomas & Betts, or Garvin Industries.
   b. Provide neoprene cover gaskets for conduit body covers exposed to the weather.
      1) Acceptable Manufacturer: American Fittings Inc., Arlington Industries, Bridgeport, O-Z Gedney, Thomas & Betts, or Garvin Industries.
   c. Expansion fittings for RMC: Comply with UL 651. Steel or PVC to match conduit type, rated for environmental conditions where installed, and including flexible external bonding jumper.
      1) Acceptable Manufacturers: O-Z Gedney Type "AX," "DX," or "TX"; Thomas & Betts; Kraloy; Crouse-Hinds, or Roxtec.
   d. Conduit fittings for RMC for hazardous (classified) locations: Comply with NFPA 70.

B. IMC: Comply with ANSI C80.6 and UL 1242. Steel tubing.
   1. Acceptable Manufacturers: Republic Conduit, Allied, Steel Duct, Shamrock Steel, Omega, Western Tube, or Wheatland.
   1. Fittings for IMC: Threaded.
   2. Expansion fittings for IMC:
      a. Acceptable Manufacturers: O-Z Gedney Type "AX," "DX," or "TX"; Thomas & Betts; Kraloy; Crouse-Hinds, or Roxtec.

C. EMT: Comply with ANSI C80.3 and UL 797. Coated steel.
   1. Acceptable Manufacturers: Republic Conduit, Allied, Steel Duct, Shamrock Steel, Omega, Western Tube, or Wheatland.
   1. Fittings for EMT: Comply with NEMA FB 1 and UL 514B. Steel or die-cast. Set-screw or compression type.

2.2 NON-METAL CONDUITS, TUBING, AND FITTINGS

A. PVC Conduit: Type EPC-40-PVC. UL-listed Schedule 40. Non-metal unthreaded smooth-walled tubing. Comply with NEMA TC 2 and UL 651, unless otherwise indicated.
   1. Acceptable Manufacturers: Allied, Carlon, Prime Conduit, Heritage Plastics, Dura-Line, Southern Pipe, Teddico, IPEX, Cantex, or National Pipe.
   2. Fittings for PVC: Comply with NEMA TC 3; match to conduit or tubing type and material.
   3. Expansion fittings for PVC:
      a. Acceptable Manufacturers: Kraloy Type "EJ," O-Z Gedney, Thomas & Betts, Allied, Carlon, Heritage Plastics, IPEX, or Conduit Manufacturer.

2.3 FLEXIBLE CONDUITS, TUBING, AND FITTINGS

A. LFMC: Comply with UL 360. Flexible steel conduit with PVC jacket.
   1. Acceptable Manufacturers: AFC Cable Systems, International Metal Hose, McMaster-Carr, Electri-Flex Liquatite, or Southwire.
   2. Fittings for LFMC.
      a. Acceptable Manufacturers: AFC Cable Systems, Appleton, Arlington Industries, Bridgeport, O-Z Gedney, Crouse-Hinds, or Thomas & Betts.

B. FMC: Comply with UL 1. Flexible steel conduit.
   1. Acceptable Manufacturers: Adaptaflex, Electri-Flex, Southwire, or McMaster Carr.
   2. Fittings for FMC:

a. Acceptable Manufacturers: Thomas & Betts, Steel City, Bridgeport, Southwire, or McMaster Carr.

2.4 WIREWAYS

A. Metal Wireways: Comply with UL 870 and NEMA 250. Rigid, heavy-gauge, steel wireways with hinged covers and baked enamel finish.
1. Wireway covers: Flanged-and-gasketed type.
2. Acceptable Manufacturers: Square D, Wiegmann, NIEDAX, Hammond, or Hoffman.

B. Non-Metal Wireways:
1. Fiberglass polyester: Extruded and fabricated to required size and shape, without holes or knockouts.
a. Cover: Gasketed with oil-resistant gasket material and fastened with captive screws treated for corrosion resistance.
b. Connections: Flanged, stainless-steel screws and oil-resistant gaskets.
2. PVC: Extruded and fabricated to required size and shape, snap-on cover, mechanically coupled connections, and plastic fasteners.
3. Fittings and accessories: Couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings as needed for a complete system.
4. Solvent cements and adhesive primers: VOC content of 510 and 550 g/L or less, respectively, when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.5 SURFACE-MOUNTED RACEWAYS

A. Acceptable Manufacturers: Wiremold or approved equal by Panduit, Hubbell, MonoSystems, or McMaster-Carr.

B. Metal Raceways:
1. Comply with UL 5. Galvanized steel with snap-on covers. Complete with boxes, fittings, elbows, terminations, dividers, and all mounting hardware.
2. Single compartment raceway system:
a. Acceptable Manufacturers: Wiremold 500/700 or approved equal by Panduit, Hubbell, MonoSystems, or McMaster Carr.
b. Boxes for wiring devices, fire alarm devices, and technology outlets as shown on the Drawings. Include plates, mounting brackets, and accessories.

C. Non-Metal Raceways:
1. Comply with UL 5A and UL 94 V-0. Rigid PVC. 2-piece or 3-piece construction. Complete with boxes, fittings, elbows, terminations, dividers, and all mounting hardware.
2. 2-compartment raceway system:
a. Acceptable Manufacturers: Wiremold 5400 or approved equal by Hubbell, Panduit, MonoSystems, or McMaster-Carr.
b. In-line device boxes for receptacles, data outlets, and telephone outlets, as shown on the Drawings. Include dividers, plates, mounting brackets, and accessories.
3. 3-compartment raceway system:
a. Panduit “T70.” White finish, in-line device boxes for receptacles, data outlets, television outlets, and telephone outlets, as shown on the Drawings.
b. Hubbell “Base Trak.” 4 in. high x 1-1/2 in. deep, with “office white” finish, (in-line) (raised) device boxes for (duplex) (quadruplex) receptacles, data outlets, and television outlets, and with in-line device boxes for duplex receptacles, as shown on the Drawings.
c. Include dividers, plates, mounting brackets, and accessories.

d. Other Acceptable Manufacturers: Approved equal by MonoSystems or McMaster-Carr.

2.6 BUSHINGS

A. Acceptable Manufacturers: O-Z Gedney, Thomas & Betts, Bridgeport, Arlington Industries, or Appleton.

2.7 SPLIT COUPLING

A. Acceptable Manufacturers: O-Z Gedney Type SP, Thomas & Betts, Bridgeport, or Erickson.

2.8 BOXES

A. Acceptable Manufacturers: Appleton, Raco, Steel City, Pass & Seymour, Thomas & Betts, National Electric, or Crouse-Hinds.

B. Boxes shall be NEMA type approved for the prevailing environmental conditions. Boxes installed in wet locations shall be listed for use in wet locations.

C. Boxes shall be large enough to accommodate the size and number of conduits secured thereto and the size and number of wiring conductors. Refer to 2023 NEC Article 314 for sizing requirements.

D. Gangable boxes are allowed.

E. All fittings, covers, and hardware shall be galvanized steel.

F. Outlet Boxes: Having more than (2) conduits, or when 3/4 in. conduit is used, shall be standard 4 in. square boxes, 1-1/2 in. deep or deeper as might be required to accommodate the wiring contained therein.
   1. Where cast in concrete slabs: Designed for concrete installation.
   2. Metal:
      a. Galvanized pressed steel of standard knockout type. Secure covers with screws.
      b. Sheet metal: Comply with NEMA OS 1 and UL 514A.
      c. Cast-metal: Comply with NEMA FB 1, ferrous alloy, Type FD, with gasketed cover.
      d. Aluminum boxes: May be used only with aluminum conduit.
   3. Luminaire: Standard 4 in. octagonal, 1-1/2 in. minimum deep boxes with 3/8 in. luminaire-mounting stud.
      a. Nonadjustable, designed for attachment of luminaire weighing 50 lbs.
      b. Designed for attachment of luminaires weighing more than 50 lbs.: Listed and marked for the maximum allowable weight.

G. Device Boxes:
   1. Metal:
      a. Sheet metal: Comply with NEMA OS 1 and UL 514A.
      b. Cast-metal: Comply with NEMA FB 1, ferrous alloy or aluminum, Type FD, with gasketed cover.
   2. Non-metal: Comply with NEMA OS 2 and UL 514C.
   3. Flush in masonry walls: Masonry boxes designed for the purpose, or 4 in. square boxes with raised covers designed for masonry.
   4. Flush in gypsum walls: 4 in. square, 2-1/8 in. deep boxes or gangable 2-1/2 in. deep boxes.
   5. For use only in walls too thin for standard depth boxes: Shallow 1-1/2 in. deep gangable boxes.
   6. For surface conduit work / located in potentially damp areas: FSY cast-device boxes.

7. Exterior exposed boxes: Weather-resistant or airtight with gaskets.

H. Pull Boxes:
1. Small sheet metal: NEMA OS 1.
2. Cast-metal: Comply with NEMA FB 1 and UL 1773. Galvanized cast iron with gasketed cover.

I. Outdoor Pull Boxes: Provide grade-mounted, precast polymer concrete, open bottom, heavy-duty gasketed covers, secured with hex-head stainless-steel bolts, tamper-resistance Penta-Head stainless steel bolts, Tier 15 suitable for occasional non-deliberate heavy vehicular traffic application, with logo. Size as needed.
1. **Exception:** Pull boxes installed in graveled areas, asphalt or concrete pavement shall be Tier 22.
2. Acceptable Manufacturers: Quazite or approved equal by Net-Tech, Maclean Highline, GlasMasters, Jensen Precast, or Oldcastle/Synertech.

J. Junction Boxes:
1. Small sheet metal: NEMA OS 1.
2. Cast-metal: Comply with NEMA FB 1 and UL 1773. Galvanized cast iron with gasketed cover.

K. Cast-Metal Access Boxes: Comply with NEMA FB 1 and UL 1773. Galvanized cast iron with gasketed cover.

L. Technology Interior Device Boxes: Refer to Division 27.
1. Flush in masonry walls: Masonry boxes designed for the purpose. 3-25/32 in. square, 3-1/2 in. deep.
2. Flush in gypsum walls: 4-11/16 in. square, 3-1/2 in. deep, with either single-gang or 2-gang plaster rings, as specified on the Technology Drawings.

M. Life Safety Device Boxes: Refer to Division 28.
1. Fire alarm device boxes: Provide boxes as recommended by the Fire Alarm System Manufacturer.

N. Video Surveillance System Boxes: Refer to Division 28.

O. Box extensions used to accommodate new building finishes shall be of same material as recessed box.

PART 3 - EXECUTION

3.1 INSTALLATION — RACEWAYS AND CONDUITS (GENERAL)

A. Comply with NECA 1 and NECA 101 for installation requirements except where requirements on Drawings or in this Section are stricter.

B. Comply with the Manufacturer's written instructions for installation of raceways and conduits.

C. Ground the conduit system at the service entrance.

D. Make the conduit system mechanically tight and electrically continuous throughout.

E. Conduit Sizes: Minimum conduit size, unless otherwise indicated:
1. Control-voltage and low-voltage wiring only: 1/2 in.
2. Line-voltage wiring: 3/4 in.
3. Technology wiring: 1 in., unless otherwise indicated in Division 27.
4. Fire alarm wiring: 1/2 in.

5. Below concrete slab or underground: 1 in. minimum.

F. Conduit Fittings:
1. All materials in raceway system shall be compatible.
2. Do not use aluminum fittings with steel conduit.
3. Expansion fittings:
   a. Provide where conduits emerge and rise up from below grade to riser conduits.
   b. Install expansion fittings with grounding continuity at all locations where conduits cross existing building or structure expansion joints.

G. Conduit Ends:
1. Square cut, ream, and file all conduit ends. Cut at least (5) threads and draw up tight.
2. Install insulated bushings and throat fittings on all conduit ends.
   a. Bushings smaller than 1-1/2 in.: Use all-metal with formed radius to prevent insulation damage.
   b. Bushings 1-1/2 in. and larger: Use insulating type constructed of metal insert and bakelite plastic, molded to the metal insert.

H. Before Pulling Conductors:
1. All conduits shall be continuous from outlet to outlet and shall be installed complete.
2. Swab conduits free of all dirt, grease, and moisture.

I. Enclose all conductors in a continuous, grounded, steel conduit or raceway, unless otherwise noted.

J. Conduit Runs:
1. Lay out conduit system to avoid crossing existing building expansion joints insofar as possible.
2. Install all conduits perpendicular to walls and parallel to floors and ceilings.

K. Line-Voltage Power and Fire Alarm Wiring: Run in separate raceways.
1. **Option:** Contractor may use red conduit for fire alarm wiring.

L. Conduit Support: Comply with requirements in Section 26 05 29 for hangers and supports.
1. Adequately support conduit from substantial structural elements of the building, such as beams, joists, purlins, and columns, using suitable straps, clamps, and hangers.
2. Conduit shall neither rest on, nor be supported from, piping, ductwork, or suspended ceilings.
3. Support conduit within 12 in. of changes in direction and within 12 in. of enclosures to which attached.
4. Secure conduits every 10 ft. and within 3 ft. of every bend, box, fitting, or coupling.

M. **DO NOT RUN CONDUIT EXPOSED ACROSS FLOORS.**

N. **CONCEAL ALL CONDUITS BY RUNNING IN CORE OF BLOCK WALLS, AND IN STUD WALLS AND CHASES, OR BY ROUTING OVER A LONGER DISTANCE.**

O. **EXPOSED CONDUIT WILL BE PERMITTED ONLY IN ELECTRIC AND MECHANICAL ROOMS AND OVERHEAD IN AREAS WITHOUT DROPPED CEILINGS.**

P. Bends:
1. Do not use field-fabricated bends containing indentations or elliptical cross-sections.
2. All conduit bends shall be done with an approved bending device.
3. Provide pull boxes:
   a. At 100 ft. on center if conductors are pulled further than 100 ft.

b. Where more than (2) 90-degree bends are required.

