April 16, 2024

Request for Bids
Lansing School District
Purchasing Department
519 West Kalamazoo
Lansing, MI 48933

This is not an order

Sealed proposals for the furnishing of items and services listed on the sheets attached to the bid proposal documents that are available on our web-site will be received in the Lansing School District Purchasing Office, 519 W. Kalamazoo St., Lansing, Michigan 48933 until

May 16, 2024, 2:00 PM local time.

At this time and place bids will be opened publicly and read aloud.

One (1) original and Two (2) copies of the bid are to be submitted on the forms furnished by the Lansing School District in a sealed envelope and clearly marked:

Bid SO-1800 Pattengill Elementary Elementary Modular Classroom Bid Package #3

BID DOCUMENTS WILL BE POSTED BY April 26, 2024

To obtain a copy of this request for bid please visit our web site at:

www.lansingschools.net.

(Click on Quicklinks at the top and click on Vendors (Bid Info), scroll down to Current Requests for Bids or Proposals) or the bid documents are also posted on the State of Michigan's procurement system SIGMA.

If you need assistance, please contact the Lansing School District Purchasing Department at 517-755-3030.

No faxed, telephone or e-mailed bids will be accepted. Late submittals will not be considered.

All questions must be in writing and should be directed to Jon Laing, Chief Financial Officer at: Projects@lansingschools.net, no later than 5:00 PM on Tuesday, May 7, 2024. Addendums will be posted on the Lansing School District's web-site and SIGMA as they are issued.

All bids/proposals must be accompanied by a 5% bid bond and a sworn and notarized statement disclosing any familial relationship with the Board of Education and selected staff. Bids must include the completed statement to be accepted or considered.

All bids shall be submitted in accordance with the attached instructions and shall remain firm for a period of ninety (90) days after the opening of bids.

A bid bond is required with this bid in the amount of 5% of the total bid amount. Certified payrolls are required with each invoice or pay application. A performance, labor and materials bond will be required to cover 100% of the project.

The Lansing School District reserves the right to reject any or all bids in whole or in part and to accept the proposal or portion of the proposal that, in their opinion, best serves the interests of the Lansing School District.

Lansing School District

_____

Jon Laing
Chief Financial Officer

PRE-BID INFORMATION

There will be a Pre-Bid Meeting held Thursday, May 2, 2024 at 9:00 AM at Pattengill Elementary 815 N. Fairview Ave. Lansing, MI 48912. Attendance is HIGHLY RECOMMENDED.

PROJECT MANUAL

Pattengill Modular Classroom Building
Lansing, MI

VOLUME 2

Bid Package 3

Thursday, April 25, 2024

MEP & Interior Finishes

CONSTRUCTION MANAGER

The Christman Company
208 N. Capitol Avenue
Lansing, Michigan, 48933-1357
517-482-1488

Architect
Kingscott Associates, Inc.
259 East Michigan Ave, Suite 308
Kalamazoo, MI 49007

Mechanical & Electrical Engineer
Strategic Energy Solutions, Inc.
4000 West 11 Mile Road
Berkley, MI 48072

Site Engineer
Spalding DeDecker
905 South Boulevard East
Rochester Hills, MI 48307

Structural Engineer
Robert Darvas Associates
440 S Main St.
Ann Arbor, MI 48104

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SECTION 00025

Project:
Pattengill Modular Classroom Building
New 16,340 SF classroom addition on the west side of Pattengill Elementary. Scope of this bid package includes MEP work, flooring, and general trades items.

Owner:
Lansing School District
519 W Kalamazoo St
Lansing, MI 48933

Architect/Engineer:
Kingscott Associates, Inc.
259 East Michigan Ave, Suite 308
Kalamazoo, MI 49007

Construction Manager:
The Christman Company
208 N. Capitol Avenue
Lansing, MI 48933-1357
517-482-1488

Sealed proposals for all work categories as described in the Project Manual for the above project will be received no later than **Thursday, May 16, 2024 at 2:00 PM**. Proposals mush be received at the Lansing School District Purchasing Office, ATTN: Jon Laing, 519 W, Kalamazoo St. Room 208, Lansing MI. The School District will not consider any late, faxed, or electronic main bids. Bids will be opened publicly and read aloud. All bids must be presented on the forms provided in the contract documents.

Duplicate proposals shall be submitted to the Construction Manager at the above address on the proposal form provided, in a sealed envelope clearly marked **WORK CATEGORY NO. _____**, and shall be identified with the project name and the bidder's name and address.

There will be **a pre-bid meeting at Pattengill (815 N Fairview Ave, Lansing, MI) on Thursday, May 2nd, 2024 at 9:00 AM** conducted by the Construction Manager. We will meet in the north parking lot under the main entrance canopy. It is strongly recommended that contractors attend the pre-bid conference.

All questions are to be directed to the Construction Manager. No direct contact with the Owner or Architect is requested. All questions need to emailed to projects@lansingschools.net no later than **5/8/24 @ 5:00pm.**

All contractors bidding on work must be bondable and must include in their bid the cost for furnishing a Co-Obligee Labor and Material Payment Bond and a Co-Obligee Performance Bond. On the proposal form the contractor will identify a cost to be **added** to their bid should bonds be Required (do not include in base bid amount).

Each Proposal shall be accompanied by a certified check, cashiers' check, money order, or bid bond made payable to The Christman Company in an amount not less than five percent (5%) of the base bid as a bid security. The Bid Security of Bidders under consideration will be returned immediately after award of contracts by the Construction Manager. The amount of the guarantee shall be forfeited to the Owner if the successful Bidder fails to enter into a contract and furnish required bonds and insurance within 30 days after award of contracts.

All proposals submitted shall remain valid for a period of sixty (60) days after the bid date. The Owner, Architect and Construction Manager reserve the right to waive any irregularities, reject any or all proposals, or accept any proposal, which, in their opinion, will serve their best interest.

END OF SECTION 00025

ARTICLE 1, SCOPE OF PROPOSALS

1.1 This is a "Construction Manager Project" for which The Christman Company is the "Construction Manager" For this portion of this project the successful bidders will become "Trade Contractors" and will enter into "Trade Contracts" with the Construction Manager. The Construction Manager will administer separate Trade Contracts for all Work Categories involved in the project. The project will be controlled, coordinated, and scheduled by the Construction Manager on behalf of the Owner.

1.2 Provisions shall be such that the Trade Contractor will assume the Construction Manager's obligations to the Owner for the portion of the work performed by each Trade Contractor.

1.3 Proposals: Separate proposals for the Work Categories included in this phase of the construction will be received by the Construction Manager. The time and place where proposals shall be received and a listing of the Work Categories included in this phase of the work are included in the Advertisement for Bids.

ARTICLE 2, BIDDER'S REPRESENTATION

2.1 Each Bidder by making his bid, represents that he has read and understands the bidding documents, and that they visited the site and familiarized himself with the local conditions under which the work is to be performed. No plea of ignorance of conditions that exist, or of any other relevant matter concerning the work to be performed in the execution of the work will be accepted as justification for failure to fulfill every detail of all the requirements of the Contract Documents. The Bidder, if awarded the Contract, shall not be allowed any extra compensation by reason of any matter or thing concerning which such Bidder did not fully inform himself prior to the bidding.

ARTICLE 3, BIDDING PROCEDURES

3.1 Proposals shall be submitted in duplicate, only on the forms provided by the Construction Manager, all blank spaces shall be fully filled in, including Addenda, Alternates, Price Breakouts, Unit Prices and Bidder's Certificate where applicable. All designations and prices shall be fully and clearly set forth with the amount of the bid stated in words and repeated in numerical figures. In cases of variations, the worded amount shall prevail. Erasures or other changes in the bid shall bear the signature of the Bidder. Insert N/A in those blanks on the Proposal Form that are not applicable. Separate Proposal Forms shall be prepared for each Work Category.

3.2 The bids shall be on the basis of a Lump Sum. Proposals shall not contain any added recapitulation of the work to be done as otherwise the proposal may be declared irregular. Oral, telegraphic or telephonic modifications of the work and/or the bid amounts shall not be considered.

3.3 The Architect or Construction Manager will make clarifications and corrections by the issuance of an addendum to all Bidders recorded in the Construction Manager's office as having in their possession a set of bidding documents. Addenda shall also be issued to all plan rooms in which bidding documents are on file.

3.4 It shall be the responsibility of the Bidders on record to provide all of their prospective sub-bidders with the information contained in any addenda.

3.5 Duplicate proposals shall be submitted in an opaque envelope, clearly marked "PROPOSAL FOR WORK CATEGORY NO. _____, and shall be identified with the Project Name and the Bidder's name and address.

3.6 Proposals for this phase of the work will be received at the time and place indicated in the "Advertisement for Bids".

3.7 An award of Contracts: Each Work Category or combination of Work Categories will be awarded based on the dollar value of the proposal, qualifications of the Contractor, his ability to perform the work, and in the best interest of the Owner.

ARTICLE 4, EXAMINATION OF THE SITE

4.1 Each Bidder shall carefully examine the site of the project and surrounding territory; the means of approach to the site, and the structure of the ground, and make all necessary investigations required to inform himself thoroughly and fully as to facilities for delivering, storing, placing and handling of materials and equipment, and to inform himself fully as to all difficulties that may be encountered in the complete execution of all work in accordance with the Contract Documents.

4.2 Should a bidder find apparent discrepancies in, or omission from the Contract Documents, or should he be in doubt as to their true meaning, or should he have any questions regarding any work or material intended, then such Bidder, either Trade Contractor or Trade Subcontractor, shall submit to the Architect, through the Construction Manager, a written request for an interpretation thereof. The person submitting the request shall be responsible for its prompt delivery and such request must be delivered to the Architect by the Construction Manager at least five days before the opening of proposals.

4.3 Any verbal information obtained from, or statements made by a representative of the Owner, Architect, or the Construction Manager at the time of examination of the Contract Documents or Site shall not be construed as in any way amending the Contract Documents. Only such corrections or addenda as are issued in writing to all Bidders shall become a part of the Contract. Neither the Owner, the Architect, nor the Construction Manager shall be responsible for verbal instructions.

ARTICLE 5, MODIFICATION OR WITHDRAWAL OF BID

5.1 Bids submitted prior to the time and date designated for receipt of Bids may be modified or withdrawn only by notice to the party receiving Bids. Such notice shall be in writing over the signature of the Bidder, and must be received prior to date and time set for receipt of Bids. Any modification shall be so worded as not to reveal the amount of the original Bid.

ARTICLE 6, REJECTION OF BIDS

6.1 The Bidder acknowledges the right of the Construction Manager, Architect, and Owner to reject any or all bids, and to waive any informality or irregularity in any bid received, or to accept any bid which in the opinion of the Construction Manager, Architect, and Owner shall serve their best interests. In addition, the Bidder recognizes the right of the Construction Manager, Architect, and Owner to reject a bid if the Bidder failed to submit on the date and time required by the bidding documents, or if the bid is in any way incomplete or irregular, including a bid security, if required, is not received with the bid proposal.

ARTICLE 7, PERFORMANCE CO-OBLIGEE BOND AND LABOR & MATERIAL PAYMENT CO-OBLIGEE BOND OWNER AND CONSTRUCTION MANAGER

7.1 The Construction Manager may, prior to the execution of the Contract, require the successful Bidders to furnish Co-obligee bonds, written in favor of the Owner and the Construction Manager, covering the faithful performance of the Contract and the payment of all obligations arising thereunder in an acceptable form to the Owner and the Construction Manager, and with such sureties secured through the Bidder's usual sources as long as the surety is licensed to do business in the State of Michigan and holds a minimum "A.M. Best" rating of A. Bonds shall be in the amount of 100% of the Contract sum. The premium for such bonds shall be paid by the Bidder. A space has been provided on the Proposal Form for the Bidders to indicate the amount that shall be deducted from their proposals if Bonds are not required. Should they be required, the Bidder shall deliver the bonds to the Construction Manager not later than the date of execution of the Contract.

7.2 The Bidder shall require the attorney-in-fact who executes the bonds on behalf of the surety, to affix thereto a certified and current copy of his power of attorney indicating the monetary limit of such power.

ARTICLE 8, VARIATIONS FROM MATERIALS SPECIFIED

8.1 Wherever materials are specified using names of specific manufacturers, the purpose is to establish a standard of quality and design, and not to limit competition. Contractors desiring to use materials of manufacturers other than those specified, shall indicate such material, manufacturer, and change of price, if any, in the space provided under the heading "Variations from Materials Specified" on the Proposal Forms. BASE BID PROPOSALS SHALL INCLUDE ONLY MATERIALS SPECIFIED. Variations, if accepted, shall be incorporated in the Contract, and the Contract Price adjusted accordingly, and no other materials shall be allowed accept upon written authorization of the Architect, Construction Manager, and Owner.

ARTICLE 9, THE CONTRACT FORM

9.1 Unless otherwise provided in the Bidding Documents, the Agreement for the Work shall be between the Trade Contractor and the Construction Manager on the contract form referenced in the Standard form section of the Project Manual (The Christman Company subcontract agreement). By submitting your bid the Trade Contractor fully agrees to accept **ALL** terms

and conditions of The Christman Company Subcontractor Agreement without modification.

ARTICLE 10, TIME OF COMPLETION

10.1 Each Bidder, as evidenced by submitting a proposal, shall agree to abide by the construction schedule dates as indicated in the Contract Documents, as developed during the post bid interview, scheduling meetings, and as required by Construction Manager. **The completion schedule for this project shall be met without exceptions.**

ARTICLE 11, QUALIFICATION OF BIDDER

11.1 The Owner, Architect, and Construction Manager may make such investigations as they deem necessary to determine the ability of the Bidder to perform the work, and the Bidder shall furnish all such information and data for this purpose as the Construction Manager may request within 24 hours, including a list of projects completed, a financial statement, organization of the firm, etc. The Owner reserves the right, based on the advice of the Construction Manager and Architect, to reject any bid if the evidence submitted by, or investigation of such Bidder fails to prove that such Bidder is properly qualified to carry out the obligations of the contract and to complete the work contemplated therein.

ARTICLE 12, TAXES AND CONTRIBUTIONS

12.1 It is understood that the bid prices stated shall include all applicable Federal, State or other Governmental Division taxes and assessments. Also, all contributions for unemployment compensation, health and welfare, old age benefits or other purposes now or hereafter effective during the term of the contract, and the Owner and Construction Manager shall not be liable for any additional charges therefore.

ARTICLE 13, WARRANTY

13.1 All work shall be guaranteed for a period of at least two (2) years and/or as more specifically stated in the contract documents after final payment but not earlier than substantial completion as determined by the Architect, and all service within that period shall be rendered without charge to the Owner.

END OF SECTION

00201 - The Construction Manager will be located at 208 N. Capitol Avenue, Lansing, MI 48933-1357 for questions regarding this Bid Package. Any questions regarding information contained in this Project Manual will be answered following a written request to the Architect through the Construction Manager, and clarified in an addendum. **Under no circumstances should any prospective bidder call the Owner or Architect for clarification of the Bidding Documents.**

00202 - AIA CONTRACT FORMS

Sample AIA Documents are available for review and reference in the Construction Manager's Main Office.

00203 - AIA STANDARD FORM FOR GENERAL CONDITIONS

AIA Document A201\2007, "General Conditions of the Contract for Construction as modified for this project," is available for review at the Construction Managers Main Office.

00204 - GEOTECHNICAL INVESTIGATION

1. A geotechnical investigation report has been prepared for the site by a geotechnical consultant.

2. Copies of the geotechnical investigation report are available for review at the offices of the Construction Manager.

3. The Contractor is cautioned that the geotechnical investigation report was prepared during early preliminary design stages, and as such, references to elevations, dimensions, loadings, quantities and the like, may not coincide with the building as designed. The Contractor shall coordinate between the geotechnical investigation report and the contract documents.

4. Site Information: Data on indicated subsurface conditions are not intended as representations or warranties of accuracy or continuity between soil borings. It is expressly understood that the Owner and Architect will not be responsible for interpretations or conclusions drawn therefrom by the Contractor. Data are made available for convenience of the contractor.

5. Additional test borings and other exploratory operations may be made by Contractor at no cost to the Owner.

00205 - PRELIMINARY CONSTRUCTION SCHEDULE NARRATIVE

1. Time is of the essence on this project. The Project sequencing will be scheduled by the Construction Manager and must be adhered to by all Trade Contractors. Time, labor, material, equipment and possible cost implication of this sequencing and others not fully conceived or described prior to the time of bidding, shall be included in base bid.

   A preliminary schedule is included for reference only. It is emphasized that start

dates for work may shift. The bidder shall familiarize himself with expected maximum durations and shall include in his proposal sufficient manpower to meet these requirements. All milestone dates are approximate and are to be used as guidelines for the Trade Contractor’s basis for bid.

3. It is the Trade Contractor's responsibility to establish which items of work within the scope of his work category will be affected by the Owner's or other Trade Contractors operations and coordinate and schedule completion of his work accordingly at no cost to the Owner.

END OF SECTION 00200

The Work Category (W.C.) Description is included as a guide for Prospective Bidders to summarize the scope of work involved with the work category. The description included is **not** a final summary of the scope of work and should not be construed as such. **All** Contract Documents should be used, as a reference in preparing the Bid Proposal and any omissions in the proposal does not relieve the successful bidder of the responsibility to perform this work.

W.C. No.	Category Description	Specification Reference
20	General Trades	Division 00, Division 01, 076200, 077100, 079200, 101100, 101423.16, 105113, 122413
22	Flooring	Division 00, Division 01, 096513, 096519, 096813
27	Mechanical & Plumbing	Division 00, Division 01, 071413, 089119, Division 21, Division 22, Division 23
28	Electrical	Division 00, Division 01, Division 26, Division 27, Division 28

Work Category No. 00 – General Requirements for All Subcontractors

Work Included:

1. All permits, fees, inspections and approvals required by governing jurisdictions are included within base bid. Coordinate well in advance (at least 24 hours), required inspections and testing with the Construction Manager. This will include liaison between state and local agencies to ensure code compliance and for securing approval for the facility.
2. Excessive noise and vibration creating equipment shall be prohibited within close proximity of existing Structures/Buildings or occupied spaces. All proposed equipment scheduled for project shall be reviewed with the Construction Manager prior to delivery onsite.
3. Cleanup is required on a daily basis, and/or as directed by the Construction Manager. Cleanup dunnage, shipping materials and associated materials/debris generated from installation and dispose of properly. At no time will shipping containers, crates, materials, piles of debris, tarps, boxes, etc. be left on site, un-attended and unsecured, subject to unsafe conditions (i.e. access, fire and slip hazards and wind blown debris).
4. At least two (2) weeks prior to starting on-site, meet with the Construction Manager, Architect and Engineer to discuss and resolve any issues relating to status of material procurements, site conditions, access, staging/storage requirements, safety, testing, sequencing and scheduling of work.
5. Any work that could interfere with existing owners operation, i.e. use of certain roads, parking lots, access to buildings, shall require pre-task planning with the Construction Manager and shut-down notification requests shall be prepared (72) hrs in advance of any work being scheduled. Pre-task planning shall review and discuss scheduling, coordination with Owner operations, working durations, safe practices and procedures.
6. Protect existing structures, equipment, and finishes, including new work in place, from damage during the performance of this work category. Any protection removed to facilitate other work shall be reinstalled / replaced by the trade needing access.
7. Include all layout and engineering for each work category. Unless otherwise indicated in Section 00210, two control lines and one bench mark will be provided by the Construction Manager for Trade Contractor use.
8. Prior to commencing with installation, verify all field conditions and measurements and report any discrepancies to the Construction Manager.
9. Whenever possible all embeds to be furnished to other trades shall be fabricated / modified by the providing contractor with holes / tabs, etc to allow easy for installation by the installing contractor.
10. Provide full-time on-site supervision during the performance of your work. Supervision will be responsible for coordination, scheduling, safety, manpower, and other activities necessary to achieve safety, quality and scheduling requirements set forth under this work category. Supervision shall not be removed from this project without prior written consent and approval of the Construction Manager.
11. Full compliance with all site specific rules and regulations, including (but not limited to) OSHA, State Authorities, Local Authorities, and the Construction Manager. This subcontractor shall submit, prior to performing any work on-site, a copy of their site specific safety program/manual.

12. Should Subcontractor require on-site trailer or storage units, Subcontractor shall obtain approval from the Construction Manager on size, count and where to locate, prior to delivery on-site. Subcontractor to arrange and pay for service to trailers, including (but not limited to) electrical, phone, etc.

13. For material deliveries, if traffic control is required, Subcontractor to arrange manpower accordingly and provide signage, barricading, flagman etc., necessary for the safe performance of own work and protection of the public. Staging, storage on-site, and all deliveries required to support this installation must be reviewed and approved in advance by the Construction Manager.

14. Furnish and receive all required materials and deliver FOB jobsite. All deliveries shall be closely coordinated with the Construction Manager and 72 hour advance notice shall be given prior to delivery. Unless noted otherwise, deliveries must be coordinated to be complete with unloading during normal working hours.

15. This subcontractor will receive and handle all respective material and properly store/protect before, during and after installations. Excessive and out-of-sequence deliveries will be prohibited and subject to re-handling and removal offsite as directed by the Construction Manager.

16. Unless noted otherwise in Section 00210, furnish all hoisting, lifting, scaffolding, and handling to complete your own work.

17. Hoisting of materials and equipment over occupied areas will not be permitted, unless areas below are vacated or occupancy access is controlled during lifting. Each subcontractor will be required to notify Construction Manager seven (7) days in advance of required hoisting over occupied areas. Pre-Task planning and shut-down notifications will be required to assure minimum interruptions to Owner operations. In general, any hoisting equipment required to be used on-site must be reviewed in advance with Construction Manager for coordination of site logistics, safety procedures (including FAA approvals if required), access, lift swing areas, duration and overall activities relating to this hoisting equipment.

18. Approved O&M manuals are required at least 2 weeks prior to equipment start-up, start of warranty, and Owner training, but no later than thirty (30) days prior to substantial completion.

19. In the event of any jurisdictional or labor issues, the subcontractor assigned the work shall arrange to complete all work as required to avoid any interruptions/continuity of work on this project at no additional cost. All labor requirements pertaining to the project will be met.

20. Cooperate fully with representatives from Architect, Engineer, Owner, Construction Manager and independent testing agency, and allow for in progress inspections, including providing access to areas of work, when required.

21. This project may require multiple phases, which will require re-mobilization. All costs for multiple phasing shall be included.

22. Each Trade Contractor shall assume full responsibility for all pre-ordered products after their arrival at this designated location. This includes transportation, storage, start-up, warranty services, and installation in accordance with the General Conditions unless otherwise specified.

23. Critical Scheduling and Sequencing of Work:

    The Construction Manager shall provide overall scheduling and coordination for the entire project. All Trade Contractors shall acknowledge the Construction Manager's right to establish and set up, or subsequently modify the sequencing and scheduling of all work on this project for the earliest completion and/or benefit to the Owner. More restrictive sequencing to coordinate the Owner's on-going operations and/or for the coordination of the various trades shall be spelled out by the Work Category descriptions or as otherwise directed by the Construction Manager. All Trade Contractors agree to cooperate and alter their operations to maintain these more specified restrictions and sequences of the work.

    A. Subcontractor agrees to work concurrently with other subcontractors and the Construction Manager, according to the Master Project Schedule.

    B. Subcontractor shall confirm fabrication lead times, installation durations and sequencing for their Work in writing within two weeks of award, and report any discrepancies to Construction Manager.

    C. Scheduling updates and proper coordination and communication with other trades shall be accomplished as follows:

        - Weekly sub-progress meetings
        - Safety meetings, BIM meetings, scheduling meetings, pre-installation meetings, etc.

24. Construction Waste Management And Disposal – Review Spec Section 017419 Construction Waste Management And Disposal

25. General Commissioning Requirements – Review Spec Section 019113 General Commissioning Requirements.

26. Indoor Air Quality Management Plan – During Construction. Comply with site specific IAQ Management Plan for this project.

End of Work Category No. 00

Work Category No. 20 – General Trades

Work Included:

The subcontractor shall timely perform all work as detailed below, in accordance with the contract documents (including Bidding Requirements, Proposal Section, Contract Forms, General Conditions, Supplemental Conditions, General Requirements, Addenda, etc.), including, but not limited to, the following Specification Sections and Work Scope Items. Unless otherwise noted, this contractor is responsible for all items specified in the following specifications sections:

Reference Work Category Index

Work Category Notes:

1. Complete all exterior and interior Carpentry/Millwork (rough and finish) and various General Trades Work as noted within this Work Category, including all labor, materials and equipment required for a complete installation.
2. All exterior and interior rough and finish carpentry including counters, cabinets, trim, nailers, blocking and plywood sheathing.
3. All architectural hardware for cabinets supplied by this Work Category.
4. Include all stainless steel required and associated with millwork.
5. Install all custom casework fabricated and furnished by others including cabinets, p-lam coat shelves, p-lam and solid surface vanity tops, and solid surface windowsills.
6. All fabricated materials are to be shop assembled to the greatest extent possible before shipping to the job site.
7. Furnish and installation of specialties including but not limited to visual display boards, lockers, roller window shades, and room signage.
8. Equipment items designated as Owner-Furnished/Contractor-Installed are a part of this scope of work. Owner furnished equipment isolated to an electrical connection "only" will be handled by the electrical subcontractor. Equipment requiring water, steam, medical gas, ducting, etc. will be handled by the mechanical subcontractor. All equipment that does not have any mechanical and/or electrical connection is the responsibility of this work category to receive, unload, distribute, and install.
9. Protect from damage existing finish work that is to remain.
10. Furnish and install sealants for all materials installed by this contractor such as lockers, etc.
11. Furnish shop drawings, samples, product data, test reports, coordination drawings and other submittals as specified. Coordinate submittal schedule with the Construction Manager.

Specific Notes and Details:

The following details and notes are included in this Work Category; this list is to clarify the specific items noted below and does not exclude other details or otherwise limit the scope of work for this Work Category.

1. This Work Category is responsible for all misc. painting that will be needed (exposed MEP items below ceilings in existing building, etc.). This will be funded from your allowance.
2. Install acoustical ceiling grid and tile where left out by Vesta Modular. Grid and Tiles are provided by Vesta. Reference Modular drawing A3.1 (Reflective Ceiling Plan) for locations at building seems. The main

corridor will also need to be installed.

3. Provide temporary fire extinguishers (during construction) within a freestanding wood cabinet painted in red, labeled "fire extinguisher" as located by the Construction Manager. Removal following use included. Quantity for each area to match minimum required by MIOSHA.

4. Provide and install parapet top of wall assembly including plywood, blocking, coping, sheet metal flashing and trim.

Related Work by Others:

1. Dumpsters
2. Temporary water and electrical
3. Benchmarks and column lines (one in each direction) by Construction Manager.
4. Roofing by Vesta Modular.
5. Independent testing and inspections by Owner.
6. Roof mechanical equipment curbs by WC 27.
7. Wall Protection by Vesta Modular.

Allowances:

This Contractor shall include in their Base Bid a Construction Manager's allowance of **$20,000**. Reference Section 01020 for specific instructions on allowances. Intent of allowance is for miscellaneous painting not referenced in contract documents,

Unit Prices:

Unit Prices are to be complete furnished in-place operations, and include all costs, incidental materials and work, insurance, fringes, bonds, engineering, overhead and profit. Reference the Trade Contract Proposal form for unit pricing required.

End of Work Category No. 20

Work Category No. 22 – Flooring

Work Included:

The subcontractor shall timely perform all Flooring work, as detailed below, in accordance with the contract documents (including Bidding Requirements, Proposal Section, Contract Forms, General Conditions, Supplemental Conditions, General Requirements, Addenda, etc.), including, but not limited to, the following Specification Sections and Work Scope Items. Unless otherwise noted, this contractor is responsible for all items specified in the following specifications sections:

Reference Work Category Index

Work Category Notes:

1. Furnish and install all flooring; including floor preparation, joints, and sealing as shown and/or specified. Includes all labor, material, accessories, and equipment for a complete installation.
2. Furnish and install all transition strips between different floor types.
3. Furnish and install materials necessary to match finishes in existing tie-in areas and at different floor types.
4. Protection of flooring shall be provided by this contractor until substantial completion. Provide final cleaning after floor protection is removed.
5. Broom sweep and prep floor as required for this work.
6. Verify curing compounds & sealers used on new and existing surfaces are compatible for flooring adhesives and materials.

Specific Notes and Details:

The following details and notes are included in this Work Category; this list is to clarify the specific items noted below and does not exclude other details or otherwise limit the scope of work for this Work Category.

1. Provide and install trim around floor access doors (2 of them).

Related Work by Others:

Allowances:

This Contractor shall include in their Base Bid a Construction Manager's allowance of **$10,000**. Reference Section 01020 for specific instructions on allowances.

Unit Prices:

Unit Prices are to be complete furnished in-place operations, and include all costs, incidental materials and work, insurance, fringes, bonds, engineering, overhead and profit. Reference the Trade Contract Proposal form for unit pricing required.

End of Work Category No. 22

Work Category No. 27 – Mechanical and Plumbing Systems

Work Included:

The subcontractor shall timely perform all Mechanical and Plumbing work, as detailed below, in accordance with the contract documents (including Bidding Requirements, Contract Forms and General Conditions, Supplemental Conditions, General Requirements, Addenda, etc.), including, but not limited to, the following Specification Sections and Work Scope Items. Unless otherwise noted, this contractor is responsible for all items specified in the following specifications sections:

Reference Work Category Index

Work Category Notes:

1. Furnish and install all mechanical and plumbing systems, including domestic water, sanitary and vent, hydronic piping, ductwork, insulation, temperature controls including DDC or BMS systems, system commissioning, air and water balancing, etc., indicated by the contract documents (not just limited to the mechanical and plumbing drawings) or as required for a complete installation, including labor, materials, accessories and equipment for a complete installation.
2. Investigate areas prior to demolition activities, reroute and relocate existing services required for occupied operation. Cut, cap, and make safe, all existing plumbing, medical gases, temperature controls and HVAC systems in renovated areas prior to demolition. Properly identify and mark system and components to be removed.
3. All cutting, capping, coring, patching and firesafing of walls, floors, ceilings, etc., required for the installation of this work. Patch and repair work is to be done professionally by skilled craftsmen. All such openings require prior written approval from the Construction Manager, before work begins. Furnish and install all sleeves and or misc. steel in walls, floors, roofs and ceilings that may be required by this W.C.
4. All utility connection, disconnections, tie-ins, crossovers, shut downs and similar work must be performed and scheduled so they will not interfere with other work. It may be necessary to make these changes during "off" hours, or it may be necessary to make "hot tap" connections. The contractor should plan on premium time for this work. Coordinate with the Construction Manager prior to performing this work.
5. Furnish access panels where required for the wall and ceiling valves, dampers and controls that are not shown on the Architectural/Mechanical plans but are necessary for the Mechanical Systems.
6. Extreme care is to be taken when installing hangers and equipment in the area that has "spray on fireproofing", so as not to damage it. This contractor will be responsible for patching fireproofing incase of damage by this trade. This work is to be performed by a qualified contractor so that the warranty will not be affected.
7. Furnish all hoisting, lifting, scaffolding and handling of all materials required to complete this work category.
8. Provide and install mechanical equipment tags, pipe identification and other required identification of signage related to his work.
9. Run the various building piping systems out five (5) feet from the building walls and make the final connections to underground systems.
10. A coordination meeting will be set up between the controls contractor, mechanical contractor, electrician, and construction manager prior to control work. This will include all required work for a complete system as indicated in the construction documents.

Specific Notes and Details:

The following details and notes are included in this Work Category; this list is to clarify the specific items noted below and does not exclude other details or otherwise limit the scope of work for this work category:

1. The roofing will be installed by the Pre-Manufactured Modular Company with the exception of flashing at penetrations, vents, curbs, etc.. This work category is responsible for providing and installing that additional roof flashing as needed.
2. Generally Vesta Modular is installing all piping within the building itself (gas is exception), but not above or below the building. This work category is responsible for providing and installing that piping.
3. Vesta furnishes the RTU and associated curbs. This work category responsible for installing the curbs and RTUs including lifting.
4. Responsible for connecting factory installed ductwork between building sections/modules. Refer to Whitley Manufacturing Drawings for locations and sizes. Ductwork is insulated duct board, no additional insulation will be needed.
5. Provide and install gas piping systems including all accessories for a complete installation. This will not be done by Vesta in the pre-manufactured modules, instead this work category is responsible for all of it.
6. Provide and install heat trace on all piping in crawl space as noted.
7. This work category responsible for fire protection scope. Like ductwork, main lines will be run by Vesta in the shop but this work category will need to make connections at building/module connections. To be funded from your allowance as layout is unknown.
    a. Include providing and installing fire suppression riser and fire department connection in base bid. Provide deduct pricing on bid form if this scope is to be removed as a voluntary alternate.
8. The crawl space might be deemed confined space; any work down there will need to follow MIOSHA regulations.
9. Base bid temperature controls contractor needs to be SC Tech. Provide voluntary alternate for any other subcontractors to perform temperature controls.
10. Provide and install architectural louvers for crawl space as shown on 1/A4.1 (including bug screen).
11. Some notes from the architect on the roof conductor/storm piping shown on P1.1:
    a. P1 feeds to P3 and is the pipe for the roof conductor/storm. Vesta is providing the roof drain and the vertical piping down to below the floor. Plumbing contractor (WC 27) to pick up from there and route it to tie into civil.
    b. P3 is specifically for the overflow (DN-1). Vesta Modular is providing the overflow drain and the vertical piping down, along with an elbow and pipe that sticks out of the wall for connection to DN-1 once the brick is applied.

Related Work by Others:

1. Water Service to the building by WC 02 (BP1). Providing up through floor to first flange.
2. Site and footing drainage systems by WC 02 (BP1)
3. Power supply to mechanical equipment by W.C. 28.

4. Site utilities beyond 5' from building perimeter by WC 02 (BP1) or Utility Company.
5. All plumbing utilities under mud mat will be by WC 02 (BP1) for schedule reasons. WC 27 to complete all piping between mud mat and tie into Modular piping.

Allowances:

This Contractor shall include in their Base Bid a Construction Manager's allowance of **$30,000.** Reference Section 01020 for specific instructions on allowances. Intent is for fire suppression connections,

Unit Prices:

Unit Prices are to be complete furnished in-place operations, and include all costs, incidental materials and work, insurance, fringes, bonds, engineering, overhead and profit. Reference the Trade Contract Proposal form for unit pricing required.

End of Work Category No. 27

Work Category No. 28 – Electrical Systems

Work Included:

The subcontractor shall timely perform all Electrical work, as detailed below, in accordance with the contract documents (including Bidding Requirements, Contract Forms and General Conditions, Supplemental Conditions, General Requirements, Addenda, etc.), including, but not limited to, the following Specification Sections and Work Scope Items. Unless otherwise noted, this contractor is responsible for all items specified in the following specifications sections:

Refence Work Category Index

Work Category Notes:

1. Furnish and install all electrical systems, including power, lighting, fire alarm, public address system, lightning protection system, clocks and clock system, telephone/data and CATV systems, system commissioning, etc., indicated by the contract documents (not just limited to the electrical drawings) or as required for a complete installation, including labor, materials, equipment, adhesives, fasteners, supports, hangers, grounds, blocking, shims and all necessary anchoring devices and accessories.
2. Investigate areas prior to demolition activities, reroute and relocate existing services required for occupied operation. Cut, cap, and make safe, all existing electrical systems in renovated areas prior to demolition. Properly identify and mark system and components to be removed by others.
3. All cutting, capping, coring, patching and firesafing of walls, floors, ceilings, etc., required for the installation of this work. Patch and repair work is to be done professionally by skilled craftsmen. All such openings require prior written approval from the Construction Manager, before work begins. Furnish and install all sleeves and or misc. steel in walls, floors, roofs and ceilings that may be required by this W.C.
4. All utility connection, disconnections, tie-ins, crossovers, shut downs and similar work must be performed and scheduled so they will not interfere with other work. It may be necessary to make these changes during "off" hours, or it may be necessary to make "hot tap" connections. The contractor should plan on premium time for this work. Coordinate with the Construction Manager prior to performing this work.
5. Furnish access panels where required for the wall and ceiling valves, dampers and controls that are not shown on the Architectural/Electrical plans but are necessary for the Electrical Systems.
6. Extreme care is to be taken when installing hangers and equipment in the area that has "spray on fireproofing", so as not to damage it. This contractor will be responsible for patching fireproofing incase of damage by this trade. This work is to be performed by a qualified contractor so that the warranty will not be affected.
7. Furnish all hoisting, lifting, scaffolding and handling of all materials required to complete this work category.
8. Provide and install panel labeling, identification and other required identification of signage related to his work.
9. A coordination meeting will be set up between the controls contractor, mechanical contractor, electrical contractor, and construction manager prior to control work. This will include all required work for a complete system as indicated in the construction documents.
10. Electrical connections to equipment and devices provided by others, including by not limited to duct detectors, fire dampers, flow and tamper switches, variable frequency drives, power assist door motors, Owner furnished items, etc. Verify construction documents have been coordinated with power requirements of equipment prior to installation of devices.