4. Do **NOT** provide more than (3) 90-degree bends in any conduit run.

Q. Do **NOT** use running threads for threaded conduit fittings and ends, either concealed or exposed.

R. Empty Conduits:
1. Install and identify nylon pull line or #16 galvanized iron wire in all empty conduits.
2. Clean and cap all empty conduits.

3.2 INSTALLATION — METAL CONDUITS, TUBING, AND FITTINGS

A. Use RMC, IMC, or EMT galvanized steel.
1. **Exception:** Conduit exposed on the building outside shall be painted RMC steel.

B. Threaded RMC or IMC is required for conduit installed as follows:
1. 2-1/2 in. or larger.
2. Exposed to physical damage.
3. Exposed within 8 ft. of finished floor.

C. EMT: Steel thin-wall EMT up through 2 in. diameter may be used elsewhere in interior construction, where RMC or IMC is not otherwise required.
1. Use set screw or compression-type fittings with insulated throats for steel thin-wall EMT.
2. Conceal EMT within finished walls, ceilings, and floors, unless otherwise indicated.

D. Threaded Conduits: Secure all threaded conduits entering panelboards, pull boxes, or outlet boxes by galvanized locknuts (inside and outside) and insulated bushings.

3.3 INSTALLATION — FLEXIBLE CONDUITS, TUBING, AND FITTINGS

A. Comply with NEMA FB 2.20. Use only fittings listed for use with flexible conduit.

B. LFMC:
1. Provide for the following:
a. From motor disconnect switch to motor.
b. Damper and valve motor operators and associated conduit or junction box.
c. Miscellaneous pilot devices and their associated conduit or junction box, including:
1) Sprinkler waterflow switches.
2. Use LFMC in damp or wet locations.
3. May use in short lengths to provide some vibration isolation.
4. May use 1/2 in. (5 ft. maximum) to match equipment hubs on items where it is impractical to use 3/4 in. fittings, such as motors, damper operators, limit switches, and similar controls.
5. Install a wired equipment grounding conductor with appropriate terminations in all LFMC.
a. Size grounding wire in accordance with 2023 NEC Article 250.
1) **Exception:** 12 AWG copper wire shall be the smallest size ground wire permitted.
b. Drill and tap a hole in motor pigtail box and other enclosures if a suitable ground lug attachment means is not provided.
c. Do **NOT** use spring steel box grounding clips as attachments.

6. Steel LFMC:
   a. Make final connections to motors and equipment subject to vibration or moisture with 3/4 in. steel LFMC, 18 in. to 24 in. long, with PVC jacket, and containing copper phase and ground conductors.

C. FMC: Securely fasten in place within 12 in. of each box, cabinet, conduit body or other conduit termination and shall be supported and secured at intervals not to exceed 4 ft.-6 in.

3.4 INSTALLATION — WIREWAYS

A. Metal wireways:
   1. Each wireway shall be NEMA type approved for the environmental conditions in which it is installed.
   2. Provide all necessary blank sections, fittings, tees, elbows, junction boxes, adapters, and hangers.
   3. Space surface wireway supports not more than 5 ft.-0 in. on center. Use closer support spacing if loading so requires.

3.5 INSTALLATION — SURFACE-MOUNTED RACEWAYS

A. In finished areas where conduits absolutely cannot be concealed, neatly install surface-mounted raceways and fittings.

B. **COORDINATE EACH LOCATION WITH, AND OBTAIN SPECIFIC PRIOR APPROVAL OF, THE A/E BEFORE PROCEEDING.**

C. Surface-Mounted Non-Metal Raceways: Use for temperature control and Category 5e data wiring.

3.6 INSTALLATION — BOXES

A. Provide boxes for the following:
   1. Devices.
   2. Luminaires.
   3. Motors and equipment connections.
   4. System equipment connections.

B. Rigidly support all boxes from building structure independent of the conduit supports.

C. Screw boxes to studs.

D. Do **NOT** use hurricane/earthquake clips (sometimes referred to as “caddy” clips).

E. Boxes cast into masonry are considered to be rigidly supported.

F. Outlet Boxes, Flush:
   1. Boxes shall finish within 1/4 in. of surface of non-combustible materials.
   2. Boxes shall not project beyond finished surfaces.
   3. Do not install flush outlet boxes in walls back-to-back. Offset for sound isolation.

G. Device Boxes, Flush:
   1. Boxes shall finish within 1/4 in. of surface of non-combustible materials.
   2. Boxes shall not project beyond finished surfaces.
   3. Do not install flush device boxes in walls back-to-back. Offset for sound isolation.

H. Pull Boxes: Attach to element of building structure

I. Outdoor Pull Boxes:
   1. Set outdoor pull boxes with adequate bedding, and properly supported in accordance with the Manufacturer’s recommendations.

2. Set open bottom boxes over a 6 in. gravel bed.
3. Install grade-mounted weatherproof pullboxes where length of conduit run is excessive (200 ft. maximum).

J. Junction Boxes:
1. Flush-mounted luminaires in drywall ceilings shall have branch circuit conduit terminated in a junction box above ceiling, but accessible through ceiling opening, and located at most 1 ft. away from the luminaire.
2. Connections between recessed luminaires and junction boxes may be installed using 1/2 in. steel “whips” (armored cable with connector) not over 72 in. long.
3. Pre-wired luminaires may have the branch circuit conduit terminate in the luminaire junction box, provided the box is sized sufficient for the wire and UL-labeled for 75 degrees C. wire.

K. Cast-Metal Access Boxes:
1. Attach to elements of building structure.

L. Technology Interior Device Wall Boxes: Install as shown on the Division 27 Drawings.

M. Life Safety Device Boxes: Install as recommended by the Fire Alarm System Manufacturer.

N. Video Surveillance System Device Boxes: Install as shown on the Division 28 Drawings recommended by the System Manufacturer.

O. Locate boxes so that cover or plate does not span different building finishes.

END OF SECTION 26 05 33

SECTION 26 05 43 – UNDERGROUND DUCTS AND RACEWAYS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Section 01 21 00, “Allowances.”

B. Section 26 05 00.35, “Special Procedures for Electrical.”

C. Section 26 05 00.45, “Testing and Inspecting Services for Electrical.”

D. Section 26 05 00.73, “Execution of Electrical.”

E. Section 26 05 19, “Low-Voltage Electrical Power Conductors and Cables.”

F. Section 26 05 29, “Hangers and Supports for Electrical Systems.”

G. Section 26 05 33, “Raceway and Boxes for Electrical Systems.”

H. Section 27 05 43, “Underground Ducts and Raceways for Communications Systems.”

1.2 DESCRIPTION

A. Provide:
1. Excavation and backfill.
2. Secondary electrical service feeders. Refer to Section 26 05 19.
3. Underground ducts and raceways for underground electrical service through Ohio Edison (First Energy Company).
4. Underground service conduits.
5. Underground conduit seals.
6. Underground service warning tape.
7. Non-service feeders and branch circuits.
8. Current transformer cabinets.
9. Outdoor pull boxes. Refer to Section 26 05 33.

1.3 COST OF UTILITY SERVICES

The Owner is responsible for paying the Power Company for the cost of electrical service for this facility.

1.4 QUALITY ASSURANCE

A. Standards:
1. American National Standards Institute (ANSI).
2. Associated General Contractors of America (AGCA) “Manual of Accident Prevention in Construction”.
3. Institute of Electrical and Electronic Engineers (IEEE).
4. Insulated Cable Engineers Association, Inc. (ICEA).
5. Insulated Power Cable Engineers Association (IPCEA).
6. National Electrical Manufacturers Association (NEMA).
7. National Fire Protection Association (NFPA): 2023 NFPA 70, “National Electrical Code® (NEC)”.
8. Occupational Safety and Health Administration (OSHA) requirements.
9. Underwriters Laboratories, Inc. (UL).
10. State Department of Transportation (DOT) construction specifications.
11. State and Local requirements.

PART 2 - PRODUCTS

2.1 BACKFILL

A. Typical backfill conditions where bedding is not specified or required by Code: Previously excavated material.

B. Materials:
1. Crushed stone (DOT Item 304).
2. Pea gravel: 1/8 in. minimum to 3/4 in. maximum diameter.
3. Sand: Clean, dry, coarse or medium.
4. Washed gravel: 3/4 in. size.

C. Materials Prohibited from Being Used for Backfill:
1. Material containing large rocks (over 2 in.), building materials, masonry debris, cinders, rubbish, wood, or other material subject to decay.
2. Any material which may cause damage to cabling, conduit, or duct banks.
3. Frozen earth.

2.2 UNDERGROUND SERVICE CONDUITS

A. Schedule 80 PVC with sweeping no burn-through fiberglass elbows.
1. Acceptable Schedule 40 PVC Conduit Manufacturers: Allied, Carlon, Dura-Line, National Pipe, Charlotte Pipe, Scepter, IPEX, Cantex, or Heritage Plastics.
2. Acceptable Schedule 80 PVC Conduit Manufacturers: Dura-Line, Charlotte Pipe, National Pipe, Scepter, Cantex, or Heritage Plastics.
3. Acceptable Fiberglass Elbow Manufacturers: Champion, United Fiberglass of America, or Atkore.

2.3 UNDERGROUND CONDUIT SEALS

A. Acceptable Manufacturers: Raychem or approved equal by Searik or Pawling Engineered Products.

B. Raychem “RDSS.” Furnish watertight inflatable plastic duct-sealing system, 20-year guarantee.

2.4 UNDERGROUND SERVICE WARNING TAPE

A. Acceptable Manufacturers: Seton or approved equal by Brady, Ideal, Scotch/3M, or Emedco.

B. Seton. 6 in. wide metallic underground warning/detection tape detectable with metal detector. Furnish as follows:
1. Buried electric line below: Red.

C.

2.5 CURRENT TRANSFORMER CABINETS

A. Acceptable Manufacturers: Unity Manufacturing Co., Brooks Utility Products, The Durham Company, B-Line, Hoffman, Carlon, Lake Shore Electric, Austin Enclosures, Milbank, or Wiegmann.

B. UL-labeled, 42 in. wide x 60 in. high x 20 in. deep gray steel, NEMA Type 3R, with hinged doors. Sealing shall be provided by minimum stainless-steel latch and rivet with provision for 3/8 in. padlock and/or ribbon seal. The inside back of the enclosure shall be entirely covered by 3/4 in. treated plywood. A grounding lug shall be provided to ground enclosure.

PART 3 - EXECUTION

3.1 UNDERGROUND CONDUIT

A. Contractor shall excavate and backfill for its own work.

B. Contractor shall be responsible for any other repairing of excavated areas.

C. Coordinate with the Lead Contractor.

3.2 EXCAVATION AND BACKFILL

A. Existing Soil Conditions:
   1. Bidders are strongly urged to visit the site and investigate existing soil conditions themselves.
   2. Rock excavation is not anticipated. Contractor will be entitled to additional compensation for excavating any rock that is not indicated on the Contract Drawings.
      a. Rock excavation is defined as the excavation of any buried boulders and rock, in excess of 1/2 cu. yd. in volume, which requires systematic drilling with jackhammer or use of other special equipment.
      b. If rock or boulders are encountered, immediately stop all excavation. Notify the A/E, and submit a cost per cubic yard, over and above Base Bid, for excavation and backfill of rock areas.
      c. All other excavation, including soft shale and similar sedimentary soil formations, shall be regarded as "earth" excavation, and shall be included in the Contractor's Bid.
      d. Do not proceed with rock excavation without prior written authorization of the A/E.
      e. **DO NOT USE EXPLOSIVES.**
   3. If available, refer to Soils Report.
   4. Whenever, in the opinion of the A/E, the soil is unsuitable for supporting feeders, conduit, or conductors, provide proper foundation after receiving written approval of the A/E. The Contract price will be adjusted accordingly.

B. Obtain approval from the A/E for bearing conditions.

C. Existing Underground Utilities:
   1. Contact the Ohio Utilities Protection Service (800-362-2764) well in advance of the start of any excavation to determine if any of the Utility Companies have underground utilities in, or near, the project area.
   2. Contact the Owner and the Local Water and Sewer Department, Gas Company, Electric Company, Telephone Company, etc., regarding the possibility of encountering existing utilities. Maintain the integrity of all existing utilities.
   3. Locate and identify existing underground utilities, if any, in the areas of new Work. If utilities are to remain in place, provide adequate means of protection during earthwork operations. Should uncharted, or incorrectly charted, piping or other utilities be encountered during excavation, notify the A/E immediately for instructions before proceeding. Cooperate with other Contractors, Utility Companies, and the Owner in keeping services and the facilities in operation.
   4. Protect existing utilities encountered during excavation work in a manner acceptable to the Owner of the Utility. Excavation damage to, or interruption of service of, any underground utility shall be a liability of the Contractor, whether or not plotted on the Drawings. Contractor shall promptly repair or replace, at its expense, all damage to any existing utility to the full satisfaction of the Utility Company, the Owner of the Utility, and the A/E.

5. All existing utility service conduits, wiring, etc., which are uncovered, whether within or beyond the property lines, shall be suitably supported, protected, and maintained in operation, and shall be protected against settlement when excavations are refilled.

D. Coordinate timing of excavations in advance with other Contractors, the A/E, and the Owner, where required by AHJ, or where otherwise specified herein.

E. Excavations shall be open-cut from the surface. No undercuts will be permitted, except where specifically directed by the A/E.

F. Remove surplus and/or unsuitable-for-fill excavated material from the site. Deposit any usable excavated material where directed by the A/E.