Specific Notes and Details:

The following details and notes are included in this Work Category; this list is to clarify the specific items noted below and does not exclude other details or otherwise limit the scope of work for this work category:

1. Provide flush mounted J-boxes with trim to WC 11 (Masonry) for them to install in brick at all exterior wall mounted electrical items.
2. Responsible for final electrical connections for roof top units and service receptacles. Vesta Modular to provide receptacles and unit disconnects as well as breaker with wire coiled up.
3. Provide and install fire alarm system. The main corridor ceiling will not be installed until after your overhead installation is complete. The ceilings in the classrooms, etc. will come pre-installed so you will need to take care working above ceiling.
4. Underground conduit and wire from transformer to building, including excavation and backfill.
5. This work category to remove and re-install ceilings in the existing school building as needed to complete your scope of work.
6. The crawl space might be deemed confined space; any work down there will need to follow MIOSHA regulations.
7. Provide and install neutral/grounding system.
    a. Note bonding of steel between modules after they are installed by this WC.
8. This WC responsible for technology scope including providing and installing boxes not provided/installed by Vesta Modular. Modular supplied rough-ins, symbols are shown as thick, solid line, color-coded. This WC rough-ins, symbols are shown as thin, dashed line, color-coded.
    a. Basically all the interior wall symbols are by Vesta Modular while all ceiling, exterior wall and existing building symbols are by WC 27.
    b. EPS is currently company that supports Pattengill's existing security systems.

Related Work by Others:

1. Underground conduits from tech room of new modular building to existing building by WC 02 in BP 1. The WC 28 to use those pathways.
2. Fire protection system and risers by W.C. 27.
3. Low voltage wiring not identified on the drawings by the trade providing equipment.
4. Site utilities to transformers/cabinets by Utility Company.

Allowances:

This Contractor shall include in their Base Bid a Construction Manager's allowance of **$20,000**. Reference Section 01020 for specific instructions on allowances.

Unit Prices:

Unit Prices are to be complete furnished in-place operations, and include all costs, incidental materials and work, insurance, fringes, bonds, engineering, overhead and profit. Reference the Trade Contract Proposal form for unit pricing required.

End of Work Category No. 28

Trade Contract Proposal
Pre-Submission Checklist

Trade Contract Proposal Form completely filled out?

Form signed by authorized officer of firm?

Costs for Performance and Labor & Material Bond costs excluded in base bid proposal sum but amount included in break out?

All taxes included in base proposal sum?

Bid security (bond or certified check or money order) of at least 5% of base proposal sum included?

Requested alternates & unit prices quoted?

Sworn & Notarized Familial Affidavit for Lansing School District?

Sworn & Notarized Familial Affidavit for Kingscott and Christman?

Non-Discrimation Certification included in your proposal?

Iran Sanctions Certificate and Act Certificate included?

Affidavit of Bidder – Non-Collusion included in your proposal?

Legal Status of Bidder Certificate included in your proposal?

All information (proposal, bond, etc.) Submitted in triplicate?

Proposal submitted in sealed envelope per specifications

TRADE CONTRACT PROPOSAL FORM

WORK CATEGORY NO. 00 and _____ Date: _____

TO: The Christman Company
208 N. Capitol Avenue
Lansing, MI 48933-1357

Re: Pattengill Modular Classroom Building
815 N Fairview Ave,
Lansing, MI

Ladies and Gentlemen:

Having carefully examined General Conditions, Supplementary Conditions, General Requirements, Advertisement for Bids, Instructions to Bidders, Proposal Section, Specifications, Drawings, all Addenda issued, Work Category Descriptions, and understanding the scope of work involved in this Work Category (ies) and those that interface with it (them), the undersigned does hereby propose to furnish all labor, materials, insurances, taxes, tools, equipment and services to complete all work required for the Work Category(ies) indicated in accordance with the Work Category Description and the Contract Documents prepared by _____.

BASE PROPOSAL SUM:

_____
_____ ($_____)

PERFORMANCE & PAYMENT BOND: The Trade Contractor may be required to furnish a Co-Obligee Labor & Material Payment & Performance Bonds for the full contract amount.
The name of the Bonding Company is: _____.
The sum of ($_____) to cover cost of furnishing these bonds is to ***added to*** the base bid (not included in the base bid amount).

EXPERIENCE MODIFICATION RATING (EMR):
List the EMR for your firm as determined by your insurance carrier for the past three (3) years.
2023 _____ 2022 _____ 2021 _____

ADDENDA: The following Addenda have been received, are hereby acknowledged, and their execution is included in Bid Sums listed herein.
No _____ Dated _____ No _____ Dated _____ No. _____ Dated _____

TIME AND MATERIAL RATES: Replace with itemized form to be submitted at bid? Including sub-tier subcontractors

Labor rates listed below include the following:

Cost of labor including Michigan Single Business Tax, Social Security and Medicare, Federal and State Unemployment Tax, and Fringe Benefits Under Collective Bargaining Agreements, and Worker's Compensation Insurance. The rates listed below do not include overhead and/or profit. These rates are only for additions and/or deletions to the contract that could not have been anticipated at the time of the bid.

TRADE CONTRACT PROPOSAL FORM

WORK CATEGORY NO. 00 and _____ Date: _____

	TRADE	STRAIGHT TIME	SHIFT TIME	1 1/2 TIME	DOUBLE TIME
1					
2					
3					
4					
5					
6					

OVERHEAD AND PROFIT(FOR FUTURE CHANGES): Overhead and Profit shall include the following: Supervision, Superintendents, Commercial General Liability and Umbrella Insurances, Wage of Time Keepers, Watchmen and Clerks, Small tools with material value of less than $1,500.00. Incidentals, General Office Expense, and all other expenses not included in Labor Rates as listed above. The percentage fee for Overhead and Profit on the Contractor's own work shall be 15% of net cost. The percentage fee for Overhead and Profit on Subcontractor's work shall be 5% (see log).

MANDATORY ALTERNATES:
NA

UNIT PRICES:
NA

VOLUNTARY ALTERNATIVES (Variations From Materials Specified):
Undersigned proposes the following voluntary alternates for materials and/or equipment specified, it being understood that, should any voluntary alternate(s) be accepted by the Owner, applicable amount(s) hereinafter listed will be added to or deducted from the Base Bid. (No voluntary alternates are required)

1. _____ $ _____ (Add/Deduct)
2. _____ $ _____ (Add/Deduct)
3. _____ $ _____ (Add/Deduct)

SCHEDULE:
The undersigned if awarded a Contract, agrees to work concurrently with the work of other Trade Contractors and the Construction Manager, according to the "Approved Construction Schedule."

BIDDER'S CERTIFICATE:

I hereby certify that all statements herein are made on behalf of

_____
(Name of Corporation, Partnership or Person Submitting a Bid)

_____
Bidder's Name

TRADE CONTRACT PROPOSAL FORM

WORK CATEGORY NO. 00 and _____ Date: _____

A Corporation organized and existing under the laws of the State of _____

An individual doing business as _____

Signature:
Title:
Address:

Phone:
Fax:
Email:

CHRISTMAN
SINCE 1894

Job No. **Work Category:**

** SUBCONTRACT **

This Subcontract (Agreement) is dated , between , , with its principal place of business at 208 N. Capitol Avenue, Lansing, MI 48933-1357 (Christman), and , with its principal place of business at , (Subcontractor). Christman and Subcontractor are collectively called the Parties. The Parties agree:

ARTICLE 1 - PROJECT

Subcontractor shall perform and pay for all of the Work, for the Contract Sum on the following Project known as , located at , , , , for (Owner) in accordance with the documents prepared by (Architect/Engineer).

ARTICLE 2 - CONTRACT SUM

2.1 Contract Sum Subcontractor shall perform the Work for the Contract Sum, subject to adjustment only with Christman's prior written approval for changes in the Work. For the complete, timely, and satisfactory performance of the Work, Christman will pay Subcontractor the Contract Sum, subject to additions or deletions by Change Order, and subject to the terms of the Contract Documents. The Contract Sum shall not be adjusted unless Subcontractor shall have strictly complied with Articles 13 (Changes). Notwithstanding the foregoing, Christman may adjust the Contract Sum by Change Order, without Subcontractor's consent, for backcharges, set offs, or all costs associated with Subcontractor's Default. Subcontractor shall pay for all costs to perform its obligations, even if those costs exceed the Contract Sum.

Contract Sum: * DOLLARS*****

. Work Category

Total for Subcontract:

2.2 Resource Planning The Contract Sum shall include any material or labor escalation, incidental costs required for the Project, any additional crews, overtime, shift time, and any other resource necessary to meet the Project Schedule, including any revisions or amendments to the Schedule.

2.3 Employer Contributions & Taxes The Contract Sum shall include: (a) all wages, prevailing wages (if required), premiums, payroll taxes, pension, fringe, welfare, vacation, annuity, travel pay, and union or benefit contributions, apprenticeship or industry advancement funds payable in connection with the Work if applicable or as required by Applicable Laws (collectively, Employer Contributions); and (b) all taxes arising out of Subcontractor's furnishing or installing any labor, material and equipment including but not limited to sales, use, personal property, and excise taxes (collectively, Taxes). Before receiving final payment, Subcontractor shall certify that it has paid all Employer Contributions and Taxes.

2.4 Patents & Copyrights The Contract Sum shall include all license fees and royalties for all items, materials, methods, or systems for the Work provided by subcontractor.

2.5 Lump Sum This is a lump sum contract. Subcontractor represents and warrants that it has independently investigated and ascertained the quantity and cost of the Work. The Contract Sum shall not be adjusted for increases in the quantity or cost of labor or materials. Subcontractor assumes exclusive liability for all matters required to be included in the Contract Sum.

ARTICLE 3 - WORK

3.1 The Work Subcontractor shall provide and install all labor, materials, tools, equipment, hoisting, scaffolding, insurance, Taxes, supervision, services, design, and all other items, in the quantities necessary to properly, efficiently and timely prosecute and

complete the Work identified in the Contract Documents and Supplements, except to the extent specifically indicated in the Contract Documents to be the responsibility of another trade (the Work). The Drawings and Specifications describe the general scope of the Project, and as such, they do not necessarily describe all work required for the full performance of the Work. The Parties execute this Agreement on the basis of such documents with the understanding that Subcontractor shall furnish and install all items reasonably implied or inferable by Christman or the Owner from the Contract Documents as required for the proper completion of the Work without adjustment to the Contract Sum. Subcontractor shall perform the Work in strict accordance with the Contract Documents. All workmanship shall be of the highest grade. All materials and equipment shall be new except as provided in the Contract Documents.

ARTICLE 4 - CONTRACT DOCUMENTS

4.1 Contract Documents Subcontractor, and its subcontractors, consultants, laborers and suppliers (collectively, Lower Tiers), shall be bound by the Contract Documents which consist of this Agreement, Exhibits to this Agreement, the agreement between Christman and Owner/Customer (Prime Contract) except as otherwise provided in this Agreement, all documents incorporated in the Prime Contract, the Drawings, Specifications, Addenda, Conditions, and any documents set forth in Supplements, all of which are incorporated herein and made a part of this Agreement, except payment terms of the Prime Contract and except dispute resolution terms of the Prime Contract as they relate to the specific method of final dispute resolution after claim submission, in which case Article 16 (Dispute Resolution) controls. Subcontractor shall perform all Work subject to all terms and conditions, express or implied, in the Contract Documents relating to its Work, it being the intention that Subcontractor will fully, properly and faithfully discharge the obligations of Christman insofar as the Subcontractor's Work.

4.2 Flow Down Subcontractor assumes toward Christman all of the obligations and responsibilities that Christman, by the Contract Documents, assumes toward Owner insofar as the Subcontractor's Work, regardless of whether Owner enforces these obligations against Christman. Subcontractor shall not have any right or remedy against Christman which Christman does not have to or against the Owner under the Contract Documents. Subcontractor shall incorporate the Contract Documents by reference into any agreements with Lower Tiers. By written contract, Subcontractor shall require its Lower Tiers to assume towards Subcontractor and Christman all of the obligations including but not limited to, insurance, indemnity, and defense that Subcontractor, by the Contract Documents, assumes toward Christman insofar as the Subcontractor's Work. If requested by Subcontractor, Christman shall supply Subcontractor with a copy of the Prime Contract with confidential information redacted.

4.3 Conflicts & Interpretation The Contract Documents are intended to complement each other and shall be so interpreted where possible. If, however, any provision of this Agreement irreconcilably conflicts with another provision of the Contract Documents, the provision imposing the greater duty, greater quality, or more stringent requirement on Subcontractor shall govern. Further, to the extent the Contract Documents give the Architect/Engineer or Owner the right to determine quantities, quality, and other factors relating to the Work, such determinations shall be binding on Subcontractor to the same extent they are binding on Christman.

4.4 Acceptance Subcontractor's signature on this Agreement or the start of any Work shall constitute Subcontractor's acceptance of this Agreement. However, this Agreement is expressly contingent upon Owner approving Subcontractor. Upon Christman's notice to Subcontractor that Owner rejects Subcontractor, Subcontractor shall have 5 days after notice to overcome its disqualification to the satisfaction of Owner, otherwise this Agreement shall be deemed null and void.

ARTICLE 5 - BONDS

5.1 Surety Qualification If Performance and/or Payment bonds are required, Subcontractor shall pay for and deliver such bonds, within 10 days of Christman's request using the form specified by Christman and attached to this Agreement, each in the full amount of this Agreement, issued by a United States (U.S.) Treasury listed surety with an AM Best rating of A or better, approved and licensed to do business in the state where the Project is located (Controlling State), duly executed by agents with complete Power of Attorney to the full limits therein. Christman shall have the right, in its discretion, to reject Subcontractor's bonds and surety and to require replacement of the bonds and/or surety, at Subcontractor's cost, if the surety proposed by Subcontractor does not meet any requirements of this Agreement upon submission. Subcontractor is not permitted any mark up on bond costs and shall present an invoice from its surety to establish the actual cost of any bonds. Subcontractor shall refund to Christman any rebate or refund in bond premiums resulting from adjustment in bonds.

5.2 Changes & Terms Christman shall have the right, without notice to Subcontractor's surety, to order changes in the performance or time of performance of the Work and to modify this Agreement. No extension of time, change, addition, or omission of terms in this Agreement or the Prime Contract shall affect the surety's obligation on the bonds. Subcontractor and its surety waive notice to the surety of any such extension of time, change, addition, or omission. Subcontractor and surety agree without the necessity for any further authorization, to increase the bonds' penal sums if or when additive changes to the Contract Sum are executed. Christman's response to any surety inquiry as to Subcontractor's performance shall not estop or impair Christman's rights under this Agreement or any bond, and surety shall be required to conduct its own independent investigation of Subcontractor's performance.

5.3 Duration Any Performance Bond shall guaranty Subcontractor's performance through the end of any warranty period and any statute of limitation as to surety's obligations under the Performance Bond shall not begin to accrue until the warranty period ends, subject to the requirements of the Prime Contract and as allowable by Applicable Law.

ARTICLE 6 - INSURANCE

6.1 General Obligation Before starting any Work and as a condition precedent to payment, Subcontractor shall maintain insurance in the types, coverages, and for the limits as set forth below, in the Prime Contract, or in Subcontractor's actual policies of insurance, *whichever is greater or requires more*, and shall furnish Certificates of Insurance (COI) evidencing such insurance.

a. Worker's Compensation — Statutory Limit | $1,000,000 Employer's Liability

b. Commercial General Liability (CGL)*
   1) Bodily Injury — $2,000,000 Each Occurrence | $2,000,000 Per Project Aggregate
   2) Property Damage — $2,000,000 Each Occurrence | $2,000,000 Per Project Aggregate

   Subcontracts greater than $3,000,000
   1) Bodily Injury — $5,000,000 Each Occurrence | $5,000,000 Per Project Aggregate
   2) Property Damage — $5,000,000 Each Occurrence | $5,000,000 Per Project Aggregate

   *Coverage shall be occurrence based and shall include products and completed operations, contractual and independent contractors, and where applicable, underground hazard and/or explosion and collapse

c. Comprehensive Automobile Liability
   1) Bodily Injury — $2,000,000 Each Occurrence | $2,000,000 Per Project Aggregate
   2) Property Damage — $2,000,000 Each Occurrence

d. Professional Liability - when the Work includes any design, engineering, or professional services with a deductible and/or self-insured retention, including those relating to defense costs, not in excess of $25,000
   $2,000,000 Each Occurrence | $2,000,000 Per Project Aggregate

Insurance policy limits shall be in the amounts specified above, as required by the Prime Contract, or as specified in Subcontractor's policies, *whichever is greater*. Policy limits may be achieved through a combination of underlying and excess (umbrella) coverage. Unless the Prime Contract provides for insurance by and at the expense of Owner to protect Subcontractor against loss, Subcontractor shall provide for all of its own insurance of every kind.

6.2 Additional Insured Subcontractor shall name the Owner, Architect/Engineer, Christman, and their directors, officers and agents, and any other persons or entities listed in the Prime Contract and Supplements, as additional insureds (AI) on every policy of insurance, except Workers Compensation, including under the completed operations coverage, using AI ISO form Endorsements CG 20 10 07 04 and CG 20 37 07 04, and with respect to the Architect/Engineer, CG 20 32 07 04. All COIs shall include evidence of these endorsements. Insurance covering the AI parties shall be primary and all other insurance carried by any additional insured shall be excess.

6.3 Qualifications Subcontractor shall provide insurance from insurers with policy holder ratings not lower than "A" and financial ratings not lower than "XI" in the Best's Insurance Guide, latest edition in effect as of the date of the Agreement.

6.4 Duration Subcontractor warrants and represents that for the duration of its Work, and for such longer periods required herein, Subcontractor has and shall maintain the required insurance coverage. Subcontractor shall maintain Products and Completed Operations insurance for a minimum period of the longer of the following: (a) six years after the Project Substantial Completion Date; or (b) the period of the statute of limitation or the statute of repose of the Controlling State; or (c) the duration set forth in the Prime Contract.

6.5 Cancellation Subcontractor shall provide written notice to Christman of the cancellation or expiration of any required insurance within 3 days of the date of the cancellation or expiration or within 3 days Subcontractor is first aware of any notice of cancellation or expiration, whichever comes first. If Subcontractor becomes uninsured, such event shall be deemed a material breach of contract and an immediate Subcontractor Default without notice.

6.6 Subcontractor Property If any loss or damage to Subcontractor's own property occurs, Subcontractor shall look solely to its own insurance for recovery regardless of whether a Builder's Risk policy is in place on the project, and is solely responsible for its deductibles. Subcontractor shall hold harmless and defend Christman and Owner from such loss or damage.

6.7 Deductibles Subcontractor shall be solely and exclusively responsible for any insurance deductibles to the extent arising out of or relating in any way to its Work, including but not limited to claims which could be covered by Builder's Risk insurance.

6.8 Waiver of Subrogation Subcontractor unconditionally waives all of its rights and shall require its insurers and Lower Tiers to unconditionally waive all rights of subrogation against the Owner, Architect/Engineer, Christman, and their parent companies, affiliates, subsidiaries, partners, officers, directors, employees, and agents, and similarly waives all rights of subrogation against all other subcontractors, vendors and suppliers.

6.9 Vertical Exhaustion Subcontractor's underlying and excess coverage shall be primary and noncontributory to any policy of insurance maintained by any other entity and shall be vertically exhausted first in the order of coverage before any other policy of insurance. Subcontractor's excess policy shall be tied only to Subcontractor's underlying policy and shall not require the exhaustion of limits of policies of any insurance maintained by any other entity before attaching. Further, Subcontractor's excess policy shall not require the exhaustion of underlying limits only through the actual payment by the underlying insurer.

6.10 Lower Tiers Subcontractor shall require, and Subcontractor represents that its Lower Tiers will maintain, the insurance coverages specified in this Article including naming Owner, Architect/Engineer, and Christman, as additional insureds.

ARTICLE 7 - INDEMNITY

7.1 TO THE MAXIMUM EXTENT PERMITTED BY LAW, SUBCONTRACTOR SHALL INDEMNIFY, DEFEND AND HOLD HARMLESS OWNER, ARCHITECT/ENGINEER, CHRISTMAN, AND THEIR OFFICERS, DIRECTORS, EMPLOYEES, AGENTS AND ASSIGNS, AND OTHER ENTITIES IF ANY, THAT CHRISTMAN IS OBLIGATED TO INDEMNIFY BY THE PRIME CONTRACT, (COLLECTIVELY, INDEMNITEES) FROM AND AGAINST ANY AND ALL CLAIMS, ALLEGATIONS, DEMANDS, DAMAGES, COSTS, EXPENSES, PENALTIES, WORK STOPPAGE, ATTORNEY FEES, AND/OR LIABILITIES OF ANY TYPE OR KIND, REGARDLESS OF THE LEGAL THEORY, ARISING OUT OF OR RELATED TO THE WORK (COLLECTIVELY, CLAIMS) INCLUDING BUT NOT LIMITED TO ANY AND ALL CLAIMS: (a) personal injury or property damage or property impairment; (b) defects or omissions in Subcontractor's workmanship or materials provided; (c) Subcontractor's violation of any Applicable Law, regulatory violations, citations or penalties; (d) Subcontractor's breach or failure to perform this Agreement; (e) Subcontractor's use of Christman's equipment or equipment operator and Christman's use of Subcontractor's equipment in accordance with section 10.4; (f) Subcontractor's infringement of any patent, trademark or other proprietary right; (g) claims and/or liens per Article 12; (h) Subcontractor's breach of any representation or warranty; (i) damage to Subcontractor's own equipment and property; (j) Subcontractor's violation of any applicable confidentiality or nondisclosure agreement; (k) Subcontractor's failure to comply with all matters required to be included in the Contract Sum; (l) Subcontractor

substitutions, regardless of whether Christman or Owner consented to the substitution; and, (m) any claim as described in the Prime Contract. **THIS INDEMNITY OBLIGATION COVERS ALL CLAIMS CAUSED BY OR CONTRIBUTED TO, IN WHOLE OR IN PART, ANY ACTIVITY OR INACTIVITY OF SUBCONTRACTOR, ITS LOWER TIERS, AND THEIR OFFICERS, DIRECTORS, EMPLOYEES, OR AGENTS. THIS INDEMNITY APPLIES REGARDLESS OF ANY ACTIVE AND/OR PASSIVE NEGLIGENT ACT OR OMISSION OF INDEMNITEES. SUBCONTRACTOR, HOWEVER, SHALL NOT BE OBLIGATED TO INDEMNIFY AN INDEMNITEE FOR CLAIMS ARISING FROM THE SOLE NEGLIGENCE OF THAT SPECIFIC INDEMNITEE. THE INDEMNITY OBLIGATIONS SHALL NOT BE LIMITED IN ANY WAY BY ANY LIMITATION ON THE AMOUNT OR TYPE OF DAMAGES, COMPENSATION OR BENEFITS PAYABLE BY OR FOR SUBCONTRACTOR UNDER WORKER'S COMPENSATION ACTS, DISABILITY BENEFIT ACTS OR OTHER EMPLOYEE BENEFIT ACTS..**

7.2 Duty to Defend At its cost and with legal counsel reasonably acceptable to Christman, Subcontractor shall defend Indemnitees from any Claims, including those raised in an administrative hearing, arbitration or similar proceeding. The obligation to defend accrues immediately upon receipt of a notice of Claim. If Subcontractor fails to provide timely, competent defense, Christman shall be entitled to reasonable costs associated with assuming such defense, including but not limited to attorney fees and costs incurred to enforce this indemnity and defense provision.

7.3 Notice to Insurer/Surety Subcontractor shall advise its insurers and sureties of these indemnity, defense, and hold harmless and insurance obligations and shall obtain a contractual coverage endorsement to discharge its obligations as set forth herein.

7.4 Consideration The Parties agree that $1,000 of the Contract Sum is part of the consideration for this indemnity obligation. Only in those states where there must be a contractual limit on indemnity obligations, the contractual limit shall be three times the aggregate value of CGL insurance limits required by this Agreement.

7.5 Survival Subcontractor's indemnity and defense obligations shall survive the termination or expiration of this Agreement and the completion of the Work.

ARTICLE 8 - SAFETY

8.1 Responsibility Subcontractor represents that it has expertise in the particular means and methods required to safely execute the Work and that it maintains a consistently high level of safety and health compliance. At its expense, Subcontractor shall furnish its workers a place of employment free from recognized hazards that cause or are likely to cause serious physical harm. Subcontractor shall protect from injury, its employees engaged in the Work, employees of other trade contractors working adjacent to Subcontractors Work and all property and persons which may be affected by its operations. The prevention of accidents to workers engaged in the Work and others affected by the Work is the responsibility of Subcontractor. Subcontractor shall strictly comply with the Safety Program of Christman and the Owner, and all Applicable Laws. The Subcontractor shall submit to Christman, a current Safety Program and Experience Modification Rates for Subcontractor and Lower Tiers. Subcontractor shall employ all engineering controls, administrative actions, and personal protective equipment to eliminate, and where elimination is not possible, control and reduce worker exposure to hazardous conditions, including but not limited to respirable crystalline silica and asbestos containing material. Subcontractor shall periodically monitor and evaluate its engineering and work practice controls to ensure they are effective and to discover, prevent and detect hazardous conditions. Subcontractor shall furnish Christman copies of Safety Data Sheets for all materials to be used in executing the Work. Subcontractor's foreman/superintendent (Foreman), at a minimum shall have satisfactorily completed OSHA 10-Hour training. The Foreman shall be assigned for the duration of the Project so as to maintain continuity. The Foreman shall speak English and be able to translate into English for non-English speaking workers to facilitate communications and ensure mutual understanding. Subcontractor shall ensure that all non-English speaking workers fully understand the site safety requirements and their duties for safety, health, and welfare. Subcontractor shall immediately correct any unsafe or hazardous condition related to its Work. If Subcontractor fails to immediately correct an unsafe condition, Christman may have the unsafe condition corrected by others at Subcontractor's expense or direct that the Work be stopped in the area of the unsafe condition.

8.2 Hazardous Materials Christman makes no representation or warranty as to conditions described in any hazardous materials

survey. If Subcontractor encounters any hazardous conditions or materials, Subcontractor shall immediately stop Work in the affected area and notify Christman in writing. Subcontractor acknowledges that it is fully apprised of all Applicable Law regarding hazardous conditions or material and that it will be fully responsible for disturbing any hazardous material, including for any and all fines, penalties, or damages assessed against Subcontractor or Christman. If Subcontractor uses hazardous materials on site of any type for which an employer is required by Applicable Laws to notify its employees of such use Subcontractor shall, before using the materials on site, give timely written notice of the materials to Christman. Subcontractor shall immediately correct any unsafe or hazardous condition related to its Work. If Subcontractor fails to immediately correct an unsafe condition, Christman may have the unsafe condition corrected by others at Subcontractor's expense or direct that the Work be stopped in the area of the unsafe condition.

8.3 Notice Subcontractor shall immediately notify Christman and provide Christman with copies of all OSHA citations and accident reports.

8.4 Responsibility Per Article 7, Subcontractor shall bear sole responsibility for any Claims arising out of any breach of, in whole or in part, or failure to comply with this Article, by the Subcontractor or its Lower Tiers, their invitees, or vendors, including any claims arising from regulatory violations, citations or penalties.

ARTCLE 9 - DESIGN SERVICES (If Applicable)

9.1 Design Services If the Work includes any design, engineering or professional services, Subcontractor accepts the design standards, criteria and performance specifications in the Contract Documents and agrees that such data is sufficient for Subcontractor's proper design and functioning of the Work. Christman does not warrant the accuracy or completeness of information in the Contract Documents, however, Subcontractor may rely on these items to the same extent Christman is entitled to rely upon such items in the Prime Contract. Subcontractor agrees that its design services relate to a part of the overall design of the Project and that its design must integrate into the Project's overall design concept expressed, inferred or reasonably implied by the Contract Documents. Subcontractor shall coordinate its Work with the services performed by others. Subcontractor shall submit to Christman detailed drawings and specifications (Work Product) describing the requirements for the Work and showing the relationship of the Work to the overall Project. Subcontractor shall provide Work Product in the form and quantity required by the Contract Documents. Christman shall be entitled to rely upon the adequacy, accuracy and completeness of the services and certifications or approvals performed by Subcontractor and its Lower Tiers. Subcontractor shall perform agreed upon revisions and submit revised Work Product for Christman's review. Subcontractor shall provide written notice to Christman and other affected trades of all design development changes in sufficient time to preclude additional costs and conflicts with the work of others.

9.2 Design Consultant Subcontractor's engagement of any design consultant shall be subject to Christman's written approval. The consultant's seal shall appear on all drawings, calculations, specifications, certifications, shop drawings and other Work Product prepared by the consultant. All consultants shall be licensed in accordance with Applicable Laws and fully bound to Christman in the same manner as Subcontractor is bound to Christman for all Contract Document requirements applicable to the Work, including all insurance requirements, including professional liability insurance. Subcontractor shall be responsible for the services performed by its consultants.

9.3 Standard of Care Subcontractor's standard of care for all design services shall be the highest care and skill used by members of the design profession practicing under similar conditions at the same time and locality of the Project, or as stated in the Prime Contract, whichever imposes the higher standard of care.

ARTICLE 10 - EXECUTION OF THE WORK

10.1 Project Investigation Subcontractor assumes responsibility for all Project investigation as related to its Work. Subcontractor represents that it has carefully inspected the Project site. Subcontractor represents that it is familiar with, has satisfied itself as to, and assumes all risk of: (a) the nature, location, and amount of the Work; (b) site conditions and access; (c) ability to perform the Work in accordance with the Project Schedule and Contract Documents; (d) any Applicable Laws and inspection requirements; (e) all safety and barricade requirements; (f) the terms and conditions of applicable collective bargaining agreements, to the extent applicable; (g) the quality, quantity, and availability of labor, materials, equipment, and utilities; and, (h) the limiting physical, climatic, and other conditions. Subcontractor is not relying on any opinion or representation of Christman as to Project conditions.

Subcontractor shall be solely responsible for all cost, expense and damage that may result from Subcontractor's failure to perform or properly perform such investigations including its failure to properly notify Christman and obtain written approval before proceeding with related Work.

10.2 Document Investigation Subcontractor warrants that it has thoroughly reviewed and fully acquainted itself with the Contract Documents and that the Contract Documents are suitable and sufficient for their intended purposes, without any express or implied representation or warranty having been made as to their accuracy, consistency, adequacy, completeness or constructability. Subcontractor shall give written notice to Christman of any error, inconsistency, ambiguity or omission in the Contract Documents within the earlier of 3 days after Subcontractor first becomes aware of the error, or 3 days before the time Christman is required to make such claims to the Owner under the Prime Contract. Subcontractor shall not be excused from any provision of the Contract Documents due to a lack of knowledge or understanding of their content. Christman disclaims any and all warranties, express or implied, as to the accuracy or adequacy of the plans, specifications, design, or other Contract Documents. Subcontractor shall make no claim based upon such disclaimed warranties.

10.3 Qualifications Subcontractor represents and warrants at all times it shall obtain and maintain all necessary credentials, certifications, licenses and other qualifications to do business and safely perform the Work. Subcontractor's obligation to perform the Work is non-delegable and nontransferable. Subcontractor shall be solely responsible for determining, supervising and implementing the means, methods, techniques, sequences, procedures and inspections of its Work. Christman shall not be responsible for the direction, supervision, inspection, quantity or quality of Subcontractor's Work.

10.4 Progress & Cooperation Subcontractor shall furnish sufficient equipment, tools and materials and a sufficient number of properly skilled workers to carry on the Work and conduct its activities in a manner and at a rate of performance in all respects satisfactory to Christman and the Owner and in a manner that will not interfere with, disrupt or delay the activities of Christman, the Owner, or others involved in the Project. Subcontractor shall erect, maintain, inspect and operate all of its equipment including but not limited to scaffolding, hoists, and material handling equipment in accordance with Applicable Laws. Subcontractor shall not unreasonably refuse Christman's use of Subcontractor equipment. If Christman utilizes Subcontractor's equipment, Christman shall not be liable to Subcontractor for the erection, maintenance or inspection of any such equipment, except to the extent Christman has assumed such obligations under written agreement with Subcontractor, and any such use by Christman shall be done in strict accordance with equipment manufacturer's instructions. Any Christman employee engaged in such use has all the necessary and requisite training to operate such equipment. Subcontractor shall cooperate with Christman and others involved in the Project, including those that Subcontractor's schedule may affect, to avoid any conflict and to ensure a first class workmanlike job in every respect. Subcontractor shall maintain good order among its employees and others and not permit upon the Project any disorderly, intemperate, or unfit person or anyone unskilled in performing the Work. At all times Subcontractor shall have a competent person with authority available to act on its behalf. Subcontractor shall provide all technical personnel required to startup, test, commission, and operate any equipment, and to test and use any material, supplies, or other items provided by Subcontractor in connection with the Work and to instruct Christman and Owner's personnel in the operation and maintenance of any equipment, materials, supplies, or other items. Subcontractor shall not perform any work directly for Owner or any Owner tenant or deal directly with the Owner's representatives in connection with the Project.

10.5 Shop Inspection The Owner, Architect/Engineer, Christman, and their representatives, shall have full access at reasonable hours to Subcontractor's Work and its Lower Tier's shops, factories, or other places of business to inspect the general condition and progress of the Work.

10.6 Submittals Within the time directed by Christman and without delay, Subcontractor shall furnish all mock ups, submittals, shop drawings, product data, specifications, samples, interim design submissions if applicable, electronic data or similar items (Work Product). By submitting such Work Product, Subcontractor represents that it has verified materials, field measurements, and field construction criteria related thereto, or will do so, and has checked and coordinated the information in its Work Product with the requirements of the Contract Documents. If Subcontractor's Work Product is rejected after a reasonable number of reviews, Christman may backcharge Subcontractor for the actual costs to continue review and process the rejected Work Product. Subcontractor waives any claim arising out of Subcontractor's failure to comply with this requirement. Christman's review of Work Product shall be limited to conformance with general design and general detailing and Christman need not verify dimensions or field

conditions. Subcontractor shall not make any substitutions in the Work, unless it first requests in writing permission for a substitution by expressly identifying the item or method substituted, as a "Substitution" and then only upon receipt of Christman's written consent to such substitution. Christman or Owner's review or consent of any Work or Work Product, shall not relieve Subcontractor from its responsibility for any deficiency that may exist or from its obligation to perform the Work in strict accordance with the Contract Documents.

10.7 Layout Subcontractor shall be solely responsible for the layout, accuracy, and workmanship of its Work. Before starting its Work, Subcontractor shall examine the work of others affecting its Work and verify all dimensions set forth in the Contract Documents as they pertain to or may affect Subcontractor's Work. If any defect, conflict, or inconsistency exists, Subcontractor shall immediately notify Christman in writing. Subcontractor shall not proceed until the defect is corrected or Christman provides written authorization to proceed. If Subcontractor fails to inspect or give written notice, Subcontractor shall be deemed to have accepted the work of others as fit and proper to receive Subcontractor's Work and waives any claim as to the defects. Subcontractor is responsible for all corrective work.

10.8 Compliance Subcontractor shall obtain and pay for all necessary permits, licenses, assessments and inspections, and comply with all statutes, ordinances, rules, regulations and orders of any governmental or quasi-governmental authority applicable to the Work (Applicable Laws) including: any LEED building, sustainable construction means, methods or requirements, or energy performance requirements, including those in the Contract Documents; local, state or federal safety and health laws and regulations, including those related to hazardous materials, such as crystalline silica; local, state or federal fair employment practices laws, affirmative action programs, minority contracting programs, business ethics and compliance; rules and regulations of any Contract Compliance Division of the state and federal Civil Rights Commission or any similar commission having jurisdiction; all immigration laws, rules and regulations, including I-9 verification and E-verify; Buy American provisions; and, Davis Bacon and/or state prevailing wage requirements. At Christman's request, Subcontractor shall certify to Christman's satisfaction that its employees have presented the correct documents to legally work in the U.S. Subcontractor shall immediately correct any violations of Applicable Laws.

10.9 Protecting the Work Subcontractor shall protect all Work, tools, material and equipment against any loss, damage or theft (Loss). At its sole risk, Subcontractor shall bear any Loss to its Work arising from any cause until Substantial Completion as defined in the Prime Contract, or such duration required by the Prime Contract, whichever is greater. Subcontractor is responsible for any Loss to existing property, structures, materials or equipment, the Work, the work of others, and property of Owner and adjacent land owners, utilities, roads, bridges, and waterways, arising out of Subcontractor's operations. Subcontractor shall repair or replace such items to the satisfaction of and at no cost to Christman. If Subcontractor refuses or fails to repair, replace, or correct the Loss, at Christman's sole election, Subcontractor shall accept a deduction in Contract Sum to the extent of the cost incurred by Christman or demanded by Owner. If a dispute arises between Subcontractor and another trade as to which is responsible for any Loss, Christman may determine the responsibility for such Loss and its determination shall be final and binding upon Subcontractor. Christman may backcharge Subcontractor the reasonable actual costs to investigate and respond to such claims.

10.10 Christman Tools & Equipment Subcontractor is responsible for all unloading, moving, lifting, protection, securing, and handling of its materials and equipment at the job site. In consideration of Christman's permission to use any tools or equipment of any nature whatsoever, including but not limited to elevators, hoists, derricks, cranes, side tracks, and yards, Subcontractor contractually assumes complete risk, responsibility, and liability for the use or operation of such equipment, and for any Claim arising in any manner because of Subcontractor's use or operation of tools and equipment or use of same for Subcontractor's benefit, irrespective of who actually operated the tools and equipment.

10.11 Clean Up Subcontractor shall at all times keep the Project and Owner's premises, adjoining premises, and streets clear of rubbish, debris, overspray and similar items resulting from its Work and shall remove all such rubbish at its own expense, as directed by Christman. Subcontractor shall maintain broom clean conditions at the end of each day. Christman shall designate the location of all dumpsters. Subcontractor shall not dispose of any hazardous waste or waste requiring special manifests in these dumpsters. If Subcontractor fails to clean the site to the satisfaction of Christman and/or the Owner upon 24 hours' notice (except where such condition creates a safety concern, and in that case, without notice) then Christman may do so and backcharge Subcontractor the actual cost of cleanup.

10.12 Labor Relations Subcontractor shall only use labor which will not cause disharmony or labor disputes in the performance at the Project. Subcontractor shall implement policies and practices to avoid work stoppages, slowdowns, disputes, and strikes. Subcontractor shall notify Christman promptly of any actual or potential dispute that may affect the Work. Subcontractor guarantees that there shall be no strike, lock-out or other work slowdown affecting its Work or the work of others. Subcontractor represents that it has the legally binding agreement of all bargaining representatives of any part of its workforce (or before beginning Work will obtain such agreement), that the represented workers will not strike, picket, engage in any slow-down or other concerted activity where Work is performed, and will cross and work behind any picket line at the job site, regardless of by whom. If Subcontractor's workers are involved in a dispute with other trades on the Project, or any union, or such workers refuse work due to any labor disputes, Subcontractor shall immediately resolve the disputes. Failure to do so shall be a material breach of this Agreement. If a labor condition threatens the timely completion of any portion of the Work, Christman may, at its option, terminate Subcontractor's right to proceed with Work for Default or employ others to perform the affected Work and backcharge Subcontractor the cost thereof. Notwithstanding the foregoing, Subcontractor shall not be liable for strikes, work stoppages, jurisdictional disputes, lockouts, union and non-union disputes and other similar claims or conflicts ("Labor Issues") except to the extent such Labor Issues are caused, in whole or in part, by the actions or inactions of Subcontractor or anyone else for whom Subcontractor is responsible.

10.13 Meetings Subcontractor shall attend any project meetings as directed by Christman. Subcontractor shall be represented by its Project Manager or Senior Representative responsible for the Project and its Site Supervision. Subcontractor shall attend an on-site pre-installation meeting before beginning any Work. Christman will maintain and distribute to attendees minutes of the meetings for review. Subcontractor shall review the minutes and provide written notice of any objections within 3 days after issuance of the minutes; failure to do so shall be deemed Subcontractor's acceptance without reservation of the content of the minutes.

10.14 Material Delivery & Installation Space for storage on the Project site may be limited. Subcontractor shall schedule material deliveries accounting for the limited storage or lay down area and to coincide with construction phasing. Subcontractor shall coordinate its access, deliveries, staging, trailers, storage areas and parking in advance, and as approved by Christman's superintendent before Subcontractor's mobilization on site. If Subcontractor's Work includes installation of materials or equipment furnished by others, Subcontractor shall examine the items with due care and install the items with such skill and care as to ensure a satisfactory and proper installation and to preserve all warranties. All material and equipment delivered to the job site or off site and in the process of fabrication shall become the property of the Owner and shall not be removed from the site or damaged in any way.

10.15 Cutting & Patching Unless otherwise directed in writing by Christman, Subcontractor shall do all cutting, fitting, and patching of its Work that may be required to make its several parts come together properly and to fit it to receive or be received by work of others.

10.16 Employment Practices Subcontractor shall not discriminate against any person with respect to his/her hire, tenure, terms, conditions or privileges of employment because of race, color, age, sex, religion, sexual orientation, the presence of a physical, sensory or mental disability, or national origin. Subcontractor shall comply with any and all Applicable Laws as to fair employment practices and other employment programs required by the Contract Documents.

10.17 Conduct Subcontractor and its Lower Tiers shall not engage in any harassment or offensive behavior. Christman strictly prohibits any request to engage in illegal or unethical conduct and negative comments or actions based on race, color, age, sex, religion, sexual orientation, physical, sensory or mental disability, or national origin. Subcontractor shall immediately address any claim of harassment or offensive behavior involving it or its Lower Tiers, properly discipline any person who engaged in such conduct, including removal from the Project where appropriate, and use its best efforts to ensure that such conduct does not reoccur. In its sole judgment, Christman shall have the right to cause removal from the Project any worker who engages in unsafe work practices or violates this Article.

10.18 Recordkeeping Subcontractor shall keep full and detailed accounts and exercise such controls as may be necessary for proper financial management, using accounting and control systems in accordance with generally accepted accounting principles.

During the Work and for a period of 3 years after final payment, Christman and/or Owner and their accountants shall be afforded access to and the right to periodically audit, upon reasonable notice, Subcontractor's records, books, receipts, subcontracts, purchase orders, man hours and equipment hours, and other data relating to the Work, all of which Subcontractor shall preserve for 3 years, or such longer period as specified in the Prime Contract.

10.19 Operation Manuals Upon approval of shop drawings and Submittals, Subcontractor shall provide an electronic copy (unless some other form is specified in the Prime Contract) of Operation and Maintenance Manuals for each item approved, as applicable.

ARTICLE 11 - WARRANTY

11.1 Warranty Subcontractor warrants that the Work shall strictly conform to the requirements of the Contract Documents and shall be free from defects in design, workmanship, and materials. Subcontractor shall promptly correct any defective or nonconforming Work, by (at Christman's exclusive option) adjustment, repair, or replacement to the satisfaction of Christman and Owner. Subcontractor shall pay all costs associated with accessing the Work to make warranty repairs and returning the Work and all affected surrounding work to the condition required by the Contract Documents. If Christman determines that Subcontractor is not timely completing its warranty obligation, Christman may replace or repair, at its sole election, and backcharge Subcontractor all associated costs. If no sums remain due Subcontractor, Subcontractor shall pay Christman all those costs immediately upon demand.

11.2 Duration The Subcontractor shall provide a one (1) year warranty from the actual Project "Substantial Completion Date" on all material, equipment and workmanship, or the warranty duration specified in the Contract Documents, whichever is longer. For any portion of the Work repaired or replaced, Subcontractor shall provide an additional one (1) year, or longer if the Contract Documents require, warranty on the Work after the date of repair or replacement.

11.3 Statutory Warranty Nothing in this Article shall limit the rights afforded to Christman and Owner under Applicable Law as to Subcontractor's warranty against defects in design, workmanship and materials or defective or non-conforming Work, nor shall this Article limit any statutory period of liability for warranty, design, and latent defects.

ARTICLE 12 - PAYMENT

12.1 Schedule of Values Subcontractor shall submit all payment, insurance and other compliance documents through Christman's Trade Contractor Portal. Within the time required by Christman, Subcontractor shall submit for review, through the Trade Contractor Portal, a detailed schedule of values (SOV) on AIA Form G703 or equivalent. The SOV shall be itemized into discrete items and areas of Work and include labor and material breakdowns for each work item, general conditions, mobilization, demobilization, punch list, and administrative close out, with no less than 5% designated for close out. For any allocation for mobilization, there must be an equal allocation for demobilization. To the extent practicable and subject to Christman's approval, the SOV shall not contain a single line item greater than 5% of the Contract Sum. Christman shall have the right to require modification at any time of the SOV to align with proper allocation of scopes of work and distribution of resources. Christman will not process a payment application until Subcontractor revises or corrects the SOV to account for imbalance, errors or irregularities.

12.2 Conditions To the extent permitted by Applicable Laws, for Subcontractor's complete, timely, and satisfactory performance of the Work, Christman will pay Subcontractor out of such equivalent payment Christman receives from Owner for Subcontractor's Work. Christman will pay Subcontractor within 7 days after Christman receives Owner's payment, less retainage held by Owner or Christman. To the extent permitted by Applicable Laws, Christman's receipt of Owner's payment is an absolute condition precedent to Christman's obligation to pay Subcontractor. If Christman has furnished a payment or performance bond, the obligations of Christman and its surety to make progress payments or final payment is subject to the absolute condition precedent of Owner prior payment. Christman's surety is a third party beneficiary of this condition precedent. Christman's payment to Subcontractor shall not be construed as an admission by Christman of the classification, quantity, quality, or sufficiency of Work done, or as an acceptance or release of Subcontractor's responsibility under this Agreement. Also to the extent permitted by Applicable Law, as an absolute condition precedent to Christman's obligation to pay Subcontractor and using Christman's Trade Contractor Portal, Subcontractor shall timely furnish with each payment request: (a) a satisfactory sworn statement sworn by an officer of Subcontractor; (b) conditional waivers of lien from Subcontractor and its Lower Tiers for the current payment application; (c)

unconditional waivers of lien or bond claims by Subcontractor and its Lower Tiers reflecting Christman's previous payments; (d) payrolls and, if required by the Prime Contract, weekly certified payrolls in compliance with Applicable Laws; and (e) any other information or documents reasonably requested by Christman. The form and content of all submissions shall be satisfactory to Christman. Sworn statements must include a complete and accurate list of all Lower Tiers including equipment lessors and any entity entitled to assert a lien or bond claim.

12.3 Process On the date of the month specified by Christman, Subcontractor shall submit a payment application in the form and manner specified by Christman, detailing costs accrued and percent of Work complete, through the time period of the month specified by Christman. Subcontractor's determination of percentage of work complete is subject to the approval of Christman, Owner, and/or Architect. Any application not timely submitted may not be included in Christman's payment application to Owner. Subcontractor shall not request payment for any Work for which it does not intend to promptly pay its Lower Tiers. Payment for all materials stored offsite is solely at Christman's discretion.

12.4 Cost Reimbursable Items If Subcontractor is entitled to reimbursement of any costs incurred for the Work (Reimbursable Costs), such as approved Change Order work, payment of Reimbursable Costs shall be made in accordance with cost reimbursement terms of the Prime Contract, or in the absence of such terms, in accordance with this Agreement. Subcontractor shall maintain, in a manner and quality satisfactory to Christman, accounting records for Reimbursable Costs, including, without limitation, Lower Tier invoices, material receiving reports, segregated cost data, payrolls, labor hours, equipment hours, and other documentation necessary to fully substantiate each Reimbursable Cost. These records shall be subject to audit by Christman, the Owner or their designated representatives.

12.5 Joint Payment Subcontractor authorizes Christman to communicate with Subcontractor's Lower Tiers on payment issues and to make payment via joint check to any Lower Tier if, in Christman's sole discretion, Christman determines that joint checks are necessary or appropriate. Subcontractor gives this authorization without the need for any further joint-check arrangement. Christman's payment by joint check shall be deemed to be made directly to Subcontractor. Christman may issue a joint check for the amount shown on Subcontractor's Sworn Statement as due to Lower Tiers, less any setoffs, backcharges, warranty work, or other deductions to which Christman may be entitled. Subcontractor waives any claim against Christman for any errors that may arise out of a joint check payment and accepts responsibility for the validity any endorsements of any joint check. Christman's right to pay by joint check does not create any obligation to do so, and no joint check payee or third party shall have third party beneficiary or other rights to demand joint payment.

12.6 Removal of Claims Provided Christman has paid Subcontractor in accordance with this Agreement, within 3 days of Christman's written request, Subcontractor shall cause to be discharged any Lower Tier lien or bond claim related to the Work. If Subcontractor fails to do so, Christman, at its sole discretion, may use whatever means necessary to remove such suit, claim or lien and backcharge Subcontractor the cost of so doing. Subcontractor shall be responsible for any costs, including attorney fees, litigation costs, and consultant fees that Christman incurs in removing or attempting to remove such suit, claim or lien, plus a markup of 20% for administrative and overhead expenses (Contractor Markup). If Owner or Christman receive any lien, bond claim or notice of intent to file, Christman may withhold the full amount of such claim, plus Contractor Markup pending adjustment. If Subcontractor defaults in payment of its debts on the Project, Christman shall have the right to pay such debts and charge them to Subcontractor. If Christman determines, in its sole discretion, that the balance of the Contract Sum then remaining unpaid will not be sufficient to complete the Work in accordance with the Contract Documents, no additional payments will be due Subcontractor unless Subcontractor, at no cost to Christman, performs, and pays in full for, a sufficient portion of the Work such that the balance of the Contract Sum then remaining, as determined by Christman, is sufficient to complete the Work.

12.7 Trust Fund Subcontractor shall hold each payment from Christman in trust to satisfy all indebtedness to Lower Tiers first, before paying any other indebtedness of the Subcontractor.

12.8 Withholding Christman may withhold payment to Subcontractor or set off any payment for any of the following reasons: (a) failure to remedy defective Work or perform clean-up; (b) off-site fabrication not meeting production quotas or quality standards; (c) Subcontractor has damaged any portion of its Work or the work of others; (d) claims, levies, liens, attachments, stop notices or court orders or reasonable evidence indicating probable filing of such claims, including unpaid insurance claims arising out of the

Work; (e) allegations that Subcontractor has not timely paid employees or Lower Tiers or Subcontractor fails to produce proof requested by Christman of such payments; (f) there exists reasonable doubt in Christman's sole discretion that the Work can be completed for the unpaid balance of the Contract Sum or within the Project Schedule; (g) unsatisfactory prosecution of the Work; (h) failure to deliver current insurance certificates, bonds, submittals, shop drawings, SOVs, "as built" drawings, written guarantees or warranties, or the approvals required of the Work by any authority having jurisdiction; (i) Christman is exposed to an Owner claim for liquidated damages arising in whole or in part from the Work; (j) a petition for bankruptcy or reorganization is filed by or against Subcontractor or Subcontractor has made an assignment without Christman's prior written consent; (k) Subcontractor is unlicensed or its license is invalid or lapsed; (l) any violation of Applicable Laws; (m) Subcontractor expresses an intent to repudiate the Agreement or reduce its work force, equipment, or materials; and (n) any circumstance that would constitute a Subcontractor Default, even if Christman has not declared a Subcontractor Default.

12.9 Contract Balance Subject to the absolute conditions precedent in this Article and Applicable Laws, the balance of the Contract Sum (Contract Balance) is defined as that amount payable to Subcontractor after Christman exercises any right to withhold or offset the Contract Sum. The Contract Balance does not include pending or disputed change order work. No Subcontractor surety bond shall alter this definition or prevent Christman's exercise of the right to withhold or setoff before making any Contract Balance available to surety under any bond.

12.10 Final Payment As an absolute condition precedent to Christman's obligation to make final payment of the Contract Balance to Subcontractor, Subcontractor shall submit to Christman: (a) an affidavit to Christman's satisfaction that Subcontractor has paid all indebtedness connected with the Work; (b) consent of surety, if required by Christman; (c) satisfaction of required closeout procedures and documentation; (d) receipts, releases, and waivers of lien and/or bonds in the form designated by Christman or Owner and other satisfactory evidence that there are no liens, bond claims, or other indebtedness related to the Work; and (e) Subcontractor's written Warranty. Upon Subcontractor's satisfaction of this condition precedent, after Subcontractor's application for final payment, and after Owner's acceptance of and payment for all Work, Christman shall pay the Contract Balance to Subcontractor. If Owner asserts a claim for, or assesses and retains against Christman any liquidated damages, Christman's payments to Subcontractor shall be reduced to the extent such assessment is attributable to Subcontractor. Subcontractor shall not assert a claim for retention until Owner's assessment of liquidated damages is finally resolved. Subcontractor's acceptance of final payment shall be deemed a final waiver of all claims of any nature against the Owner and Christman, but shall not relieve Subcontractor of liability for indemnity and warranty obligations, or for faulty or defective work appearing before or after final payment. To the extent permissible by Applicable Laws, all payments, including final payment, shall be out of such equivalent payments Christman receives from the Owner. Christman's receipt of such payments is an absolute condition precedent to payment to Subcontractor.

ARTICLE 13 - CHANGES AND EXTRA WORK

13.1 Changes Without invalidating this Agreement, Christman may make any changes by altering, adding to, or reducing the extent and/or scope of the Work, including the deletion of any major items of work to be completed. Except as provided below, no change in the extent or scope of such Work shall be made except by a Change Order signed by Christman. The charge or credit for any such changes shall be determined, at Christman's option, by any of the following methods: (a) agreed upon lump sum price; (b) unit prices named in this Agreement or subsequently agreed upon in writing; or (c) time and material. Subcontractor shall submit for approval a quotation covering any change in the Work which affects the Contract Sum. The quotation shall contain a detailed itemization of costs and shall identify any impact on the Project Schedule, Subcontractor's progress of the Work, milestone dates, and/or the Substantial Completion date. Subcontractor shall submit its quotation within 7 days' of receipt of notification of the change, or such shorter time as Christman directs. If the Parties cannot agree about whether there exists a change in the Work or cannot agree on the amount of the addition or deletion, to maintain the Project Schedule, pending final resolution of the Change Order, Subcontractor shall nonetheless timely perform the Work as changed by Christman's written direction and proceed in accordance with Article 13.4.

13.2 Written Authorization Subcontractor shall not perform any changes or additional work except upon Christman's prior written direction. If Subcontractor proceeds without such written authority, Subcontractor expressly waives any and all claims for additional payment. No oral or other claimed waiver of the requirement of prior written authority shall be binding. An increase in the Contract Sum by virtue of such change shall not occur until a Change Order has been issued and signed by Christman and

Subcontractor, and, for Owner or Architect initiated changes, Owner has signed a Change Order. Any adjustment in the Contract Sum, Project Schedule or other provisions as set forth in each Change Order shall operate as an Accord and Satisfaction and shall constitute the full, final and complete compensation to Subcontractor for the entire cost and schedule effect related to the stated changes and the cumulative impact and effect resulting from the stated changes on all prior Work and prior changes in the Work. Subcontractor waives any claims for any other additional compensation, damages or time extensions in connection with the stated changes. The Contract Sum may be equitably adjusted by Christman by written Change Order or directive issued by Christman, with or without Subcontractor's consent, for reasonable backcharges and adjustments to the Contract Sum permitted under this Agreement.

13.3 Signature With the exception of backcharges, all Change Orders must be approved and signed either by Christman's representative who executed this Agreement or another representative on the same or higher level of authority. No changes to the Agreement may be made or agreed to by any field personnel. Email, texts, or other electronic means of communications shall not be sufficient to establish a Change Order. Field representatives may not authorize or sign for changes in the Work or additional work and do not have any authority to agree to or approve changes. Superintendents may sign time tickets for the sole purpose of documenting time on the Project; under no circumstances shall such signature be deemed to accept or authorize additional work or otherwise obligate Christman to pay for such work, notwithstanding any language on Subcontractor's time ticket or other documentation to the contrary.

13.4 Claims If Subcontractor intends to assert any claim for additional compensation or schedule extension, as an absolute condition precedent to such claim, Subcontractor's notice and claim shall strictly conform to Articles 14 and 15.

ARTICLE 14 - TIME

14.1 Schedule Time is of the essence. Within the time specified by Christman, Subcontractor shall provide Christman with scheduling information and a proposed schedule for performing the Work which shall include a projection of labor hours and crew sizes, all in forms acceptable to Christman. Subcontractor's proposed schedule shall conform to the Project Schedule and all revisions or changes made to the Project Schedule from time-to-time. Subcontractor shall maintain the specified rate of progress for its Work and shall complete the Work on or before the dates set by Christman for Subcontractor's Work. Subcontractor shall perform the Work in a prompt and diligent manner without delaying or hindering the work of others. The Project Schedule is not a representation by Christman that Subcontractor will be able to perform its activities on certain dates. Subcontractor acknowledges that as construction progresses it may be necessary for Christman to change the sequential order and duration of activities to account for unanticipated delays, occurrences, and other factors that alter Christman's schedule. Christman may require Subcontractor, at no additional cost to Christman, to prosecute the Work in such sequence as the progress of other trades and the Project Schedule reasonably dictate. Scheduling may require temporary omission of the Work at locations determined by Christman. All patches, fill-in and "come back" work for the proper completion of the Work shall be included in the Contract Sum. Subcontractor expressly agrees that the reasonable scheduling and sequencing of the Work is Christman's exclusive right and that Christman reserves the right to reasonably reschedule and re-sequence the Work from time to time as the demands of the Project require without additional cost or expense to be paid to Subcontractor. Christman's exercise of any rights or remedies under this Agreement, including ordering changes in the Work, directing suspension, rescheduling or correction of the Work, regardless of the extent or frequency of Christman's exercise of such rights or remedies shall not be construed as active or unreasonable interference with Subcontractor's performance of the Work.

14.2 Failure to Progress If Subcontractor delays or disrupts the progress of any work, Subcontractor shall, at its own cost and expense, take such action as Christman deems necessary or appropriate to improve Subcontractor's rate of progress, including, but not limited to, increasing the number of superintendents, foemen, skilled and unskilled labor, increasing the number of crews and or shifts, employing more or better equipment, working overtime, expediting delivery of materials, changing sequence of performance, prosecuting parts of the Work in preference to other parts, and any other increase or acceleration effort to avoid or mitigate delays. Subcontractor shall be subject to liquidated or other damages on the basis stated in the Prime Contract if Subcontractor causes or contributes, in whole or in part, to any delay, even if concurrent, which would allow the Owner to assess liquidated or other damages against Christman. Regardless of whether liquidated damages are specified, Subcontractor shall be liable to Christman for any loss, damage or liability of Christman, caused in whole or in part by delays, disruptions or other reasons attributable to Subcontractor.

14.3 Cure If Subcontractor fails to correct, replace and/or re-execute faulty or defective Work or materials, fails to maintain the progress of its Work in a timely and proper manner and with such effort, speed and diligence to maintain the Project Schedule, current revisions of milestone dates, interim completion dates, activity durations, or otherwise fails to facilitate the orderly progress of the Project, or is unable to proceed with the Work because of any labor dispute, then Christman, upon 48 hours' notice to Subcontractor, shall have the right to correct, replace and/or re-execute such faulty, defective, damaged or delayed work, or to supplement Subcontractor's crews, or to take over this Agreement with all materials of the Subcontractor on the site and complete the remaining Work, charging such cost to Subcontractor. Under such circumstances, Christman shall also have the right to withhold payments to Subcontractor until Subcontractor pays Christman in full for such costs.

14.4 Time Extension If, without fault or cause by Subcontractor, Subcontractor's performance is delayed, and provided that such delay is not concurrent with a delay caused by Subcontractor, Subcontractor may request an extension of time for performance, but shall not be entitled to any increase in the Contract Sum, any additional compensation, damages for schedule compression, acceleration, stacking, or loss of labor/equipment productivity, or consequential damages, as a result of such delays, such extension of time for performance being Subcontractor's sole and exclusive remedy for any schedule or delay related claim. Notwithstanding the foregoing, Christman will cooperate with Subcontractor in submitting to Owner any just claim arising from delay which is permitted by the Contract Documents and by applicable law.

14.5 Claims Any claim for a time extension shall strictly comply with the Claim provisions in Article 15.

ARTICLE 15 - CLAIMS

15.1 Owner Claims For any claim by Subcontractor seeking payment of money or a schedule extension because of any act, failure to act, default or interference by the Owner and/or the Architect, and/or their respective subcontractor or suppliers, the Subcontractor shall carefully observe all terms and conditions of the Prime Contract relating to claims and shall give Christman timely written notice of such claim in the form required by the Prime Contract. Subcontractor shall specifically label the notice a "Notice of Claim." Unless expressly prohibited by Applicable Laws, Subcontractor shall provide such notice, no later than 5 days before the time Christman is required to make such claim to the Owner under the Prime Contract, or within 5 days of the beginning of the event giving rise to the claim, whichever is earlier. Subcontractor shall not claim any time extension, cost reimbursement, compensation, or damages for any delay, disruption, or interference except to the extent that Christman is entitled to a corresponding time extension, cost reimbursement, compensation, or damages from Owner under the Contract Documents and Applicable Laws. Subcontractor shall be solely responsible for all attorneys' fees, costs, and expenses (Pursuit Costs) Christman incurs in submitting such claim and shall reimburse Christman on a monthly basis for Pursuit Costs. Subcontractor's recovery shall be limited to the amount, if any, that Christman actually receives from Owner for Subcontractor's claim. To the extent permitted by Applicable Laws, Owner's payment to Christman for such claim shall be an express condition precedent to Christman's duty of payment to Subcontractor.

15.2 Contractor Claims For any claim by Subcontractor against Christman seeking payment of money or a schedule extension or other relief with respect to the terms of this Agreement because of any claimed act, failure to act, default or interference by Christman or Christman's other subcontractors, Subcontractor shall give Christman written notice no later than 5 days from the beginning of the event giving rise to the claim. Such notice shall be specifically labeled a "Notice of Claim" and served in accordance with 15.5.

15.3 Claim Substantiation For all claims, within 14 days of providing a timely Notice of Claim, Subcontractor shall provide Christman with: (a) detailed actual cost records supporting the claim and identifying the actual discrete costs attributable to the claim; (b) an affidavit under oath by an officer of Subcontractor certifying and stating (a) the specific relief sought; if money is sought, the specific dollar amount sought; (b) that the actual discrete costs claimed are true and correct. The affidavit must contain or attach sufficient supporting documentation to reasonably allow its consideration, including without limitation, any documentation required by the Contract Documents.

15.4 Claim Calculation Subcontractor agrees that the total cost approach of calculating damages, or variations thereof (collectively, TCA) or any other method of calculating claims through estimating based upon the measured mile analysis (MMA),

earned value analysis (EVA), or the use of industry standards, is inherently unreliable and uncertain. Therefore, Subcontractor waives any damages based on the TCA, MMA, or EVA, and/or any claim based on estimated costs or industry guidelines such as the Mechanical Contractors Association of America, the National Electrical Contractors Association, or any other organization. As an absolute condition precedent to any claim, claims must be based upon a discrete actual costs analysis supported by contemporaneously (daily) documented actual costs properly allocated to the claim. Subcontractor waives any claim not contemporaneously documented and properly allocated. If Christman receives Subcontractor daily time reports, such receipt shall be deemed solely for documentation purposes and not as an admission of quantity, validity or liability of a claim.

15.5 Delivery of Notice For all claims, Subcontractor shall provide written notice via certified or registered mail to the address on page 1 of this Agreement. **EMAIL OR FACSIMILE OF A NOTICE OF CLAIM IS PROHIBITTED AND IS INSUFFICIENT TO ESTABLISH NOTICE.**

15.6 Strict Compliance Subcontractor's strict compliance with all claim requirements (timely notice, form, substantiation, calculation and delivery) is a strict and absolute condition precedent to any claim and the failure to adhere to any one of these requirements is an absolute defense to the claim. Subcontractor waives any claim that does not strictly comply with Article 15 and Christman shall not be liable to Subcontractor on any claim not timely or properly presented. Christman's actual or constructive notice of a claim shall not satisfy or excuse Subcontractor from strict compliance nor prevent Subcontractor's waiver of the claim. If Subcontractor does not strictly comply with this Article or if Christman cannot in good faith certify or submit Subcontractor's Owner Related Dispute to Owner, Christman is not obligated to do so.

ARTICLE 16 - DISPUTE RESOLUTION

16.1 Owner Related Disputes In case of any dispute between Christman and Subcontractor, which in Christman's sole opinion is in any way related to or arising from any act or omission of the Owner or Architect/Engineer, (Owner Related Dispute), Subcontractor shall be bound to Christman to the same extent that Christman is bound to Owner by the Contract Documents and by any and all preliminary and final decisions, determinations or agreements made by Christman and Owner or so authorized in the Contract Documents or by the court or arbitrator designated in the Contract Documents whether or not Subcontractor is a party to such agreement or proceeding. Subcontractor shall stay any and all legal actions against Christman or its surety until a final non-appealable decision has been obtained from or against the Owner as to the Owner Related Dispute. Christman and its surety shall not be liable to Subcontractor in excess of any sum actually received from Owner for Subcontractor's Owner Related Dispute. Unless expressly prohibited by Applicable Laws, Christman's receipt of payment from the Owner for Subcontractor's Owner Related Dispute is a strict condition precedent to Christman's and its surety's obligation to pay Subcontractor.

16.2 All Other Disputes All disputes arising out of or relating to this Agreement or any performance or payment bonds furnished by either party shall first be resolved in the following order: (1) by a meeting of the project management on site, within 7 days of the date a party requests such meeting; (2) if that fails, by a meeting of the principals in charge for each Party within 10 days following the project management site meeting; (3) if that fails, within 30 days after the principals in charge meeting, by mediation where the Parties select a mediator, the costs of which shall be shared equally. All disputes and claims that are not disposed of as provided herein shall be resolved by submission to the state or federal court whose district includes the county where the Project is located (Controlling Venue). The Controlling Venue is the exclusive venue for any claim and litigation may only be filed in that county. Subcontractor consents to personal jurisdiction in any court whose jurisdiction includes the Controlling County. **The Parties waive their right to a trial by jury and acknowledges that they have had the opportunity to seek the advice of legal counsel before waiving this right**.

16.3 No Stop Work Pending the resolution of any dispute, Subcontractor, without waiver of its other rights and remedies, shall not stop work or reduce its labor force, equipment, or progress, and shall diligently proceed with the Work.

ARTICLE 17 - DEFAULT AND TERMINATION

17.1 Adequate Assurance If at any time Christman deems in its sole discretion, that there are reasonable grounds of insecurity as to Subcontractor's ability to properly and timely perform, Christman may give Subcontractor written demand for adequate assurance of performance. Subcontractor shall provide such assurance, reasonably acceptable to Christman, within 10 days after Subcontractor's receipt of written demand.

17.2 Subcontractor Default Any of the following shall be considered a Subcontractor Default: (a) default in the performance of any requirement of this Agreement or the Prime Contract insofar as the Work; (b) failure to provide a sufficient crew of skilled workers and proper quantity and quality of equipment and materials as and when required; (c) failure to maintain the progress of its Work in a timely and proper manner and with such effort, speed and diligence to maintain the Project Schedule, current revisions of milestone dates, interim completion dates, activity durations, or otherwise failing to facilitate the orderly progress of the Project as a whole; (d) reduction in work force, equipment or materials, or abandonment of portions of the Work; (e) interference with the performance of others on the Project; (f) failure to timely pay any Employer Contributions, labor employed by Subcontractor, or any Lower Tiers; (g) failure to pay or to maintain satisfactory credit relationships for the purchase of labor, supplies, materials, equipment, and services; (h) repudiation or anticipatory repudiation of all or part of the Agreement; (i) failure to provide adequate assurance of timely performance; (j) failure to timely remedy any defects in Work; or (k) failure to perform in strict accordance with Christman's safety requirements.

17.3 Notice to Cure / Remedies If Subcontractor commits a Default and fails to commence and continue satisfactory correction of the Default within 48 hours after receipt of a written Notice of Default, then Christman, at its option, and in its sole discretion, and without prejudice to any other right or remedy, shall have the immediate right to any or all of the following remedies: (a) supplement Subcontractor's Work; (b) enter on the site of the Work and take possession of, for the purpose of completing the Work, Subcontractor's material; (c) employ any other person or persons to finish the Work; (d) provide materials or equipment to complete the Work; (e) terminate Subcontractor and/or Subcontractor's right to proceed; or (f) take whatever other or additional steps Christman deems, in its sole discretion, are in the best interests of Christman or the Project. Notwithstanding the terms of any surety bond to the contrary, Christman shall have the absolute right to exercise any remedy at the cost of Subcontractor or its sureties and shall have the right to enforce any bond right if Subcontractor is declared in Default, during Subcontractor's attempted cure of Default, and/or during surety's investigation of Default. Christman's exercise of any remedy shall not be deemed to impair, prejudice, extinguish, or otherwise diminish any obligation of Subcontractor's surety, nor shall it impair, prejudice, extinguish or diminish the rights of Christman under any such bond.

17.4 Assignment If Christman elects in writing, in its sole discretion, and effective only upon Christman's termination of Subcontractor's right to proceed, Subcontractor shall assign to Christman any Lower Tier contract for the Work. Subcontractor shall include provisions in its Lower Tier contracts for such assignment without further consent of such Lower Tiers.

17.5 Set Off Christman shall be entitled to recover from Subcontractor and its sureties (as applicable), all expenses, damages, and liabilities Christman incurs as a result of a Default including the cost of labor and materials to complete the Work, acceleration costs incurred in performing the work or engaging others to perform the Work, costs paid to other subcontractors, additional supervision, consultant fees, attorney's fees, and liquidated damages, plus Contractor Markup (collectively, Default Damages). Christman shall have the immediate right to offset or deduct the Default Damages from any money due or to become due to Subcontractor and thereby reduce any unpaid balance of the Contract Sum, notwithstanding any term in a surety bond to the contrary. Subcontractor and its sureties shall remain liable to Christman for Default Damages as they continue to accrue, without waiver of or prejudice to any other right, remedy or claim Christman may have. If a Default occurs, Subcontractor shall not be entitled to any further payment until Owner finally accepts the Work, and until after Christman offsets or deducts Default Damages. If the Default Damages exceed the unpaid balance of the Contract Sum, then Subcontractor and/or its surety shall pay the difference to Christman. If it is determined, by litigation, arbitration or otherwise, that any remedy exercised by Christman, including a termination for Default, was unjustified, such remedy or termination shall be deemed for convenience and Subcontractor's remedies shall be limited to those provided for as a termination for convenience.

17.6 Termination for Convenience Christman may terminate this Agreement for convenience by written notice to Subcontractor for any reason provided in the Prime Contract or within Christman's sole discretion. If a Termination for Convenience occurs, Christman shall only be obligated to pay Subcontractor, as otherwise provided for and in accordance with the terms of this Agreement, and as Subcontractor's sole and exclusive remedy: (a) that portion of the cost of the Work allocable to the portion of the Project satisfactorily performed by Subcontractor before the effective date of termination, plus reasonable overhead and profit on such work; and (b) demobilization costs as properly substantiated by proof acceptable to Christman. Under no circumstances shall Subcontractor be entitled to recover for profit and overhead on work not performed before the notice of termination for

convenience.

ARTICLE 18 - MISCELLANEOUS

18.1 Calendar Day All references in this Agreement to days shall mean calendar days.

18.2 Assignment Subcontractor shall not assign or subcontract this Agreement or any portion thereof, nor assign any payment, claims or rights under this Agreement to any third party without Christman's prior written consent. Consent will not be given to any proposed agreement that would relieve the Subcontractor or its surety of their responsibilities under this Agreement. Christman may assign this Agreement to its surety, joint venture partner, an affiliate, or other third party. Christman may also assign this Agreement to Owner, its designated assignee, or lender, in accordance with the terms of the Prime Contract or Owner's loan documents associated with the Project.

18.3 Ownership of Work Product Subcontractor grants to Christman and the Owner if required by the Prime Contract, all ownership and property interests in all Subcontractor Work Product. To the extent Subcontractor Work Product includes or otherwise utilizes trade secrets, copyrighted materials or other similarly protected intellectual property, Subcontractor grants to Christman a license for the use of such Work Product solely and exclusively for the Project.

18.4 Data Ownership & Confidentiality Engineering, architectural, or other information provided pursuant to this Agreement is the property of Christman (or the Owner if so provided in the Prime Contract) and is not to be reproduced or disclosed to others or used for other purposes without Christman's written permission. All information about the Project. Christman's systems, processes, procedures, and other operations, and the Owner's systems, processes, procedures, and business operations shall be kept strictly confidential by Subcontractor and its Lower Tiers unless otherwise prohibited by Applicable Laws or to the extent exceptions are permitted by written approval from Christman. If confidential information is disclosed by Subcontractor or its Lower Tiers, Subcontractor shall immediately notify Christman of the unauthorized disclosure and details pertaining to what was disclosed, to whom and when the disclosure occurred. Subcontractor shall be responsible to Christman and to the extent applicable in the Prime Contract, to the Owner for any unauthorized disclosure.

18.5 E-Data Except as to a Notice of Claim, the parties may exchange and execute records in electronic form. Christman disclaims any representation or warranty as to the functionality of the software or computer program associated with electronic transmission of records. Christman disclaims any warranty, express or implied, including the warranty of fitness for a particular purpose, as to the information transmitted in electronic form.

18.6 Integration This Agreement including incorporated documents is the entire agreement between the Parties, supersedes and cancels any prior written or verbal agreements, and constitutes the only agreement between the Parties for the Work and the Project. Except for Christman backcharges to Subcontractor, no terms of this Agreement or the nature and extent of the Work shall be waived, modified, reduced, or enlarged, except in writing signed by both Parties. No additional or contrary term in any Subcontractor document related to this Agreement is binding on Christman.

18.7 Controlling Law This Agreement is governed by the law of the Controlling State and to the extent applicable, all federal laws, rules and regulations. The term "State" includes all 50 states, the District of Columbia, Puerto Rico, and any other unincorporated territory of the U.S.

18.8 Independent Contractor Subcontractor shall be deemed to be an independent contractor fully responsible for the means, methods and safety measures and procedures utilized fulfilling the scope of services or terms of this Agreement. Under no circumstances shall the Subcontractor be deemed to be an employee or joint venturer with Christman.