G. Excavation Safety:
1. **ALL EXCAVATION WORK SHALL COMPLY WITH REQUIREMENTS OF THE LATEST OSHA STANDARDS.**
2. Excavation and trench wall supporting, shoring, sloping, cribbing, stepping of excavations, and other steps required for safety shall be in strict accordance with OSHA and Local Code requirements.
3. Slope sides of excavations to comply with requirements of OSHA and AHJ. Shore and brace where sloping is not possible because of space restrictions or instability of material exposed.
4. Maintain sides and slope of all excavations in a safe condition, until completion of backfilling.
5. Provide materials for shoring and bracing, such as sheet piling or sheathing, uprights, stringers, and cross-braces, in good serviceable condition, to safely support walls of the excavation. Maintain shoring and bracing in excavations regardless of time period excavations will be open. Carry down shoring and bracing as excavation progresses.
6. Barricade open excavations occurring as part of this Work, and post with warning lights. Erect warning lights in accordance with OSHA and AHJ requirements. Consult with the A/E regarding additional requirements.
7. Maintain in place adequate barricades, guards, planking, plating, signage, warning lights, etc., at and around excavations. Maintain in a safe condition until backfilling is completed.
8. Install steel cover plates, safety barricades, and coverings for holes in walks, pavements, streets, or grassy areas.
9. Protect existing structures that are to remain, such as utilities, sidewalks, pavements, and other facilities, from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations.
10. Refer to AGCA's "Manual of Accident Prevention in Construction" and to the safety regulations of the appropriate State Agency.
11. Refer to Section 26 05 00.35 for additional safety requirements.

H. Maintain at least 5 ft. clearance from underground gas line, where running parallel. Provide at least 12 in. clearance where crossing.

I. Provide and operate pumping equipment to keep excavation free of water at all times.

J. Protect excavations from frost by covering and heating.

K. Trenches:
1. Coordinate the use of a joint trench with all Utility Companies sharing the trench.
2. Do not excavate utility trenches closer than 5 ft. parallel to building or column footings, except with prior written approval of the A/E. When parallel trenches deeper than the building footings are required, the horizontal distance from the footing shall be equal

to, or greater than, 1-1/2 times the vertical distance below the footing, but in no case shall the horizontal distance be less than 5 ft., except with the written approval of the A/E.

3. Coordinate routing of underground lines with the A/E to minimize disruption and damage to existing walks, and drives.
4. Contractor may, with approval of the A/E, directionally bore conduits to avoid mature trees. Coordinate route of conduits with trees; obtain A/E approval prior to start of work.
5. Mark trench location. Hold trench width to a minimum. Cover as soon as possible.
6. Minimize time trenches are kept open. Fill as soon as possible.
7. Burial of electrical cable, conduit, duct, or conductors:
   a. Trenches shall be of sufficient depth, such that the top of the highest duct is not less than 24 in. below finished grade, or greater, if required by Code, specified elsewhere in these Specifications, or shown on the Drawings.
   b. Trench bottoms shall accommodate the conductors, conduit, or duct bank and shall be at least 6 in. wide.

L. Refer to Section 26 05 00.73 for cutting and patching responsibilities.

M. Backfilling:
1. The bedding and backfill requirements listed in this Section represent a minimum requirement. If State or Local requirements are in excess of listed requirements, such requirements shall supersede.
   a. Reference datum: All dimensions or elevations are relative to finished grade (not existing grade).
2. **ALL BACKFILL WORK SHALL COMPLY WITH REQUIREMENTS OF THE LATEST OSHA STANDARDS.**
3. Deposit fill in layers of thickness required by the nature of the soil, or as directed, but not exceeding 6 in. compacted thickness, to a point 24 in. above conduit, and 12 in. thickness above this point. Compact each layer to a uniform solid mass. Place fill in horizontal layers, beginning with lowest areas and building up until entire area to be filled is at a uniform elevation. Compaction shall be a minimum of 90 lbs. per cu. ft., laboratory dry weight.
4. Do not place fill material on frozen ground, or use fill in a frozen condition.
5. Backfill only when exact locations of lines and equipment have been recorded, and all tests and inspections have been completed.
6. Control moisture content of compacted fill to ensure maximum density by adding water and working soil prior to compacting.
7. Use machine tampers around perimeter of foundation walls or areas inaccessible to large equipment and rollers. Do not use rolling equipment in areas adjacent to foundations.
8. Provide clay bulkheads, minimum 3 ft. long, across the trench at 100 ft. intervals to impede the natural movement of ground water. Top of bulkheads shall extend 6 in. above top of conduit.
9. Backfill to finish grade or to levels suitable for finish grading.
10. Provide finish grading.
11. Where excavations have not been properly filled or where settlement occurs, refill, compact, smooth off, and finish excavations to a final condition acceptable to the Owner and A/E.
12. Install underground warning tapes 12 in. (minimum) above underground installation, except for coilable HDPE conduit, to identify all the underground Electrical Work.
13. Mark location of trenches, wiring, and conduit on As-Built Drawings.

14. (11) months after Contract Completion, review the excavated areas and add any backfill required due to settling, etc. Re-seed or re-sod as needed.
15. Provide seed grass cover to reestablish landscape to previous condition where disturbed by Electrical Work. This includes replacement of existing grass.
16. Repair and restore sodded areas, paving, and walks. Match existing items in the area where excavations are made.

3.3 INSTALLATION — UNDERGROUND ELECTRICAL SERVICE

	Electrical Contractor	**Lead Contractor**	**Power Company**
Primary cables			Provide
Secondary electrical service feeders & Schedule 40 PVC conduits	Provide		
Secondary lug connectors	Furnish		Install
Meter			Provide
Meter wiring			Provide
Meter base	Install		Furnish
Current transformers			Provide
Current transformer cabinet	Provide		
Ground rods	Provide	Provide	
Trenching & backfill for primary & secondary electrical service	Provide		

A. Coordinate and install work in accordance with the requirements of Local Utility Companies and the specific standards of the Power Company.

B. Install underground electrical systems, wiring, and conduit as shown on the Drawings.

C. Install the meter base on building.

D. Current Transformer Cabinet: Install on exterior of building. Provide 1-1/2 in. conduit from current transformer cabinet to meter base.

E. Top of primary or secondary electrical service conduit envelopes shall have a minimum of 36 in. earth cover to finished grade except as is necessary for utility crossings.

F. **WITHOUT EXCEPTION, ELECTRICAL SERVICE CONDUITS SHALL CROSS <u>BELOW</u> GAS LINES WITH 12 IN. MINIMUM CLEARANCE.**

G. Secondary Electrical Service Feeders and Schedule 40 PVC Conduits: Refer to the Drawings and Section 26 05 19.

H. Provide 7-1/2 in. center-to-center spacing between conduits enclosing secondary feeders.

I. Provide a 200-lb. test pull line in all empty conduits.

J. Seal around all cables, conduits, and sleeves that enter the building below grade. Make openings absolutely watertight.

3.4 PAVING

A. Repave all areas affected by electrical construction work. Paving shall either match existing pavement or comply with the requirements listed below.

B. Preparation:
   1. Proof-roll the sub-grade. Roll and compact to obtain an acceptable, firm, even sub-grade surface. Fill and consolidate dented or depressed areas. Remove incompatible material, replace with clean fill, and compact solidly.
   2. Coordinate junction of new and existing pavement. Meet existing surface levels and maintain drainage slopes.

C. Installation:
   1. Cut and patch pavement. 4" ODOT Item 4481, Type II.

D. Final Sealing:
   1. Prior to sealing, thoroughly clean and sweep area. Block all traffic to areas to be sealed. Provide striping as shown on the Drawings. Maintain barriers until sealing and striping is complete.
   2. Apply (2) coats of sealer to all asphalt surfaces (30) days after paving installation.

END OF SECTION 26 05 43

SECTION 26 05 00.31 – PROJECT COORDINATION FOR ELECTRICAL

PART 1 - GENERAL

1.1 DESCRIPTION

A. Electrical Contractor shall provide electrical work associated with equipment being provided by other Trades.

B. Each Trade Contractor shall coordinate all wiring requirements for its Work with the Electrical Contractor.

C. Electrical Contractor shall provide power wiring, rough-in, and final connection, for each piece of equipment requiring power.

D. Alternative Manufacturer Electrical Requirements: Contractor furnishing the equipment shall compensate the Electrical Contractor for the cost of any additional labor and materials required to wire and hook up equipment other than the Design Base Model and Manufacturer.

E. All electrical equipment shall be UL-listed and furnished in accordance with Division 26, "Electrical," requirements.

1.2 QUALITY ASSURANCE

A. Standards:
   1. National Fire Protection Association (NFPA): 2023 NFPA 70, "National Electrical Code® (NEC)."
   2. Underwriters Laboratories, Inc. (UL).

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION

3.1 PREPARATION

A. Consult Drawings that may affect location of equipment, conduit, or wiring, and make minor adjustments in locations to secure coordination.

3.2 INSTALLATION

A. Installation shall comply with NEC and shall be inspected and approved by the AHJ.

B. Each Trade Contractor shall assist in the check-out and start-up operations for its equipment.

C. Each Trade Contractor is responsible for the final operation of all equipment furnished under its Work.

D. Electrical Contractor shall complete the applicable sections of start-up checklists for all equipment provided by all Trades.

E. Each Trade Contractor shall provide the Electrical Contractor with a full detailed set of all required wiring diagrams for equipment furnished under its Contract.

END OF SECTION 26 05 00.31

SECTION 26 05 00.33 – SHOP DRAWING SUBMITTALS FOR ELECTRICAL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Division 01, "General Requirements."

B. Section 26 05 00, "Common Work Results for Electrical."

1.2 DESCRIPTION

A. Submittal dates:
   1. Within (14) calendar days after the Award of Contract, submit complete materials list of all items proposed to be provided on this Project.
   2. Submit shop drawings within (28) days after the Award of Contract.

B. Materials and equipment installed under the Electrical Work shall meet all the requirements of the Contract Documents. Do not order or install materials or equipment until submittals are reviewed by the A/E.

C. Submit shop drawings for the installation of the Electrical Work for review by the A/E before any Electrical Work is installed, enlarged, or extended. Under **NO** circumstances shall any Electrical Work be performed prior to receiving shop drawings reviewed by the A/E.

D. The A/E's review is **ONLY** for conformance with the design concept of the Project and with the Contract Documents.

E. Catalog data for equipment reviewed by the A/E shall not take precedence over the requirements of the Contract Documents. Review by the A/E shall not relieve the Contractor from the responsibility for deviations from Drawings or Specifications, nor from the responsibility for providing proper clearance and coordination with other Contractors.

F. Color Selections: The A/E shall approve all color selections for electrical equipment, including lighting fixtures, lighting controls, switches, receptacles, and cover plates.

1.3 SHOP DRAWINGS

A. Submit shop drawings for each manufactured item of equipment and all components to be used in the Work. Refer to the Shop Drawing Log attached to this Section and to the Sections listed in Section 26 05 00, Article 1.03, for items.

B. Submit shop drawings electronically in Portable Document Format (PDF). Submit number of copies indicated in Division 01. Contractor shall be responsible for making all copies for distribution and file.

C. Include the following information:
   1. Complete original PDF or first-generation scanned PDF copies of the Manufacturer's catalog sheets, brochures, diagrams, schedules, performance charts, illustrations, and other standard descriptive product data.
   2. Brand name.
   3. Catalog number.
   4. Specific performance data.
   5. Material description.
   6. Characteristics.
   7. Ratings.
   8. Capacities.

9. Dimensional data.
10. Material gauge or thickness.
11. Wiring diagrams and control diagrams.
12. Arrangement of component parts, physical dimensions, clearances, materials, service requirements, colors (where required), controls, and accessories.

D. Clearly mark or highlight each shop drawing copy to identify pertinent materials, products, models, and colors (where appropriate).

E. Coordinate each submittal with the requirements of the Work and the Contract Documents.

F. When (2) or more items of the same material or equipment are required, they shall be of the same Manufacturer.

G. Completely review shop drawings, product data, and samples prior to submission.

H. When submitted for review, all shop drawings shall bear the Contractor's stamped and signed certification of the following:
1. Contractor has reviewed, checked, and approved the shop drawings.
2. Contractor has coordinated the shop drawings with the requirements of the Project and with the provisions of the Contract Documents.
3. Contractor has ensured that the equipment shown on the shop drawings meets all the requirements of the Contract Documents.
4. Contractor has determined and verified all of the following:
   a. Materials.
   b. Field measurements.
   c. Field construction criteria.
   d. Catalog numbers and similar data.
   e. Conformance with Specifications.
   f. Quantities and sizes.

I. **UNSIGNED COPIES WILL NOT BE REVIEWED.**

J. Notify the A/E, in writing, at the time of submission, of any deviations in the submittals from the requirements of the Contract Documents.

K. Provide the following certifications information:
1. Test Agency results verifying capacities, operating conditions, and power requirements at design conditions.
2. Manufacturer's statement of compliance with Standards discussed in individual Specification Sections.
3. Equipment labels indicating Certification requirements.
4. Quality standard designations on each unit piece, e.g., each device, luminaire, or component.
5. Typed verification that noted testing procedures were complied with.
6. Other Certifications listed in other Sections of the Specifications.

L. Contractor shall make submittals promptly in accordance with the approved schedule, and in such sequence as to cause no delay either in its Work or in the work of any other Contractor.

M. If a submittal is rejected, immediately make any corrections or changes required by the A/E. Resubmit until accepted.

N. If the Contractor orders equipment or materials, or begins installation, fabrication, or work prior to the return of approved submittals, it shall be "at the Contractor's own risk."

O. Incorporate Shop Drawings into the Operating and Maintenance Manuals.

1.4 REQUIRED SUBMITTAL INFORMATION

A. The form attached to this section contains a list of required submittals. This list may not be a complete list of all required submittals. Submit for approval all items to be provided, whether listed or not.