18.9 Authority Subcontractor affirms that its signatory to this Agreement is an authorized agent of Subcontractor, with full authority to enter into this Agreement on behalf of Subcontractor. This Agreement may be executed electronically and a copy of a signed Agreement may be exchanged via email in which case signatures shall be deemed binding for all purposes and an original signature is not required.

18.10 Severability If any portion of this Agreement is deemed invalid or unenforceable, such term may be severed from this Agreement and the remainder of the Agreement shall be valid and enforceable to the fullest extent permitted by law.

18.11 Work Before Signing Subcontractor's liabilities and obligations to Christman hereunder shall apply to all the Work, even Work that may have been performed before the date of this Agreement pursuant to prior negotiations, representations, agreements, understandings or otherwise. Notwithstanding a later signing of this Agreement by Christman or Subcontractor, this Agreement is deemed effective on the date Subcontractor first commences any Work.

18.12 Enforcement Christman's failure to insist in any one or more instances on Subcontractor's performance of any term or condition of this Agreement, or failure to exercise any of its rights, shall not constitute waiver or relinquishment of such term, condition, or right as to further performance or Christman's right to enforce any term or condition. Christman's waiver of any term, condition, or rights shall be made in writing and such written waiver shall not be deemed a waiver of any other term or condition.

ARTICLE 19 - EXHIBITS

The following Exhibits, whether attached hereto or not, are incorporated by reference.

Exhibit I	Supplement A
Exhibit II	Christman's Safety Program
Exhibit III	Payment & Performance Bonds
Exhibit IV	Supplement B, if applicable

[SIGNATURE PAGE TO FOLLOW]

Job No. **Work Category:**

ACCEPTANCE

The said parties, for themselves, their heirs, successors, executors, and administrators and assignees, do hereby agree to the full performance and covenants contained herein.

By signing below these parties affirm that they are each authorized agents of their respective organizations, with full rights and privileges to enter into this Agreement on behalf of those respective organizations. This Agreement may be executed by facsimile signature, or a copy of a signed Agreement may be delivered via email by either party and such signature will be deemed binding for all purposes hereof without delivery of an original signature being thereafter required.

Signature	Signature
Print Name	Print Name
Title	Title
Date	Date

SUBCONTRACTOR PAYMENT BOND

BOND NUMBER: _____

SUBCONTRACTOR: _____
Address: _____

SURETY: (or Sureties) _____
Address: _____
Phone Number: _____
Email: _____

CONTRACTOR: **THE CHRISTMAN COMPANY**
Address: 208 N. Capitol Avenue, Lansing, MI 48933

PROJECT: _____

SUBCONTRACT DATE: _____

CONTRACT AMOUNT: $ _____

BOND AMOUNT: _____ Dollars
($)

Contractor has entered into a Subcontract or Purchase Order (Agreement) with Subcontractor in the amount stated above (Contract Amount) for the Project for the performance of work, including warranty obligations (Work), as detailed in the Agreement. That Agreement is incorporated by reference in its entirety into this Bond.

By virtue of this Bond, Subcontractor and Surety are held and firmly bound to Contractor to pay for labor, materials, and equipment (collectively, "Improvements") furnished for use in performing the Work and agree to bind themselves and their respective heirs, administrators, executors, successors and permitted assigns, jointly and severally, firmly as follows:

1. **Payment Made** If Subcontractor promptly pays all sums due Claimants and defends, indemnifies and holds harmless Contractor from claims, demands, liens or suits by any person or entity seeking payment for Improvements furnished for use in performing the Work, then Subcontractor and Surety shall have no obligation under the Bond.

2. **Surety Obligation to Contractor** Surety's obligations to Contractor shall arise after Contractor notifies Surety and Subcontractor in writing of claims, demands, liens or suits against Contractor or the real property upon which the Project is located, by any person or entity seeking payment for Improvements. Upon such notice, Surety shall promptly, and at Surety's expense, defend, indemnify and hold Contractor harmless from such claim, demand, lien or suit.

3. **Surety Obligation to Claimant** Every Claimant who has not been paid in full before the expiration of ninety (90) days after Claimant provided or performed the last of the Work, or furnished the last of the Improvements for which the claim is made, may have a right of action on this Bond. The Surety's obligation shall not exceed the Bond Sum, as modified.

4. **Limitation of Action** Claimant shall not commence any suit or action on this Bond:

   a. Unless Claimant, except a Claimant having a direct contract with Subcontractor, shall have given written notice of non-payment to Subcontractor, Contractor and Surety within ninety (90) days after Claimant last performed or furnished the Improvements for which the claim is made, stating with substantial accuracy the amount claimed and the name of the party to whom Claimant provided the Improvements. Claimant shall serve such notice to the addresses set forth in this Bond. And, after the expiration of one (1) year from the date when Claimant last performed or provided Improvements to the Project. If this provision is prohibited by law, the minimum period of limitation available to surety in the jurisdiction shall apply; and,
   b. Other than in any court of competent jurisdiction in the location where the Project is located.

5. **Contractor Notice** Contractor's written notice to Subcontractor and Surety of Claimant's claim, served by Contractor to the addresses set forth in this Bond, shall be sufficient to satisfy Claimant's obligation in paragraph 4(a) to furnish notice. Contractor's notice in the form of email with delivery or read-receipt verification shall be sufficient written notice. Notwithstanding the foregoing, Contractor shall have no affirmative obligation to Claimant, Subcontractor or Surety to provide notice on behalf of Claimant.

SUBCONTRACTOR PAYMENT BOND

BOND NUMBER: _____

6. **Surety Response** When the conditions of paragraph 4(a) are satisfied, Surety shall promptly, and at Surety's expense, take the following actions:

    a. Provide a written response to Claimant, with a copy to Subcontractor, within forty-five (45) days after receipt of the Claim, stating the amounts that are undisputed and the basis for challenging any amounts that are disputed; and,
    b. Pay any undisputed amounts.

7. **Claimant** Claimant means an individual or entity having a direct contract with Subcontractor, or with a subcontractor or vendor of the Subcontractor, to provide Improvements. The term Claimant also includes any individual or entity that has rightfully asserted a claim under an applicable mechanic's lien or similar statute against the real property upon which the Project is located.

8. **Improvements** The intent of this Bond shall be to include, without limitation, in the terms "Improvements" and "labor, materials, or equipment" that part of water, gas, power, light, heat, oil, gasoline, telephone service or rental equipment used in performing the Work, architectural, engineering, and consulting services required for the work of the Subcontractor and the Subcontractor's subcontractors, and all other items for which a mechanic's lien may be asserted.

9. **Principal Surety** Surety is the principal surety and its obligations under this Bond shall be deemed primary to any bond procured by Contractor, with Contractor's surety being deemed a sub-surety.

10. **Changes** Surety agrees that no change, extension of time, alteration, addition, deletion, amendment, or other modification of the Agreement or the Prime Contract between Contractor and the Project owner, or both, or in the Work, specifications, drawings, whether material or otherwise, or in the manner, time or amount of payment as provided therein, and whether or not made in the manner as provided therein, shall in any way affect Surety's obligations on this Bond, except that the Bond Sum shall increase directly with any additive amendments to the Agreement. Surety hereby waives notice of any changes, extensions of time, alterations, additions, deletions, amendments, and other modifications to the Agreement.

Subcontractor and Surety cause this Bond to be duly executed and acknowledged as set forth below, on this day of _____.

SUBCONTRACTOR
Company:

_____
By:
Its:

SURETY
Company:

_____
By:
Its: Attorney in Fact

(Impress Corporate Seal)

SUBCONTRACTOR PERFORMANCE BOND

BOND NUMBER: _____

SUBCONTRACTOR: _____
Address: _____
As Principal (the Principal), and

SURETY: (or Sureties) _____
Address: _____
Phone Number: _____
Email: _____
As Surety or Co-Sureties (collectively, Surety), and

CONTRACTOR: **THE CHRISTMAN COMPANY**
Address: 208 N. Capitol Avenue, Lansing, MI 48933
As Obligee (Obligee)

PROJECT: _____

SUBCONTRACT DATE: _____

CONTRACT AMOUNT: $ _____

BOND AMOUNT (Penal Sum): Dollars _____
($)

WHEREAS, Principal has by written agreement entered into a Subcontract Agreement or Purchase Order (Agreement) with Obligee in the amount stated above (Contract Amount) for the performance of work, including warranty obligations (Work), as detailed in the Agreement, which Agreement in its entirety is by reference expressly incorporated into this Bond.

WHEREAS, the amount of this Bond (Penal Sum) is in the amount stated above.

NOW THEREFORE, Principal and Surety are held and firmly bound to Obligee for the payment of the Penal Sum and agree to bind themselves and their respective heirs, administrators, executors, successors and permitted assigns, jointly and severally, firmly as follows:

1. If Principal shall promptly and faithfully perform the Agreement within the time provided therein, then this obligation shall be null and void; otherwise it shall remain in full force and effect.

2. Surety agrees that no change, extension of time, alteration, addition, deletion, amendment, or other modification of the Agreement or the Prime Contract between Obligee and the Project owner, or both, or in the Work, specifications, drawings, whether material or otherwise, or in the manner, time or amount of payment as provided therein, and whether or not made in the manner as provided therein, shall in any way affect Surety's obligations on this Bond, except that the Penal Sum of this Bond shall increase directly with any additive amendments to the Agreement provided the additive change(s) do not, either singly or in the aggregate, exceed 20% of the original Contract Amount. If any change singly or in the aggregate exceeds 20% of the original Contract Amount, Obligee shall obtain Surety's written consent to increase the Penal Sum. Surety hereby waives notice of any changes, extensions of time, alterations, additions, deletions, amendments, and other modifications to the Agreement.

3. Whenever Obligee has declared Principal to be in default of the Agreement, Surety shall, within twenty (20) calendar days of receipt of Obligee's declaration of default (Investigation Period), respond as follows, failure of

which shall be a material breach of this Bond:

a. Determine the amount for which Surety may be liable and tender the amount to Obligee; or,

b. Notify Obligee that Surety has elected to complete the Work itself or through its agents or contractors in accordance with the terms and conditions of the Agreement, in a manner acceptable to Obligee, and thereafter promptly begin the Work; or,

c. Obtain bids or offers from replacement subcontractors (Completing Subcontractor), reasonably acceptable to Obligee, to complete the Agreement in accordance with its terms and conditions, and upon determination by Surety and Obligee jointly of the lowest responsible bidder or offeror, arrange for new performance and payment bonds from the Completing Subcontractor in a form and from a surety as required by the Agreement, all of which must be completed before expiration of the Investigation Period. Upon execution of the agreement between Completing Contractor and Obligee, Surety shall pay to Obligee, within five (5) days of execution, the difference between the cost to complete the Work and the Contract Balance; or,

d. Arrange to provide financial and/or other assistance to the Principal (Financing) to assist the Principal with timely completion of the Agreement. This option is subject to Obligee's concurrence, which concurrence may be withheld in Obligee's sole discretion.

e. Having made an independent assessment of the facts and circumstances of Obligee's declaration of default, deny Surety's liability in whole or in part and provide a detailed explanation of the reasons for its denial, specifying amounts that are disputed and undisputed. Surety shall tender payment of any undisputed amount.

4. Surety may request an extension of up to twenty (20) calendar days (Extension Period) to respond as required by the Bond. Surety shall finance performance of the Work during the Extension Period on a schedule and in a manner acceptable to Obligee. Upon expiration of the Extension Period, Surety shall respond as outlined in paragraph 3.

5. Upon declaration that Principal is in default, Obligee shall have the right, but not the obligation, to immediately proceed to perform or correct the Work and take such other action pursuant to its rights under the Agreement to mitigate the damages caused by Principal's default (Mitigation Work). Obligee's overhead (both field and home office) and profit shall be included in the cost of the Mitigation Work at a markup of 20% to the actual labor, material, equipment, and subcontractor costs Obligee incurs. Obligee shall keep Surety reasonably informed of costs incurred for the Mitigation Work. Obligee shall be entitled to deduct the cost of the Mitigation Work from the Contract Balance. To the extent Obligee's cost of the Mitigation Work exceeds the Contract Balance, Surety shall, as the Work progresses, promptly and without deduction, reimburse Obligee for such shortage. Reimbursement by Surety shall reduce the Penal Sum by the amount of Surety's reimbursement to Obligee.

6. The term Contract Balance means the Contract Amount, as adjusted by any amendments to the Agreement issued before declaration of default, less the amount paid by Obligee to Principal or others in accordance with the Agreement, less amounts to which Obligee is entitled to a setoff under the Agreement, and less any other amounts for which the Principal or Surety is liable under the Bond or Agreement.

7. Surety shall be liable for:

a. Principal's responsibilities for correcting defective work, warranty work, latent defects, indemnity, and completion of the Work.

b. Legal, design professional and delay costs resulting or arising from Principal's default, or resulting or arising from the actions or failure to act of the Surety under paragraph 3 herein,

and liquidated damages, or if no liquidated damages are specified in the Agreement, and actual damages caused by delayed performance or non-performance of the Principal.

c. Principal's responsibilities for damages and set-offs in accordance with the Agreement.

8. If Surety elects to act under paragraph 3, Surety's liability is limited to Penal Sum, as adjusted pursuant to paragraph 2 above. Notwithstanding the foregoing, Surety shall reimburse Obligee for Obligee's reasonable attorney fees and costs, which shall not be credited against the Penal Sum, from disputes arising from this Bond.

9. Neither Surety's payments for Work performed before Obligee's declaration of default, nor Surety's payments to Claimants as defined in any payment bond issued by Surety as a companion payment bond to this Bond, shall be credited against the Penal Sum of this Bond.

10. All Information Obligee provides to Surety, whether before or after Surety issues the Bond, is provided by Obligee voluntarily as a matter of courtesy and is merely an expression of opinion. Furnishing such information is not a guaranty or warranty of the accuracy or correctness and no responsibility or liability is assumed by Obligee as a result of providing such information to Surety. Surety shall not rely on such information in any manner and waives and releases Obligee and Obligee's surety from any such claims.

11. Surety shall not be liable to Obligee for obligations of the Principal that are unrelated to the Agreement.

12. If this Bond has been furnished to comply with a statutory requirement in the location of the Project, any provision in this Bond conflicting with the statutory requirement shall be deemed deleted and provisions conforming to such statutory or other legal requirement shall be deemed incorporated herein. When so furnished, the intent is that this Bond shall be construed as a statutory bond and not as a common law bond.

13. No right or action shall accrue on this Bond to or for the use of any person or corporation other than Obligee or its heirs, executors, administrators, assigns or successors.

Principal and Surety cause this Bond to be duly executed and acknowledged as set forth below, on this day of _____.

SUBCONTRACTOR AS PRINCIPAL	**SURETY**
Company:	Company:
_____	_____
By:	By:
Its:	Its: Attorney in Fact
	(Impress Corporate Seal)

AFFIDAVIT OF BIDDER

The undersigned, the owner or authorized officer of _____(the "Bidder), pursuant to the familial disclosure requirement provided in the _____(the "School District") advertisement for construction bids, hereby represent and warrant, except as provided below, that no familial relationships exist between the owner(s) or any employee of _____and any member of the Board of Education of the School District or the Superintendent of the School District.

List any Familial Relationships:

BIDDER:

_____

By: _____

Its: _____

STATE OF MICHIGAN)
)ss.
COUNTY OF _____)

This instrument was acknowledged before me on the _____ day of _____, 20___, by _____.

_____

, Notary Public

_____ County, Michigan

My Commission Expires: _____

Acting in the County of: _____

The undersigned, the owner or authorized officer of _____(the "Bidder), pursuant to the familial disclosure requirement provided in the (the "School District") advertisement for construction bids, hereby represent and warrant, except as provided below, that no familial relationships exist between the owner(s) or any employee of Kingscott Architects and or The Christman Company .

List any Familial Relationships:

By:

Its:

STATE OF MICHIGAN)
)ss.
COUNTY OF)

This instrument was acknowledged before me on the day of , 20 , by

.

, Notary Public

County, Michigan

My Commission Expires:

Acting in the County of:

NON-DISCRIMINATION IN EMPLOYMENT CERTIFICATION

Lansing School District
Certificate of Intent to Comply with
"NON-DISCRIMINATION IN EMPLOYMENT" POLICY

I have read Lansing School District's Policy #3310, including paragraph #13 and hereby state my intent to comply with the terms and conditions contained therein. Further I agree to furnish the Michigan Civil Rights Commission with such data and records concerning employment as may be requested by that agency in determining compliance with the policy.

Print or type name of Contact Person:

Signed: _____

_____

Title: _____

Company: _____

Date: _____

AFFIDAVIT OF BIDDER - NON-COLLUSION

Lansing School District
AFFIDAVIT OF BIDDER
SWORN STATEMENT
"Non-Collusion"

DATE: _____

The Bidder, by its officers and agents or representatives, present at the time of filing this bid, being duly sworn, on their oaths, say that neither they nor any of them, have in any way, directly or indirectly, entered into any arrangement or agreement with any other Bidder, whereby such affiant or affiants or either of them has paid or is to pay to such other Bidder any sum of money, or has given, or is to give, to such other Bidder anything of value whatever, or such affiant or affiants or either of them has not, directly or indirectly, entered into any arrangement or agreement with any other Bidder or Bidders, which tends to or does lessen or destroy free competition in the letting of the Contract sought for by the attached bids; that no inducement of any form or character other than that which appears upon the face of the bid, will be suggested, offered, paid or delivered to any person whomsoever to influence the acceptance of the said bid or awarding of the Contract, nor has this Bidder any agreement or understanding of any kind whatsoever, with any person whomsoever to pay, deliver to, or share with any other person in any way or manner, any of the proceeds of the Contract sought by this bid.

IN TESTIMONY WHEREOF, the Bidder (an authorized individual) has agrees to the above:

_____
(Company Name)

By: _____
(Authorized Signer)

_____
Print or type Name and Title of Signer

Address:_____

Notary Public:_____

Subscribed and sworn to before me on this _____ day of _____, 2016

County of:_____ My Commission expires: _____

Telephone number: _____

IRAN ECONOMIC SANCTIONS ACT CERTIFICATE

In accordance with the Iran Economic Sanctions Act, Michigan 2012 PA 517, effective April 1, 2013, (MCL 129.311, *et seq.*), (the "Act"), the undersigned certifies in support of its bid or proposal that it is not an Iran linked business as such is defined in the Act.

Contractor:_____

By:_____

Dated: _____

Name:_____

Title:_____

Act No. 517
Public Acts of 2012
Approved by the Governor
December 28, 2012
Filed with the Secretary of State
December 28, 2012
EFFECTIVE DATE: April 1, 2013

STATE OF MICHIGAN
96TH LEGISLATURE
REGULAR SESSION OF 2012

Introduced by Senators Kahn, Marleau, Brandenburg, Anderson, Green and Booher

ENROLLED SENATE BILL No. 1024

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

The People of the State of Michigan enact:

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

Sec. 2. As used in this act:

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

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

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

(*ii*) A loan or other extension of credit.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Sec. 4. If a public entity determines, using credible information available to the public, that a person has submitted a false certification under section 3(2), the public entity shall provide the person with written notice of its determination and of the intent not to enter into or renew a contract with the person. The notice shall include information on how to contest the determination and specify that the person may become eligible for a future contract with the public entity if the person ceases the activities that cause it to be an Iran linked business. The person shall have 90 days following receipt of the notice to respond in writing and to demonstrate that the determination of false certification was made in error. If a person does not make that demonstration within 90 days after receipt of the notice, the public entity may terminate any existing contract and shall report the name of the person to the attorney general together with information supporting the determination.

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

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

Enacting section 1. This act takes effect April 1, 2013.

This act is ordered to take immediate effect.

Carol Morey Viventi

Secretary of the Senate

Gary L. Randall

Clerk of the House of Representatives

LEGAL STATUS OF BIDDER

CERTIFICATION REGARDING DEBARMENT, SUSPENSION, AND OTHER RESPONSIBILITY MATTERS. The Vendor and/or Bidder certifies to the best of its knowledge and belief that it and its principals: Are not presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from covered transactions by any Federal department or agency; Have not within a three-year period preceding this agreement been convicted of or had a civil judgment rendered against them for commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public (Federal, State, or local) transaction or contract under a public transaction; violation of federal or state antitrust statutes or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, or receiving stolen property; Are not presently indicted for or otherwise criminally or civilly charged by a government entity (Federal, State, or local) with commission of any of the offences enumerated above in this certification; and Have not within a three-year period preceding this agreement had one or more public transactions (Federal, State, or local) terminated for cause or default; is not now or has been, within a three-year period preceding this date, been listed on the Excluded Parties List System website (EPLS).

Vendor/contractor will notify the Lansing School District Purchasing Office immediately upon becoming suspended or debarred if there is any current or ongoing contract or agreement in place between the district and the vendor/contractor.

Firm Name: _____

Address: _____

Phone & E-mail: _____

Name, title and signature of individual duly authorized to execute contracts:

The Owner, Principal, or Corporate Office of the responding firm is also attesting that all the information provided within this response is true.

Name: _____

Title: _____

Signature: _____

A Corporation organized and existing under the laws of the State of ____

DATE: Tuesday, March 12, 2024

PROJECT: Pattengill Modular Classroom Building

OWNER: Lansing School District

GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION

Attached project specific version of AIA A201-2017 as modified. All references to the “Standard form of General Conditions” are hereinafter used in these specifications shall refer to the above documents.

END OF SECTION

AIA® Document A201® – 2017

General Conditions of the Contract for Construction

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

2022 Bond Issue Construction as identified in the preliminary qualification of bonds application # SBL/33-020-4-K12-28-01, in accordance with the Owner-approved plans and specifications, all applicable laws, the Owner's fixed budget, and as otherwise approved by the Owner.

THE OWNER:
(Name, legal status and address)

Lansing School District
519 West Kalamazoo Street
Lansing, Michigan 48933
Telephone Number: (517) 755-1000

THE ARCHITECT:
(Name, legal status and address)

C2AE
106 West Allegan Street, Suite 500
Lansing, MI 48933

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.

TABLE OF ARTICLES

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(Topics and numbers in bold are Section headings.)

ARTICLE 1 GENERAL PROVISIONS

§ 1.1 Basic Definitions

§ 1.1.1 The Contract Documents

The Contract Documents are enumerated in the Agreement between the Owner and Contractor (hereinafter the Agreement) and consist of the Agreement, Conditions of the Contract (General, Supplementary and other Conditions), Drawings, Specifications, Addenda issued prior to execution of the Contract, other documents listed in the Agreement, and Modifications issued after execution of the Contract. A Modification is (1) a written amendment to the Contract signed by both parties, (2) a Change Order, (3) a Construction Change Directive, or (4) a written order for a minor change in the Work issued by the Architect. Unless specifically enumerated in the ~~Agreement,~~ Agreement in writing, the Contract Documents ~~do not~~ also include the advertisement or invitation to bid, Instructions to Bidders, sample forms, other information furnished by the Owner in anticipation of receiving bids or proposals, accepted portions of the Contractor's bid or proposal, ~~or~~ and portions of Addenda relating to bidding or proposal requirements. The Contractor's execution of the Owner/Contractor Agreement and the Architect's execution of the Owner/Architect Agreement shall constitute their respective acceptance of all provisions of the Drawings, Addenda, and all Contract Documents as of the revision applicable to the date of such signature.

§ 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 the Contractor's performance of ~~the Architect's~~ its duties.

§ 1.1.3 The Work

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

§ 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 person identified in the Agreement to render initial decisions or interpretations, as applicable, on Claims in accordance with Section 15.2. The Initial Decision Maker shall not show partiality to the Owner or Contractor and shall not be liable for results of interpretations or decisions rendered in good faith.

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

§ 1.1.10 The terms "Warranty" and "Guarantee" as uscd in the Contract Documents shall have the same meaning and shall be defined as "legally enforceable assurance of satisfactory performance or quality of a product or Work," but in all events subject to the terms and qualifications of the Contract Documents.

§ 1.1.11 Where materials, systems and equipment items are referred to in the singular, such reference shall not serve to limit the quantity required. The Contractor shall furnish quantities as required by the Contract Documents to complete the Work.

§ 1.1.12 Unless specifically limited in the Contract, the words "furnish," "install," and "provide," or any combination thereof, mean to furnish and incorporate into the Work, including all necessary labor, materials, and equipment and other items required to perform the Work indicated.

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

§ 1.2 Correlation and Intent of the Contract Documents

§ 1.2.1 The intent of the Contract Documents is to include all items necessary for the proper execution and completion of the Work by the Contractor. The Contract Documents are complementary, and what is required by one shall be as binding as if required by all; performance by the Contractor shall be required only to the extent consistent with the Contract Documents and reasonably inferable from them as being necessary to produce the indicated results. If the Drawings and Specifications conflict with each other regarding the quality or quantity of Work required, the better quality and/or the greater quantity shall govern, and shall be provided, unless instructions are otherwise furnished to the Contractor by the Architect in writing with the Owner's consent.

§ 1.2.1.1 The invalidity of any provision of the Contract Documents shall not invalidate the Contract or its remaining provisions. If it is determined that any provision of the Contract Documents violates any law, or is otherwise invalid or unenforceable, then that provision shall be revised to the extent necessary to make that provision legal and enforceable. In such case the Contract Documents shall be construed, to the fullest extent permitted by law, to give effect to the parties' intentions and purposes in executing the Contract.

§ 1.2.2 Organization of the Specifications into divisions, sections and articles, and arrangement of Drawings shall not control the Contractor in dividing the Work among Subcontractors or in establishing the extent of Work to be performed by any trade. Where responsibility for particular Work is required of the Contractor, the Contractor shall not be released from that responsibility by reason of the location of the Specification, Drawing, or other information that establishes the responsibility. Thus, for example, the Contractor shall be responsible for all Work required of it, even though that responsibility may be shown only in that portion of the Contract Documents typically pertaining to another contractor or trade.

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

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

.1 Where requirements specifically set forth in the Agreement are in conflict with other Contract Documents, including, but not limited to, these General Conditions, the Agreement shall govern.

.2 In all other instances, the conflict shall be resolved by complying with the provision that is most favorable to the Owner, as determined in the Owner's sole discretion.

.3 When a duplicate of material or equipment occurs in the Drawings, the Specifications or other Contract Documents, each Contractor shall be deemed to have bid on the basis of each furnishing such material or equipment. The Owner will decide which Contractor shall furnish the same.

§ 1.2.4.1 Without limiting the applicability of Section 1.2.4, if there should be conflict or ambiguity within any single Contract Document (for example, these General Conditions, as modified), the conflict or ambiguity shall be resolved by complying with the provision that is most favorable to the Owner, as determined in the Owner's sole discretion.

§ 1.2.5 It is the intent of the Contract Documents to accomplish a complete and workmanlike installation in which there shall be installed new products as specified, and workmanship shall be thoroughly first class, executed by competent and experienced workmen.

.1 Details of preparation, construction, installation, and finishing encompassed by the Contract Documents shall conform to the industry standards of the respective trades, and that workmanship and construction methods shall be of workmanlike quality so as to accomplish a neat and finished job, consistent with industry standards.

.2 Where specific recognized standards are mentioned in the Specifications, it shall be interpreted that such requirements shall be complied with.

§ 1.2.6 The Contractor acknowledges that there may be items of the Work that the Contractor is responsible to provide under the Contract Documents that are not drawn or specified in the design but are necessary for the proper execution and completion of the Work, and are consistent with, and reasonably inferable from, the Drawings and Specifications. Provided the necessary work or materials does not materially increase the cost of the Work, all such items shall be provided as part of the Work without delay in its progress and without any increase in the Contract Sum.

§ 1.3 Capitalization

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

§ 1.4 Interpretation

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

§ 1.5 Ownership and Use of Drawings, Specifications, and Other Instruments of Service

§ 1.5.1 The Architect and the Architect's consultants shall be deemed the authors and owners of their respective Instruments of Service, including the Drawings and Specifications, and unless otherwise indicated in the Contract Documents or the Owner/Architect Agreement, the Architect and the respective consultants will retain all common law, statutory, and other reserved rights in their Instruments of Service, including copyrights. The Contractor, Subcontractors, Sub-subcontractors, and suppliers shall not own or claim a copyright in the Instruments of Service. Submittal or distribution to meet official regulatory requirements or for other purposes in connection with the Project is not to be construed as publication in derogation of the Architect's or Architect's consultants' reserved rights.

§ 1.5.2 The Contractor, Subcontractors, Sub-subcontractors, and suppliers are authorized to use and reproduce the Instruments of ~~Service provided to them,~~ Service, subject to any protocols established pursuant to ~~Sections 1.7 and 1.8,~~ Section 1.7, solely and exclusively for execution of the Work. All copies made under this authorization shall bear the copyright notice, if any, shown on the Instruments of Service. The Contractor, Subcontractors, Sub-subcontractors, and suppliers may not use the Instruments of Service on other projects or for additions to the Project outside the scope of the Work without the specific written consent of the Owner, Architect, and the Architect's consultants.

§ 1.5.3 The Drawings, Specifications, and other documents and all data used in compiling any tests, surveys, or inspections at the Project Site and the results therefrom, as well as all photographs, drawings, specifications, schedules, data processing output, computer-aided design/drafting (CADD) system disks/tapes, computations, studies, audits, reports, models and other items of like kind, and all intellectual property, prepared or created for or in connection with the Project and required by the Owner, the Contractor, or a third party, belong to the Owner. The Contractor may retain one record set. All copies of them, except Contractor's record set, shall be returned or suitably accounted for upon completion of the Work. They are for use solely with respect to the Project. The Contractor shall not, without the prior written consent of the Owner, use or permit anyone to use any Drawings, Specifications, or other documents prepared for or in connection with the Project, or any concepts or ideas developed in connection with the Project, for any purpose other than the Project. The Owner shall at all times have access to and control over the disposition of any Drawings, Specifications, and other documents pertaining to the Project.

§ 1.6 Notice

§ 1.6.1 Except as otherwise provided in Section 1.6.2, where the Contract Documents require one party to notify or give notice to the other party, such notice shall be provided in writing to ~~the designated~~ an appropriate representative of the party to whom the notice is addressed and shall be deemed to have been duly served if delivered in person, by

registered or certified mail, by courier, or by electronic transmission if ~~a method for electronic transmission is set forth in the Agreement.~~an acknowledgment of receipt is received from the recipient or proof of receipt is otherwise established. The parties acknowledge that an appropriate representative of the Owner shall have authority only to the extent provided by the Owner's Board of Education.

§ 1.6.2 Notice of Claims as provided in Section 15.1.3 shall be provided in writing and shall be deemed to have been duly served only if delivered to ~~the designated~~ an appropriate representative of the party to whom the notice is addressed by certified or registered mail, or by courier providing proof of delivery. The parties acknowledge that an appropriate representative of the Owner shall have authority only to the extent provided by the Owner's Board of Education.

§ 1.7 Digital Data Use and Transmission

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

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

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

ARTICLE 2 OWNER

§ 2.1 General

§ 2.1.1 The Owner is the person or entity identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number. The Owner shall designate in writing a representative who shall have express authority to bind the Owner with respect to ~~all~~ matters requiring the Owner's approval or ~~authorization.~~ authorization subject to parameters of authority established by the Owner's Board of Education as provided in writing to Contractor. Benjamin Shuldiner or his designee shall serve as initial Owner representatives and shall be reasonably available to Contractor. Except as otherwise provided in Section 4.2.1, the Architect does not have such authority. The term "Owner" means the Owner or the Owner's authorized representative.

§ 2.1.2 ~~The Owner shall furnish to the Contractor, within fifteen days after receipt of a written request, information necessary and relevant for the Contractor to evaluate, give notice of, or enforce mechanic's lien rights. Such information shall include a correct statement of the record legal title to the property on which the Project is located, usually referred to as the site, and the Owner's interest therein.~~ **NOT USED.**

§ 2.2 Evidence of the Owner's Financial Arrangements

§ 2.2.1 Prior to commencement of the Work and upon written request by the Contractor, the Owner shall ~~furnish~~ furnish, as applicable, to the Contractor reasonable evidence that the Owner has made financial arrangements to fulfill the Owner's obligations under the Contract. The Contractor shall have no obligation to commence the Work until the Owner provides such evidence. If commencement of the Work is delayed under this Section 2.2.1, the Contract Time shall be extended ~~appropriately.~~ appropriately by a mutual agreement in writing by the Owner and Contractor.

§ 2.2.2 Following commencement of the Work and upon written request by the Contractor, the Owner shall furnish to the Contractor reasonable evidence that the Owner has made financial arrangements to fulfill the Owner's obligations under the Contract only if (1) the Owner fails to make payments to the Contractor as the Contract Documents require; (2) the Contractor identifies in writing a reasonable concern regarding the Owner's ability to make payment when due; or (3) a change in the Work materially changes the Contract Sum. If the Owner fails to provide such evidence, as required, within fourteen days of the Contractor's request, the Contractor may immediately stop the Work and, in that event, shall immediately notify the Owner that the Work has ~~stopped.~~ stopped and state with specificity why any evidence provided (or not provided) by the Owner is insufficient. However, if the request is made because a change in the Work materially changes the Contract Sum under (3) above, the Contractor may immediately stop only that portion of the Work affected by the change until reasonable evidence is provided. If the Work is stopped under this

Section 2.2.2, the Contract Time shall be extended appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable costs of shutdown, delay and start-up, plus interest as provided in the Contract Documents. The parties' disagreement as to the appropriateness of payment for services performed shall not constitute the Owner's failure to make financial arrangements to fulfill the Owner's obligations under the Contract Documents.

§ 2.2.3 After the Owner furnishes evidence of financial arrangements under this Section 2.2, the Owner shall not materially vary such financial arrangements without prior notice to the Contractor.

§ 2.2.4 Where information is protected by law and/or the Owner has designated information furnished under this Section 2.2 as "confidential," the Contractor shall keep the information confidential and shall not disclose it to any other person. However, the Contractor may disclose such "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~~ To the extent permitted by law, the Contractor may also disclose such "confidential" information to its employees, consultants, sureties, Subcontractors and their employees, Sub-subcontractors, and others who need to know the content of such information solely and exclusively for the Project and who agree to maintain the confidentiality of such information.

§ 2.3 Information and Services Required of the Owner

§ 2.3.1 Except for permits and fees that are the responsibility of the Contractor under the Contract Documents, ~~including~~ including, but not limited to, those required under Section 3.7.1, the Owner shall secure and pay for necessary approvals, easements, assessments and charges required for construction, use or occupancy of permanent structures or for permanent changes in existing facilities.

§ 2.3.2 The Owner shall retain an architect lawfully licensed to practice architecture, or an entity lawfully practicing architecture, in the ~~jurisdiction where the Project is located.~~ State of Michigan. 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 shall 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 The Owner shall furnish surveys describing physical characteristics, legal limitations and utility locations for the site of the Project, and a legal description of the site. ~~The~~ Taking into account the Contractor's experience and expertise, and exercise of professional caution, the Contractor shall be entitled to rely on the accuracy of information furnished by the Owner but shall exercise proper precautions relating to the safe performance of the Work. The Contractor shall not be entitled to additional compensation resulting from its failure to confirm the location of site utilities or existing structures.

§ 2.3.5 ~~The~~ Upon specific written request by the Contractor, the Owner shall furnish information or services required of the Owner by the Contract Documents with reasonable promptness. The Owner shall also furnish any other information or services under the Owner's control and relevant to the Contractor's performance of the Work with reasonable promptness after receiving the Contractor's written request for such information or services. Contracts with other Contractors alone shall not constitute sufficient Owner control for purposes of this Section.

§ 2.3.6 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 ~~repeatedly~~ fails to carry out Work in accordance with the Contract Documents, the Owner may issue a written order to the Contractor to stop the Work, or any portion thereof, until the cause for such order has been eliminated; however, the right of the Owner to stop the Work shall not give rise to a duty on the part of the Owner to exercise this right for the benefit of the Contractor or any other person or entity, except to the extent required by Section 6.1.3. This right shall be in addition to and not in limitation of the Owner's rights under any provision of the Contract Documents.

§ 2.5 Owner's Right to Carry Out the Work

If the Contractor defaults or neglects to carry out the Work in accordance with the Contract Documents and fails within a ~~ten-day~~ three business day period after receipt of notice from the Owner or the Owner's designee (including, for this purpose, the Architect) to commence and continue correction of such default or neglect with diligence and promptness, the Owner may, without prejudice to other remedies the Owner may have, ~~correct such default or neglect. Such action by the Owner and amounts charged to the Contractor are both subject to prior approval of the Architect and the Architect may,~~ including any claim against the Contractor's Performance Bond, correct such default or neglect. In the event the Contractor's default or neglect results in a threat to the safety of persons or property, the Contractor shall immediately commence and continue correction; otherwise, the Owner may undertake the same actions as permitted in the prior sentence. In such case, an appropriate Change Order shall be issued deducting from payments then or thereafter due the Contractor the reasonable cost of correcting such deficiencies, including Owner's expenses, including any and all legal expenses incurred to effectuate and enforce this provision, and compensation for the Architect's and/or other Contractor's additional services made necessary by such default, neglect, or failure. If the Contractor does not agree to a Change Order as described in the preceding sentence, the Owner may nevertheless withhold the reasonable cost of correcting such deficiencies and the expenses identified in the preceding sentence (including, but not limited to, all legal expenses incurred to effectuate and enforce this provision). Exercise of such rights shall in no way limit or jeopardize the Owner's right to any claim against the Performance Bond or Contractor. The Architect may also, pursuant to Section 9.5.1, withhold or nullify a Certificate for Payment in whole or in part, to the extent reasonably necessary to reimburse the Owner for the reasonable cost of correcting such deficiencies, including the aforementioned Owner's expenses and compensation for the Architect's additional services made necessary by such default, neglect, or failure. If current and future payments are not sufficient to cover such amounts, the Contractor shall pay the difference to the Owner. If the Contractor disagrees with the actions of the Owner or the Architect, or the amounts claimed as costs to the Owner, the Contractor may file a Claim pursuant to Article 15. In the event the Owner directs another entity to perform Work pursuant to this Section that otherwise is the obligation of the Contractor, including correction of safety violations, either at the Contractor's request or as a result of the Contractor's failure to perform such Work, the Owner may withhold any payments due Contractor to cover all costs for labor, material, and equipment plus that other entity's administrative, profit, and overhead costs. If payments then or thereafter due the Contractor are not sufficient to cover such amounts, the Contractor shall pay the difference to the Owner.