END OF SECTION 26 05 00.33

SHOP DRAWING LOG FOR ELECTRICAL

Roger D. Fields Associates, Inc.
580 N. 4th Street, Suite 240
Columbus, Ohio 43215-2156
614-451-2248

Project Name: Mt. Gilead EVSD – Preschool Expansion & District Office Renovation

Project Number: Rdfa #25096 / Schorr #2604

SUBMITTAL KEY

A	Catalog Cuts/Shop Drawings	G	Completed start-up test forms
B	Installation instructions	H	Coordination Drawings / Studies
C	Color samples	I	Calculations
D	Product samples	J	Schedule
E	Typed statement of material to be furnished	K	Sample of finish
F	Typed verification of compliance with certification requirements		

STATUS KEY

APP	Approved (conforms)
CAN	Corrections Are Noted (conforms as noted)
ICN	Incorporate Corrections Noted
R&R	Revise & Resubmit
R	Rejected

Electrical Submittals Required	Specification Section	Submittal Key	Contractor	Original Submittal			Re-submittal			Remarks / Reviewed by
				Date A/E Received	Date A/E Returned	Status Key	Date A/E Received	Date A/E Returned	Status Key	
Division 26										
Line-Voltage Conductors	26 05 19	A, G								
Low-Voltage Conductors	26 05 19	A, G								
Grounding Bus	26 05 26	A								
Boxes and Exterior Pull Boxes	26 05 33	A								
Raceway and Fittings	26 05 33	A								
Arc Flash Calculations	26 05 73.19	H								
Lighting Control System	26 09 23	A, G								
Occupancy Sensors	26 09 23	A, G								
Vacancy Sensors	26 09 23	A, G								
Fused Cutouts	26 10 00	A								
Distribution Panelboards	26 24 16	A								
Distribution System Coordination Study	26 24 13 & 16	A, H								
Bus Duct System	26 25 00	A								
Wiring Devices and Plates	26 27 00	A								
Circuit Breakers	26 28 00	A								
Disconnect Switches	26 28 00	A								
Elevator Shunt-Trip Disconnect	26 28 00	A, G								
LED Interior Luminaires	26 51 19	A, C, G								
LED Exterior Luminaires	26 56 19	A, C, G								
Division 28										
Refer to list in Section 28 05 00.33										

Electrical Submittals Required	Specification Section	Submittal Key	Contractor	Original Submittal			Re-submittal			Remarks / Reviewed by
				Date A/E Received	Date A/E Returned	Status Key	Date A/E Received	Date A/E Returned	Status Key	
Conventional Fire Alarm System Components	28 46 13.02	A, G								
Conventional Fire Alarm System Wiring Diagram	28 46 13.02	A								

SECTION 26 05 00.35 – SPECIAL PROCEDURES FOR ELECTRICAL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Division 02, “Existing Conditions.”

B. Section 26 05 43, “Underground Ducts & Raceways for Electrical Systems.”

1.2 QUALITY ASSURANCE

A. Standards:
   1. National Fire Protection Association (NFPA): 2024 NFPA 70E, “Standard for Electrical Safety in the Workplace.”
   2. Occupational Safety and Health Administration (OSHA), including 29 CFR 1910.147.

1.3 SAFETY

A. Contractor shall be solely responsible for safety precautions and programs in connection with the Work. The Owner or A/E will not be responsible for the Contractor’s failure to employ proper safety procedures.

B. Maintain the Project in accordance with Federal, State, and Local Safety and Insurance Standards. All procedures shall comply with the latest OSHA regulations.

C. Contractor shall provide head, eye, and ear protection for each of its employees in accordance with OSHA regulations.

D. Exercise precaution for the protection of persons and property.
   1. Provide guard rails, barricades, enclosures, canopies, passageways, lanterns, warning lights, and other protective safety devices required by the AHJ, and required to protect persons and property against accidentally dropped materials or other construction hazards.
   2. Provide guard lights at all barricades, railings, obstructions in the streets or sidewalks, trenches, or pits.

E. Provide protection as may be required to prevent existing glass breakage. Replace broken glass at no cost to the Owner.

F. **DO NOT USE POWDER-ACTUATED ANCHORS OR FASTENERS.**

G. Electrical Equipment Operation Safety: Make provisions for locking off and tagging out disconnect switches or other power control devices in accordance with the requirements of Federal OSHA Regulations 29 CFR 1910.147 and 2024 NFPA 70E Part II, Chapter 5.

H. Excavation Safety: Refer to Section 26 05 43.

1.4 ENVIRONMENTAL PROCEDURES

A. Hazards Control:
   1. Do not dispose of volatile wastes, such as mineral spirits, oil, or paint thinner, in storm or sanitary drains. Dispose of such wastes properly.
   2. Store volatile wastes in covered metal containers, and remove from premises daily.
   3. Prevent accumulation of waste that creates hazardous conditions.
   4. Provide adequate ventilation during use of volatile or noxious substances.

B. Asbestos Abatement:
   1. During the course of Work, if any suspected asbestos is encountered, cease working in the area, and immediately notify the Owner and A/E. Do not remove or disturb any material suspected of, or identified as, containing asbestos.
   2. Do not drill, cut, sand, penetrate with nails, screws, or other fasteners, or otherwise disturb asbestos or asbestos-containing material, insulation, structure, or ceiling or floor covering.
   3. Immediately notify the Owner of the presence, or suspected presence, of asbestos or asbestos-containing materials. The Owner shall remove or encapsulate such materials **PRIOR** to any work under this Contract.
   4. Refer to Division 02 for additional requirements.

END OF SECTION 26 05 00.35

SECTION 26 05 00.40 – QUALITY REQUIREMENTS FOR ELECTRICAL

PART 1 - GENERAL

1.1 DESCRIPTION

A. Provide Work of the highest quality, complete in every respect and conforming to the accepted practices and standards of the Trades involved.

B. Further definition of quality is given by reference to various Laws, Codes, Standards, and Regulations.

1.2 REGULATORY REQUIREMENTS

A. All work on this Project shall conform to the currently enforced Edition of all applicable National, Federal, State, and Local Laws, Rules, Regulations, Standards, and Building Codes, and any local ordinances and requirements pertaining to this work, unless otherwise noted.

B. Any Law, Regulation, Standard, or Code referred to in other Sections of Division 26 is included in its entirety as a part of these Specifications.

C. Give notice and comply with all Laws, Rules, Regulations, Ordinances, and lawful orders of the AHJ bearing on the performance of the Electrical Work.
   1. If the Contractor observes that any of the Contract Documents are at variance therewith in any respect, it shall promptly notify the A/E in writing, and any necessary changes will be arranged by the A/E.
   2. If the Contractor performs any Work knowing it to be contrary to such Laws, Rules, Regulations, and Ordinances and fails to give prior notice to the A/E, the Contractor shall assume full responsibility for, and shall bear all costs associated with, correcting the Work.

D. Only a Contractor and craftsmen licensed by the AHJ shall provide this Electrical Work.

E. Methods and materials shall be certified where noted in the individual Specification Sections.

F. All equipment and appliances installed on this Project shall bear the label of an Approved Testing Agency and shall be installed in accordance with the Manufacturer’s instructions for the labeled equipment and appliances.

G. All electrical equipment, luminaires, devices, and wiring shall be listed by Underwriters Laboratories, Inc.

H. All structural steel used on this Project shall be manufactured in the United States, in accordance with Ohio Revised Code 153.011, unless specifically approved otherwise by the Owner.

1.3 APPLICABLE PERMITS, FEES, BONDS, LICENSES, AND CERTIFICATIONS

A. The A/E will obtain all permits, licenses, and certifications required by the AHJ.

B. The A/E will pay plan approval fees for this Project. **CONTRACTOR SHALL NOT INCLUDE THIS COST IN ITS BID.**

C. The A/E will submit all Contract Drawings and Specifications and the plan approval application to the AHJ, pay the application fees, and obtain plan approval.

D. Contractor shall secure and pay for any **ADDITIONAL** permits, governmental fees, bonds, and licenses required for the proper execution and completion of the Electrical Work.

E. Contact the Power Company. Arrange for both temporary and permanent electrical service.

1.4 REFERENCES

A. Titles, Abbreviations, and Symbols: Titles and abbreviations may be used in these Specifications. Abbreviations may be shown on the Electrical Drawings. Refer to the list of abbreviations attached to this Section. Refer also to the symbols lists shown on the Drawings for further abbreviations. All titles and abbreviations may not necessarily apply to this Work.

B. Definitions:
1. Provide: To furnish, install, and connect to make completely ready for regular operation.
2. Furnish: To supply or deliver to site complete with all required accessories and installation instructions.
3. Install: To mount, erect, hang, or fasten in place, and connect to make ready for regular operation.
4. Concealed: Either embedded in masonry or other construction, or installed below floor slab, behind wall furring, within chases or soffits, within walls, within double partitions, above ceilings, in trenches, in tunnels, or within crawl spaces.
5. Exposed: In full or partial view; not “Concealed” as defined above.
6. Accessible Ceiling: Lay-in ceiling with removable ceiling tiles.
7. Medium-Voltage: Systems or wiring operating at potentials from 2,400 volts to 69 kilovolts.
8. Low-Voltage: Systems or wiring operating at potentials less than 600 volts.
9. Control-Voltage: Systems or wiring operating at potentials less than 50 volts.
10. Refer to additional Definitions in Division 01 and in the AHJ’s Building Codes.

TITLES, ABBREVIATIONS, AND SYMBOLS

#	Number
&	And
∠	Angle
@	At
Ø	Diameter
Ø	Round OR Phase
A.	Compressed air
A.D.	Access door OR Area drain
A.F.D.	Acid floor drain
A.F.F.	Above finished floor
A.P.	Access panel
A.W.C.O.	Acid wall cleanout
A/E	Architect/Engineer
AABC	Associated Air Balance Council
AB.	Above
ACI	American Concrete Institute
ACPA	American Concrete Pipe Association
ADA-AG	Americans with Disabilities Act — Accessibility Guidelines
ADC	Air Diffusion Council
AFCI	Arc-fault circuit interrupter
AH	Air handler
AHJ	Authority Having Jurisdiction
AHRI	Air-Conditioning, Heating, and Refrigeration Institute
ALT.	Alternate
ALUM.	Aluminum
AMCA	Air Movement and Control Association
amp	ampere
ANSI	American National Standards Institute
APPROX.	Approximately
ARCH.	Architect
ARR'T.	Arrangement
ASA	Acoustical Society of America
ASHRAE	American Society of Heating, Refrigerating, and Air Conditioning Engineers
ASME	American Society of Mechanical Engineers
ASPE	American Society of Plumbing Engineers
ASSE	American Society of Sanitary Engineering
ASTM	American Society for Testing & Materials
AUTO.	Automatic
AV	Acid vent
AW	Acid waste
AWG	American wire gauge
AWS	American Welding Society
AWWA	American Water Works Association
B.D.D.	Backdraft damper
B.T.	Bathtub
B.V.	Backwater valve
BAL.	Balancing
BFP	Backflow preventer
BHP	Brake horsepower
BICSI	Building Industry Consulting Services International
BLDG.	Building
BSBD.RAD.	Baseboard radiation
BSMT.	Basement
BTM.	Bottom
BTU	British thermal unit
C.	Conduit
C.B.	Catch basin
C.I.	Cast iron
C.O.	Clean out
CO	Carbon Monoxide
C/C	Center to center
C/L	Center line
CAB.	Cabinet
CAP.	Capacity
CEIL./CLG.	Ceiling
CFC	Chlorofluorocarbon
CFH	Cubic feet per hour
CFM	Cubic feet per minute
CFR	Code of Federal Regulations
CGA	Compressed Gas Association
CHEM.	Chemical
CISPI	Cast Iron Soil Pipe Institute
CMA	Construction Manager Agent/Advisor
CMR	Construction Manager at Risk
COL.	Column
COMB.	Combination
CONC.	Concrete
COND.	Condensate OR Condenser
CONN.	Connection OR Connect
CONST.	Construction
CONTR.	Contractor
CONV.	Convector OR Converter
COORD.	Coordinate
CRU	Computer Room Unit
CSA	CSA Group (formerly the Canadian Standards Association).
CSI	Construction Specifications Institute
CT	Current transformer
CU	Condensing Unit
CU IN.	Cubic inch
CU. FT.	Cubic feet
CUH	Cabinet unit heater
Cx	Commissioning Agent
D.	Deep
D.F.	Drinking fountain
D.L.	Door louver
D.M.	Damper motor
D.S.	Downspout
D-B	Design-Build OR Design-Builder
DB	Dry bulb
DBL.	Double
DCW	Domestic cold water
DET.	Detail
DHW	Domestic hot water
DHWR	Domestic hot water return
DIA. / Ø	Diameter
DIFF.	Diffuser
DIM.	Dimension
DISCH.	Discharge
DN.	Down
DOE	United States Department of Energy
DPR.	Damper
DR.	Door
DW	Distilled water
DWG.	Drawing
DWH	Domestic water heater
DWV	Drain, waste and vent
E.A.T.	Entering air temperature
E.C.	Electrical Contractor
EF	Exhaust Fan