ARTICLE 3 CONTRACTOR

§ 3.1 General

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

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

§ 3.1.3 The Contractor shall not be relieved of its obligations to perform the Work in accordance with the Contract Documents either by activities or duties of the 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.

§ 3.1.4 These General Conditions refer to the relationship between the Owner and Contractor. As to the contract between the Contractor and its Subcontractors, the General Conditions shall be read as the Contractor having the position of the Owner and the Subcontractors having the position of the Contractor. The Subcontractors are bound to the Contractor just as the Contractor is bound to the Owner. The Subcontractor shall have all the rights, duties and obligations to the Contractor as the Contractor has rights, duties and obligations to the Owner. The Subcontractors shall agree to and accept the same responsibility to the Owner as the Contractor. In the event any failure of a Subcontractor or the Subcontractor's Subcontractor or supplier, at any tier, causes any type of defective Work, injury, loss or damage to the Owner, direct or indirect, the Contractor shall be jointly and severally liable to the Owner for such injury in addition to any responsibility or liability of the Subcontractor.

§ 3.2 Review of Contract Documents and Field Conditions by Contractor

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

observations with requirements of the Contract Documents. The Contractor shall independently verify all information related to utilities prior to beginning the Work. The Contractor shall make careful investigation to establish the exact location of any such items indicated on the Drawings (e.g., locate via hand digging before excavating). The Contractor shall be responsible for all costs arising out of damage to such items or additional construction costs incurred because Contractor failed to verify said information.

§ 3.2.2 Because the Contract Documents are complementary, the Contractor shall, before starting each portion of the Work, carefully study and compare the various Contract Documents relative to that portion of the Work, as well as the information furnished by the Owner pursuant to Section 2.3.4, shall take field measurements of any existing conditions related to that portion of the Work, and shall observe any conditions at the site affecting it. These obligations are for the purpose of facilitating coordination and construction by the Contractor and are not for the purpose of discovering errors, omissions, or inconsistencies in the Contract Documents; however, the Contractor shall promptly report to the Architect 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 The Contractor is not required to ascertain that the Contract Documents are in accordance with applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of public authorities, but the Contractor shall promptly report to the Architect any nonconformity discovered by or made known to the Contractor as a request for information in such form as the Architect may ~~require.~~require, with a copy of same to be forwarded to the Owner.

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

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

§ 3.3 Supervision and Construction Procedures

§ 3.3.1 The Contractor shall supervise and direct the Work, using the Contractor's best skill and attention. The Contractor shall be solely responsible for, and have control over, construction means, methods, techniques, sequences, and procedures, and for coordinating all portions of the Work under the Contract. If the Contract Documents give specific instructions concerning construction means, methods, techniques, sequences, or procedures, the Contractor shall evaluate the jobsite safety thereof and shall be solely responsible for the jobsite safety of such means, methods, techniques, sequences, or procedures. If the Contractor determines that such means, methods, techniques, sequences or procedures may not be safe, the Contractor shall give timely notice to the Owner and Architect, and 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 notify the Architect and Owner of delays of any other Contractors that could impact timely coordination and completion of the Work.

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

§ 3.3.3 The Contractor shall be responsible for inspection of portions of Work already performed to determine that such portions are in proper condition to receive subsequent Work. The Contractor shall be deemed to have accepted prior work when it commences provision of subsequent Work and shall be responsible for the cost of repair, replacement, or reconstruction if the prior work is found to be improper.

§ 3.4 Labor and Materials and Utilities

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

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

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

§ 3.4.4 The Contractor agrees that neither it nor its Subcontractors will discriminate against any employee or applicant for employment, to be employed in the performance of this Contract, with respect to hire, tenure conditions or privilege of employment, or any matter directly or indirectly related to employment, because of race, age, sex, color, religion, national origin, ancestry or physical disability. Breach of this covenant may be regarded as a material breach of this Contract.

§ 3.4.5 Immediately after "award of the Contract," the Contractor shall provide the Architect a list showing the name of the manufacturer proposed to be used for each of the product(s) identified in the Specifications and, where applicable, the name of the installing Subcontractor.

§ 3.4.6 The Architect will reply in writing to the Contractor stating whether the Owner or the Architect, after due investigation, has reasonable objection to any such proposal. If adequate data on any proposed manufacturer or installer is not available, the Architect may state that action will be deferred until the Contractor provides further data.

§ 3.4.7 In all cases involving utilities, unless the Contract Documents specifically provide otherwise, it shall be the Contractor's responsibility to coordinate the Work with the owners of such utilities for the protection of such utilities and for the safety associated with working with or in the vicinity of such utilities. The Contractor shall coordinate any work required by private and/or public utility companies to provide utilities to the Work and/or shall coordinate relocation of utilities as required by the Work. Any reference to the Owner being responsible for the coordination of, the paying for, or the relocation of any utility or associated equipment, which it does not own or control, requires only reasonable efforts by the Owner to coordinate such activity.

§ 3.4.8 Asbestos-Free Product Installation

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

§ 3.4.8.2 The Contractor also shall be required to furnish certified statements from the manufacturers of supplied materials used during construction verifying their products to be asbestos-free in accordance with the requirements of Section 3.4.8.1.

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

§ 3.4.9 Asbestos may be present within the construction areas. Contractors are to become aware of Owner's hazardous material report prior to construction. Work is not to disturb any in-place hazardous materials. The Contractor must immediately stop all Work and notify the Owner if it reasonably suspects the presence of unknown hazardous materials and/or has disturbed any materials reasonably suspected to be hazardous materials.

§ 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, except for those inherent in the quality of the Work the Contract Documents require or permit. Work, materials, or equipment not conforming to these requirements may be considered defective.~~ In addition to any other warranties, guarantees, or obligations set forth in the Contract Documents or applicable as a matter of law, and not in limitation of the terms of the Contract Documents, the Contractor warrants and guarantees that:

.1 The Owner will have good title to the Work and all materials and equipment incorporated into the Work and, unless otherwise expressly provided in the Contract Documents, will be new.

.2 The Work and all materials and equipment incorporated into the Work will be free from all defects, including any defects in workmanship or materials.

.3 The Work and all materials and equipment incorporated into the Work will be merchantable at the time of installation.

.4 The Work and all materials and equipment incorporated into the Work will conform in all respects to the Contract Documents in the reasonable judgment of Architect.

The Contractor's warranty excludes remedy for damage or defect caused by abuse, alterations to the Work not executed by the Contractor, improper or insufficient maintenance, improper operation, or normal wear and tear and normal usage. ~~If required by the Architect, the Contractor shall furnish satisfactory evidence as to the kind and quality of materials and equipment.~~

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

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

Notwithstanding anything contrary in the foregoing or in any other Contract Document(s), labor shall be warranted for one year, commencing as of the date specified in the Architect's Certificate of Substantial Completion, and the manufacturer warranties applicable to the materials integrated into the Work shall commence and end as provided in the such warranty documents, provided to Owner in accordance with this Section 3.5.1.

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

§ 3.6 Taxes

The Contractor shall pay sales, consumer, use and similar taxes for the Work provided by the Contractor that are legally enacted when bids are received or negotiations concluded, whether or not yet effective or merely scheduled to go into effect. The Contractor shall pay all local, state and federal taxes levied on its business, income or property and

shall make all contributions for social security and other wage or payroll taxes. The Contractor shall be solely responsible for such payments and shall indemnify the Owner and hold it harmless from same.

§ 3.7 Permits, Fees, Notices and Compliance with Laws

§ 3.7.1 ~~Unless otherwise provided in the Contract Documents, the~~ The Contractor shall secure and pay for the building permit as well as for other permits, fees, licenses, and inspections by government agencies necessary for proper execution and completion of the Work that are customarily secured after execution of the Contract and legally required at the time bids are received or negotiations concluded.

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

§ 3.7.3 If the Contractor performs Work ~~knowing it to be~~ contrary to applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of public authorities, the Contractor shall assume appropriate responsibility for such Work and shall bear the costs attributable to correction.

§ 3.7.4 Concealed or Unknown Conditions

If the Contractor encounters conditions at the site that are (1) subsurface or otherwise concealed physical conditions that differ materially from those indicated in the Contract Documents or (2) unknown physical conditions of an unusual nature that differ materially from those ordinarily found to exist and generally recognized as inherent in construction activities of the character provided for in the Contract Documents, the Contractor shall promptly provide written and dated notice to the Owner 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 Owner and 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, they will recommend that an equitable adjustment be made in the Contract Sum or Contract Time, or both. If the ~~Architect determines~~ Owner and Architect determine 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,~~ Contractor in writing, stating the reasons. If ~~either party~~ Contractor disputes the ~~Architect's~~ determination or recommendation, ~~that party may~~ the Contractor shall submit a Claim as provided in Article 15. The requirements of Section 2 of 1998 PA 57, as amended, are hereby incorporated into this document. The Contractor shall be alert to any indication or evidence of existing underground or concealed utilities or structures not shown on the Contract Documents and shall immediately notify the Owner of discovery of such evidence. If the Contractor encounters such utilities or structures, it shall cease operations immediately to minimize damage and shall notify the Owner and Architect. The Contractor shall bear the cost of damage resulting from its failure to exercise reasonable care in its construction activity or from continuing operations without notifying the Owner.

§ 3.7.4.1 The Contractor bidding on the Work is responsible for visiting the site and determining all local conditions, except those that are hidden or unknown, that may in any way affect its Work.

§ 3.7.5 If, in the course of the Work, the Contractor encounters human remains or recognizes the existence of burial markers, archaeological sites or wetlands not indicated in the Contract Documents, the Contractor shall immediately suspend any operations that would affect them and shall ~~notify~~ provide written and dated notification to the Owner and Architect. Upon receipt of such notice, the Owner shall promptly take any action necessary to obtain governmental authorization required to resume the operations. The Contractor shall continue to suspend such operations until otherwise instructed by the Owner but shall continue with all other operations that do not affect those remains or features. Requests for adjustments in the Contract Sum and Contract Time arising from the existence of such remains or features ~~may be made~~ shall be made, as needed, as provided in Article 15.

§ 3.8 Allowances

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

§ 3.8.2 Unless otherwise provided in the Contract Documents,

.1 allowances shall cover the cost to the Contractor of materials and equipment delivered at the site and all required taxes, less applicable trade discounts;

.2 Contractor's costs for unloading and handling at the site, labor, installation costs, overhead, profit, and other expenses contemplated for stated allowance amounts shall be included in the Contract Sum but not in the allowances; and

.3 whenever costs ~~are more than or less than~~ differ from allowances, the Contract Sum ~~shall~~ may be adjusted accordingly by Change Order. The amount of the Change Order shall reflect (1) the difference between actual costs and the allowances under Section 3.8.2.1 and (2) changes in Contractor's costs under Section 3.8.2.2.

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

§ 3.9 Superintendent

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

§ 3.9.2 The Contractor, as soon as practicable after award of the Contract, shall notify the Owner and Architect of the name and qualifications of a proposed superintendent. Within 14 days of receipt of the information, the Owner and/or the Architect may notify the Contractor, stating whether the Owner ~~or~~ and/or the Architect (1) has reasonable objection to the proposed superintendent 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.~~

§ 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 change the superintendent without the Owner's ~~consent, which shall not unreasonably be withheld or delayed.~~consent .

§ 3.10 Contractor's Construction and Submittal Schedules

§ 3.10.1 The Contractor, promptly after being awarded the Contract, shall prepare and submit for the Owner's and Architect's information a Contractor's construction schedule for the Work. The schedule shall contain detail appropriate for the Project, including (1) the date of commencement of the Work, interim schedule milestone dates, and the date of Substantial Completion; (2) an apportionment of the Work by construction activity; and (3) the time required for completion of each portion of the Work. The schedule shall provide for the orderly progression of the Work to completion and shall not exceed time limits ~~current under the Contract Documents.~~ required under the Contract Documents or any scheduling updates issued by the Architect or Owner. The schedule shall be revised at appropriate intervals as required by the conditions of the Work and Project. In no event shall the Contractor's Construction Schedule be extended due to action or inaction of the Contractor, except with prior written approval of the Owner within the Owner's sole discretion.

The Contractor shall cooperate with the Architect and Owner in scheduling and performing the Contractor's Work to avoid conflict with, and as to cause no delay in, the work or activities of other contractors or the construction or operations of the Owner's own forces. The Contractor acknowledges and understands that the work schedule will be modified from time-to-time with the Owner's approval to coordinate with the work of others and that such schedule changes do not give rise to a claim for damages or additional compensation by the Contractor for delay or otherwise. The Contractor shall be required to conform to the most recent Owner-approved schedule and acknowledges that fact was taken into account when it agreed to the Contract Sum and entered into this Contract.

§ 3.10.2 The Contractor, promptly after being awarded the Contract and thereafter as necessary to maintain a current submittal schedule, shall submit a submittal schedule for the ~~Architect's approval. The Architect's approval~~ Owner's and Architect's approval. The Owner's and the Architect's approvals 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.~~ (2) allow for a reasonable amount of time to review submittals, and (3) shall provide for expeditious and practical execution of the Work. If the Contractor fails to submit a submittal schedule, or fails to provide submittals in accordance with the approved submittal schedule, the Contractor shall not be entitled to any increase in Contract Sum or extension of Contract Time based on the time required for review of submittals.

§ 3.10.3 The Contractor shall perform the Work in general accordance with the most recent ~~schedules submitted to the Owner and Architect.~~approved Project schedules and the most recent Work schedule submitted to the Owner and Architect consistent therewith.

§ 3.10.4 Progress Meetings: Meetings of representatives of the various Contractors may be held for the purpose of coordination and furthering the progress of the Work. Contractor and Subcontractor attendance is mandatory. Meetings shall be held at regular intervals as provided in the General Requirements; special meetings may be held if deemed necessary by the Owner and/or Architect.

§ 3.10.5 The Contractor shall proceed strictly (not substantially) in accordance with the critical path set forth in the Construction Schedule. The Contractor shall monitor the progress of the Work for conformance with the requirements of the Construction Schedule and shall promptly advise the Owner of any delays or potential delays. If any progress report indicates any delays, the Architect shall propose an affirmative plan to correct the delay, including overtime and/or additional labor, if necessary. In no event shall any progress report constitute an adjustment of the Contract Time or any Milestone Date or the Contract Sum unless any such adjustment is agreed to by the Owner and authorized pursuant to a Change Order.

§ 3.11 Documents and Samples at the Site

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

§ 3.12 Shop Drawings, Product Data and Samples

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

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

§ 3.12.3 Samples are physical examples for submittal to and review by the Architect 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.

The Contractor agrees to ensure that its first submissions shall comply with all the requirements of the Contract Documents. It is further agreed that if any Shop Drawing, Project Data, Sample, or similar submittals require excessive submissions to secure the approval of the Architect due to the Contractor's failure to comply with specified

products, resulting in delays or excessive reviews by the Architect, the Contractor will be held responsible for delays, added review costs, and damages to the Owner caused by such delays. Without limiting the foregoing, the Contractor's obligation to hold the Owner harmless from and bear the costs for any delay, good faith rejection of or resulting from any Shop Drawing, Project Data, Sample or similar submittal by Architect provided such delay or rejection is conditioned on such delay or rejection being attributable to a negligent act or omission of Contractor.

§ 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, or will do so, and (3) checked and coordinated the information contained within such submittals with the requirements of the Work and of the Contract Documents.

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

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

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

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

§ 3.12.10.1 If professional design services or certifications by a design professional related to systems, materials, or equipment are specifically required of the Contractor by the Contract Documents, the Owner and the Architect will specify all performance and design criteria that such services must satisfy. ~~The~~ Subject to its professional skill and expertise, the Contractor shall be entitled to rely upon the adequacy and accuracy of the performance and design criteria provided in the Contract Documents. The Contractor shall cause such services or certifications to be provided by an appropriately licensed design professional, whose signature and seal shall appear on all drawings, calculations, specifications, certifications, Shop Drawings, and other submittals prepared by such professional. Shop Drawings, and other submittals related to the Work, designed or certified by such professional, if prepared by others, shall bear such professional's written approval when submitted to the Architect. The Owner and the Architect shall be entitled to rely upon the adequacy and accuracy of the services, certifications, and approvals performed or provided by such design professionals, provided the Owner and Architect have specified to the Contractor the performance and design criteria that such services must satisfy. 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.

§ 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.

§ 3.13 Use of Site

~~The Contractor shall confine operations at the site to areas permitted by applicable laws, statutes, ordinances, codes, rules and regulations, lawful orders of public authorities, and the Contract Documents and shall not unreasonably encumber the site with materials or equipment.~~ **§ 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 of public authorities, and the Contract Documents and shall not unreasonably encumber the site with materials or equipment.

§ 3.13.2 Anything contained in the Contract Documents to the contrary notwithstanding, no one except the Owner shall be permitted to disrupt the operation of any building system or any other services without the Owner's prior written consent. Any request to perform such work shall be in writing, received by the Owner no less than five (5) days prior to the commencement of the requested disruption, and shall detail (1) the exact nature and duration of such interruption, (ii) the area affected, and (iii) any impact upon the Construction Schedule caused by such proposed temporary disruption. Unless otherwise approved by the Owner, all work shall be performed during the hours and on the days set forth in the Specifications, in accordance with the most-recent project schedule, and/or as directed by the Owner or Architect. The Contractor's failure to comply with the notice provisions of this section shall constitute a waiver by the Contractor of any right it may have to an adjustment of the Contract Time, on account of any postponement, rescheduling, or other delays ordered by the Owner in connection with any Work for which appropriate notice was not furnished.

§ 3.13.3 The Contractor will consult with the Owner and the Architect concerning any necessary operations at the Project site, including staging area limits, office or storage trailer locations, dumpster operations, equipment and material deliveries, hoisting areas and any other construction impacts on the Owner's grounds.

§ 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.

§ 3.15 Cleaning Up

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

§ 3.15.2 If the Contractor fails to clean up as provided in the Contract Documents, the Owner may do so and the Owner shall be entitled to reimbursement from the Contractor.

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

§ 3.15.4 In addition to removal of rubbish, the Contractor and its Subcontractors, under the Contractor's direction, shall replace any broken glass, remove stains, spots, marks, and dirt from decorated work, clean hardware, and/or remove spots and smears from all surfaces which were affected by the Work.

§ 3.16 Access to Work

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

§ 3.17 Royalties, Patents and Copyrights

The Contractor shall pay all royalties and license fees. The Contractor shall defend suits or claims for infringement of copyrights and patent rights and shall indemnify and hold harmless the Owner and Architect ~~harmless from~~ from any and all cost, damages, or loss on account thereof, including, but not limited to, actual attorneys' fees, but shall not be

responsible for defense or loss when a particular design, process, or product of a particular manufacturer or manufacturers is required by the Contract Documents, or where the copyright violations are contained in Drawings, Specifications, or other documents prepared by the Owner or Architect. However, if an infringement of a copyright or patent is discovered by, or made known to, the Contractor, the Contractor shall be responsible for the loss unless the information is promptly furnished to the Architect. The review by the Owner or Architect of any method of construction, invention, appliance, process, article, device or materials of any kind shall be for its adequacy in the Work and shall not be an approval for the use thereof by the Contractor in violation of any patent or other rights of any third person.

§ 3.18 Indemnification

§ 3.18.1 To the fullest extent permitted by law, the Contractor shall indemnify and hold harmless the Owner, the Owner's Board of Education, its board members, administration, its successors, assigns, Architect, Architect's consultants, and agents and employees of any of them (the "Indemnitees") from and against any and all claims, costs, damages, losses, liabilities, and expenses, including but not limited to attorneys' fees, arising out of or resulting from performance of the ~~Work, provided that such claim, damage, loss, or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the~~ Work ~~itself), but only~~ to the extent caused in whole or in part by (i) the negligent acts or omissions of the Contractor, ~~a Subcontractor, anyone directly or indirectly employed by them, or anyone for whose acts they may be liable, regardless of whether or not such claim, damage, loss, or expense is caused in part by a party indemnified hereunder.~~ its officers, directors and employees, agents or subcontractors; (ii) any breach of the terms of the Contract Documents by the Contractor; or (iii) any breach of any representation or warranty by the Contractor under the Contract Documents. The Contractor shall notify the Owner by certified mail, return receipt requested, immediately upon knowledge of any claim, suit, action, or proceeding for which the Owner or one or more of the Indemnitees may be entitled to indemnification under the Contract Documents. Further, the Owner shall be entitled to recover attorneys' fees and legal fees from the Contractor under the following eireumstances: (1) the Owner has to defend a third-party claim or action for which the Contractor must indemnify the Owner as described above; and (2) the Owner successfully asserts a claim or action against the Contractor for professional negligence, breach of contract, and/or defective Work. For purposes of the previous sentence "successfully" means the Owner recovers damages from the Contractor, regardless of amount. The Contractor shall not be responsible for indemnifying an Indemnitee for the Indemnitee's negligence, but shall remain responsible to the fullest degree of Contractor's fault, on a comparative basis. Such obligation shall not be construed to negate, abridge, or reduce other rights or obligations of indemnity that would otherwise exist as to a party or person described in this Section 3.18.

§ 3.18.2 In ~~claims against any person or entity indemnified under this Section 3.18 by an employee of the Contractor, a Subcontractor, anyone directly or indirectly employed by them, or anyone for whose acts they may be liable, the indemnification obligation under Section 3.18.1 shall not be limited by a limitation on amount or type of damages, compensation, or benefits payable by or for the Contractor or a Subcontractor under workers' compensation acts, disability benefit acts, or other employee benefit acts.~~addition to and not in limitation of the Contractor's other indemnity obligations, the Contractor hereby accepts and assumes exclusive liability for and shall indemnify, protect, and hold harmless the Owner and Architect from and against the payment of the following:

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

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

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

Provided Owner or Architect has, in good faith and to the best of their knowledge, provided Contractor with complete, accurate, reports identifying the presence of any and all hazardous materials on Site as of the date of commencement of the Work, Contractor shall indemnify, defend, and hold the Owner harmless from any claim, damage, loss or

expense, including, but not limited to, actual attorney fees, incurred by the Owner related to any hazardous material, condition or waste, toxic substance, pollution, or contamination brought into the Project site or caused or exacerbated by the Contractor or used, handled, transported, stored, removed, remediated, disturbed, or dispersed of by Contractor.

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

ARTICLE 4 ARCHITECT

§ 4.1 General

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

§ 4.1.2 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, Contractor, and Architect. Consent shall not be unreasonably withheld.~~Owner and Architect.

§ 4.2 Administration of the Contract

§ 4.2.1 The Architect will provide administration of the Contract as described in the Contract Documents and will be an Owner's representative during construction until the date the Architect issues the final Certificate for ~~Payment.~~ Payment and with the Owner's written concurrence during the correction period. The Architect will have authority to act on behalf of the Owner only to the extent provided in the Contract Documents.

§ 4.2.2 The Architect will visit the site at intervals appropriate to the stage of construction, or ~~as otherwise agreed with the Owner, to become generally~~ more frequently as agreed with the Owner or required by law, to become 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~~ Except as otherwise set forth herein or in the Owner/Architect Agreement, 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. The Architect shall provide all services and duties that may be performed by an "Architect" or "Engineer" in 1937 PA 306 and 1980 PA 299, including but not limited to supervision of construction.

§ 4.2.3 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, will guard the Owner against defects and deficiencies in the Work, 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~~ Except as required by the Owner/Architect Agreement or other Contract Documents, 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, except as provided in the agreement between Owner and Architect or this document, 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. The Architect shall provide all services and duties that may be performed by an "Architect" or "Engineer" in 1937 PA 306 and 1980 PA 299, including but not limited to supervision of construction.

§ 4.2.4 Communications

The Owner and Contractor shall endeavor to include the Architect in all communications that relate to or affect the Architect's services or professional responsibilities. The Owner shall promptly notify the Architect of the substance of any direct communications between the Owner and the Contractor otherwise ~~relating to~~ materially affecting the Project. Communications by and with the Architect's consultants shall be through the Architect. Communications by and with Subcontractors and suppliers shall be through the Contractor. Communications by and with Separate Contractors shall be through the Owner. The Contract Documents may specify other communication protocols.

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

§ 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 the 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, suppliers, their agents or employees, or other persons or entities performing portions of the Work.

§ 4.2.7 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 Owner and Architect or, in the absence of an approved submittal schedule, with reasonable promptness as to cause no delay in the Work 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 of any construction means, methods, techniques, sequences, or procedures. The Architect's approval of a specific item shall not indicate approval of an assembly of which the item is a component. However, should the Architect discover during the course of such review any inaccuracies, incompleteness, or other irregularities, the Architect shall immediately notify the Owner of the same to determine an appropriate corrective course of action or notify the Contractor of the same to correct the irregularities.

§ 4.2.8 The Architect will ~~prepare~~ review and recommend for approval Change Orders and Construction Change Directives, and may order 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~~ determine, with the Owner's concurrence, 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 issue 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 Owner shall notify the Contractor of any change in the duties, responsibilities and limitations of authority of the Project representatives.~~

§ 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.~~ promptness given the particular circumstances.

§ 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,~~ interpretations, the Architect will endeavor to secure faithful performance by ~~both Owner and~~ Contractor, ~~will not show partiality to either,~~ and will not be liable for results of interpretations or decisions rendered in good ~~faith.~~ faith and without negligence.

§ 4.2.13 The Architect's ~~decisions~~ interpretations on matters relating to aesthetic effect will be final 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.~~ promptness given the particular circumstances. If appropriate, the Architect will prepare and issue supplemental Drawings and Specifications in response to the requests for information.

ARTICLE 5 SUBCONTRACTORS

§ 5.1 Definitions

§ 5.1.1 A Subcontractor is a person or entity who has a direct contract with the Contractor to perform a portion of the Work at the site. The term "Subcontractor" is referred to throughout the Contract Documents as if singular in number and means a Subcontractor or an authorized representative of the Subcontractor. The term "Subcontractor" does not include a Separate Contractor or the subcontractors of a Separate Contractor. The term "Subcontractor" shall also include Sub-subcontractors at any tier and material and equipment suppliers. Each and every subcontract shall be understood to have the Owner as a third-party beneficiary, and the Owner shall enjoy all third-party beneficiary rights permitted by law.

§ 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,~~ Documents or the bidding requirements, the Contractor, as soon as practicable after award of the Contract, shall notify the Owner and Architect in writing 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.~~ All contractual agreements with additional persons or entities serving as a Subcontractor or supplier shall expressly identify the Owner as a third-party beneficiary, and the Owner shall enjoy all third-party beneficiary rights not prohibited by law.

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

§ 5.2.3 If the Owner or Architect has reasonable objection to a person or entity proposed by the Contractor, the Contractor shall propose another to whom the Owner or Architect has no reasonable objection. If the proposed but rejected Subcontractor was reasonably capable of performing the Work, despite the Architect's or Owner's reasonable objection, 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 makes reasonable objection to such substitution. The Contractor shall notify the Owner and Architect of any proposed substitution a minimum of ten (10) days prior to such proposed change.

§ 5.3 Subcontractual Relations

By appropriate written agreement, the Contractor shall require each Subcontractor, to the extent of the Work to be performed by the Subcontractor, to be bound to the Contractor by terms of the Contract Documents, and to assume toward the Contractor all the obligations and responsibilities, including the responsibility for safety of the Subcontractor's Work that the Contractor, by these Contract Documents, assumes toward the Owner 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 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 that 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;~~ Contractor in writing; and

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

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

§ 5.4.2 Upon such assignment, if the Work has been suspended for more than 30 days, the Subcontractor's compensation ~~shall be equitably adjusted for increases in cost resulting from the suspension.~~may be adjusted as negotiated by the parties.

§ 5.4.3 Upon assignment to the Owner under this Section 5.4, the Owner may further assign the subcontract to a successor contractor or other entity. ~~If the Owner assigns the subcontract to a successor contractor or other entity, the Owner shall nevertheless remain legally responsible for all of the successor contractor's obligations under the subcontract.~~

ARTICLE 6 CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS

§ 6.1 Owner's Right to Perform Construction 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 under Conditions of the Contract substantially similar to those of this Contract, including those provisions of the Conditions of the Contract related to insurance and waiver of subrogation. The Contractor shall be responsible for coordinating the Work with the work of other Contractors, including the Owner's own forces or Separate Contractors, so as to complete the Work in accordance with the Project time schedule.

§ 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 provide for coordination of the activities of the Owner's own forces and of each Separate Contractor 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 mutual agreement. The construction schedules shall then constitute the schedules to be used by the Contractor, Separate Contractors, and the Owner until subsequently revised.

§ 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 have the same obligations and rights that the Contractor has under the Conditions of the Contract, including, without excluding others, those stated in Article 3, this Article 6, and Articles 10, 11, and 12.~~**NOT USED.**

§ 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

notify the Architect of apparent discrepancies or defects in the construction or operations by the Owner or Separate Contractor that would render it unsuitable for proper execution and results of the Contractor's Work. Failure of the Contractor to notify the Architect of apparent discrepancies or defects prior to proceeding with the Work shall constitute an acknowledgment that the Owner's or Separate Contractor's completed or partially completed construction is fit and proper to receive the Contractor's Work. The Contractor shall not be responsible for discrepancies or defects in the construction or operations by the Owner or Separate Contractor that are not ~~apparent.~~ reasonably discoverable.

§ 6.2.3 The Contractor shall reimburse the Owner for costs the Owner incurs that are payable to a Separate Contractor because of the Contractor's delays, improperly timed activities or defective construction. The Owner shall be responsible to the Contractor for costs the Contractor incurs because of a Separate Contractor's ~~delays, improperly timed activities,~~ damage to the Work or defective construction.

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

§ 6.2.5 The Owner and each Separate Contractor 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 Owner's right to clean up shall in no event be deemed a duty, and should the Owner choose not to pursue this remedy, the Contractor necessitating such action shall remain fully responsible for the same.

ARTICLE 7 CHANGES IN THE WORK

§ 7.1 General

§ 7.1.1 Changes in the Work may be accomplished after execution of the Contract, and without invalidating the Contract, only by Change Order, Construction Change ~~Directive~~ Directive, written contract amendment, or order for a minor change in the Work, subject to the limitations stated in this Article 7 and elsewhere in the Contract Documents.

§ 7.1.2 A Change Order shall be based upon agreement among the Owner, Contractor, and Architect. A Construction Change Directive ~~requires agreement~~ may be issued 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.

§ 7.2 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 Unless expressly stated otherwise in the Change Order, an agreement on any Change Order shall constitute the Contractor's final position on all matters relating to the change in the work that is subject to the Change Order, including, but not limited to, all direct and indirect costs associated with such change and any and all adjustments to the Contract Sum and the Contract Time.

§ 7.3 Construction Change Directives

§ 7.3.1 A Construction Change Directive is a written order prepared by the 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 or more of the following methods:

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

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

.3 Cost to be determined in a manner agreed upon by the parties and a mutually acceptable fixed or percentage fee; or

.4 As provided in Section 7.3.4.

However, the Contract Time shall be adjusted only if the Contractor demonstrates to the Owner that the changes in the Work required by the Construction Change Directive adversely affect the critical path of the Work.

§ 7.3.4 If the Contractor does not respond promptly or disagrees with the method for adjustment in the Contract Sum, the Architect shall ~~determine~~ determine, with the Owner's approval, the adjustment on the basis of reasonable expenditures and savings of those performing the Work attributable to the change, including, in case of an increase in the Contract Sum, an amount for overhead and profit as set forth in the Agreement, or if no such amount is set forth in the Agreement, a reasonable amount. In such case, and also under Section 7.3.3.3, the Contractor shall keep and present, in such form as the Architect may prescribe, an itemized accounting together with appropriate supporting data. Unless otherwise provided in the Contract Documents, costs for the purposes of this Section 7.3.4 shall be limited to ~~the following:~~ a reasonable amount of the following that are actually incurred by the Contractor:

.1 Costs of labor, including applicable payroll taxes, fringe benefits required by agreement or custom, workers' compensation insurance, and other employee costs approved by the Architect;

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

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

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

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

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

§ 7.3.6 Upon receipt of a Construction Change Directive, the Contractor shall promptly proceed with the change in the Work involved and advise the 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. Contractor agreements to a Construction Change Directive shall require a follow-up writing or signature as contemplated in Section 7.3.7.

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

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

§ 7.3.9 Pending final determination of the total cost of a Construction Change Directive to the Owner, the Contractor may request payment for undisputed Work completed under the Construction Change Directive in Applications for Payment. ~~The~~ For those undisputed portions, the 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~~ cost, if agreed to by the Owner in writing, shall adjust the Contract Sum on the same basis as a Change Order, subject to the right of ~~either party~~ the Contractor to disagree and assert a Claim in accordance with Article 15.

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

§ 7.3.11 In no event shall the Contractor be entitled to receive, and the contractor hereby waives the right to receive, any payment or any extension of time for additional or changed work, whether partially or fully completed or simply proposed, unless such additional work is authorized by a written Change Order or Construction Change Directive signed by the Owner, nor shall the Contractor be obligated to proceed with any such work. Only the Owner shall have the right to issue a written Change Order or Constructive Change Directive to the Contractor authorizing an addition, deletion or other revision in the scope of the Work and/or an adjustment in the Contract Sum or the Construction Schedule.

§ 7.4 Minor Changes in the Work

The Architect may order minor changes in the Work that are consistent with the intent of the Contract Documents and do not involve an adjustment in the Contract Sum or an extension of the Contract Time. The Architect's order for minor changes shall be in writing. If the Contractor believes that the proposed minor change in the Work will affect the Contract Sum or Contract Time, the Contractor shall either (i) file a Claim in accordance with Article 15 and continue to implement the change in the Work, or (ii) notify the Owner and Architect in writing and shall not proceed to implement the change in the Work. ~~If~~ Without limiting other restrictions on payment, 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.

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

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

§ 8.2 Progress and Completion

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

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

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

§ 8.3 Delays and Extensions of Time

§ 8.3.1 ~~If~~ Provided the Contractor submits a written request for an extension not more than fourteen (14) days after the occurrence that gives rise to the delay, if the Contractor is delayed at any time in the commencement or progress of the Work by (1) an act or neglect of the Owner or Architect, of an employee of either, or of a Separate Contractor; (2) by changes ordered in the Work; (3) by ~~labor disputes, fire, unusual delay in deliveries,~~ fire, government-declared

emergencies, unavoidable casualties, adverse weather conditions documented in accordance with Section 15.1.6.2, or other causes beyond the Contractor's control; (4) by delay authorized by the Owner pending ~~mediation and binding dispute resolution;~~ litigation, mediation, arbitration or binding dispute resolution, as applicable; or (5) by other causes that the Contractor asserts, and the Architect determines, justify delay, then the Contract Time shall be extended for such reasonable time as the Architect may ~~determine.~~
determine and with which the Owner agrees. Failure of the Contractor to submit a timely request for an extension shall irrevocably waive the Contractor's right to such an extension of time. If the Contract Time is subject to extension pursuant to this subparagraph, the Contractor shall receive such an extension, and subject to Owner review and written approval, may receive extension costs related to Construction Management staff and GC costs.

§ 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. Only upon Owner review and written approval, the Contractor may receive extension costs related to Construction Management staff and GC costs..

§ 8.4 Delay Damage Claims

§ 8.4.1 In the absence of a delay caused by something outside the Contractor's reasonable control, if the Contractor fails to complete its Work on time resulting in loss or damage to the Owner, whether or not liquidated damages are called for in the Contract Documents, the Owner shall be entitled to make a Claim for direct damages caused by the Contractor's delay.

§ 8.4.2 In the event the Contractor is hindered in the commencement or progress of the Work for any reason by someone other than the Owner, and in the event the Contractor claims damages as a direct and proximate consequence thereof (including, but not limited to, extended general conditions, overhead, profit, overtime, interest, supervision or other costs or profits whatsoever), then the Contractor shall only assert claims against the Owner related to extended general conditions and costs of paying staff.