E.S.P.	External static pressure
E.T.	Expansion tank
E.W.T.	Entering water temperature
EA.	Each
EFF.	Efficiency
EIA	Electronic Industries Alliance
ELEC.	Electric OR Electrical
ELEM.	Element
ELEV.	Elevation
ENGR.	Engineer
ENT.	Entering
EPA	Environmental Protection Agency
EQUIP.	Equipment
ETL	Electrical Testing Laboratories
EUH	Electric Unit Heater
EW	Eye wash
EWC	Electric water cooler
EWH	Electric Wall Heater
EX.	Existing
EXH.	Exhaust
EXIST.	Existing
EX	Existing
EXT.	Exterior
F & T	Float and thermostatic
F.	Fan OR Fire
FACP	Fire Alarm Control Panel
F.D.	Fire damper
F.E.	Fire extinguisher
F.E.C.	Fire extinguisher cabinet OR Food Service Equipment Contractor
F.H.	Fire hydrant
F.H.C.	Fire hose cabinet
F.H.E.C.	Fire hose/extinguisher cabinet
FLA	Full Load Amps
F.V.	Flush valve
FCC	Federal Communications Commission
FD	Floor drain
FDA	Food and Drug Administration
FHA	Federal Housing Administration
FIG.	Figure
FIN.	Finish
FIN.RAD.	Finned radiation
FLEX.	Flexible
FLR. / FL.	Floor
FMG	Factory Mutual Global
FOR	Fuel oil return
FOS	Fuel oil supply
FPC / FSC	Fire Protection / Fire Suppression Contractor
FPM	Feet per minute
FT.	Feet
FT.HD.	Feet of head
FURN.	Furnish(ed)
G	Gas
G.C.	General Contracting OR General Contractor
G.I.	Grease interceptor
G.T.C.	General Trades Contractor
gal.	Gallon
GALV.	Galvanized
GEN.	General
GFI / GFCI	Ground-fault circuit interrupter
GPM	Gallons per minute
GR	Grille
GRAV.	Gravity
Grd.	Ground
H	Heat Detector
H./HT.	Height
H.P.	High pressure
H.S.	Hair strainer
H'STAT	Humidistat
HAC	Heating and air conditioning
HB	Hose bibb
HCFC	Hydrochlorofluorocarbon
HHS	United States Department of Health and Human Services
H.O.A	Hand-Off-Auto
HORIZ.	Horizontal
HP	Horsepower or Heat Pump
HPC	High pressure steam condensate
HPS	High pressure steam
hr.	Hour
HTG.	Heating
HTR.	Heater
HUD	United States Department of Housing and Urban Development
HV	Heating and ventilating OR High velocity
HVAC	Heating, ventilating, and air conditioning
I.D.	Inside diameter
IAQ	Indoor air quality
IBC	International Building Code
ICC	International Code Council
ICEA	Insulated Cable Engineers Association, Inc.
IDF	Intermediate distribution frame
IEC	International Electrotechnical Commission
IEEE	Institute of Electrical and Electronics Engineers, Inc.
IESNA	Illuminating Engineering Society of North America
IDF	Intermediate Distribution Frame
IN.	Inside OR Inches
IND.	Indirect
IND. U.	Induction unit
INSUL.	Insulation
INT.	Interior
INV.	Invert
INV. ELEV.	Invert elevation
IPS	Iron pipe size
ISO	International Organization for Standardization
J.R.	Janitor's receptor
JCAH	Joint Commission for Accreditation of Hospitals
kVA	Kilovolt-ampere
L.	Length
L.A.T.	Leaving air temperature
L.W.T.	Leaving water temperature
LAB	Laboratory
LAV	Lavatory
lb.	pound
LEED	Leadership in Energy and Environmental Design
LH	Left hand
LP	Liquefied petroleum
LPC	Low pressure steam condensate
LPS	Low pressure steam
LV	Low Voltage
LV'G.	Leaving
M.A.	Mixed air
M.O.	Motor operated
MAN. DPR.	Manual damper
MAT.	Material
MAX.	Maximum

MBH	1,000 British thermal units/hour
MDF	Main Distribution Frame
MECH.	Mechanical
MERV	Minimum efficiency reporting value
MET./MTL.	Metal
MEZZ.	Mezzanine
MFR.	Manufacturer
MH	Manhole
MIN.	Minimum
MISC.	Miscellaneous
MP	Multiple Prime
MPS	Medium pressure steam
MS	Motor starter
MSS	Manufacturers Standardization Society of the Valve and Fittings Industry Inc.
MTD./MT.	Mounted OR Mount
NAC	Notification Appliance Circuit
N.I.C.	Not in contract
N.T.S.	Not to scale
N2	Nitrogen
N2O	Nitrous oxide
NADCA	National Air Duct Cleaners Association
NAECA	National Appliance Energy Conservation Act
NB	National Board of Boiler and Pressure Vessel Inspectors
NCPI	National Clay Pipe Institute
NEBB	National Environmental Balancing Bureau
NEC	National Electrical Code
NECA	National Electrical Contractors Association
NEMA	National Electrical Manufacturers Association
NESHAPs	National Emissions Standards for Hazardous Air Pollutants
NFPA	National Fire Protection Association
NIOSH	National Institute for Occupational Safety and Health
NIST	National Institute of Standards and Technology
NO. OR #	Number
NOM.	Nominal
NP	Not permitted
NPT	National Pipe Thread Tapered
NSF	National Sanitation Foundation
NSPE	National Society of Professional Engineers
O.	Oxygen
O.A.	Outside air
O.D.	Outside diameter
O.I.	Oil interceptor
O.V.	Outlet velocity
O/C	On center
OAC	Ohio Administrative Code
OBC	Ohio Building Code
ODH	Ohio Department of Health
ODOE	Ohio Department of Energy
ODOT	Ohio Department of Transportation
OFCC	Ohio Facilities Construction Commission
OPG.	Opening
OPP.	Opposite
ORC	Ohio Revised Code
OSDM	Ohio School Design Manual
OSHA	Occupational Safety and Health Administration
OU./OZ.	Ounce
P.C.	Plumbing Contractor
P.D.	Pressure drop
P.I.V.	Post indicator valve
P/L	Property line
PDI	Plumbing & Drainage Institute
PEI	Petroleum Equipment Institute
PLBG.	Plumbing
PNEU.	Pneumatic
PRESS.	Pressure
PROP.	Propeller
PRV	Pressure-reducing valve
PSF	Pounds per square foot
PSI	Pound-force per square inch
PSIG	Pound-force per square inch gauge
PT	Plaster trap OR Potential transformer
PVC	Polyvinyl chloride
R	Register
R.A.	Return air
R.D.	Roof drain
R/W	Right of way
RAD.	Radius OR Radiation OR Radiator
RECIRC.	Recirculating
REG.	Register
REINF.	Reinforced
REL.	Relief
REQ'D.	Required
RH	Right hand
RHC	Reheat coil
RM.	Room
RPM	Revolutions per minute
RTA/C	Rooftop air-conditioning unit
RW	Raw water
RWC	Rainwater conductor
S	Sink
S & R	Supply and return
S. DPR.	Smoke damper
S.A.	Shock absorber OR Supply air
S.F.	Square feet
S.M., S/M	Sheet metal
S.P.	Static pressure
S.S.	Service sink OR Storm sewer
S.S., S/S	Stainless steel
SAN.	Sanitary sewer
SB	Shampoo bowl
SD	Shower drain OR Smoke detector
SECT.	Section
SHR.	Shower
SHT.	Sheet
SHT. MT'L.	Sheet metal
SMACNA	Sheet Metal and Air Conditioning Contractors National Association
SPD	Surge protection device
SPEC.	Specification
SQ.	Square
SQ. FT.	Square feet
SQ. IN.	Square inch
ST	Sound trap
STAT	Thermostat
STD.	Standard
STL.	Steel
STM.	Storm
SUCT./S	Suction
SW	Softened water
SW.	Switch
T.W.	Tempered water
T'STAT	Thermostat
TD	Temperature difference
TEMP.	Temperature

THERM.	Thermometer OR Thermostat
TIA	Telecommunications Industry Association
TMV	Thermostatic Mixing Valve
TYP.	Typical
UC	Undercut or Under Cabinet
UH	Unit heater
UL	Underwriters Laboratories, Inc.
UR	Urinal
USB	Universal Serial Bus
USGBC	United States Green Building Council
UV	Unit ventilator
V.	Vent
V.T.R.	Vent through roof
VAC.	Vacuum
VAV	Variable Air Volume
VC	Vacuum cleaning
VCP	Vitrified clay pipe
VERT.	Vertical
VIB. ISO.	Vibration isolator
VOC	Volatile organic compound
VSP	Vitrified sewer pipe
W.	Width OR Water
W.G.	Water gauge or Wire Guard
W/	With
W/O	Without
WP	Weatherproof
W/W	Wall to wall
WAT.	Water
WB	Wet bulb
WC	Water closet OR Water column
WCB	Washer Connection Box
WH	Wall hydrant OR Water heater
WO	Waste oil
W.P.	Weatherproof
WOG	Water/oil/gas
XFMR	Transformer
YD.	Yard
YH	Yard hydrant

END OF SECTION 26 05 00.40

SECTION 26 05 00.45 – TESTING AND INSPECTING SERVICES FOR ELECTRICAL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Section 26 05 43, “Underground Ducts & Raceways for Electrical Systems.”

B. Division 27, “Communications.”

C. Division 28, “Electronic Safety and Security.”

1.2 INSPECTIONS, TESTS, AND APPROVALS

A. The Contract Documents, Laws, Ordinances, Rules, Regulations, or Orders of any AHJ may require the Work to be inspected, tested, or approved.

B. Contractor shall bear all costs of such inspections, tests, or approvals.

C. Contractor shall pay all professional engineering fees involved in required testing of equipment.

D. Contractor shall arrange and pay for all inspections required to obtain a Certificate of Occupancy. Contractor shall include this cost in its bid.

E. Arrange for inspection of the Work by the AHJ.

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION

3.1 TESTING, ADJUSTING, AND BALANCING FOR ELECTRICAL

A. Notify the A/E of all scheduled tests and adjustments at least (48) hours before they are scheduled, so that the A/E may witness same. If the Contractor performs any test or adjustment without the A/E present, or without proper notification, the Contractor shall perform the test or adjustment a second time, in the presence of the A/E. Coordinate all test schedules with the Owner to minimize inconvenience.

B. Provide all required testing and obtain approvals. Secure required certificates of inspection, testing, or approval, and include them in the Operating and Maintenance Manual.

C. Coordinate the enclosure or concealment of the Work with the required inspections and tests so as to minimize the necessity of uncovering work for that purpose.

D. Should any of the Work be covered up or enclosed prior to completion of all required inspections, tests, and approvals, uncover the Work and, after it has been completely inspected, tested, and approved, make all repairs and replacements with such materials and workmanship as are necessary to secure the approval of the A/E, and at no additional cost to the Owner.

E. Furnish all meters, equipment, and personnel required, and test to demonstrate the integrity of the finished installation to the approval of the AHJ and the A/E.

F. Check each piece of equipment for defects and verify that all parts are properly furnished and installed, that all items function properly, and that all adjustments have been made.

G. Conduct such tests and adjustments of equipment required by the A/E or needed to verify performance requirements. Submit data taken during such tests to the A/E.

H. Test and check all alarm devices and supervisory switches for proper operation. Submit a written record of these tests to the A/E.

I. Obtain optimum phase balance under full load condition by reconnection of existing panelboard branch circuits. Make properly revised changes to any existing panelboard, which requires circuit changes for load balance, in its panel directory.

J. Verify proper rotation of motors during load balance and final adjustments.

K. Perform a megger test at 1,000 volts on all new 600-volt insulation-rated power conductors.

L. Certified Representative of Equipment Supplier shall check out and test all special systems in Division 28 and submit a report to the A/E indicating the results of such final checkout and test.

M. Demonstrate to the Owner that all electrical systems are operating properly. Make available to the Owner, upon request, the following information:
1. Feeder and branch wiring megger tests.
2. Grounding resistance measurements.
3. Load balance.
4. Tests of Special Systems in Division 28.

3.2 ENERGIZATION OF POWER TO EQUIPMENT ITEMS

A. Coordinate application of power to each equipment item with the Contractor supplying that item.

B. Power may be applied briefly to check direction of motor rotation; however, the Electrical Contractor shall **NOT** power up the equipment item unless the Contractor responsible for the equipment item is present during start-up.

3.3 FACTORY INSTALLATION AND START-UP

A. For those items of equipment that are to be installed, tested, started up, and certified by a factory-trained Representative, furnish a letter from the Manufacturer to the A/E stating that this service shall be provided for this Project, describing the scope of services to be provided, and disclosing the name of the Representative assigned to provide the required services.

3.4 FINAL OPERATING TESTS AND PROCEDURES

A. Prior to Contract completion, conduct system operational tests for a period of at least (5) days, not necessarily consecutive, as scheduled by the Owner, to demonstrate fulfillment of the requirements of the Contract. During this time, adjust equipment so that it will perform as the Manufacturer intended, and so that systems will function as designed.

B. Operate each system in every mode of operation and check the position of switches and other devices for proper closure, operation, and switching.

C. Check motors for proper rotation and operating temperature.

D. Test operation of elevator shunt-trip (circuit breakers).

E. Check breakers and switches for proper operation.

F. Test operation of all ground-fault circuit interrupter (GFCI) breakers and receptacles.

G. Check the polarity of all receptacles.

H. Test continuity of conduit system.

I. Test insulation leakage and impedances.

J. Test ground system resistance.

K. Check and verify that overcurrent protection is adequate for each load being served.

L. Surge Protective Devices: Factory-trained technician shall inspect and test all surge protective devices to ensure proper wiring, operation, and ground-to-neutral bond.

M. Lighting:
   1. Test proper operation of luminaires.
   2. Test emergency lighting systems by simulating loss of power.
   3. Test all lighting control, low-voltage switching, and dimming systems.
   4. Test operation of exterior lighting system. Program time clock as directed by the Owner.
   5. For new luminaires only, replace all damaged, deformed, defective, inoperative, or noisy luminaires, occupancy sensors, and vacancy sensors.

N. Special Systems in Division 28:
   1. Perform any Special System tests.
   2. Test **ALL** fire alarm system devices. System operation shall be witnessed and approved by the AHJ.

O. Remove panel covers and clean inside of all new panels. Provide As-Built typewritten circuit directory.

3.5 CERTIFICATE

A. Furnish approved Certificate of Final Inspection.

3.6 FOLLOW-UP INSPECTIONS

A. Make an inspection within (90) days after occupancy of the building to make minor adjustments as needed to ensure that all equipment is operating properly and that satisfactory conditions are being maintained throughout, and to satisfy any unusual conditions. Schedule with the A/E. Consult with the Owner.

B. A minimum of (1) month before the end of the guarantee period, contact the A/E and Owner to discuss system operation, and to plan for the future care and maintenance of the system.

C. Follow-up infrared scanning: Perform a follow-up infrared scan of each electrical splice (11) months after date of Substantial Completion.

D. (1) month before the end of the guarantee period, contact the Owner and perform an inspection to review any items needing correction.

E. Re-check all connections before the end of the 1-year guarantee period in the following equipment:
   1. Enclosed switches and circuit breakers.

F. Refer to Section 26 05 43 for additional inspection requirements related to excavation and backfill.

END OF SECTION 26 05 00.45

SECTION 26 05 00.50 – TEMPORARY FACILITIES AND CONTROLS FOR ELECTRICAL

PART 1 - GENERAL

1.1 DESCRIPTION

A. Provide and maintain temporary facilities and controls required for construction as long as needed for the safe and proper completion of the Work, and remove upon completion of the Work.

1.2 QUALITY ASSURANCE

A. Standards: Comply with the provisions of the following Codes:
   1. Institute of Electrical and Electronics Engineers, Inc., "National Electrical Safety Code®."
   2. National Fire Protection Association (NFPA): 2023 NFPA 70, "National Electrical Code® (NEC)," Articles 250 and 590.
   3. United States Department of Labor, Occupational Safety and Health Administration, Part 1926, "Safety and Health Regulations for Construction."
   4. Applicable Local Electrical and Building Codes.

1.3 POWER AND DISTRIBUTION SYSTEM

DESIGNER — CHOOSE (C) or (D):

A. Energy Consumption: The Owner will pay for the cost of electrical energy used during construction.

B. Service Connection: Obtain the temporary power service immediately after awarding of Contract, unless such temporary power service is definitely not needed until a later date, as confirmed by the Lead Contractor.

C. Maintain the temporary power system and remove it as construction progresses.

D. Installation shall comply with 2023 NEC Article 590.

E. Balance loads connected to 3-phase service.

F. Install all panel feeders in conduit. Do **NOT** use armor-clad (AC) or metal-clad (MC) cable.

G. Use #12 wire for branch circuits shorter than 100 ft. to the last receptacle or outlet, and #10 wire for circuits longer than 100 ft.

H. Protect all branch wiring from accidental damage. Flexible cables and extension cords shall be extra-hard-usage Type S, SE, ST, or SO.

I. Temporary Receptacles: Provide an average of (2) receptacles per 400 sq. ft. of construction area. Connect no more than (4) receptacles to (1) 20-ampere circuit. All receptacles shall be ground-fault circuit interrupter (GFCI) type.

J. Temporary Lighting: Provide temporary lighting, disconnects, and receptacles. Provide luminaires ((1) 1,500-lumen LED luminaire per 100 sq. ft.) suitable for the environment and sufficient to provide an average maintained illumination of 15 foot-candles, minimum.

K. Grounding:
   1. System ground: Ground power service and distribution system properly. Whenever a system neutral point is established, install neutral grounding.

2. Equipment ground: Provide a full-size ground wire, sized in accordance with 2023 NEC Article 250, capable of equipment grounding with all feeders and branch circuits not installed in metallic raceways.
3. All luminaires, receptacles, and power circuits shall have a continuous ground. Check integrity of all ground systems at least every (3) months during construction or whenever there is evidence of physical damage.

L. Safety: Eliminate all tripping hazards. Post signs regarding specific hazards that are presented by the temporary wiring system.

M. Contractor may use existing panels and receptacles for lighting and power required during construction.

N. Other Contractors shall provide their own extension cords to extend power to their power tools and equipment. If other Contractors require voltages other than 120 volts, they shall be responsible for obtaining these voltages.

1.4 TEMPORARY CONSTRUCTION

A. Materials shall be adequate in capacity for the required usage, shall not create unsafe conditions, and shall not violate applicable Codes and Standards.

B. Contractor shall be solely responsible for the structural design of all temporary items that it uses in the construction of the building, or that become a permanent part of the building, including, but not limited to:
1. Hoisting.
2. Temporary bracing for structural steel.
3. Shoring for concrete and masonry work.
4. Shoring for cut earth banks.
5. Suspended ceilings, equipment, walls, etc.

C. Provide hoists, staging, rigging, scaffolding, runways, and necessary appurtenances required for the performance of the Work.

D. Completely remove temporary materials and equipment when their use is no longer required.

E. Clean and repair damage caused by temporary installation or use of temporary facilities.

F. Restore existing facilities used for temporary services to original condition.

END OF SECTION 26 05 00.50

SECTION 26 05 00.60 – PRODUCT REQUIREMENTS FOR ELECTRICAL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Division 00, “Procurement and Contracting Requirements.”

1.2 DESIGN BASE MANUFACTURER STANDARD

A. The Drawings and Specifications reflect a design based on the specific equipment requirements and configuration for a Design Base Manufacturer. Design coordination of equipment with the building and with other Trades has been made for this specific Model and Manufacturer of equipment. Where several Manufacturers are listed for an item of equipment or material, the first-named shall be considered the Design Base Manufacturer Standard.

1.3 OTHER ACCEPTABLE COMPONENTS (MANUFACTURERS)

A. Other Manufacturers listed in the Specifications shall be acceptable; however, whenever the Contractor elects to furnish specified equipment or material manufactured by other than the Design Base Manufacturer, the Contractor shall be responsible for the cost and coordination of all modifications required to accommodate the selected equipment or material, including any Work of other Trades that might be affected. Where changes to other Trades’ Work are required, the Contractor shall include the additional costs of all such Work in its bid.

B. Any specified Equipment Manufacturer furnished by the Contractor, other than the Design Base Manufacturer, shall be, in the opinion of the A/E, equivalent in quality, design, features, performance, arrangement, and appearance to that of the Design Base equipment or material, including any special features or requirements.

C. Luminaires:
   1. Other Luminaire Manufacturers shall provide the same room/area illumination levels as the minimum values provided by the Design Base Manufacturer.
   2. Submit photometrics and illumination calculations to validate performance of the luminaires in representative rooms or areas selected by the A/E.
   3. The A/E shall approve that illumination calculations meet the minimum recommendations of the Illuminating Engineering Society of North America or other applicable lighting standard used during design.

D. The inclusion of other Manufacturers in these Specifications shall not be construed to infer that each Manufacturer’s product has been reviewed by the A/E for this application, or that it will provide all the features or capabilities required, or that its physical dimensions can be accommodated in the available space. Verify that the proposed equipment will provide all features and accommodations provided by the Design Base Manufacturer, and that it will fit in the available space.

E. The A/E will not give consideration to any Manufacturer that the Contractor proposes as a Substitution, unless the A/E approves the Manufacturer during the bid period and specifically names the Manufacturer in the Contract Documents or Addenda thereto.

F. Where deemed necessary by the A/E, the Contractor shall, at no additional cost to the Owner, prepare layouts for these other brands of equipment that may have different

dimensional or service requirements from the Design Base Manufacturer Standard. Submit these layouts to the A/E for review.

G. Contractor shall reimburse the Owner for the cost of any design changes incurred by the A/E in the preparation of revised Drawings or Specifications to accommodate the use of any Manufacturer other than the Design Base Manufacturer.

1.4 SUBSTITUTIONS

A. Refer to the Bid Documents for substitution requirements. If this Specification Section conflicts with the Bid Documents, comply with the Bid Documents.

B. Contractor shall submit information for review no later than (10) days prior to the bid opening to the A/E on any other proposed equipment or material that the Contractor desires to use.

C. Contractor shall be responsible for the same costs of coordination and modifications, etc., listed above in Article 1.03, "Other Acceptable Components (Manufacturers)."

D. If the A/E determines that the proposed Manufacturer is acceptable, the A/E will issue an Addendum adding that Manufacturer to the Specifications and/or the Drawings prior to the bid opening.

1.5 EQUIPMENT SUITABILITY

A. All equipment provided shall perform as intended. All items listed shall function properly, and as the Manufacturer intended. Install equipment according to the Manufacturer's recommendations. Properly attach equipment to the floor, wall, or structure. Each item of equipment shall be compatible with all other accessories or hook-ups, including controls, wiring, and other equipment not furnished by the equipment Manufacturer, but required to achieve the intended function.

1.6 MISCELLANEOUS ACCESSORIES

A. Provide any additional adapters, fittings, trim, structural steel angles, channels, strut channels, brackets, or other appurtenances to securely install all items of equipment specified or shown on the Drawings.

B. All steel installed outside or exposed to moisture shall be hot-dipped galvanized.

C. These accessories are required even though they may not be shown or detailed on the Drawings.

D. Installation shall be compatible with the existing building construction on which the item is to be located.

E. Verify the type of construction prior to ordering the equipment item, so that all required accessories are included.

1.7 QUANTITIES

A. Equipment may be referred to in these Specifications, or on the Drawings, as either singular or plural; the Contractor shall verify the exact number of items required to complete its Work.

END OF SECTION 26 05 00.60

SECTION 26 05 00.71 – EXAMINATION AND PREPARATION FOR ELECTRICAL

PART 1 - GENERAL

1.1 EXAMINATION OF SITE

A. Certain existing conditions may affect the manner or sequence of the performance of the Work.

B. Before submitting its Bid, it is recommended that the Contractor visit the site of the proposed Project.

C. After receipt of Bids, no adjustments to Bids will be permitted for lack of knowledge of Project conditions.

D. Verify and reconcile Work required by the Contract Documents with existing conditions at the Site.

E. Should the Contractor note any discrepancies during the Bidding Period, it shall notify the A/E immediately, in writing, to permit issuance of an Addendum to prevent misunderstandings at a later date.

F. Existing services, structures, and operating schedules may need to be reviewed, prior to bidding, to facilitate the installation of the Work without disrupting the normal operation of the facility.

1.2 PREPARATION

A. Provide a Superintendent, on site, whose duties include the directing and supervising of work. Inform the A/E of the Superintendent's name and phone number, and the method of contact when the Superintendent is not at the site.

B. As soon as possible after the Award of the Contract and the approval of shop drawings, the Contractor shall place orders for materials and equipment required for its Work. Immediately inform the A/E in writing as to any materials and equipment that cannot be obtained within the required time period, either due to conditions of the market or other governing factors.

C. Inspect each item of materials or equipment immediately prior to installation. Reject damaged and defective items.

D. Contractor shall determine erection procedures and sequence the construction to keep its work on schedule and to ensure the safety of the building and its occupants. This includes supplying any temporary bracing, guys, or tie-downs that might be required. Such materials shall remain the Contractor's property after completion of the Project.

E. Provide attachment and connection devices and methods for securing work. Secure all work true to line and level and within recognized industry tolerances. Allow for expansion and building movement.

F. Recheck measurements and dimensions of the Work as an integral step of starting each installation.

G. Where mounting heights are not indicated, individual units generally can be mounted at industry-recognized standard mounting heights for the particular application indicated. However, all mounting heights shall be approved by the A/E.

1.3 COORDINATION OF WORK

A. Contractor shall coordinate its Work carefully with all other Contractors.

B. Do not install work without first coordinating the layout, routing, etc., with other Contractors whose work may be affected.

C. Coordinate location of all work with other Contractors and equipment.

D. Consult all Contract Drawings that may affect the location of any equipment, devices, luminaires, panels, wiring, and conduit, and make any other adjustments in location to secure coordination.

E. Coordinate locations of all Electrical Work with existing hangers, sprinklers, piping, ductwork, diffusers, grilles, registers, and other equipment, and with ceilings, soffits, structural members, joists, metal decks, bracing, etc.

F. Notify the A/E immediately of any changes in location or other conflicts that may affect the work of other Contractors.

G. Contractor shall be responsible for the cost of additional engineering work required for changes to the work as shown or described, due to the relocation of items requested by the Contractor.

H. Review all equipment nameplate ratings and advise the A/E immediately of any system design changes required to wire the equipment properly.

END OF SECTION 26 05 00.71

SECTION 26 05 00.73 – EXECUTION OF ELECTRICAL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Division 00, “Procurement and Contracting Requirements.”

B. Division 01, “General Requirements.”

C. Division 09, “Finishes.”

1.2 DESCRIPTION

A. Contractor shall be solely responsible for construction means, methods, techniques, sequences, and procedures in connection with the Work.

1.3 QUALITY ASSURANCE

A. Standard: National Fire Protection Association (NFPA). 2023 NFPA 262, “Standard Method of Test for Flame Travel and Smoke of Wires and Cables for Use in Air-Handling Spaces.”

1.4 CONTRACT DOCUMENTS

A. The Contract Drawings are schematic and show approximate locations, general arrangement, and general extent of Work. Not all items of work required for a complete and operating system are shown on the Drawings. Refer also to the Specifications for additional work that shall be provided. If a conflict occurs, the Contractor is responsible for the more restrictive requirement.

B. Verify exact locations in the field and coordinate with all other Contractors.

C. The A/E shall approve, in writing, significant deviations from the Drawings.

D. The A/E reserves the right to make minor changes in location that do not require additional labor or material, up to the time of roughing-in, without additional cost. The A/E reserves the right to determine what is “significant” and what is “minor.”