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

§ 8.4.3 Notwithstanding the foregoing, in the event of any delay in the completion of the Contractor's Work or scheduling of the Contractor's Work, including the sequence of that Work which is attributable to the Owner, and if it is determined by a court of competent jurisdiction that the Owner is liable for such delay despite the other terms of this Contract barring any Owner liability for damages for delay, then the Owner shall be liable to the Contractor for liquidated damages in the amount of not to exceed One Hundred Dollars ($100) per day, maximum, which shall include all of the Contractor's claims, including by way of example, delays, compressions of schedule, lost productivity, lost profits, lost opportunities, out of sequence work, overhead, crowding, tools, equipment, rentals, etc.

ARTICLE 9 PAYMENTS AND COMPLETION

§ 9.1 Contract Sum

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

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

§ 9.2 Schedule of Values

~~Where the Contract is based on a stipulated sum or Guaranteed Maximum Price, the~~ The Contractor shall submit a schedule of values to the Architect before the first Application for Payment, allocating the entire Contract Sum to the various portions of the Work. The schedule of values shall be prepared in the form, and supported by the data to substantiate its accuracy, required by the Architect. This schedule, unless objected to 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 Owner or Architect may require, and unless objected to by the Owner or Architect, shall be used as a basis for reviewing the Contractor's subsequent Applications for Payment.

§ 9.2.1 The schedule of values shall be prepared in such manner that the value associated for each major item of work and each subcontracted item of work is shown with materials and labor indicated separately on AIA Document G702 - Application and Certificate of Payment, and AIA Document G703 - Continuation Sheet, or otherwise.

§ 9.3 Applications for Payment

§ 9.3.1 At least ~~ten~~ fifteen (15) days before the date established for each progress payment, the Contractor shall submit to the Architect an itemized Application for Payment prepared in accordance with the schedule of ~~values, if required under Section 9.2,~~ values for completed portions of the Work. The application shall be notarized, if required, and supported by all data substantiating the Contractor's right to payment that the Owner or Architect require, such as copies of requisitions, and releases and waivers of liens from Subcontractors and suppliers, and shall reflect retainage if provided for in the Contract Documents. The form of Application and Certificate for Payment shall be AIA Document G702, Application and Certification for Payment, supported by AIA Document G703, Continuation Sheet, unless otherwise agreed by the Owner. Applications for Payment are due to the office of the Architect by the designated day of the month. Applications for Payment that are received after the specified date will not be processed until the following month.

§ 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. A request for payment of sums related to work regarding Construction Change Directives shall, unless qualified in writing at the time of request, constitute full and complete consent to the Construction Change Directive(s) and to the issuance of a Change Order.

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

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

§ 9.3.1.4 The Contractor must provide copies of the insurance certificates, bonds, and the same for all of the Subcontractors prior to submitting the first Application for Payment.

§ 9.3.2 Unless otherwise provided in the Contract Documents, payments shall be made on account of materials and equipment delivered and suitably stored at the site for subsequent incorporation in the Work. If approved in advance by the Owner, payment may similarly be made for materials and equipment suitably stored off the site at a location agreed upon in writing. Payment for materials and equipment stored on or off the site shall be conditioned upon compliance by the Contractor with procedures satisfactory to the Owner to establish the Owner's title to such materials and equipment or otherwise protect the Owner's interest, and shall include the costs of applicable insurance, storage, and transportation to the site, for such materials and equipment stored off the site. Payment to Contractor for materials stored off site is discouraged. When circumstances indicate that the Owner's best interest is served by off-site storage, the Contractor shall make written request to the Owner for approval to include such material costs in the next progress payment. The Contractor's request shall include the following information:

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

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

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

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

.5 Costs incurred by the Architect to inspect material in off-site storage shall be paid by the Contractor.

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

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

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

§ 9.4 Certificates for Payment

§ 9.4.1 The Architect will, within seven days after receipt of the Contractor's Application for Payment, either (1) issue to the Owner a Certificate for Payment in the full amount of the Application for Payment, with a copy to the Contractor; or (2) issue to the Owner a Certificate for Payment for such amount as the Architect determines is properly due, and notify the Contractor and Owner of the Architect's reasons for withholding certification in part as provided in Section 9.5.1; or (3) withhold certification of the entire Application for Payment, and notify the Contractor and Owner of the Architect's reason for withholding certification in whole 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 in the Application for Payment, that, to the best of the Architect's knowledge, information, and belief, the Work has progressed to the point indicated, the quality of the Work is in aeeordance 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 eonformance 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. However,~~ Architect, in writing, together with the certification to which it pertains. However, unless otherwise required by the Owner/Architect Agreement, any other Contract Document, or applicable law, 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 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. Nothing in this Section 9.4.2 shall be interpreted to reduce or eliminate the Architect's duties as set forth in Section 3.1.9 of the Owner/Architect Agreement, including supervision of construction.

§ 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;~~remedied, or the Contractor is in default on the Agreement;

.2 third party claims filed or reasonable evidence indicating probable filing of such claims, unless security acceptable to the Owner is provided by the Contractor;

.3 failure of the Contractor to make payments properly to Subcontractors or suppliers for labor, materials or equipment;

.4 reasonable evidence that the Work cannot be completed for the unpaid balance of the Contract Sum;

.5 damage to the Owner or a Separate Contractor;

.6 reasonable evidence that the Work will not be completed within the Contract Time, and that the unpaid balance would not be adequate to cover actual or liquidated damages for the anticipated delay;~~or~~

.7 ~~repeated~~ failure to carry out the Work in accordance with the Contract ~~Documents.~~ Documents;

.8 the Work not having progressed to the extent set forth in the Application for Payment;

.9 representations of the Contractor are untrue;

.10 failing to conform to Project Schedule;

.11 default in the performance of any obligation to the Owner under another contract; or

.12 failure to provide sufficiently skilled workers.

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

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

§ 9.5.4 If the Architect 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 supplier to whom the Contractor failed to make payment for Work properly performed or material or equipment suitably delivered. If the Owner makes payments by joint check, the Owner shall notify the Architect and the Contractor shall reflect such payment on its next Application for Payment.

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

§ 9.5.6 Notwithstanding anything herein to the contrary, the Owner has no obligation to pay the Contractor absent receipt of a Certificate for Payment for the requested amount, and neither the Architect's failure to issue a Certificate for Payment nor the Architect's failure to notify the Contractor and/or Owner of a withheld Certificate for Payment creates an obligation on the Owner to pay the Contractor. The foregoing sentence shall not operate to limit the right of the Owner to dispute amounts requested by the Contractor or to withhold payments from the Contractor as provided in the Contract Documents.

§ 9.6 Progress Payments

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

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

§ 9.6.3 The 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 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 suppliers shall be treated in a manner similar to that provided in Sections 9.6.2, 9.6.3 and 9.6.4.~~Owner may, in its sole discretion, after providing Contractor with ten (10) days prior written notice, make direct payments to the Contractor's Subcontractors, suppliers, laborers or claimants relating to labor or material provided to the Contractor for which the Contractor has not provided a waiver of lien, in the event the Subcontractors, suppliers, laborers or claimants threaten to or actually cease providing labor and/or materials for the Project such that, in the Owner's determination, progress of the Project and the Project's Schedule are jeopardized. All payments made

pursuant to this section shall be considered the same as if paid directly to the Contractor and shall constitute partial payment of the Contract Sum. In the event the Contractor disagrees with the amount proposed to be paid to one or more Subcontractors, suppliers, laborers or claimants, the Contractor shall provide a bond in the amount the Contractor believes the Owner will overpay, within ten (10) days of receipt of notice, or be barred from making any claim that the amount of the direct payment was incorrect. Payment under this provision shall not jeopardize any other remedy available to the Owner.

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

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

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

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

§ 9.7 Failure of Payment

If ~~the Architect does not issue a Certificate for Payment, through no fault of the Contractor, within seven days after receipt of the Contractor's Application for Payment, or if~~ without justifiable basis under the Contract Documents, including these General Conditions, the Owner does not pay the Contractor within seven days after the date established in the Contract ~~Documents, the amount certified by the Architect or awarded by binding dispute resolution, then the Contractor may, upon seven additional days'~~ Documents the undisputed amount asserted by the Contractor in its Application for Payment or awarded by a court, then the Contractor may, upon twenty-one (21) additional days' written notice to the Owner and Architect, stop the Work until payment of the undisputed 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. The Contractor acknowledges the Owner's right to dispute in good faith any amount requested by the Contractor, and, irrespective of the Architect's issuance of a Certificate for Payment, the Owner's right to withhold payments from the Contractor, including, without limitation, to correct Work that fails to conform with the Contract Documents or as an offset or recoupment to recover the cost of damages incurred by the Owner due to the Contractor's breach of the Contract or a wrongful or negligent act or omission of the Contractor.

§ 9.8 Substantial Completion

§ 9.8.1 Substantial Completion is the stage in the progress of the Work when the Work or designated portion thereof is sufficiently complete in accordance with the Contract Documents and when all required occupancy permits, if any, have been issued, so that the Owner can occupy or utilize the Work for its intended use.

§ 9.8.2 When the Contractor considers that the Work, or a portion thereof which the Owner agrees to accept separately, is substantially complete, the Contractor shall prepare and submit to the Architect a comprehensive list of

items to be completed or corrected prior to final payment. Failure to include an item on such list does not alter the responsibility of the Contractor to complete all Work in accordance with the Contract Documents.

§ 9.8.3 Upon receipt of the Contractor's list, 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 or designated portion thereof for its intended use, the Contractor shall, before issuance of the Certificate of Substantial Completion, complete or correct such item ~~upon notification by the Architect.~~ immediately. In such case, the Contractor shall then submit a request for another inspection by the Architect to determine Substantial Completion.

§ 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; establish responsibilities of the Owner and Contractor for security, maintenance, heat, utilities, damage to the Work and insurance; and fix the time within which the Contractor shall finish all items on the list accompanying the Certificate. Warranties required by the Contract Documents shall commence on the date of Substantial Completion of the Work or designated portion thereof unless otherwise provided in the Certificate of Substantial Completion.

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

§ 9.8.6 Notwithstanding Sections 9.8.1 and 9.8.2, as a condition precedent to establishing the date of Substantial Completion, the Contractor shall prepare and submit to the Architect a comprehensive list of items to be completed or corrected (a "punch list"). The Contractor shall respond immediately to correct Work deficiencies and/or punch list items. Should the Contractor fail to make corrections in a timely fashion, but not later than fifteen (15) calendar days from the date of Substantial Completion or notification of the required corrections, whichever is earlier, such Work may be corrected by the Owner at the Contractor's sole expense, and any remaining payments due the Contractor shall be withheld by the Owner.

§ 9.8.7 The Contractor shall promptly notify the Architect, in writing, when the Work deficiencies and/or punch list items are completed. Upon the review of the Work by the Architect after such notification by the Contractor, if Work deficiencies and/or punch list items shall continue to exist, the Contractor shall reimburse the Owner its cost plus ten percent (10%) overhead and profit on any cost incurred by the Owner, including the Architect's fees for re- inspection of the Work. Failure to pay such costs within ten (10) days of receipt of a demand regarding the same shall permit the Owner to pay such costs out of retainage held by the Owner on the Contractor's contract.

§ 9.9 Partial Occupancy or Use

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

§ 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.

§ 9.9.4 Any agreement as to the acceptance of non-conforming Work not complying with the requirements of the Contract Documents shall be in writing in the form of a Change Order, acceptable to the Owner's authorized representative and signed by all parties.

§ 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, the Architect will promptly make such inspection. When the Architect finds the Work acceptable under the Contract Documents and the Contract fully performed, 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.

§ 9.10.2 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, (3) a written statement that the Contractor knows of no reason that the insurance will not be renewable to cover the period required by the Contract Documents, (4) consent of surety, if any, to final payment, (5) documentation of any special warranties, such as manufacturers' warranties or specific Subcontractor warranties, ~~and (6)~~ (6) an affidavit that states the Work is fully completed and performed in accordance with the Contract Documents, (7) in the event of Contractor bankruptcy, at the Owner's option, an order entered by the court having jurisdiction of the Contractor's insolvency proceeding authorizing such payment, (8) a general release executed by the Contractor on a form provided by the Architect, (9) all close-out documents, (10) all warranties collected and provided in an acceptable manner, and (11) if required by the Owner, other data establishing payment or satisfaction of obligations, such as receipts and releases and waivers of liens, claims, security interests, or encumbrances arising out of the Contract, to the extent and in such form as may be designated by the Owner. If a Subcontractor refuses to furnish a release or waiver required by the Owner, the Contractor may furnish a bond satisfactory to the Owner to indemnify the Owner against such lien, claim, security interest, or encumbrance. If a lien, claim, security interest, or encumbrance remains unsatisfied after payments are made, the Contractor shall refund to the Owner all money that the Owner may be compelled to pay in discharging the lien, claim, security interest, or encumbrance, including all costs and ~~reasonable~~ actual attorneys' fees.

§ 9.10.3 If, after Substantial Completion of the Work, final completion thereof is materially delayed through no fault of the Contractor or by issuance of Change Orders affecting final completion, and the 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~~from:

.1 ~~liens, Claims, security interests, or encumbrances arising out of the Contract~~ Claims already asserted as of the date of final payment and unsettled;

.2 failure of the Work to comply with the requirements of the Contract Documents and resulting demands and Claims asserted in accordance with the Contract Documents;

.3 terms of ~~special~~ all warranties required by the Contract ~~Documents;~~ Documents or provided at law or in equity; or

.4 audits performed by the Owner, if permitted by the Contract Documents, after final payment.

§ 9.10.5 Acceptance of final payment by the Contractor, a Subcontractor, or a supplier, shall constitute a waiver of ~~claims by that payee except those previously made in writing and identified by that payee~~ all claims of the Contractor except those previously made by the Contractor in writing, including Claims pending as of the final payment date, or

identified by the Contractor as unsettled at the time of final Application for ~~Payment.~~Payment and specifically referenced as being an exception to the waiver contained in this section.

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.

§ 10.1.1 The Contractor shall be responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the performance of the Contract. The Contractor shall continuously maintain adequate protection of all Work from damage and shall protect the Owner's property from injury or loss. The Contractor shall make good any such damage, injury or loss at no cost to the Owner, except to the extent directly caused by agents or employees of the Owner. The Contractor shall adequately protect the Work and adjacent property as required by law, the Contract Documents, or as otherwise required, to cause no damage to the Work and adjacent property during the execution of the Work. This requirement shall also apply to structures above and below ground as conditions of the site require. The Contractor shall also provide recommendations and information to the Owner regarding (a) the assignment of responsibilities for safety precautions and programs by the Subcontractors and responsibilities for safety precautions and programs by the Subcontractors and the Owner for the safety of the Owner, and the general public; (b) temporary facilities; and (c) equipment, materials and services for common use of Subcontractors. The Contractor shall verify that the requirements and assignment of responsibilities are included in the proposed Contract Documents.

§ 10.1.2 The Contractor is solely responsible to the Owner for safety at the Project site and, accordingly, shall be solely responsible for initiating, monitoring, maintaining and supervising all safety precautions and programs in connection with the performance of the Work. The foregoing does not relieve the Subcontractors of their responsibility to the Contractor for the safe performance of their Work in accordance with all applicable laws.

§ 10.1.3 The Contractor shall develop and implement a safety plan that complies with all applicable laws covering all activities on the Project Site except those activities performed solely by the Owner. The Contractor shall provide the Owner a copy of such health and safety plan prior to commencement of Work. The Owner shall have no duty to review the plan and shall assume no duty by doing so.

§ 10.2 Safety of Persons and Property

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

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

.2 the Work and materials and equipment to be incorporated therein, whether in storage on or off the site, under care, custody, or control of the Contractor, a Subcontractor, or a Sub-subcontractor; 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.~~take all reasonable safety precautions with respect to its Work and work of others, shall comply with all standard industry safety measures and shall comply with all applicable laws, ordinances, rules, regulations and orders of any public authority and all other requirements of the Contract Documents, including those applicable to the safety of persons or property. The Contractor shall be responsible for the safety of all of the Contractor's employees and the safety of all of the Contractor's Subcontractors, suppliers, and their employees. The Contractor shall report in writing to the Architect any injury to any of Contractor's or its Subcontractor's employees at the site within one (1) day after the occurrence of such injury.

§ 10.2.3 The Contractor shall implement, erect, and maintain, as required by existing conditions and performance of the Contract, ~~reasonable~~ reasonable, necessary and appropriate safeguards for safety and protection, including posting danger signs and other warnings against hazards; promulgating safety regulations; and notifying the owners and users of adjacent sites and utilities of the safeguards.

§ 10.2.4 When use or storage of explosives or other hazardous materials or equipment, or unusual methods are necessary for execution of the Work, the Contractor shall exercise utmost care and carry on such activities under supervision of properly qualified personnel. The Contractor shall be solely and fully responsible for any and all damage claims and for defense of all actions against the Owner relating to such explosives, hazardous materials and/or unusual methods.

§ 10.2.5 The Contractor shall promptly remedy damage and loss ~~(other than damage or loss insured under property insurance required by the Contract Documents)~~ to property referred to in Sections 10.2.1.2 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. The Contractor may make a Claim for the cost to remedy the damage or loss to the extent such damage or loss is attributable to acts or omissions of the Owner 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.

§ 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 ~~either party~~ the Contractor suffers injury or damage to person or property because of an act or omission of the ~~other party,~~ Owner, or of others for whose acts ~~such party~~ the Owner is legally responsible, written notice of the injury or damage, whether or not insured, shall be given to the ~~other party~~ Owner within a reasonable time not exceeding 21 days after discovery. The notice shall provide sufficient detail to enable the ~~other party to investigate the matter.~~ Owner to investigate the matter. This provision shall be for investigative purposes only and shall not eliminate or reduce a party's obligation to pursue Claims. The Contractor's failure to do so shall be an irrevocable waiver of any Claim arising out of such injury or damage. Injury or damage to persons or property suffered by the Owner because of an act or omission of the Contractor, or others for whose acts the Contractor is legally responsible, shall be subject to the limitation periods established by Michigan law.

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

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

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

§ 10.3 Hazardous Materials and Substances

§ 10.3.1 ~~The~~ To the extent specified in the Contract Documents, the Contractor is responsible for compliance with any requirements ~~included in the Contract Documents~~ regarding hazardous materials or substances. If the Contractor encounters a hazardous material or substance not addressed in the Contract Documents and if reasonable precautions will be inadequate to prevent foreseeable bodily injury or death to persons resulting from a material or substance, including but not limited to asbestos or polychlorinated biphenyl (PCB), encountered on the site by the Contractor, the

Contractor shall, upon recognizing the condition, immediately stop Work in the affected area and notify the Owner and Architect in writing of the condition.

§ 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, 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 the material or substance or who are to perform the task of removal or safe containment of the material or substance. ~~The Contractor and the Architect will promptly reply to the Owner in writing stating whether or not either has reasonable objection to the persons or entities proposed by the Owner. If either the Contractor or Architect has an objection to a person or entity proposed by the Owner, the Owner shall propose another to whom the Contractor and the Architect have no reasonable objection.~~ When the material or substance has been rendered harmless, Work in the affected area shall resume upon written agreement of the Owner and Contractor. By Change Order, the Contract Time shall be extended appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable additional ~~costs of~~ costs, as they relate to payment of staff and extended general conditions, to address shutdown, delay, and start-up.

§ 10.3.3 To the ~~fullest~~ extent permitted by law, the Owner shall indemnify and hold harmless the Contractor, Subcontractors, Architect, Architect's consultants, and agents and employees of any of them from and against claims, damages, losses, and expenses, including but not limited to attorneys' fees, arising out of or resulting from performance of the Work in the affected area if in fact the material or substance presents the risk of bodily injury or death as described in Section 10.3.1 and has not been rendered harmless, provided that such claim, damage, loss, or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the Work itself), except to the extent that such damage, loss, or expense is due to the fault or negligence of the party seeking indemnity.

§ 10.3.4 The Owner shall not be responsible under this Section 10.3 for hazardous materials or substances the Contractor brings to the ~~site unless such materials or substances are required by the Contract Documents. The Owner shall be responsible for hazardous materials or substances required by the Contract Documents, except to the extent of the Contractor's fault or negligence in the use and handling of such materials or substances.~~site. To the extent the Contract Documents require the removal, transport and disposal of hazardous materials, the Contractor agrees that it assumes responsibility for said tasks as part of the Contract.

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

§ 10.3.6 If, without negligence or attributable fault of any kind on the part of the Contractor, the Contractor is held liable by a government agency for the cost of remediation of a hazardous material or substance solely by reason of performing Work as required by the Contract Documents, the Owner shall reimburse the Contractor for all cost and expense thereby incurred.

§ 10.4 Emergencies

In an emergency affecting safety of persons or property, the Contractor shall act, at the Contractor's reasonable discretion, to prevent threatened damage, injury, or loss. Additional compensation or extension of time claimed by the Contractor on account of an emergency shall be determined as provided in Article 15 and Article 7. Nothing in this paragraph will be construed as relieving Contractor from the cost and responsibilities for emergencies covered hereby.

§ 10.5 Notification of Utility Companies

§ 10.5.1 At least five (5) working days prior to the start of work in areas which may involve existing utility lines, the Contractor shall notify the MISS DIG notification system, as legally required and, if applicable, any Registered Utility Protection Service of the utility company possibly affected by the planned work by certified mail with return receipt requested.

§ 10.5.2 The utility company should, upon receipt of notice, stake, mark or otherwise designate the location (and depth) of their lines, or temporarily move the line(s). The Contractor shall wait for the applicable utility to stake and/or mark its utility lines before commencing the relevant Work

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

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

§ 10.6 Security

§ 10.6.1 All construction participants, including the Contractor, Architect, Subcontractors, etc., shall cooperate with the Owner's security personnel and shall comply with all of the Owner's security requirements. Such requirements shall include, without limitation, if requested by the Owner, delivering to the Owner's security personnel, prior to the commencement of the Work on each day, a list of all personnel who will be permitted access to the Work. The foregoing, however, shall not relieve the Contractor of any obligation to provide a safe and secure workplace for all parties entering the Project Site. The Contractor shall be responsible to implement commercially reasonable data security protection measures to protect the Owner's networks and data when performing technology-related Work.

§ 10.7 Fire Protection

§ 10.7.1 The Contractor shall maintain free access to the building areas for firefighting equipment and shall at no time block off main roadways or fire aisles without providing adequate auxiliary roadways and means of entrance for firefighting equipment, including heavy fire department trucks, where applicable.

§ 10.7.2 The Contractor shall at all times cooperate with the Owner and kept the municipal fire department informed of the means of entrance and changes to the roadways or fire aisles as needed to provide fire department access to or around the Project Site.

§ 10.7.3 The Contractor shall, during the entire construction period and until the completion of the Work, provide and maintain all material, equipment, and services necessary for an adequate fire protection system, which shall meet the approval of the Owner and/or the Architect. The system shall, at a minimum, meet the requirements set forth in the Contract Documents and of applicable laws. These requirements shall be augmented and/or the installations relocated, as may be necessary to meet, at all time, the demands of adequate protection in all areas and shall not be reduced prior to the completion of the Work with the written approval of the Owner and/or the Architect.

§ 10.8 Environmental Statement and Responsibility of Contractors and Sub-Contractors

§ 10.8.1 It shall be the responsibility of the Contractor to pay any and all costs incurred in any way related to clean up related to any environmental hazard created by means of release, spill, leak or any other means of contamination caused by accident or negligence that is the responsibility of Contractor or its subcontractors or other agents.

§ 10.8.2 It shall be the responsibility of the Contractor to dispose of any product(s) and/or material in strict compliance with applicable federal, state, and local laws (e.g., Environmental Protection Agency, Michigan Department of Natural Resources, etc.).

ARTICLE 11 INSURANCE AND BONDS

§ 11.1 Contractor's Insurance and Bonds

§ 11.1.1 The Contractor shall purchase and maintain insurance of the types and limits of liability, containing the endorsements, and subject to the terms and conditions, as required by law and as otherwise described in the Agreement or elsewhere in the Contract Documents. The Contractor shall purchase and maintain the required insurance from an insurance company or insurance companies rated A- or better by A.M. Best Company and lawfully authorized to issue insurance in the jurisdiction where the Project is located. The Owner, Architect, and Architect's consultants shall be named as additional insureds under the Contractor's commercial general liability policy or as otherwise described in the Contract Documents.

§ 11.1.2 The ~~Contractor shall provide surety bonds of the types, for such penal sums, and subject to such terms and conditions as required by the Contract Documents.~~ Owner hereby requires the Contractor to furnish bonds covering

faithful performance of the Contract and payment of obligations arising thereunder, each in the penal sum of 100% of the Contract Sum and in accordance with applicable law, on the date of execution of the Contract. The Owner may also require, through the Contract Documents or otherwise, that any contract valued at $50,000 or less shall also include payment and performance bonds each in the penal sum of up to 100% of the Contract Sum. The Contractor shall purchase and maintain the required bonds from a company or companies lawfully authorized to issue surety bonds in the jurisdiction where the Project is located. The Contractor shall obtain and provide to the Owner copies of any and all bonds required by the Contract prior to Contractor beginning performance pursuant to the Contract. The Contractor's obligation to provide such bonds shall not be waived in any fashion, including any failure to secure such bonds prior to Contractor beginning performance pursuant to the Agreement.

§ 11.1.2.1 The Contractor's liability insurance shall be not less than the following:

.1	General Requirements		
	a. Worker's Compensation	-	Statutory
	b. Employer's Liability	-	$1,000,000 Each Accident
		-	$1,000,000 Each Employee
		-	$1,000,000 Policy Limit
.2	Comprehensive General Liability		
	a. Bodily Injury	-	$1,000,000 Each Occurrence
		-	$2,000,000 Aggregate
	b. Personal Injury	-	$1,000,000 Each Occurrence
		-	$2,000,000 Aggregate
.3	Automobile Liability		
	a. Bodily Injury	-	$1,000,000 Each Person
		-	$1,000,000 Each Occurrence
	b. Property Damage	-	$1,000,000 Each Occurrence
.4	Independent Contractors	-	$1,000,000 Each Occurrence
.5	Products and Complete Operations	-	$1,000,000 for one (1) year, commencing with issuance of final Certificate for Payment
.6	Contractual Liability	-	$1,000,000 Each Occurrence
.7	Asbestos Abatement Liability	-	$1,000,000 Per Claim
		-	$2,000,000 Aggregate
.8	Pollution	-	$1,000,000
.9	Umbrella Coverage	-	$4,000,000

§ 11.1.3 Upon the request of any person or entity appearing to be a potential beneficiary of bonds covering payment of obligations arising under the Contract, the Contractor shall promptly furnish a copy of the bonds or shall authorize a copy to be furnished.

§ 11.1.4 ~~Notice of Cancellation or Expiration of Contractor's Required Insurance.~~ ~~Within three (3) business days of the date the Contractor becomes aware of an impending or actual cancellation or expiration of any insurance required by the Contract Documents, the Contractor shall provide notice 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.~~For all insurances for which the Contractor is obligated to have its insurance company name the Owner, Architect and Architect's consultants as additional insured, the Contractor shall require such insurance company to add to the policy the following clause: "The insurance afforded to the Additional Insured is primary insurance. If the Additional Insureds have other insurance which is applicable to the loss on an excess or contingent basis, the amount of the insurance company's liability under this policy shall not be reduced by the existence of such other insurance." Insurances provided on a "claims-made" basis shall be enforceable upon commencement of services and maintained for six years following substantial completion. Insurances provided on an "occurrence" basis shall be enforceable upon commencement of services and maintained for one year following substantial completion. Should the Contractor's insurance costs increase due to adding the Architect and/or Architect's Consultants as additional insureds, and should such costs be passed on to the Owner, the Architect and Architect's Consultants, as applicable, shall reimburse the Owner for such additional costs.

§ 11.1.5 Notice of Cancellation or Expiration of Contractor's Required Insurance. Immediately after the Contractor becomes aware of an impending or actual cancellation or expiration of any insurance required by the Contract Documents, but in no event less than the sooner of three (3) days after becoming aware or the coverage actually lapsing, the Contractor shall provide notice to the Owner of such impending or actual cancellation or expiration, including the Contractor's plan to immediately procure replacement insurance as required by the Contract Documents to avoid any lapse in coverage. Contractor's failure to do so is a material breach of this Agreement, shall entitle the Owner to purchase replacement insurance at Contractor's sole cost, and shall subject the Contractor to any and all damages related to its failure to comply with its required insurance obligations. Further, 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, but not the obligation, to stop the Work until the lapse in coverage has been cured by the procurement of replacement coverage by the Contractor. The furnishing of notice by the Contractor shall not relieve the Contractor of any contractual obligation to provide any required coverage.

§ 11.2 Owner's Insurance

§ 11.2.1 The Owner shall purchase and maintain insurance of the types and limits of liability, containing the endorsements, and subject to the terms and conditions, as described in the Agreement or elsewhere in the Contract Documents. The Owner shall purchase and maintain the required insurance from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located. This policy will exclude any tools, equipment, scaffolding, glass breakage, etc., owned or rented by the Contractor or Subcontractors and materials stored on the site, but not incorporated into the Project. The Contractor shall be responsible for protecting all product until the Date of Final Completion is established by the Architect/Engineer. The Contractor shall replace any Work if damaged before Final Completion. The Contractor may assume the risk itself or obtain insurance in amounts it deems sufficient.

§ 11.2.2 Failure to Purchase Required Property Insurance. If the Owner fails to purchase and maintain the required property insurance, with all of the coverages and in the amounts described in the Agreement or elsewhere in the Contract Documents, the Owner shall inform the Contractor in writing prior to commencement of the Work. Upon receipt of notice from the Owner, the Contractor may ~~delay commencement of the Work and may obtain insurance~~ obtain insurance of reasonable type and coverage amount that will protect the interests of the Contractor, Subcontractors, and Sub-Subcontractors in the ~~Work. When the failure to provide coverage has been cured or resolved, the Contract Sum and Contract Time shall be equitably adjusted. In the event the Owner fails to procure coverage, the Owner waives all rights against the Contractor, Subcontractors, and Sub-subcontractors to the extent the loss to the Owner would have been covered by the insurance to have been procured by the Owner. The cost of the insurance shall be charged to the Owner by a Change Order. If the Owner does not provide written notice, and the Contractor is damaged by the failure or neglect of the Owner to purchase or maintain the required insurance, the Owner shall reimburse the Contractor for all reasonable costs and damages attributable thereto.~~Work and the parties shall negotiate an adjustment to the Contract Sum and Contract Time. Property Insurance provided by the Owner will cover only Work incorporated into the construction and will not cover tools, equipment, or other property owned, leased, rented, or borrowed by the Contractor, Subcontractor, Sub-Subcontractor, or others.

§ 11.2.3 Notice of Cancellation or Expiration of Owner's Required Property Insurance. Within three (3) business days of the date the Owner becomes aware of an impending or actual cancellation or expiration of any property insurance required by the Contract Documents, the Owner shall provide notice to the Contractor of such impending or actual cancellation or expiration. Unless the lapse in coverage arises from an act or omission of the Contractor: (1) the Contractor, upon receipt of notice from the Owner, shall have the right to stop the Work until the lapse in coverage has been cured by the procurement of replacement coverage by either the Owner or the ~~Contractor;~~ Contractor and (2) the Contract Time and Contract Sum shall be ~~equitably adjusted; and (3) the Owner waives all rights against the Contractor, Subcontractors, and Sub-subcontractors to the extent any loss to the Owner would have been covered by the insurance had it not expired or been cancelled.~~ negotiated. If the Contractor purchases replacement coverage, the cost of the insurance shall be charged to the Owner by an appropriate Change Order. The furnishing of notice by the Owner shall not relieve the Owner of any contractual obligation to provide required insurance.

§ 11.3 Waivers of Subrogation

§ 11.3.1 ~~The Owner and Contractor waive all rights against (1) each other and any of their subcontractors, sub-subcontractors, agents, and employees, each of the other; (2) the 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 those losses are covered by property insurance required by the Agreement or other property insurance applicable to the Project, except such rights as they have to proceeds of such insurance. The Owner or Contractor, as appropriate, shall require similar written waivers in favor of the individuals and entities identified above from the Architect, Architect's consultants, Separate Contractors, subcontractors, and sub-subcontractors. The policies of insurance purchased and maintained by each person or entity agreeing to waive claims pursuant to this section 11.3.1 shall not prohibit this waiver of subrogation. This waiver of subrogation shall be effective as to a person or entity (1) even though that person or entity would otherwise have a duty of indemnification, contractual or otherwise, (2) even though that person or entity did not pay the insurance premium directly or indirectly, or (3) whether or not the person or entity had an insurable interest in the damaged property.~~All parties referenced in this General Conditions or otherwise related to this Project acknowledge and agree that the Owner is not waiving any rights its insurer(s) may have to subrogation. To the extent any term in the Contract Documents contrary to this provision, such term is void and unenforceable.

§ 11.3.2 ~~If during the Project construction period the Owner insures properties, real or personal or both, at or adjacent to the site by property insurance under policies separate from those insuring the Project, or if after final payment property insurance is to be provided on the completed Project through a policy or policies other than those insuring the Project during the construction period, to the extent permissible by such policies, the Owner waives all rights in accordance with the terms of Section 11.3.1 for damages caused by fire or other causes of loss covered by this separate property insurance.~~**NOT USED.**

§ 11.4 Loss of Use, Business Interruption, and Delay in Completion Insurance

The Owner, at the Owner's option, may purchase and maintain insurance that will protect the Owner against loss of use of the Owner's property, or the inability to conduct normal operations, due to fire or other causes of loss.~~The Owner waives all rights of action against the Contractor and Architect for loss of use of the Owner's property, due to fire or other hazards however caused.~~

~~**§11.5 Adjustment and Settlement of Insured Loss**~~
§ 11.5 Adjustment and Settlement of Insured Loss

§ 11.5.1 A loss insured under the property insurance required by the Agreement shall be adjusted by the Owner as fiduciary and made payable to the Owner as fiduciary for the insureds, as their interests may appear, subject to requirements of any applicable mortgagee clause and of Section 11.5.2. The Owner shall pay the Architect and Contractor their just shares of insurance proceeds received by the Owner, and by appropriate agreements the Architect and Contractor shall make payments to their consultants and Subcontractors in similar manner. The Owner shall use its best efforts, with consultation of the Architect, to reach a quick and fair settlement for all interested parties, with the insurance companies after a loss.

§ 11.5.2 Prior to settlement of an insured loss, the Owner shall notify the Contractor of the terms of the proposed settlement as well as the proposed allocation of the insurance proceeds. The Contractor shall have 14 days from receipt of notice to object to the proposed settlement or allocation of the proceeds. If the Contractor does not object, the Owner shall settle the loss and the Contractor shall be bound by the settlement and allocation. Upon receipt, the Owner shall deposit the insurance proceeds in a separate account and make the appropriate distributions. Thereafter, if no other agreement is made or the Owner does not terminate the Contract for convenience, the Owner and Contractor shall execute a Change Order for reconstruction of the damaged or destroyed Work in the amount allocated for that purpose. If the Contractor timely objects to either the terms of the proposed settlement or the allocation of the proceeds, the Owner may proceed to settle the insured loss, and any dispute between the Owner and Contractor arising out of the settlement or allocation of the proceeds shall be resolved pursuant to Article ~~15.~~15 if the Contractor timely and properly files a claim under Article 15.. Pending resolution of any dispute, the Owner may issue a Construction Change Directive for the reconstruction of the damaged or destroyed Work.

ARTICLE 12 UNCOVERING AND CORRECTION OF WORK

§ 12.1 Uncovering of Work

§ 12.1.1 If a portion of the Work is covered contrary to the 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.~~Time or Contract Sum.

§ 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 with the Owner's consent to see such Work and it shall be uncovered by

the Contractor. If such Work is in accordance with the Contract Documents, the Contractor shall be entitled to ~~an equitable~~ a negotiated adjustment to the Contract Sum and Contract Time as may be appropriate. At the time the Owner's consent is sought as described herein, the Architect shall notify the Owner that additional costs may apply if the Work is in accordance with the Contract Documents. If such Work is not in accordance with the Contract Documents, the costs of uncovering the Work, and the cost of correction, shall be at the Contractor's expense.

§ 12.2 Correction of Work

It is understood that the correction of work, either before or after Substantial Completion, shall occur without extension of the Contract Time, without increase in the Contract Sum, and without use of any contingency, unless the need for corrections is due to acts of the Owner, Architect, or others who are acting under the Owner's control.

§ 12.2.1 Before Substantial Completion

The Contractor shall promptly correct Work rejected by the Architect or failing to conform to the requirements of the Contract Documents, discovered before Substantial Completion and whether or not fabricated, installed or completed. Costs of correcting such rejected Work, including work of other Contractors and Subcontractors, compensation of consultants, any delay or related damages, attorneys' fees incurred by the Owner, 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. The Owner shall have the right to charge the Contractor for any such costs and expenses and to deduct such amounts from any future payments due the Contractor.

§ 12.2.2 After Substantial Completion

§ 12.2.2.1 In addition to the Contractor's obligations under Section 3.5, if, within one year after the date of Substantial Completion of the Work or designated portion thereof or after the date for commencement of warranties established under Section 9.9.1, or by terms of any applicable special warranty required by the Contract Documents, any of the Work is found to be not in accordance with the requirements of the Contract Documents, the Contractor shall correct it promptly after receipt of notice from the Owner to do so, 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. ~~During the one-year period for correction of Work, if the Owner fails to notify the Contractor and give the Contractor an opportunity to make the correction, the Owner waives the rights to require correction by the Contractor and to make a claim for breach of warranty.~~ If the Contractor fails to correct nonconforming Work within a reasonable time during that period after receipt of notice from the Owner 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 or other provisions of the Contract Documents establishing a "correction warranty" or other similar concept shall be construed to establish a period of limitation with respect to other obligations the Contractor has under the Contract ~~Documents.~~ Documents, including, without limitation, Section 3.5. Establishment of the one-year period for correction of Work as described in Section 12.2.2 relates only to the specific obligation of the Contractor to correct the Work, and has no relationship to the time within which the obligation to comply with the Contract Documents may be sought to be enforced, nor to the time within which proceedings may be commenced to establish the Contractor's liability with respect to the Contractor's obligations other than specifically to correct the Work.

§ 12.2.6 The Contractor shall respond immediately to correct Work deficiencies and/or punch list items. Failure to correct Work deficiencies and/or punch list items in a timely fashion shall be a substantial breach, and the Owner may terminate the Contract immediately. The Owner's right of termination in this Section 12.2.6 is separate and distinct from the right of termination in Section 14.2. Whether or not the Contract is terminated, if the Contractor fails to make corrections in a timely fashion, such Work may be corrected by the Owner, in its sole discretion, at the Contractor's expense and the Contract Sum may be adjusted by back charge and/or withholding future payments due the Contractor accordingly. The Contractor shall promptly notify the Architect in writing when Work deficiencies and/or punch list items are completed. If upon review of the Work by the Architect, after such notification by the Contractor, Work deficiencies and/or punch list items shall continue to exist, the Contractor shall reimburse the Owner for any costs incurred by the Owner, plus ten percent (10%) overhead and profit, as well as the Architect's fees for reinspections of 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. The acceptance of nonconforming Work by the Owner shall be by written Change Order signed by the Owner's authorized representative. Acceptance of nonconforming Work may only occur pursuant to such written Change Order.

ARTICLE 13 MISCELLANEOUS PROVISIONS

§ 13.1 Governing Law

The Contract shall be governed by the law of the ~~place where the Project is located, excluding that jurisdiction's choice of law rules. If the parties have selected arbitration as the method of binding dispute resolution, the Federal Arbitration Act shall govern Section 15.4.~~State of Michigan in all respects, except that Claims and causes of action for breach of the Contract Documents brought by the Owner shall not be deemed untimely if filed within six (6) years of Substantial Completion of the entire Project.

§ 13.2 Successors and Assigns

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

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

§ 13.3 Rights and Remedies

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

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

§ 13.4 Tests and Inspections

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

§ 13.4.2 If the 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,~~ Documents or applicable law, 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.

§ 13.4.4 Required certificates of testing, inspection, or approval shall, unless otherwise required by the Contract Documents, be secured by the Contractor and promptly delivered to the 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 the legal rate prevailing from time to time at the place where the Project is located. For any late payments by the Owner, the interest rate shall not exceed five percent (5%) per annum (see MCL 438.31).

ARTICLE 14 TERMINATION OR SUSPENSION OF THE CONTRACT

§ 14.1 Termination by the Contractor

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

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

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

.3 Because the ~~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~~ an undisputed Certificate for Payment within the time stated in the Contract Documents, subject to justifiable withholding of payment as described herein or in the Contract Documents; or

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

§ 14.1.2 The Contractor may terminate the Contract if, through no act or fault of the Contractor, a Subcontractor, a Sub-subcontractor, their agents or employees, or any other persons or entities performing portions of the Work, repeated suspensions, delays, or interruptions of the entire Work by the Owner as described in Section 14.3, constitute in the aggregate more than 100 percent of the total number of days scheduled for completion, or 120 days in any 365-day period, whichever is less.

§ 14.1.3 If one of the reasons described in Section 14.1.1 or 14.1.2 exists, the Contractor may, upon seven days' written notice to the Owner and Architect, terminate the Contract and recover from the Owner payment for Work executed, as well as reasonable overhead and profit on Work not executed, and costs incurred by reason of such termination.

§ 14.1.4 If the Work is stopped for a period of 60 consecutive days for reasons within the Owner's control and through no act or fault of the Contractor, a Subcontractor, a Sub-subcontractor, or their agents or employees or any other

persons or entities performing portions of the Work because the Owner has repeatedly failed to fulfill the Owner's obligations under the Contract Documents with respect to matters important to the progress of the Work, the Contractor may, upon seven additional days' 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 ~~repeatedly~~ refuses or fails to supply enough properly skilled workers or proper ~~materials;~~materials to the point of negatively impacting the Project and/or the related schedule;

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

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

.4 otherwise is guilty of substantial breach of a provision of the Contract ~~Documents.~~Documents; or

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

§ 14.2.2 When any of the reasons described in Section 14.2.1 exist, and upon certification by the Architect that sufficient cause exists to justify such action, the Owner may, without prejudice to any other rights or remedies of the Owner and after giving the Contractor and the Contractor's surety, if any, ~~seven days' notice, terminate employment of the Contractor and may, subject to any prior rights of the surety:~~three (3) business days' notice, terminate the Contractor's right to proceed with the Work, or such part of the Work as to which such defaults have occurred, and may take any one or more of the following actions:

.1 Exclude the Contractor from the site and take possession of all materials, equipment, tools, and construction equipment and machinery thereon owned by the Contractor;

.2 Accept assignment of subcontracts pursuant to Section 5.4; and

.3 Finish the Work by whatever reasonable method the Owner may deem expedient. Upon written request of the Contractor, the Owner shall furnish to the Contractor a detailed accounting of the costs incurred by the Owner in finishing the Work.

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

The three (3) day notice period identified in this Section does not give rise to an opportunity for the Contractor to cure the cause for termination. Further, the Owner's failure to properly follow the termination procedure shall not be a substantial or material breach of the Contract or the Owner's obligations.

§ 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 damages incurred by the Owner in pursuing termination and completion of the Work, including actual attorney and legal fees and costs, and not expressly waived, such excess shall be paid to the Contractor. If such costs and damages exceed the unpaid balance, the Contractor shall pay the difference to the Owner. The amount to be paid to the Contractor or Owner, as the case may be, shall 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.

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

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

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

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

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

§ 14.4.3 In case of such termination for the Owner's convenience, the Owner shall pay the Contractor for Work properly ~~executed;~~ executed and costs incurred by reason of the ~~termination, including costs attributable to termination of Subcontracts; and the termination fee, if any, set forth in the Agreement.~~termination.

ARTICLE 15 CLAIMS AND DISPUTES

§ 15.1 Claims

§ 15.1.1 Definition

A Claim is a demand or assertion by one of the parties seeking, as a matter of right, payment of money, a change in the Contract Time, or other relief with respect to the terms of the ~~Contract.~~ Contract, including, but not limited to, additional sums, additional time for performance, or damages for delay. The term "Claim" also includes other disputes and matters in question between the Owner and Contractor arising out of or relating to the Contract. The responsibility to substantiate Claims shall rest with the party making the Claim. This Section 15.1.1 does not require the Owner to file a Claim in order to impose liquidated damages in accordance with the Contract Documents. The Contractor shall not knowingly (as "knowingly" is defined in the Federal False Claims Act, 31 USC 3729, *et seq.*) present or cause to be presented a false or fraudulent Claim. As a condition precedent to making a Claim by the Contractor, the Claim shall be accompanied by an affidavit sworn to before a notary public or other person authorized to administer oaths in the State of Michigan and executed by an authorized representative of the Contractor, which states that, "The Claim which is submitted herewith complies with subparagraph 15.1.1 of the General Conditions, as amended, which provides that the Contractor shall not knowingly present or cause to be presented a false or fraudulent claim." Claims of the Owner shall be governed by the relevant Michigan statutory limitations period, excepting Warranty claims which shall be controlled by the warranty documents.

§ 15.1.2 Time Limits on Claims

The Owner and Contractor shall commence all Claims as set forth herein and subject to law and shall pursue all causes of action against the other and arising out of or related to the Contract, whether in contract, tort, breach of warranty or otherwise, in accordance with the requirements of the binding dispute resolution method selected in the Agreement and within the period specified by applicable law, but in any case not more than 10 years after the date of Substantial Completion of the Work. The Owner and Contractor waive all Claims and causes of action not commenced in accordance with this Section 15.1.2. The Owner shall commence all claims and causes of action in accordance with Section 13.1 and Section 15.1.2.1, regardless of any other time frames identified in the Contract Documents. The Contractor shall commence all Claims and causes of action in accordance with Section 15.1.2 and Section 15.1.3, other provisions of the Contract, and in accordance with Michigan law.

§ 15.1.2.1 Regardless of any provisions to the contrary, the limitations period with respect to any Claim or cause of action by the Owner with respect to defective or nonconforming Work shall not commence until the discovery of such defective or nonconforming Work by the Owner. See also Section 13.1.

§ 15.1.2.2 Surety Notice and Prior Approval

Except where otherwise expressly required by the terms of the Agreement or the General Conditions, exercise by the Owner of any contractual or legal right or remedy without prior notice to or approval by the Contractor's surety shall in no way prohibit the Owner's ability to pursue such right or remedy. Further, pursuit of such a right or remedy

without prior notice to or approval of surety shall in no way compromise, limit or bar any claim by the Owner against a surety bond of the Contractor.

§ 15.1.3 Notice of Claims

§ 15.1.3.1 Claims by ~~either~~ the ~~Owner or~~ Contractor, where the condition giving rise to the Claim is first discovered prior to expiration of the period for correction of the Work set forth in Section 12.2.2, shall be initiated by notice to the ~~other party~~ Owner and to the Initial Decision Maker with a copy sent to the Architect, if the Architect is not serving as the Initial Decision Maker. Claims by ~~either party under this Section 15.1.3.1~~ the Contractor shall be initiated within 21 days after occurrence of the event giving rise to such Claim or within 21 days after the ~~claimant~~ Contractor first recognizes the condition giving rise to the Claim, whichever is later. The Contractor's failure to timely and properly initiate a Claim shall be an absolute and irrevocable waiver of such Claim and any cause of action. Claims and causes of action by the Owner shall be governed by the applicable statute of limitations period. The parties acknowledge, understand, and agree that the Contractor's required prompt filing of a Claim is critical to the Project, as Contractor Claims often affect the Project schedule and/or Project budget, and that the deadline and waiver applicable to Contractor Claims is a material inducement to the Owner entering into an agreement with the Contractor.

§ 15.1.3.2 ~~Claims by either the Owner or Contractor, where the condition giving rise to the Claim is first discovered after expiration of the period for correction of the Work set forth in Section 12.2.2, shall be initiated by notice to the other party. In such event, no decision by the Initial Decision Maker is required.~~**NOT USED.**

§ 15.1.4 Continuing Contract Performance

§ 15.1.4.1 Pending final resolution of a ~~Claim,~~ Claim or cause of action, including mediation, arbitration and/or litigation, as applicable, except as otherwise agreed in writing or as provided in Section 9.7 and Article 14, the Contractor shall proceed diligently with performance of the Contract and the Owner shall continue to make undisputed payments in accordance with the Contract Documents.

§ 15.1.4.2 ~~The Contract Sum and Contract Time shall be adjusted in accordance with the Initial Decision Maker's decision, subject to the right of either party to proceed in accordance with this Article 15. The Architect will issue Certificates for Payment in accordance with the decision of the Initial Decision Maker.~~**NOT USED.**

§ 15.1.5 Claims for Additional Cost

If the Contractor wishes to make a Claim for an increase in the Contract Sum, written notice as provided in Section 15.1.3 shall be given before proceeding to execute the portion of the Work that is the subject of the Claim. Failure to provide such notice shall serve as an absolute bar against a Claim or cause of action for such an increase in the Contract Sum. Prior notice is not required for Claims relating to an emergency endangering life or property arising under Section 10.4. A Project delay shall not be a basis for a Claim or cause of action for additional cost by the Contractor, except for costs related to payment of staff and extended general conditions.

§ 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, written notice as provided in Section 15.1.3 shall be given. The Contractor's Claim shall include an estimate of cost and of probable effect of delay on progress of ~~the Work.~~ the Work due to the increase in Contract Time and allowable costs (e.g., payment of staff and general conditions) sought. In the case of a continuing delay, only one Claim is necessary.

§ 15.1.6.2 If adverse weather conditions are the basis for a Claim for additional time, such Claim shall be documented by data substantiating that weather conditions were abnormal for the period of time, could not have been reasonably anticipated, and had an adverse effect on the scheduled construction.

§ 15.1.7 Waiver of Claims for Consequential Damages

~~The~~ As permitted by law, the Contractor and Owner waive Claims and/or causes of action against each other for consequential damages arising out of or relating to this Contract. This mutual waiver includes

.1 damages incurred by the Owner for rental expenses, for losses of use, income, profit, financing, business and reputation, and for loss of management or employee productivity or of the services of such persons; and

.2 , without limitation damages incurred by the Contractor for principal office expenses including the compensation of personnel stationed there, for losses of financing, business and reputation, and for loss of profit, except anticipated profit arising directly from the Work.

This mutual waiver is applicable, without limitation, to all consequential damages due to either party's ~~termination in accordance with Article 14.~~ termination. Nothing contained in this Section 15.1.7 shall be deemed to preclude assessment of liquidated damages, when applicable, in accordance with the requirements of the Contract Documents.

§ 15.2 Initial Decision

§ 15.2.1 ~~Claims, excluding those where the condition giving rise to the Claim is first discovered after expiration of the period for correction of the Work set forth in Section 12.2.2 or arising under Sections 10.3, 10.4, and 11.5, shall~~ Claims of the Contractor shall, and Claims of the Owner may, be referred to the Initial Decision Maker for initial ~~decision.~~ interpretation. The Architect will serve as the Initial Decision ~~Maker, unless otherwise indicated in the Agreement.~~ Maker. Except for those Claims excluded by this Section 15.2.1, an initial ~~decision~~ interpretation shall be required as a condition precedent to ~~mediation of any Claim. If an initial decision~~ mediation, arbitration and/or litigation of any Claim brought by the Contractor against the Owner. If an initial interpretation has not been rendered within 30 days after ~~the~~ a Contractor-required or Owner-requested Claim has been referred to the Initial Decision Maker, the party asserting the Claim may demand mediation and binding dispute resolution without ~~a decision~~ an interpretation having been rendered. Unless the Initial Decision Maker and all affected parties agree, the Initial Decision Maker will not decide disputes between the Contractor and persons or entities other than the Owner.

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

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

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

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

§ 15.2.6 ~~Either party may file for mediation of an initial decision at any time, subject to the terms of Section 15.2.6.1.~~ **NOT USED.**

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

§ 15.2.7 In the event of a Claim against the Contractor, the ~~Owner~~ Owner, Architect or Initial Decision Maker 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~~ Owner, Architect or Initial Decision Maker 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 Except as stated in this Agreement or otherwise agreed in writing by the parties, Claims, disputes, or other matters in controversy arising out of or related to the Contract, except those waived as provided for in Sections ~~9.10.4, 9.10.5, and 15.1.7,~~ 9.10.4 and 9.10.5, shall be subject to mediation as a condition precedent to ~~binding dispute resolution.~~the parties' agreed-upon dispute resolution process.

§ 15.3.2 The parties shall endeavor to resolve their Claims by mediation which, unless the parties mutually agree otherwise, shall be administered by the American Arbitration Association in accordance with its Construction Industry Mediation Procedures in effect on the date of the Agreement. A request for mediation shall be made in writing, delivered to the other party to the Contract, and filed with the person or entity administering the mediation. The request may be made concurrently with the ~~filing of binding~~ commencement of the parties-agreed-upon dispute resolution proceedings but, in such event, mediation shall proceed in advance of ~~binding dispute resolution~~ such proceedings, which shall be stayed pending mediation for a period of 60 days from the date of filing, unless stayed for a longer period by agreement of the parties or court order. ~~If an arbitration is stayed pursuant to this Section 15.3.2, the parties may nonetheless proceed to the selection of the arbitrator(s) and agree upon a schedule for later proceedings.~~ All limitations periods shall be tolled during the mediation process.

§ 15.3.3 ~~Either party may, within 30 days from the date that mediation has been concluded without resolution of the dispute or 60 days after mediation has been demanded without resolution of the dispute, demand in writing that the other party file for binding dispute resolution. If such a demand is made and the party receiving the demand fails to file for binding dispute resolution within 60 days after receipt thereof, then both parties waive their rights to binding dispute resolution proceedings with respect to the initial decision.~~**NOT USED.**

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

~~**§ 15.4 Arbitration**~~

~~**§ 15.4.1** If the parties have selected arbitration as the method for binding dispute resolution in the Agreement, any Claim subject to, but not resolved by, mediation shall be subject to arbitration which, unless the parties mutually agree otherwise, shall be administered by the American Arbitration Association in accordance with its Construction Industry Arbitration Rules in effect on the date of the Agreement. The Arbitration shall be conducted in the place where the Project is located, unless another location is mutually agreed upon. A demand for arbitration shall be made in writing, delivered to the other party to the Contract, and filed with the person or entity administering the arbitration. The party filing a notice of demand for arbitration must assert in the demand all Claims then known to that party on which arbitration is permitted to be demanded.~~

~~**§ 15.4.1.1** A demand for arbitration shall be made no earlier than concurrently with the filing of a request for mediation, but in no event shall it be made after the date when the institution of legal or equitable proceedings based on the Claim would be barred by the applicable statute of limitations. For statute of limitations purposes, receipt of a written demand for arbitration by the person or entity administering the arbitration shall constitute the institution of legal or equitable proceedings based on the Claim.~~

~~**§ 15.4.2** The award rendered by the arbitrator or arbitrators shall be final, and judgment may be entered upon it in accordance with applicable law in any court having jurisdiction thereof.~~

~~**§ 15.4.3** The foregoing agreement to arbitrate and other agreements to arbitrate with an additional person or entity duly consented to by parties to the Agreement, shall be specifically enforceable under applicable law in any court having jurisdiction thereof.~~

§ 15.4.4 Consolidation or Joinder

The Contractor further agrees to include similar dispute resolution provisions in all agreements with the Subcontractors, suppliers, and independent contractors and consultants retained for the Project and to require them to include a similar dispute resolution provision in all agreements with Subcontractors, all subconsultants, suppliers or fabricators so retained, thereby providing for a consistent method of dispute resolution between the parties to those agreements. Subject to the other limitations periods identified in these General Conditions which are understood to govern over this sentence, no demand for mediation or arbitration shall be made after the date when the applicable statutes of limitation would bar legal or equitable proceedings. During the pendency of any mediation or arbitration, all applicable limitations periods shall be tolled until the conclusion of that process.

The Owner reserves the right in its discretion to require consolidation or joinder of any mediation or other legal proceeding arising out of or relating to this Agreement or any of the agreements incorporated by reference with another mediation or other legal proceeding involving (i) a person or entity not a party to this Agreement or (ii) an independent contractor or consultant engaged by the Owner in connection with the Project, in any event the Owner believes such consolidation or joinder is necessary in order to resolve a dispute or avoid duplication of time, expense or effort. In the event the Owner is involved in a dispute which is not subject to mediation or arbitration involving a person or entity not a party to this Agreement, the mediation and arbitration provisions of this article shall be deemed to be void and nonexistent in the event Owner, in its discretion, determines the Contractor should become a party to that dispute by joinder or otherwise. Any mediation or arbitration hearing shall be held in the general location where the Project is located, unless another location is mutually agreed upon.

Modified: 09/26/22; 11:22 am~~§ 15.4.4.1 Subject to the rules of the American Arbitration Association or other applicable arbitration rules, either party may consolidate an arbitration conducted under this Agreement with any other arbitration to which it is a party provided that (1) the arbitration agreement governing the other arbitration permits consolidation, (2) the arbitrations to be consolidated substantially involve common questions of law or fact, and (3) the arbitrations employ materially similar procedural rules and methods for selecting arbitrator(s).~~

~~§ 15.4.4.2 Subject to the rules of the American Arbitration Association or other applicable arbitration rules, either party may include by joinder persons or entities substantially involved in a common question of law or fact whose presence is required if complete relief is to be accorded in arbitration, provided that the party sought to be joined consents in writing to such joinder. Consent to arbitration involving an additional person or entity shall not constitute consent to arbitration of any claim, dispute or other matter in question not described in the written consent.~~

~~§ 15.4.4.3 The Owner and Contractor grant to any person or entity made a party to an arbitration conducted under this Section 15.4, whether by joinder or consolidation, the same rights of joinder and consolidation as those of the Owner and Contractor under this Agreement.~~

Certification of Document's Authenticity

AIA® Document D401™ – 2003

I, _____, hereby certify, to the best of my knowledge, information and belief, that I created the attached final document simultaneously with this certification at 11:29:55 ET on 09/26/2022 under Order No. 2114277845 from AIA Contract Documents software and that in preparing the attached final document I made no changes to the original text of AIA® Document A201™ – 2017, General Conditions of the Contract for Construction, as published by the AIA in its software, other than changes shown in the attached final document by underscoring added text and striking over deleted text.

_____

(Signed)

_____

(Title)

_____

(Dated)

The Drawings which will be issued for the use of Bidders and upon which all Proposals and the Contracts will be based, consist of the following:

Drawing No.	Description	Date
G0.1	Title Sheet	3/22/24
C0.0	Cover	3/22/24
C1.0	Topographical Survey	3/22/24
C2.0	Existing Conditions & Demolition Plan	3/22/24
C4.0	Utility Plan	3/22/24
C5.0	Stormwater Management Details	3/22/24
C6.0	Site Layout Plan	3/22/24
C7.0	Details & Specifications	3/22/24
C8.0	Grading Plan	3/22/24
C8.1	Ground Improvements	3/22/24
C9.0	Soil Erosion and Sedimentation Control Plan	3/22/24
S0.1	Structural Notes and Special Instructions	3/22/24
S1.0	Foundation and Lintel Framing Plans	3/22/24
S2.0	Sections and Details	3/22/24

Section 00210 - Special Provisions

1. General - All Bidders are responsible to review all work categories descriptions, and report any conflicts or ambiguities which may affect the execution of their Work Categories. All Bidders are responsible to review all Bidding Documents and become familiar with them to coordinate their work accordingly. Work Category descriptions should in no way be construed as being all-inclusive. Should a conflict exist between the Work Category description and other Bidding Documents, the Work Category description shall prevail and take precedence. Bidders are required to bid the entire Work Category and may bid more than one Work Category.

2. Electronic Documentation – In an effort to promote sustainability, information shall be conveyed electronically to the greatest extent possible.

3. Pre-approved contractors – The invitation procedure requires that each primary bidder be pre-qualified by the Construction Manager. If you are unsure if you are pre-qualified please contact Andrew Dobbs immediately at 517-482-1488. Subcontractors and vendors responding to the primary bidders do not need to be pre-qualified. To become pre-qualified, please visit the following link - (http://www.christmanco.com/documents_forms.asp) and fill out the "Trade Contractor Information Request" form.

4. Labor Requirements – This project has no labor rate requirements.

5. Construction Waste Management And Disposal – Review Spec Section 017419 Construction Waste Management And Disposal.

6. General Commissioning Requirements – Review Spec Section 019113 General Commissioning Requirements.

7. Indoor Air Quality Management Plan – During Construction. Comply with site specific IAQ Management Plan for this project.

8. Parking – Limited parking is available onsite as shown on the logistics plan.

9. Project Scheduling - A preliminary project schedule has been included within the Bidding Documents for your review and use. As input from the Trade Contractors is provided and as progress begins, this schedule will be periodically updated and re-issued. Each Trade Contractor is required to become familiar with the preliminary schedule and sequence their work accordingly. Activity durations shall be maintained regardless of actual start dates.

10. Post Bid interviews – We will be holding post bid interviews for the low qualified bidders immediately after bids are received. It is essential to the interview process that the primary and secondary Trade Contractors are included in the meeting, as well as the intended project foreman and project manager. The purpose of the interview will be to discuss the bids but will also focus on schedule, submittals, safety, site utilization and unique project requirements.

11. Shop Drawings & Submittals – The Trade Contractor shall review, approve in writing, and submit through the Construction Manager all submittals within two weeks after contract award at the latest, as to cause no delay in the work or in the work of any separate Trade Contractor. Shop drawings, product data and samples shall be properly identified as specified or as the Construction Manager may require. At the time of submission, each Trade Contractor shall inform the Construction Manager in writing of any deviation in the shop drawings, product data or samples from the requirements of the Bidding Documents.

    For Re-Submittals – Each Trade Contractor shall make any corrections required by the Construction Manager or Architect and shall resubmit the shop drawings, product data or new samples until approved.

Each Trade Contractor shall direct specific attention, in writing or on resubmitted shop drawings, product data or samples, to revisions other than those requested by the Construction Manager or Architect on previous submittals. Refer to Section 01300 Submittals for definitions of Action Markings.)

Fill-in A/E stamp markings by utilized by the project's architects and engineers: "Reviewed", "Approved as noted", etc.

FINAL UNRESTRICTED RELEASE: Marking: _____ (i.e. "No Exceptions Taken" or "Reviewed")

MAKE CORRECTIONS NOTED: Marking: _____ (i.e. "Approved as Noted")

REVISE AND RESUBMIT: Marking: _____ (i.e. "Revise and Resubmit")

REJECTED: Marking: _____ (i.e. "Rejected")

12. Procore – The Christman Company has set up a Procore Project for the construction documents for the project. This website will be used for (not limited to) the following:
    a. Submittal upload and approvals
    b. RFI upload and approvals
    c. Updated drawings
    d. Updated schedule
    e. Meeting minutes
    f. Project directory
    g. Testing reports
    h. Safety Information
    i. Punchlists
13. Submittal Uploads – All submittals must be submitted to The Christman Company via the Procore Website and must be the original PDF document. Hard copies or re-scanned documents will not be accepted. The only exception is actual samples (paint draw downs, masonry, etc.); however, all brochures and product data related to these samples must be submitted electronically.
14. Schedule of Values (SOV) – Per Section 01370 Schedule of Values, submit for approval through the Trade Contractor Portal. Once approved, adhere to the Application for Payment process. The SOV must be divided up by: type of work, labor, materials, submittals, closeouts, etc.
15. Application for payment – Create and Submit the Pay Application through the Trade Contractor Portal. Payment period: Signed payment applications are due the 25th of each month. Each request for payment shall be provided with a fully executed sworn statement along with its relative unconditional waivers. All subcontractors and suppliers are to be listed on the sworn statement.
16. Change Management – Refer to Sections 01150 and 01019 for definitions, but the following change management documents will be utilized on this project: Bulletins, Change Orders
17. Existing Services – The existing utilities and fixtures (power, plumbing, fire alarm system and fire suppression) will remain in operation during construction. Care must be taken when working around the site and in the building. The Owner will pay for all power consumed for the temporary electrical service, all natural gas consumed for temporary heat, and all water consumed for temporary potable water.

Under conditions where tie-ins to existing services/utilities are required, each Trade Contractor will be required to notify Construction Manager five (5) working days in advance. Pre-Task planning and shut-down notifications will be required to assure minimum interruptions to Owner operations, including performing required tie-ins after normal working hours. Trade Contractors are responsible to cover premium time costs to complete required tie-ins.)

18. Hoisting – In general, any hoisting activities required to be used onsite must be reviewed in advance with Construction Manager.

19. Site Boundaries – No swinging or staging of any materials shall extend beyond the project boundaries. Special care must also be taken when any activities take place outside of the construction fencing as we are adjacent to an occupied elementary school.

20. Existing Facilities – Work is taking place directly adjacent to an occupied elementary school. Portable chemical toilets will be provided and are to be utilized for the duration of the project.

21. Material Deliveries and Staging –Due to the limited lay-down area available, all material deliveries must be coordinated with the Construction Manager a minimum of 24-hours in advance of said delivery. At no time, will delivery trucks be allowed to stage or park on existing roads and parking lots. Queuing for trucks will be available on-site at designated locations as coordinated with the Construction Manager. If deliveries require traffic control, the Trade Contractor is required to provide flagmen accordingly. All Trade Contractors are responsible for directing responsible trucks into project site, unloading of materials, handling, protection and storage of all received equipment. The Owner and Construction Manager will not accept deliveries.

22. Communication and Phones –All Trade Contractor field supervision shall have cellular phones available for communication with The Christman Company's field personnel. All project managers shall have email access for communications with The Christman Company's office personnel. Cell phone use by trade personnel (non-supervisory) will not be permitted, except during breaks or lunch.

23. Independent Testing, Inspections and Commissioning – The Owner has arranged independent testing for certain portions of the project. All Trade Contractors are to cooperate and provide access and assistance for the independent testing and inspections to be performed. These services include at a minimum: soil/material testing and commissioning.)

24. Layout –The Construction Manager will provide two perpendicular control lines established at the northwest corner of the building footprint, and one benchmark indicated on the documents.

25. Noise, Odors & Vibration – Due to close proximity of adjacent existing facilities, vibration must be closely monitored as to not cause any damage to the existing building and facilities. Odor causing chemicals, adhesives, paints, cleaning supplies must have MSDS sheets submitted and approved by the Construction Manager prior to use. All equipment shall be self powered and all diesel powered equipment shall be operated with "Bio-diesel" fuels and/or emission "scrubbers" to reduce exhaust fumes.

26. Jobsite Safety Orientation – All Trade Contractors of any tier and visitors entering this jobsite will be required to check-in with the Construction Manager upon arrival at the project site. Check-in procedures will include the review and acknowledgement of the Construction Managers Project Specific Safety Orientation and Policies. All construction personnel will be required to wear The Christman Company issued safety sticker when working on or visiting this jobsite.

    a. Safety (see contract form section for project safety program) - It is a fundamental value of the Construction Manager that safety is always a primary consideration. There is no phase of the project that has greater importance than accident prevention and the preservation of human

resources. The Construction Manager's safety program is stringent and rigorous. The following represents a few important pre-construction requirements that apply to this project. Before any awarded Trade Contractor starts work on-site, the following requirements shall be satisfied:

i. Provide a copy of Trade Contractor's site specific safety program.

ii. Attend Construction Manager's project specific safety orientation program, which includes review of our safety video, review of project specific written safety program, review of Project Specific Infection Control Policy, sign-in and badging requirements.

iii. No tobacco products, including but not limited to cigarettes, cigars, chewing tobacco, etc. are permitted on Lansing School District premises.

iv. Provide a copy of Material Safety Data Sheets (MSDS) for all proposed materials.

v. Hardhats and safety glasses are to be worn at all times. Additional personal protection equipment will be worn appropriately based on the work performed.

vi. Designate a Safety Representative(s) who will be working on-site – Provide telephone numbers and emergency telephone numbers.

vii. Hoisting over occupied areas will not be permitted unless areas are vacated or a controlled access program initiated.

viii. Hot work permits shall be obtained as required, including fire watch requirements.

ix. Shut down notifications shall be obtained as required with a minimum of five (5) working days advance notice.

x. An understanding of our safety program and specifically our policy that in the event of an injury or near miss, all parties involved will be required to take a drug screening test immediately. Failure to perform the required test will result in removal from the site.

xi. Fall protection shall be worn and used, 100% of the time, by all persons when there is exposure to a fall greater than six (6) feet unless other provisions such as guardrails, safety nets, or fall restraints have been provided. This includes, but is not limited to, steel erection (including connecting, bolting-up, decking, welding or any other steel erection activity), pre-cast erection, roofing activities and masonry work including overhand laying operations.

xii. Hot Work Permits - Hot work permits will be required during all cutting, grinding, welding and torch cutting activities, including fire watch requirements. These permits are to be filled out in the jobsite trailer with a copy of it to be placed at the place of hot work.

27. Progress Cleanup – A composite clean-up crew will be assembled each Friday immediately after lunch. Each Trade Contractor shall provide labor and supplies as directed by the Construction Manager to support this effort. This does not relieve any Trade Contractor of their responsibility to cleanup all debris resulting from their own operations on a daily basis and discard waste into jobsite dumpsters provided by the Construction Manager (as identified in section 01524), Each Trade Contractor shall clean all surfaces and leave the work area "broom clean" or its equivalent, unless otherwise specified.

If contractors do not maintain their work areas or provide the proper resources for our daily clean up, The Christman Company will provide one warning to the contractor. If the problem continues after the warning, The Christman Company will provide labor for the relative clean-up at the cost of the contractor.

28. Drug Testing – Upon incident requiring drug testing (including but not limited to accident, damages, injury) the Construction Manager may require the responsible parties, or parties involved to submit a drug test within 24 hours of the incident.

29. As-Builts –As-Builts must be accurately updated throughout the project. At the end of the project, the trade contractor must update the As-Builts and forward the following to The Christman Company: CAD drawing file, PDF file and two full size hard copies.

30. Warranties –The contractor shall guarantee all materials and work for a period of two years from Substantial Completion. Before final payment, Contactor must provide a letter of guarantee confirming the effective date and duration of the guarantee.

31. Waste Management/Indoor Air Quality Plan – The Construction Manager's Waste Management Plan and Indoor Air Quality plan will be strictly adhered to for this project. Please pay special attention to these specifications (01410 and 01524). The trade contractors are responsible to provide the necessary resources to follow these guidelines.

32. Phasing – Underground detention work will not take place until school is out for the summer of 2024.

33. RFI's – RFI's must be submitted to Projects@lansingschools.net prior to the specified RFI cutoff date. RFI's after contract award will be handled through Procore.

34. Work Hours - Common jobsite working hours shall be 7:00 am to 3:30 pm, Monday through Friday. Any overtime requires advance approval by Construction Manager.

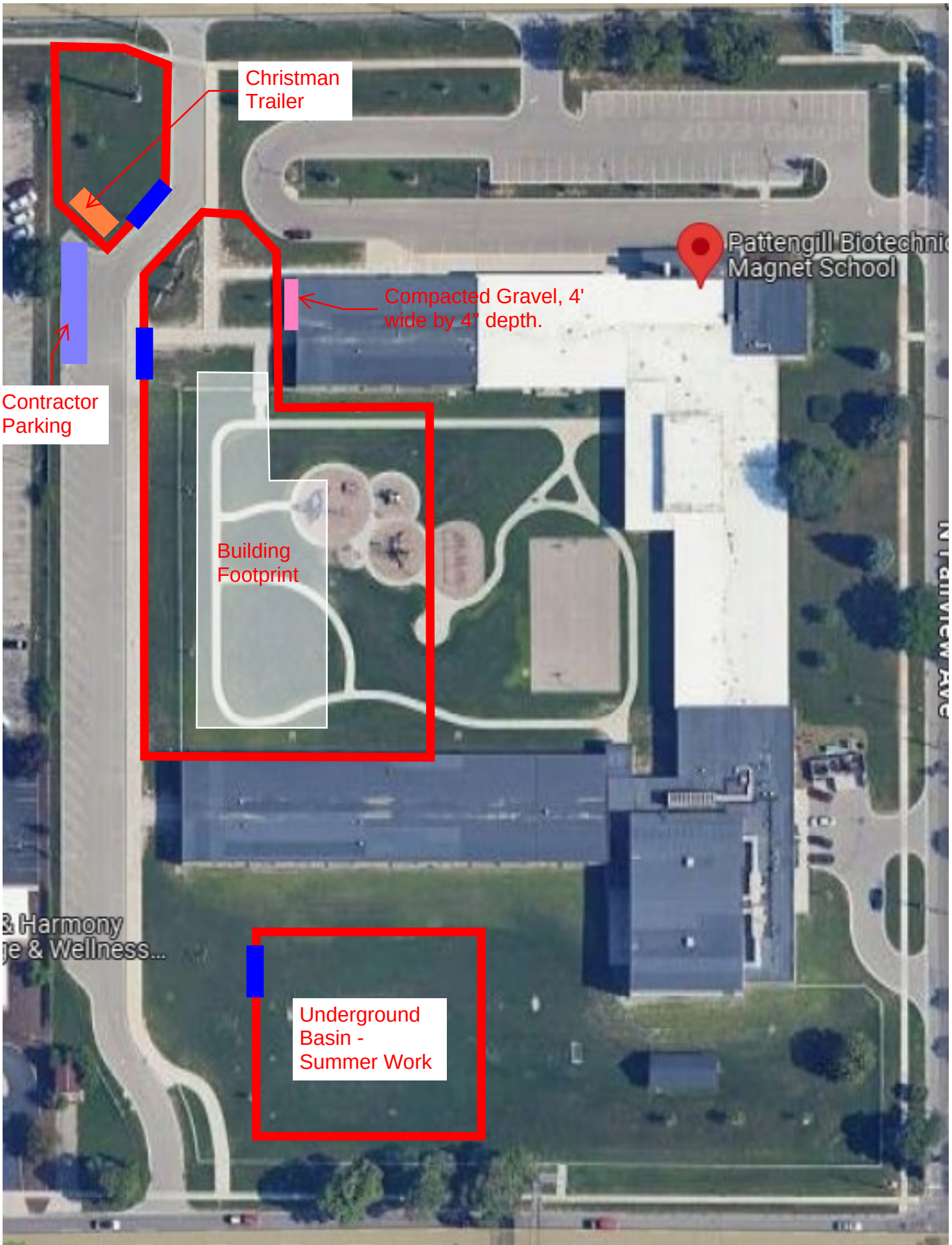
35. Hazardous Materials – No known hazardous materials on this project.