E. If a conflict occurs between the Drawings and Specifications, or an overlap of work among the Trades become evident, immediately submit a written request for an interpretation or clarification from the A/E, who shall determine which interpretation has precedence. Refer to Division 00 General Conditions. In such event, none of the Contractors shall assume that it is relieved of the Work that is specified under its branch unless instructions are received, in writing, from the A/E.

1.5 UTILITIES AND OUTAGES

A. Locate and identify all existing utilities prior to construction.

B. Where necessary, make minor relocations to permit installation of the Electrical Work.

C. Advise the A/E immediately of major conflicts to permit modification of the Contract Documents prior to bidding.

D. Conform to all Utility Company requirements.

E. Closely coordinate any utility service shutdowns or outages, interruptions, or downtime with the A/E and Owner.

F. Provide temporary service during the curtailment, if required by the A/E.

G. Avoid inconveniencing the Owner.

H. If any electrical outage exceeds (4) hours, provide a portable generator sufficient in size and capacity to power the entire building for the duration of the outage.

I. Notify the Owner at least (10) full working days in advance of commencing work in existing utilities.

J. Contractor shall alert occupants of nearby premises of any emergency conditions that arise as a result of its work in connection with existing utilities.

1.6 PROTECTION

A. Unless equipment and material can be protectively stored in a manner acceptable to the A/E, they shall not be delivered to the site until the Work is ready to receive them.

B. Protect all equipment and materials during construction from damage by weather, water, dirt, paint droppings, welding and cutting spatters, and other construction activities.

C. All materials or equipment stored outside shall be elevated and protectively covered in a secured and locked area.

D. Store materials and equipment sensitive to weather or construction conditions inside. Where necessary, store sensitive equipment in a heated area.

E. During construction, cover all luminaires, panels, controls, equipment, and other items that are susceptible to damage until they can be installed in place.

F. Immediately repair or replace damaged equipment or materials to the satisfaction of the A/E and at no additional cost to the Owner.

G. Contractor shall protect the existing building and other Contractors' material and equipment from damage caused by its Work. Protect floors from cutting oil and chips.

H. Use all means necessary to protect materials before, during, and after installation.

I. Refer also to individual Specification Sections for specialized protection.

1.7 EQUIPMENT ACCESS

A. Locate all equipment to provide sufficient access to operate equipment or to service items requiring periodic maintenance. Coordinate with the structure and with all other Contractors' work.

B. Maintain Code-required setbacks from the edge of the roof, minimum 10 ft., for equipment.

1.8 ACCESS PANELS

A. Contractor shall be responsible, unless otherwise noted, for all access panels shown on the Drawings, or where otherwise required, to permit convenient access to concealed electrical equipment, boxes, connections, controls, or other devices requiring service, adjustment, or maintenance. Refer to the Architectural Drawings for location.

B. Acceptable Manufacturers: Inryco-Milcor, Babcock-Davis, Bilco, Boico, Cesco, Inland-Ryerson, JL, Milco, Karp, Larsen's Manufacturing Co., Mifab, Mitco, or Zurn.
   1. Manufacturer and Model Number listed below shall be considered to be the Design Base Manufacturer and Model Number. Other Acceptable Manufacturers will be permitted, unless specifically excluded.

C. Access Panels:
   1. Panels shall be a minimum size of 18 in. x 18 in. unless larger panels are shown or required. Panels shall be steel construction (except where aluminum or stainless steel is specified) with overlapping edges and concealed hinge door with screwdriver lock. Mounting frames shall be compatible with the building construction material in which they are installed. Each access panel in fire-rated shaft walls and in fire-rated ceilings shall be B Label.
   2. Ceiling access panels:
      a. Gypsum: Inryco-Milcor Style DW. Prime-painted for finish painting with ceiling.
      b. Plaster:
         1) Inryco-Milcor Style AP. With finish material same as ceiling material.
         2) Inryco-Milcor Style K. Prime-painted for finish painting with ceiling.
      c. Acoustical concealed spline: Inryco-Milcor Style AT.
      d. Fire-rated: Inryco-Milcor Style ATR.
   3. Wall access panels:
      a. Gypsum: Inryco-Milcor Style DW. Prime-painted for finish painting with wall.
      b. Plaster: Inryco-Milcor Style K. Prime-painted for finish painting with wall.
      c. Masonry and tile:
         1) Inryco-Milcor Style M Standard. Prime-painted for finish painting with wall.
         2) Inryco-Milcor Style M. Stainless steel.
      d. Fire-rated: Inryco-Milcor. Fire-rated access door, prime-painted for finish painting with wall.

D. Coordination:
   1. Coordinate closely with other Contractors to ensure that all panels furnished by the various Contractors shall be identical.
   2. Coordinate the location and installation of each access panel with equipment and other Contractors.
   3. Advise other Contractors of specific requirements relating to access panel installation, including sizes of openings to receive access panel and frame, as well as locations of supports, inserts, and anchoring devices.

E. Determine specific locations and sizes for access panels needed, but not indicated on the Drawings, to gain access to concealed equipment.

F. Plan panel locations to clear ceiling luminaires, grids, and obstructions, and to allow, wherever possible, full shoulder clearance beside the device to be inspected, adjusted, or repaired.

1.9 BLOCK COURSE COORDINATION

A. Mounting heights are called out on the Drawings for many items. Adjust equipment mounting heights to accommodate brick or block coursing.

B. Coordinate installation of all items in a masonry wall with the Lead Contractor and A/E.

1.10 CUTTING AND PATCHING

A. All cutting and patching shall be accomplished in a neat and workmanlike manner, acceptable to the A/E.

B. Cutting:
   1. Contractor shall perform all cutting required for installing its own Work unless otherwise noted.
   2. Cutting shall be done with such tools and methods so as to prevent unnecessary damage to surrounding areas and equipment.
   3. Use rotary drills to cut holes through concrete, brick, plaster, or tile.
   4. No cutting shall be done that will, in any way, reduce the structural strength of the building. Cutting of structural support beams, joists, plates, or other structural members is strictly prohibited without the specific written consent of the A/E and the Structural Engineer. Should such cutting be necessary, consult the A/E and do not proceed further without written approval of the A/E.

C. Patching:
   1. Lead Contractor shall be responsible for patching, unless otherwise noted.
   2. Only a qualified Finish Tradesperson, skilled in the respective craft required, shall perform patching.
   3. Patching shall match adjacent surface construction.
   4. Materials and equipment used in the patching work shall comply with requirements of other Sections of this Specification.

D. Perform all cutting and patching promptly. Make all repairs to leave the entire Work in good condition, including all cutting, fitting, and drilling of masonry, concrete, metal, wood, plaster, or other materials, as specified for proper assembly, fabrication, installation, and completion of the Work.

E. Coordinate drilling, welding, etc., and method of attachment to existing columns, joists, beams, purlins, etc., with the Lead Contractor and A/E before proceeding.

F. If a Contractor finds it necessary to cut into the Work of another Contractor, the cutting and patching shall be performed by such other Contractor at this Contractor's expense. With the written consent of the A/E, the Contractor shall be allowed to perform the cutting. Patching shall be similarly executed.

G. Roofing:
   1. Lead Contractor shall be responsible for all cutting of roofing, modification of roofing, roof opening framing, or roofing repair work for electrical items.
   2. A qualified Roofing Contractor shall perform all work in a manner such that any existing roof warranties are not voided.

H. Lead Contractor, or other Tradesperson approved by the A/E, shall replace existing floors, ceilings, roofs, etc., damaged during construction. The cost of repairs shall be borne by the Contractor causing damage.

I. Provide openings, with lintels if needed, for sleeves, panels, and other similar openings in new and existing interior masonry walls and floors. Locate and dimension the opening prior to construction. Refer to Electrical Drawings.

J. Remove and replace masonry, wall tile, drywall, ceilings, and ceiling tiles to install Electrical Work.

K. Contractor shall be responsible for construction that is disturbed during the installation of conduit, luminaires, or equipment.

L. Cutting and patching includes remodeling and repairing of previously graveled or paved areas, walks, curbs, sod, floors, etc. Saw cuts shall be done in neat, straight lines.

M. Contractor shall repair or replace any existing roads, sidewalks, or other items that its employees may damage during the performance of the Electrical Work.

N. Cutting and Patching of Existing Work:
   1. Remodeling, modifying, patching, and repair of the existing building shall be done so as to match the existing conditions. Complete all work necessary to achieve this requirement. Quality of workmanship, materials, and finish shall complement appearance of existing construction.
   2. Where limits of demolition are exposed in the existing finished work, cutting shall be made with saws, providing an absolutely straight line, plumb, true, and square.
   3. Use saws to cut existing plaster or gypsum wall board. Equip power saws with blades designed to cut plaster or gypsum wall board and with dust collection systems. Operate equipment so as to cause a minimum of damage to plaster or gypsum wall board that is to remain, and so as to keep creation of dust and dirt to a minimum.
   4. Fill existing holes where conduit is removed.

O. Refer to Division 01 for additional requirements.

1.11 PAINTING AND RELATED WORK

A. **ALL PAINTING SHALL BE DONE BY A QUALIFIED TRADESPERSON SKILLED IN THE CRAFT.**

B. Lead Contractor shall be responsible for finish painting of walls, ceilings, and other Architectural items in the areas of construction.

C. Previously Finished Areas: Contractor shall repaint any previously finished areas disturbed by its own cutting and patching. Painting of the patched area shall match the color of the adjacent construction in the general area of the patch. Repaint the entire wall-to-wall and floor-to-ceiling surface if, in the opinion of the A/E, a uniform appearance cannot be accomplished by touch-up.

D. Factory-Finished Equipment: Clean, spot-prime with zinc chromate, and finish, equal to the original quality, any new factory-finished equipment that has rusted, has been damaged, or has deteriorated. Repaint the entire surface if, in the opinion of the A/E, a uniform appearance cannot be accomplished by touch-up.

E. Support Steel / Ferrous Metal: Clean, remove rust from, and paint with zinc-chromate primer any electrical support steel and bare ferrous metal that is not factory-painted, shop-painted, or galvanized, and that remains exposed to view in the finished areas of the building. Consult with the Lead Contractor to ensure that the prime coat shall be compatible with the finish coat.

F. Steel Hangers, etc.: Clean, remove rust from, and paint with zinc-chromate primer and aluminum-bronze paint all steel hangers, boxes, straps, and rods furnished under Electrical Work, that are not provided with rust-protective finish or are damaged in installation, and that remain exposed to view or are in unfinished and mechanical spaces.

G. Exterior Ferrous Metal: Paint with a prime coat any ferrous metal installed outside the building that is not factory-painted, shop-painted, or galvanized.

H. Junction Boxes:
   1. Paint all junction boxes containing fire alarm wiring red.

I. Where painting has already been done, paint all conduits and Wiremold raceways that are later run exposed in “finished” areas. Color shall match structure, ceiling, or wall background.

J. Refer to Division 09 for additional requirements.

END OF SECTION 26 05 00.73

SECTION 26 05 00.74 – CLEANING AND WASTE MANAGEMENT FOR ELECTRICAL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Division 01, “General Requirements.”

1.2 CLEANING AND WASTE MANAGEMENT

A. The Contractor shall do its own cleanup, shall move materials that are in the way of constructing its work, shall repair and replace any damage it does, and shall do any other work of a similar nature which shall be done.

1.3 PROGRESS CLEANING

A. Maintain all work areas in a neat and orderly manner, free of debris. Clean up all occupied travel areas at the end of each shift. Clean up material removed immediately after use.

B. Clean up building and site thoroughly every day.

C. Equipment cleaning and touch-up:
   1. Use only cleaning materials recommended by the Manufacturer of the surface to be cleaned.
   2. Clean interiors of all enclosures of dirt and debris before installing trim or covers.
   3. Brush-clean, prime, and paint-in-kind rust spots on any part.

1.4 CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

A. On-site rubbish collection containers shall be furnished, and weekly rubbish removal service shall be provided or all rubbish and debris from the site shall be removed daily. Refer to Division 01.

B. Do **NOT** use the Owner’s dumpster for on-site rubbish and debris.

C. Disposal of material by removal:
   1. Prior to the completion of the work, remove from the construction area all material designated to be removed.
   2. All material to be removed shall become the property of the Contractor.
   3. Conduct cleaning and disposal operations in compliance with local ordinances and anti-pollution laws. Make all necessary arrangements with private parties and with local officials pertinent to locations and regulations for dumping. Contractor shall pay fees or charges required for dumping of materials.
   4. The Contractor shall be responsible for locating a legal dump site and for all expenses due to length of haul.
   5. Do not burn or bury rubbish and waste materials on Project site. Do not dispose of waste into streams or waterways.

D. Prior to completion of the work, remove from the vicinity of the work all temporary structures, unused materials, concrete forms, and other like materials. All work areas shall be graded and left in a neat manner conforming to the natural appearance of the landscape or as directed elsewhere in the Contract Documents.

1.5 FINAL CLEANING

A. Repair, patch, and touch up all scratched or damaged surfaces to specified finish that matches adjacent surfaces, before final acceptance of the work. Repair dents and marred

finishes to the satisfaction of the A/E. Prepare for finish painting, where painting is specified.

B. Thoroughly clean all luminaires; material; finished surfaces of equipment; painted, enameled, or varnished work; and all other exposed finished surfaces. Remove all labels, stickers, marks, stains, fingerprints, spots, rust, oil, grease, dirt, dust, and other foreign materials, so that the Work is presented in a complete and finished condition, ready for acceptance and intended use.

C. Employ experienced workers or professional cleaners for final cleaning.

D. Expedite the cleaning, washing, waxing, and polishing required within other Sections of these Specifications.

E. Refer to Division 01 for additional requirements.

END OF SECTION 26 05 00.74

SECTION 26 05 00.77 – CLOSEOUT PROCEDURES FOR ELECTRICAL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Division 01, “General Requirements.”

B. Section 26 05 00.33, “Shop Drawings Submittals for Electrical.”

C. Section 26 05 00.45, “Testing and Inspecting Services for Electrical.”

D. Section 26 05 00.73, “Execution of Electrical.”

E. Section 26 05 00.74, “Cleaning and Waste Management for Electrical.”

F. Section 26 05 00.78, “Closeout Submittals for Electrical.”

G. Section 26 05 00.79, “Demonstration and Training for Electrical.”

H. Section 26 05 53, “Identification for Electrical Systems.”

1.2 DESCRIPTION

A. Complete and submit the following items, which is a partial list of the items required prior to Contract Completion:

ITEM	**REFER TO SECTION**
Shop drawing submittals	26 05 00.33
Operational inspection, testing, adjusting, and balancing of all equipment and systems	26 05 00.45, as well as other Sections
Protection	26 05 00.73, as well as other Sections
Painting	26 05 00.73
Cleaning	26 05 00.74
Operating and Maintenance Manuals	26 05 00.78
All required certifications and labels	26 05 00.78, as well as other Sections
Guarantees and equipment warranties	26 05 00.78, as well as other Sections
Spare parts	26 05 00.78, as well as other Sections
As-Built Documents	26 05 00.78
Instruction of the Owner’s personnel	26 05 00.79, as well as other Sections
Equipment identification	26 05 53

B. Provide or perform all of the above items before Contract Completion.

1.3 PUNCH LIST PROCEDURE

A. Refer to Division 01.

END OF SECTION 26 05 00.77

SECTION 26 05 00.78 – CLOSEOUT SUBMITTALS FOR ELECTRICAL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Division 00, “Procurement and Contracting Requirements.”

B. Division 01, “General Requirements.”

C. Section 26 05 00.77, “Closeout Procedures for Electrical.”

D. Section 26 05 00.79, “Demonstration and Training for Electrical.”

E. Section 26 52 13, “Emergency and Exit Lighting.”

F. Section 28 46 13.02, “Conventional Fire-Alarm Systems.”

1.2 OPERATING AND MAINTENANCE MANUALS

A. An Operating and Maintenance Manual, approved by the A/E, is required for Contract Completion. Compile and submit a draft of the Operating and Maintenance Manual to the A/E (90) days before Contract Completion.

B. Submit the final corrected Operating and Maintenance Manual (7) days before Contract Completion.

C. Upon approval, provide:
1. (1) Operating and Maintenance Manual in the physical format described below.
2. A Portable Document Format (PDF) file containing a copy of the Operating and Maintenance Manual saved on a Universal Serial Bus (USB) flash drive.

C. The following items, together with any other pertinent data, shall be included in each Operating and Maintenance Manual. This list is not necessarily complete and shall be used only as a guide. Format of manual is to be as follows:
1. Operating and Maintenance Manual binders shall be heavy-duty, loose-leaf, 3-ring, vinyl-covered binders, no larger than 11 in. wide x 12 in. high, with pocket inside the covers to receive folded oversized sheets.
2. Identify each binder on front and spine with the printed title “OPERATION AND MAINTENANCE MANUAL,” project name, and subject matter of contents.
3. Material shall be typewritten or printed and shall be fully legible.
4. Inside cover:
    a. Title of Project.
    b. Date of Project completion.
    c. Name and address of the Owner.
    d. Date of submittal.
    e. Name and address of the Contractor.
    f. Name and address of the Architect.
    g. Name and address of the Engineer.
5. Second Page: Index.
6. Each section shall be divided by labeled tabs.
7. First Section: A copy of each shop drawing and approved submittal with an index at the beginning of the section.
8. Second Section:
    a. A list of all equipment used on the job.

b. Complete list of all devices installed and cross-referenced to room number or location.
c. Parts list with numbers of replaceable items, including sources of supply.
d. Model and serial numbers of components of systems installed.
e. Suppliers and Manufacturers List:
   1) Typed statement of material to be furnished.
   2) Manufacturers' and nearest Factory Representatives' names, addresses, telephone numbers, and e-mail addresses.
   3) Routine and 24-hour emergency service/repair information:
      a) Name, address, telephone number, and e-mail address of servicing agency.
      b) Names of personnel to be contacted for service arrangements.

9. Third Section:
   a. Description of systems.
   b. Manufacturer's literature describing each piece of equipment, including the following:
      1) Operating and maintenance instructions.
      2) Start-up and shutdown procedures.
      3) Routine and emergency servicing instructions.
   c. List of fuses used, if any.
   d. Copies of all panel directories.
   e. Copies of all testing, adjusting, and balancing reports.
   f. Prints of all system wiring and control diagrams.
   g. All certifications and related information.
      1) Typed verification of compliance with certification requirements.
   h. Copies of all written warranties.
   i. The Owner's receipt of spare parts.
   j. The Owner's statement of completion of instruction. Refer to Section 26 05 00.79.

D. Refer to Division 01 for additional requirements.

1.3 GUARANTEES AND WARRANTIES

A. Guarantee: Contractor shall guarantee its equipment, workmanship, and materials for a period of (1) year from the date of Contract Completion. Should defects develop within this period, the Contractor shall, at no cost to the Owner, remedy the defects and reimburse the Owner for all damage to other Work caused either by the defects or as a result of the work of correcting the same.

B. Extended Warranties: The table below contains a list of items with warranty requirements and their specification sections. These extended warranties are over and above the 1-year guarantee specified above. This list may not be a complete list of all required warranties. Include copies of all written warranties in the Operating and Maintenance Manual, whether listed or not.

ITEM WITH WARRANTY REQUIREMENTS	**SPECIFICATION SECTION**
Division 26 items	
Indoor Vacancy Sensors	26 09 23
Panelboards	26 24 16
Surge Protective Devices	26 43 00
Exit Sign Batteries	26 52 13

ITEM WITH WARRANTY REQUIREMENTS	SPECIFICATION SECTION
Emergency Battery Inverters	26 52 13
Luminaires, LED Power Supply & Driver	26 56 19
Division 28 items	
Refer to Section 28 05 00.78, "Closeout Submittals for Electronic Safety and Security."	

C. Post-Warranty Service:
   1. The products and Manufacturers identified throughout these Specifications represent reputable suppliers that generally have an inventory of spare parts, and a network of authorized service providers that can support the products installed on this Project.
   2. Contractor shall, for a reasonable charge, assist the Owner for a period of (7) years in obtaining parts and service on the products installed.
   3. Once the Contractor's 1-year guarantee has expired, the Owner will pay the cost of these parts and service.
   4. If the item cannot be repaired, the Contractor shall recommend an equivalent replacement item at a reasonable cost to the Owner.

D. Refer also to Division 00, "General Conditions," Division 01, and other Specification Sections that define the starting date of the guarantee period, or that discuss either additional warranty requirements, or extended equipment warranties beyond the standard period.

1.4 PROJECT AS-BUILT DOCUMENTS

A. Contractor shall maintain, at the job site, (1) copy of the As-Built Documents, including the following items related to its Trade:
   1. Contract Drawings.
   2. Specifications.
   3. Addenda.
   4. Reviewed Shop Drawings.
   5. Change Orders.
   6. Other modifications to Contract.
   7. Field Test Records and Start-Up Reports.
   8. Minutes of Coordination and Progress Meetings.
   9. (1) set of the Contract Drawings that will be used for As-Built Drawings. This set shall be used exclusively for documenting and recording the exact location of all installed Work.
   10. **Option:** With the approval of the A/E and Owner, As-Built Documents may be made available in an electronic format via an Internet-accessible server.

B. Do not use As-Built Documents for construction purposes.

C. Store As-Built Documents apart from documents used for construction at the Contractor's temporary field office, or in another location readily available to the A/E.

D. Provide files and racks for storage of As-Built Documents, as appropriate, with As-Built Documents identified.

E. Maintain As-Built Documents in clean, dry, legible condition.

F. Use red ballpoint pen for all marking of As-Built Documents.

G. As-Built Documents shall be available at all times for inspection by the A/E and Owner.

H. As-Built Drawings:
   1. As-Built Drawings shall be legibly marked to record actual "as-built" construction with the following information (some of these items may not be applicable):
      a. Horizontal and vertical location of above-ground and underground utilities and appurtenances referenced to permanent surface improvements.
      b. Location of internal utilities and appurtenances concealed in construction referenced to visible and accessible features of structure.
      c. Field changes of dimension and detail.
      d. Changes made by Change Order.
      e. Details not on the original Contract Drawings.
   2. Do not permanently conceal any work until the required information has been recorded.
   3. Record the location of all concealed utilities on the As-Built Drawings.
   4. Record deviations in locations of concealed conduit, wiring, equipment, and all buried or concealed utility lines and services, etc., dimensioned from a fixed control point, including depth of bury, and additional dimensions in order to fully define location.
   5. Minor conduit and wiring variations need not be recorded.
   6. Record locations of abandoned conduit and wiring, including exterior lines.
   7. Record deviations made necessary to incorporate equipment different from the Design Base equipment.
   8. Record all Addendum Items.
   9. Mark locations of access panels on the As-Built Drawings.

I. Include a complete list of all devices installed and cross-referenced to room number or location.

J. At completion of project, the Contractor shall deliver (1) printed copy of its As-Built Documents to the A/E.

K. Contractor shall accompany its As-Built Documents with a transmittal letter, in duplicate, containing the following information:
   1. Date.
   2. Project title and number.
   3. Contractor's name and address.
   4. Title and number of each As-Built Document.
   5. Certification that each As-Built Document as submitted is complete and accurate.
   6. Signature of the Contractor or its Authorized Representative.

1.5 SPARE PARTS

A. Provide a receipt, signed by the Owner, for (1) complete set of all the operating appurtenances and loose items related to the operation and maintenance of the completed Project for the Owner's use after the guarantee period expires. Insert the receipt in the Operating and Maintenance Manual. These appurtenances and items include, but not are limited to, the following:
   1. Keys to panels and other devices not directly provided to the Owner from the Manufacturer.
   2. Operating handles, levers, cranks, specialized wrenches or drivers, remote controls, and similar items.

3. Extra materials (e.g., attic stock) listed below. This list may not be a complete list of all spare parts. Provide all spare parts, whether listed or not.

SPARE PART AND QUANTITY	SPECIFICATION SECTION
Division 26 items	
Spare low-voltage switching system override switches — (3) switches	26 09 23
Spare low-voltage dimmers — (3) dimmers	26 09 23
Spare occupancy sensors and power pack relays — (3) of each type specified	26 09 23
Spare vacancy sensors and power pack relays — (3) of each type specified	26 09 23
Spare luminaire drivers — 5%, (3) minimum per type/wattage	26 51 19
Spare luminaire LED arrays/light engines — 5%, (3) minimum per type/wattage	26 51 19
Spare emergency battery/drivers — 5%, (3) minimum per type	26 52 13
Spare emergency battery packs — 5%, (3) minimum per type	26 52 13
Spare emergency battery inverters — 5%, (3) minimum per type/wattage	26 52 13
Spare luminaires — Refer to Lighting Fixture Schedule	26 52 13
Spare luminaire drivers — 5%, (3) minimum per type/wattage	26 56 19
Refer to Section 28 05 00.78, “Closeout Submittals for Electronic Safety and Security.”	
Any other parts mentioned elsewhere	

B. Additional Spare Parts for Emergency and Exit Lighting: Contractor shall include in its Bid the items listed below, installed complete at the direction of the A/E or AHJ. If, at the completion of the project, these items are not installed, the contractor shall turn them over to the Owner as spare parts. Refer to Section 26 52 13 for additional information.
   1. Battery-operated exit lights: Quantity 10%, [3] minimum.
   2. Battery-operated emergency lights: Quantity 10%, [3] minimum.

C. Additional Spare Parts for Fire-Alarm Systems: Contractor shall include in its Bid the items listed below, installed complete at the direction of the A/E or AHJ. If, at the completion of the project, these items are not installed, the contractor shall turn them over to the Owner as spare parts. Refer to Section 28 46 13.02 for additional information.
   1. Fire-alarm pull station: Quantity 10%, [1] minimum.
   2. Fire-alarm audio/visual alarm horn/strobes: Quantity 10%, [3] minimum.
   3. Fire-alarm visual alarm strobes: Quantity 10%, [3] minimum.

END OF SECTION 26 05 00.78

SECTION 26 05 00.79 – DEMONSTRATION AND TRAINING FOR ELECTRICAL

PART 1 - GENERAL

1.1 DESCRIPTION

A. Provide training schedule and training outline for approval (45) days prior to Contract Completion.

B. Provide in-service training for the system's operators. Provide all applicable user manuals and related training documentation.

C. After all system operational tests have been completed, schedule an instruction period with the Owner. Schedule well in advance, so that all the Owner's personnel may attend if they desire. Coordinate with the Owner and A/E for date and time of training sessions.

D. Participate in training sessions. Instruct the Owner in the operation and maintenance of all systems and equipment. Use Operating and Maintenance Manuals to familiarize the Owner with equipment and procedures. Allow sufficient time for this instruction.

E. Instruction shall include the following:
   1. Location of equipment and explanation of what it does (function).
   2. Reference to operating instruction manuals for record and clarity.
   3. Coordination of written and verbal instructions, so that the operation of each system is fully understood by operating personnel.
   4. Complete review of items contained in Operating and Maintenance Manuals.
   5. Discussion of maintenance procedures that shall be followed by the Owner, including cleaning procedures and what items to check.
   6. Complete demonstration and explanation of each System.

F. Provide a copy of the Owner's "Certificate of Equipment Demonstration," signed by the Contractor, the Owner, and the A/E, in each Operating and Maintenance Manual. If the Owner does not have a standard demonstration form, the A/E will provide one.

END OF SECTION 26 05 00.79