End of Special Provisions Section 00210

Temporary Fencing

Gate

Logistics Plan

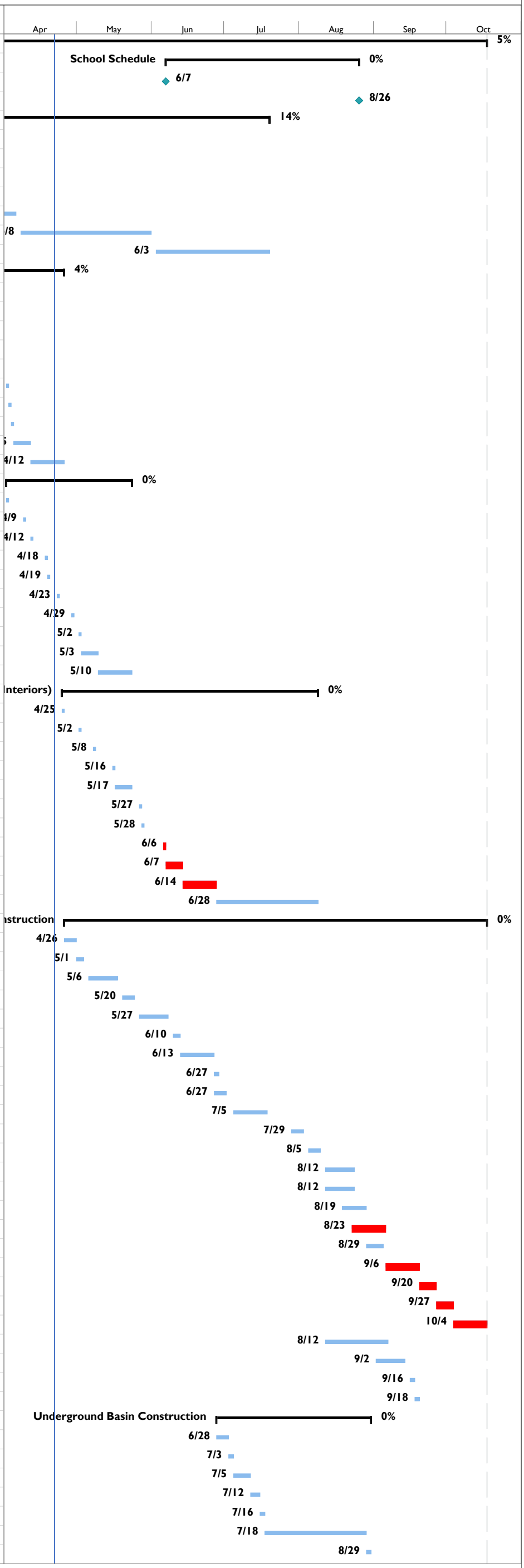


CHRISTMAN
BUILDING SINCE 1894

Pattengill
Draft Schedule

Lansing School District

ID	WC	Task Name	Duration	Start	Finish
1		**KPS Pattengill**	**216 days**	**Thu 12/21/23**	**Thu 10/17/24**
2		**School Schedule**	**56 days**	**Fri 6/7/24**	**Mon 8/26/24**
3		Last Day of School	0 days	Fri 6/7/24	Fri 6/7/24
4		First Day of School	0 days	Mon 8/26/24	Mon 8/26/24
5		**Design**	**152 days**	**Thu 12/21/23**	**Fri 7/19/24**
6		Kingscott Design	20 days	Thu 12/21/23	Wed 1/17/24
7		Order Placed	1 day	Thu 1/18/24	Thu 1/18/24
8		Vesta Shop Drawings	36 days	Fri 1/19/24	Fri 3/8/24
9		Owner Review	5 days	Mon 3/11/24	Fri 3/15/24
10		Vesta Engineers Drawings	15 days	Mon 3/18/24	Fri 4/5/24
11		State Plan Review	40 days	Mon 4/8/24	Fri 5/31/24
12		Manufacturing	35 days	Mon 6/3/24	Fri 7/19/24
13		**Bid Pack 1 (Fencing & Civil)**	**33 days**	**Tue 3/12/24**	**Thu 4/25/24**
14		Out To Bid	1 day	Tue 3/12/24	Tue 3/12/24
15		Pre-Bid Meeting	1 day	Fri 3/15/24	Fri 3/15/24
16		RFIs Due	1 day	Fri 3/22/24	Fri 3/22/24
17		Bids Due	1 day	Thu 3/28/24	Thu 3/28/24
18		Post Bid Interviews	1 day	Fri 3/29/24	Fri 3/29/24
19		Steering Committee	1 day	Tue 4/2/24	Tue 4/2/24
20		Board Facilities	1 day	Wed 4/3/24	Wed 4/3/24
21		Board Meeting	1 day	Thu 4/4/24	Thu 4/4/24
22		Contracts	5 days	Fri 4/5/24	Thu 4/11/24
23		Submittals	10 days	Fri 4/12/24	Thu 4/25/24
24		**Bid Pack 2 (Footings & Foundations)**	**38 days**	**Tue 4/2/24**	**Thu 5/23/24**
25		Out To Bid	1 day	Tue 4/2/24	Tue 4/2/24
26		Pre-Bid Meeting	1 day	Tue 4/9/24	Tue 4/9/24
27		RFIs Due	1 day	Fri 4/12/24	Fri 4/12/24
28		Bids Due	1 day	Thu 4/18/24	Thu 4/18/24
29		Post Bid Interviews	1 day	Fri 4/19/24	Fri 4/19/24
30		Steering Committee	1 day	Tue 4/23/24	Tue 4/23/24
31		Board Facilities	1 day	Mon 4/29/24	Mon 4/29/24
32		Board Meeting	1 day	Thu 5/2/24	Thu 5/2/24
33		Contracts	5 days	Fri 5/3/24	Thu 5/9/24
34		Submittals	10 days	Fri 5/10/24	Thu 5/23/24
35		**Bid Pack 3 (MEP & Interiors)**	**76 days**	**Thu 4/25/24**	**Thu 8/8/24**
36		Out To Bid	1 day	Thu 4/25/24	Thu 4/25/24
37		Pre-Bid Meeting	1 day	Thu 5/2/24	Thu 5/2/24
38		RFIs Due	1 day	Wed 5/8/24	Wed 5/8/24
39		Bids Due	1 day	Thu 5/16/24	Thu 5/16/24
40		Post Bid Interviews	5 days	Fri 5/17/24	Thu 5/23/24
41		Steering Committee	1 day	Mon 5/27/24	Mon 5/27/24
42		Board Facilities	1 day	Tue 5/28/24	Tue 5/28/24
43		Board Meeting	1 day	Thu 6/6/24	Thu 6/6/24
44		Contracts	5 days	Fri 6/7/24	Thu 6/13/24
45		Submittals	10 days	Fri 6/14/24	Thu 6/27/24
46		State Fire Alarm Review	30 days	Fri 6/28/24	Thu 8/8/24
47		**Classroom Construction**	**122 days**	**Fri 4/26/24**	**Thu 10/17/24**
48		Temp Fencing	3 days	Fri 4/26/24	Tue 4/30/24
49		Selectice Demo & Salvage	3 days	Wed 5/1/24	Fri 5/3/24
50		Underground Storm for Existing Structur	10 days	Mon 5/6/24	Fri 5/17/24
51		Demo Old Underground Storm	5 days	Mon 5/20/24	Fri 5/24/24
52		Underground Water, Sanitary, Electric, A	10 days	Mon 5/27/24	Fri 6/7/24
53		Excavation for Footings	3 days	Mon 6/10/24	Wed 6/12/24
54		Form & Pour Footings & Foundations	10 days	Thu 6/13/24	Wed 6/26/24
55		Backfill Foundation	2 days	Thu 6/27/24	Fri 6/28/24
56		Mud Mat	3 days	Thu 6/27/24	Mon 7/1/24
57		New Underground MEP	10 days	Fri 7/5/24	Thu 7/18/24
58		Set Building	5 days	Mon 7/29/24	Fri 8/2/24
59		Final Connections (Vesta)	5 days	Mon 8/5/24	Fri 8/9/24
60		MEP Final Connections	10 days	Mon 8/12/24	Fri 8/23/24
61		Low Voltage & Fire Alarm Install	10 days	Mon 8/12/24	Fri 8/23/24
62		Gas Main Overhead in Corridor	8 days	Mon 8/19/24	Wed 8/28/24
63		Lockers, VDBs, Signage	10 days	Fri 8/23/24	Thu 9/5/24
64		Finish Acoustical Ceilings	5 days	Thu 8/29/24	Wed 9/4/24
65		Flooring	10 days	Fri 9/6/24	Thu 9/19/24
66		Punchlist	5 days	Fri 9/20/24	Thu 9/26/24
67		Final Cleaning	5 days	Fri 9/27/24	Thu 10/3/24
68		Owner Move In	10 days	Fri 10/4/24	Thu 10/17/24
69		Brick Fasade	20 days	Mon 8/12/24	Fri 9/6/24
70		Sidewalk & Playground Patching	10 days	Mon 9/2/24	Fri 9/13/24
71		Remove Temp Fencing	2 days	Mon 9/16/24	Tue 9/17/24
72		Seed Lawn	2 days	Wed 9/18/24	Thu 9/19/24
73		**Underground Basin Construction**	**45 days**	**Fri 6/28/24**	**Fri 8/30/24**
74		Temp Fencing	3 days	Fri 6/28/24	Tue 7/2/24
75		Excavate	2 days	Wed 7/3/24	Thu 7/4/24
76		Underground Basin	5 days	Fri 7/5/24	Thu 7/11/24
77		Backfill	2 days	Fri 7/12/24	Mon 7/15/24
78		Seed Lawn	2 days	Tue 7/16/24	Wed 7/17/24
79		Grow Grass	30 days	Thu 7/18/24	Wed 8/28/24
80		Remove Temporary Fencing	2 days	Thu 8/29/24	Fri 8/30/24



01010 SUMMARY OF WORK

01011 RELATED DOCUMENTS

1.1 Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specification Sections, apply to work specified in this section.

1.2 Information given in the Division 1 General Requirements shall supplement information given in the General and Supplementary Conditions. The most stringent provision in the General Conditions, General Requirements, Contract Drawings and Specifications shall govern the execution of any work or requirement.

01012 CONSTRUCTION MANAGER

1.1 The Christman Company is the Construction Manager. Wherever the term General Contractor or Contractor (in the context of the General Contractor) is used, it shall be given the same meaning as Construction Manager.

1.2 The Trade Contractor and his sub-Trade Contractors shall agree to and accept the same responsibility and follow the same terms of the Conditions of the Contract as the Construction Manager for the work for which he is under contract.

01013 PROJECT

1.1 The Work as defined in the General Conditions and described in the Contract Document.

01014 RELATED WORK NOT-IN-CONTRACT (NIC)

1.1 Reference Section 00210 for any work that will be performed by the Owner or accomplished under separate contract.

01015 REPLACEMENT MATERIAL (For Owner's future use)

1.1 If any specific amounts are called for in the individual Sections, provide the specified amounts. If none are specified and a surplus is left, request instructions from the Construction Manager before discarding the surplus.

01016 LABOR, MATERIALS, TAXES & WORKMANSHIP

1. LABOR AND MATERIALS

1.1 Unless otherwise specified in these Contract Documents, all materials and workmanship shall be new and of the best grade of their respective kind for the purpose.

1.2 Unless otherwise specifically provided in the Contract Documents, the Trade Contractor shall provide and pay for all labor, materials, equipment, tools, construction equipment and machinery, transportation, and other facilities and services necessary for the proper execution and completion of the Work.

1.3 The Trade Contractor shall at all times enforce strict discipline and good order among his

employees and shall not employ on the Work any unfit person or anyone not skilled in the task assigned to him.

2. TAXES

2.1 Unless tax exempt status is specifically noted, it is understood that the bid prices stated shall include all applicable Federal, State or other Governmental division taxes and assessments. Also, all contributions for unemployment compensation, health and welfare, old age benefits or other purposes now or hereafter effective during the term of the contract, and the Owner and Construction Manager shall not be liable for any additional charges therefore.

01017 CRITICAL PHASING & STAGES OF CONSTRUCTION

1. INTRODUCTION

1.1 Critical phasing and critical stages of construction have been established herein for the project. It is extremely important that the "Critical Phasing & Stages of Construction" requirements be understood and complied with.

1.2 The Construction Manager shall coordinate detailed critical phasing and sequencing and scheduling with the Owner's representative.

1.3 The Construction Manager shall provide overall scheduling and coordination for the entire project. All Trade Contractors shall acknowledge the Construction Manager's right to establish and set up, or subsequently modify, the sequencing and scheduling of all Work on this project for the earliest completion and/or benefit to the Owner.

1.4 All Trade Contractors shall expedite the ordering and delivering of materials and equipment, etc. to meet these critical phasing and staging requirements and to make every effort possible to minimize disruption of normal building usage.

2. BID SCHEDULES

2.1 The preliminary construction schedule narrative included in the Contract Documents represents the general order and time frames for work to be followed by the Construction Manager in coordinating the project. Trade Contractors are to assume that their work will be coordinated in a manner consistent with industry practice, and the efficient coordination of all other trades. Trade Contractors recognize and accept their work may be sequenced and paced by other trades.

2.2 Please note that although the schedule defines the planned order of construction, Bidders should not assume that any assurance is given or implied as to the calendar dates associated with completion of the work of a particular contract.

2.3 All Trade Contractors and Trade Subcontractors recognize and shall accept modifications to the schedule which are reasonable, in the opinion of the Construction Manager, for the general interest of the project as a result of allowable time extensions (formally or informally approved) in any contract, and such modifications are inherent to the construction process and shall not qualify as a basis for extra compensation from the Construction Manager or Owner.

2.4 The Trade Contractor, in submitting a proposal for the work of a particular work category, agrees to commit the necessary resources to complete the work activities of that work category, within a time span not greater than the planned duration. Work included within a work category, but not specifically defined by a particular work activity, is to be accomplished in a reasonable manner in conjunction with other work of the work category, and in such a way as to avoid complication of or to delay the work of other Trade Contractors.

3. PROJECT SEQUENCING

3.1 GENERAL SEQUENCING

3.1.1 The overall project sequencing is indicated within the Preliminary Construction Schedule. Refer to Section 00200 and Section 01310.

3.2 RESTRICTIVE SEQUENCING & SCHEDULING

3.2.1 More restrictive sequencing to coordinate the Owner's on-going operations and/or for the coordination of the various trades shall be identified in Section 00210 SPECIAL PROVISIONS or as otherwise directed by the Construction Manager; All Trade Contractors agree to cooperate and alter their operations to maintain these more specified restrictions and sequences of the work.

3.3 SPECIFIC PROJECT REQUIREMENTS

3.3.1. Refer to the work category description and Section 00210 for specific information on scheduling requirements.

4. MUTUAL COOPERATION

4.1. Mutual cooperation between the Owner, the Architect, the Construction Manager, and the Trade Contractors to coordinate these construction and building operation requirements is anticipated and expected.

01018 USE OF SITE

1.1 Trade Contractor shall limit his use of the premises for his work and for storage to allow for (I) work by other Trade Contractors; (ii) Owner occupancy; and (iii) public use.

1.2 Limitations on site usage as well as specified requirements that impact site utilization are indicated on the drawings and by other contract documents. In addition to these limitations and requirements, the Construction Manager will administer allocation of available space equitably among entities needing both access and space so as to produce the best overall efficiency in performance as the total work of the project. Schedule deliveries so as to minimize space and time requirements for storage of materials and equipment on site.

1.3 ACCESS TO SITE

Use of Site: Limit use of Project site to areas within the Contract limits indicated. Do not disturb portions of Project site beyond areas in which the Work is indicated.

1.4 Trade Contractor shall assume full responsibility for the protection and safekeeping of products under his contract, stored on the site.

1.5 Move any stored products, under Trade Contractor's control, which interfere with operations of the Owner or separate Contractor.

1.6 Obtain and pay for the use of additional storage or work areas needed for operations.

1.7 Nonsmoking Property: Tobacco is not permitted on Lansing School District property.

01019 OWNER'S RIGHT TO OCCUPY

1.1 The Owner, at his election, may from time to time occupy any parts of the project as the work in connection therewith is completed to such a degree as will, in the opinion of the Owner, permit

of their use for the purposes for which they are intended. The Owner will, prior to any such partial occupancy, give notice to the Construction Manager thereof and such occupancy shall be based upon the following:

a. Such occupancy shall not constitute an acceptance of work not performed in accordance with the Contract Documents or relieve Trade Contractors of liability to perform any work required by their Contract but not completed at the time of occupancy.

b. Trade Contractors shall be relieved of all maintenance costs on the units or parts occupied under this agreement.

c. Owner shall assume the risk of loss with respect to any unit or part occupied under the terms of this agreement.

d. The Trade Contractor shall not be required to furnish heat, light and water or other such services used in the units or parts occupied, without proper re-numeration therefore.

END OF SECTION

01019 CONTRACT CONSIDERATIONS

SECTION INCLUDES:

1.1 Inspection and Testing Allowance

1.2 Schedule of Values

1.3 Application for Payment

1.4 Change Procedures

1.1 INSPECTION & TESTING ALLOWANCES

If inspection and testing allowances have been assigned to the Trade Contractors, the following shall apply:

1.1.1 Costs included in allowances

a. Cost of engaging an inspection or testing firm, execution of inspection or tests, reporting results.

1.1.2 Costs not included in the allowance:

a. Incidental labor and facilities required to assist inspection or testing firm.

b. Costs of testing laboratory services required by Contractor separate from Contract Document requirements.

c. Costs of retesting upon failure of previous tests as determined by Architect-Engineer.

1.1.3 Payment Procedures:

a. Submit one copy of the inspection or testing firm's invoice with next application for payment.

b. Pay invoice on approval by Architect-Engineer.

1.1.4 Funds will be drawn from inspection and testing allowances only by Change Order.

1.2 SCHEDULE OF VALUES

1.2.1 Submit schedule through Contractor's Trade Contractor Portal. Application for Payments cannot be processed until Schedule of Values is approved. Without prior approval of the Construction Manager, **no single line item can exceed $100,000. Unless indicated otherwise, allowances and change orders must be listed as separate line items.**

The schedule of values must be itemized as follows:

1.2.2 Format: Unless instructed otherwise, utilize the Table of Contents of this Project Manual. Identify each line item with number and title of the major specification Section. Identify bonds, insurance, and permits separately.

1.2.3 Allowances should be added as individual line items for each section in the Schedule of Values.

1.2.4 Include within each line item, a directly proportional amount of Contractor's overhead and profit.

1.2.5 Approved Change Orders will automatically be added as a line item in the Schedule of

Values through the Trade Contractor Portal.

1.3 APPLICATIONS FOR PAYMENT

1.3.1 Pay Applications are to be created and submitted through the Trade Contractor Portal which conforms to the AIA G702 Form. The Trade Contractor Portal is the exclusive method of submitting a payment application.

1.3.2 Payment Period: First of month to first of month unless agreed to otherwise.

1.3.3 Waiver of liens and Sworn Statements shall accompany all Payment Requests unless agreed to otherwise. Also to be produced and submitted through the Trade Contractor Portal.

1.4 CHANGE PROCEDURES

1.4.1 The Architect-Engineer will advise of minor changes in the Work not involving an adjustment to Contract Sum/Price or Contract Time as authorized by AIA A201, 1987 Edition, Paragraph 7.4.

1.4.2 The Architect-Engineer may issue a change management document which includes a detailed description of a proposed change with supplementary or revised Drawings and Specifications, a change in Contract Time for executing the change with a stipulation of any overtime work required and the period of time during which the requested price will be considered valid. Contractor will prepare and submit an estimate within five (5) calendar days.

1.4.3 The Contractor may propose a change by submitting request for change to the Architect-Engineer, describing the proposed change and its full effect on the Work. Include a statement describing the reason for the change, and the effect on the Contract Sum/Price and Contract Time with full documentation and a statement describing the effect on Work by separate or other contractors. Document any requested substitutions in accordance with Sections 01600 and 01600A.

1.4.4 Stipulated Sum/Price Change Order: Based on change management document and Contractor's fixed price quotation; or, Contractor's request for a Change Order as approved by Architect-Engineer.

1.4.5 Unit Price Change Order: For pre-determined unit prices and quantities, the Change Order will be executed on a fixed unit price basis. For unit costs or quantities of units of work, which are not pre-determined, execute Work under a change management document. Changes in Contract sum/Price or Contract Time will be computed as specified for Time and Material Change Order.

1.4.6 Change Management Document: Architect-Engineer may issue a change authorization signed by the Owner, instructing the Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order. Document will describe changes in the Work, and designate method of determining any change in Contract Sum/Price or Contract Time. Promptly execute the change.

1.4.7 Time and Material Change Order: Submit itemized account and supporting data after completion of change, within time limits indicated in the Conditions of the Contract. Architect-Engineer will determine the change allowable in Contract Sum/Price and Contract Time as provided in the Contract Documents.

a. Maintain detailed records of work done on Time and Material basis. Provide full information required for evaluation of proposed changes, and to substantiate

costs for changes in the Work.

b. Execution of Change Orders: Architect-Engineer will issue Change Orders for signatures of parties as provided in the Conditions of the Contract.

c. Overhead and Profit: Overhead and Profit shall include the following:

d. Supervision, Superintendents, Commercial General Liability and Umbrella Insurances, Wage of Time Keepers, Watchmen and Clerks, Small tools with material value of less than $1,500.00, Incidentals, General Office Expense, and all other expenses not included in Labor Rates. The percentage fee for Overhead and Profit on the Contractor's own work shall be 15% of net cost. The percentage fee for Overhead and Profit on Subcontractor's work shall be 5%.

END OF SECTION

01020 ALLOWANCES

1. GENERAL

1.1 Allowances will be established as directed in the Work Category Descriptions and are required to be included within the Trade Contractor's base bid. The amount included is an actual cost and does not include overhead and profit. Overhead and profit shall be included in the Trade Contractor's base bid, not in the allowance. Charges against the allowances will be at the Trade Contractor's net rate without overhead and profit as it is already included in the Contractor's base bid. These allowances are set up to be used only when authorized by the Construction Manager. Labor charged against the allowances will be in accordance with mutually accepted labor rates listed in each Trade Contractor's respective contract. Work expended by use of the allowances may be billed for each month in the Trade Contractor's monthly billing provided proper documentation and allowance authorizations are provided. In the event a balance remains within a specific allowance at the end of the project, a change order will be issued deducting the balance remaining in the allowance from the Trade Contractor's contract. All savings as a result of the Trade Contractor's non-use of these allowances will be the Owner’s.

END OF SECTION

01030 SPECIAL PROJECT PROCEDURES

01031 ALTERATIONS

1.1 ASBESTOS ADVISORY

1.1.1 All asbestos contaminated materials shall be removed by the Owner.

1.2 NON-ABATEMENT TRADE CONTRACTOR RESPONSIBILITIES

1.2.1 Some areas of this project may contain asbestos in some locations. The Owner will attempt to remove or encapsulate all known asbestos prior to the start of renovations. This section contains the asbestos related requirements of all Trade Contractors working on this project.

1.3 GENERAL REQUIREMENTS

1.3.1 All Federal, State and local laws, rules, regulations and ordinances for asbestos related work shall be adhered to, including but not limited to, OSHA, MIOSHA, EPA and DEQ.

1.3.2 All Non-Abatement Trade Contractors working around asbestos containing materials are to have a minimum of 2-hours of awareness training on the health and safety aspects of asbestos.

1.3.3 All Non-Abatement Trade Contractors involved with the disturbance of Category I non-friable asbestos (roof felts, floor tile, transit chimney, etc.) are required to have all workers receive a minimum of 8-hours "hands-on" OSHA approved training prior to beginning work.

1.3.4 In addition a Non-Abatement Trade Contractor involved with the removal of Category I non-friable asbestos will have at least one on-site worker, employed by the Non-Abatement Trade Contractor, who has successfully completed an asbestos "Supervisor" course and received accreditation. The course shall meet the criteria of EPA's Model Accreditation Plan (40CFR Part 763) for Supervisor or its equivalent.

1.3.5 Documentation of said training must be posted at the job site during the removal of asbestos containing material(s), disposal, and/or handling.

1.3.6 Monitoring will be conducted pursuant to OSHA regulation 29 CFR 1926.1101.

1.3.7 **THE NON-ABATEMENT TRADE CONTRACTOR IS TO STOP WORK AND NOTIFY THE CONSTRUCTION MANAGER ANY TIME SUSPECTED ASBESTOS CONTAINING MATERIALS ARE ENCOUNTERED BY ANY OF HIS/HER WORKERS.**

1.3.8 All Non-Abatement Trade Contractors that will be removing Category I non-friable asbestos containing materials are to contact the Owner who will arrange and pay for the Environmental Consultant to provide air monitoring services.

1.4 EXCLUSIONARY STATEMENT FOR BUILDING CONSTRUCTION/RENOVATION MATERIALS

1.4.1 All building materials/products used for renovations or replacement purposes are to be asbestos and lead-free. Asbestos and lead-free is to be defined as materials that contain 0% asbestos or lead. All Contractors are to be prepared to submit data, for a building

material/product that he/she is proposing or required to use, to verify the absence of asbestos and lead.

1.4.2 The Non-Abatement Trade Contractors are to complete and sign the form titled "Exclusionary Statement for Building Construction/Renovation Materials".

1.5 NOTIFICATION

1.5.1 All Non-Abatement Trade Contractors that are required to remove Category I non-friable asbestos are to fill out and submit to the Michigan Department of Natural Resources, the "**NOTIFICATION OF INTENT TO RENOVATE/DEMOLISH**", in accordance with the Asbestos National Emission Standards for Hazardous Air Pollutants (NESHAP) and the Department of Labor and Economic Growth (DLEG).

END OF SECTION

01040 COORDINATION

01041 GENERAL

1.1 The Construction Manager is ultimately responsible for coordination to complete all work shown on the drawings and specified herein independent of the location of the work on drawings and within the specifications. The arrangement of work within the specifications into Divisions and Sections shall be considered as given for convenience of reference only and shall not be held to conform to jurisdictional rules which may prevail in any particular trade. It shall be the responsibility of the Construction Manager to so arrange or group items of work under a particular trade to conform with the prevailing customs of that trade and best interest of the Owner.

01042 GENERAL INSTALLATION PROVISIONS

1.1 PRE-INSTALLATION CONFERENCES: The Construction Manager shall hold pre-installation meeting at the project site well before installation of each unit of work, which requires coordination with other work. Installer and representatives of the manufacturers and fabricators who are involved in or affected by that unit of work, and with its coordination or interpretation with other work that has preceded or will follow shall attend this meeting. The Construction Manager will advise the Architect/Engineer of scheduled meeting dates.

a. The Construction Manager shall record significant discussions of each conference, and record agreements and disagreements, along with the final plan of action. The Construction Manager shall then distribute the record of meeting promptly to everyone concerned, including the Owner and Architect/Engineer.

b. Do not proceed with the work if the pre-installation conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the work and reconvene pre-installation conference at the earliest possible date.

1.2 Installer's Inspection of Conditions: Require the installer of each major unit of work to inspect the substrate to receive work and conditions under which the work is to be performed. The installer shall report all unsatisfactory conditions in writing to the Construction Manager. Do not proceed with the work until unsatisfactory conditions have been corrected in a manner acceptable to the installer.

1.3 Coordinate enclosure of the work with required inspections and tests so as to minimize the necessity of uncovering work for that purpose.

1.4 Mounting Heights: Where mounting heights are not indicated. Refer to the Construction Manager for decision. Products installed at a location not indicated or approved by the Architect or Construction Manager shall be relocated at the Trade Contractor's expense.

01043 COORDINATION OF PERMANENT UTILITY CONNECTIONS

1.1 New utility connections shall be coordinated with local utilities and the Project Superintendent.

01044 MECHANICAL & ELECTRICAL COORDINATION

1.1 All Trade Contractors shall make arrangements with the Construction Manager before connecting to existing facilities. If interruption of service is required, it shall be done at the convenience of the Owner as scheduled by the Construction Manager / General Contractor.

END OF SECTION

01045 CUTTING AND PATCHING

1. GENERAL

1.1 RELATED DOCUMENTS

Drawing and general provisions of contract, including General and Supplementary Conditions and other Division 1 Specification sections apply to work of this Section.

1.2 DESCRIPTION OF REQUIREMENTS

1.2.1 Definition: "Cutting and patching" includes cutting into existing construction to provide for the installation or performance of other work and subsequent fitting and patching required to restore surfaces to their original condition.

a. "Cutting and patching" is performed for coordination of the work, to uncover work for access or inspection, to obtain samples for testing, to permit alterations to be performed or for other similar purposes.

1.3 RELATED WORK SPECIFIED ELSEWHERE

1.3.1 Refer to mechanical and electrical specifications sections for additional requirements and limitations on cutting and patching of mechanical and electrical work.

1.4 QUALITY ASSURANCE

1.4.1 Requirements for Structural Work: Do not cut and patch structural work in a manner that would result in a reduction of load-carrying capacity or of load-deflection ratio.

a. Before cutting and patching the following categories of work, obtain the Construction Manager's approval to proceed:

- Structural Steel - Miscellaneous structural metals, including lintels, equipment supports, stair systems and similar categories of work.
- Structural Concrete - Foundation construction, Retaining walls, Structural decking, Exterior wall construction, Piping, ductwork, vessels and equipment. Reinforcing steel shall not be heated to bend or reshape a bar.

b. Visual Requirements: Do not cut and patch work exposed on the building's exterior or in it's occupied spaces, in a manner that would, in the Architect/Engineer's opinion, result in lessening the building's aesthetic qualities. Do not cut and patch work in a manner that would result in substantial visual evidence of cut and patch work. Remove and replace work judged by the Architect/ Engineer to be cut and patched in a visually unsatisfactory manner.

2. PRODUCTS

2.1 MATERIALS

2.1.1 General: Use materials for cutting and patching that are identical to existing materials. If identical materials are not available, or cannot be used, use materials that match existing adjacent surfaces to the fullest extent possible with regard to visual effect. Use materials for cutting and patching that will result in equal-or-better performance characteristics.

3. EXECUTION

3.1 INSPECTION

3.1.1 Inspect existing conditions of the project, including elements subject to damage or to movement during cutting and patching.

3.1.2 After uncovering work, inspect the conditions affecting the installation of products or performance of the work.

3.1.3 Report unsatisfactory or questionable conditions to the Construction Manager in writing; do not proceed with the work until the Construction Manager has provided further instructions.

3.2 PREPARATION

3.2.1 Provide adequate temporary support as necessary to assure the structural value or integrity of the affected portion of the work.

3.2.2 Provide devices and methods to protect other portions of the project from damage.

3.2.3 Provide protection from the elements for that portion of the project, which may be exposed by cutting and patching work, and maintain excavations free from water.

3.3 PERFORMANCE

3.3.1 Execute cutting and demolition by methods which will prevent damage to other work, and will provide proper surfaces to receive installation or repairs. Cutting and patching shall be performed by individuals certified, licensed, or otherwise qualified as experienced and with sufficient training to perform the required task.

3.3.2 Execute excavating and backfilling by methods which will prevent settlement or damage to other work.

3.3.3 Execute fitting and adjustment of products to provide a finished installation to comply with specified products, functions, tolerances and finishes.

3.3.4 Restore work which has been cut or removed; install new products to provide complete work in accord with requirements of Contract Documents.

3.3.5 Fit work airtight to pipes, sleeves, ducts, conduit and other penetrations through surfaces.

3.3.6 Refinish entire surfaces as necessary to provide an even finish to match adjacent finishes.

3.3.7 For continuous surfaces refinish to nearest intersection. For an assembly, refinish the entire unit.

3.4 CLEANING

3.4.1 Thoroughly clean areas and spaces where work is performed or used as access to work. Remove completely paint, mortar, oils, putty and items of similar nature. Thoroughly clean piping, conduit and similar features before painting or other finishing is applied. Restore damaged pipe covering to its original condition.

4. CUTTING & PATCHING FOR MECHANICAL WORK

4.1 The Mechanical Contractor shall be responsible for all cutting, core drilling, and patching for their work. Cutting and patching shall be performed by individuals certified, licensed, or otherwise qualified as experienced and with sufficient training to perform the required task.

4.2 The Mechanical Contractor shall be responsible for the accurate location of all openings necessary for the installation of the mechanical work. Any additional openings required to move his work due to an error in the initial layout shall be made at the expense of the Mechanical Contractor.

5. CUTTING & PATCHING FOR ELECTRICAL WORK

5.1 The Electrical Contractor shall be responsible for all cutting, core drilling, and patching for their work. Cutting and patching shall be performed by individuals certified, licensed, or otherwise qualified as experienced and with sufficient training to perform the required task.

5.2 The Electrical Contractor shall be responsible for the accurate location of all openings necessary for the installation of the electrical work. Any additional openings required to move his work due to an error in the initial layout shall be made at the expense of the Electrical Contractor.

END OF SECTION

01050 FIELD ENGINEERING

01051 LAYOUT

1.1 Under the supervision and with the assistance of the Construction Manager, each Trade Contractor will be responsible for the layout of his particular portion of the work. Checking of layout and any assistance provided by the Construction Manager shall in no way be construed to relieve the Trade Contractors of their responsibilities for layout dimensions, tolerances, and accuracy of their work as set forth in the Contract Documents.

1.2 Each Trade Contractor shall carefully protect monuments, stakes, and benchmarks. If destroyed or disturbed by the Trade Contractor or his employees, the cost of replacing them shall be charged against the Trade Contractor and shall be deducted from the Trade Contractor's contract amount.

1.3 Except as otherwise noted, each Trade Contractor shall obtain his own field measurements and establish lines, grades, levels, and measurements shown on the drawings, and reconcile all measurements and conditions shown on the drawings with existing conditions at site, from the site survey provided and building corner indications and ground floor elevation designated by the Construction Manager.

1.4 Before custom fabricating any materials, the Trade Contractor shall verify all dimensions of any existing and new work, and shall be responsible for their accuracy. Any differences found shall be submitted to the Architect through the Construction Manager, for consideration before proceeding with the work. No extra compensation will be permitted because of differences between actual dimensions and measurements indicated on the project drawings.

END OF SECTION

01060 REGULATORY REQUIREMENTS

01061 APPLICABLE CODES

1.1 Reference section 00210 for the list of applicable codes.

01062 WAGES, LABOR & EQUAL EMPLOYMENT OPPORTUNITY

1.1 The Trade Contractor shall provide for labor needs from the ranks of working labor locally. The Trade Contractor shall enforce the same conditions upon all Trade Subcontractors engaged by the Trade Contractor for the performance of any portion of the work.

1.2 Successful bidders shall be required to subscribe to the principles of equal opportunity in its employment practices, and shall be required to enforce the same conditions upon all Trade Subcontractors engaged by the Trade Contractor for the performance of any portion of the work.

01063 FIRE HAZARD CLASSIFICATION

1.1 Fire hazard classifications for materials as specified in the technical specification shall be those established by publication in Current Building Materials List published by Underwriters' Laboratories, Inc., or certified to by notarized affidavit from Southwest Research Institute, or other agency acceptable to the State Construction Code Commission.

1.2 Where compliances are established by publication in Building Materials List, Trade Contractor shall so represent in writing to the Construction Manager. Where compliances are to be established by affidavit, Trade Contractor shall submit properly notarized affidavit that the material has been tested in accordance with requirements of ASTM E84, ASTM E119, or other specified standard, and found to qualify for the specified classifications. Affidavit shall state the name of the testing agency. The affidavit for testing is to be certified by the manufacturer for material and by the installer for installation.

1.3 Six copies of affidavits and other representations of compliance shall be submitted to the Construction Manager at time of shop drawing or sample submittal, whichever comes first.

1.4 In addition, the Construction Manager and Trade Contractor shall have the said materials inspected upon receipt, also before installation, and shall submit upon request prior to final acceptance of project, six copies of properly notarized affidavits by the Construction Manager and Trade Contractor as to the inspection (naming the inspector and other witnesses), certifying that the materials covered by previously submitted affidavits or other representations of compliance with the requirements for specified classifications were received at the jobsite properly labeled or otherwise certified to, and said materials were installed, and in a manner to in no way harm said compliances.

2. FIRE MARSHAL AFFIDAVITS

2.1 The Conditions of the Contract and Division 1 - General Requirements, are a part of this Section.

2.2 The requirements specified hereinafter refer to compliance with Codes and Regulations of governing authorities referred to in Article 4 of the General Conditions.

2.3 Submit in triplicate, notarized affidavits for the products required as specified in the various technical sections of the specifications. Affidavits shall be submitted to the appropriate field office responsible for the project. Affidavit shall be signed and notarized, and in the following format:

AFFIDAVIT

This is to certify that, (Name of Product) which was or will be furnished to (Company making Application of Product) for (Job or Project Name and Address) is the same in all respects in content, and specifications for mixing and/or application as the specimen tested by (Name of Laboratory) on their project or test number (Test Number) dated (Date of Test).

Flame Spread _____
Fuel Contributed _____
Smoke Developed _____

END OF SECTION

01070 ABBREVIATIONS & SYMBOLS

01071 LIST OF ABBREVIATIONS

ACI	American Concrete Institute
AIA	American Institute of Architects
AISC	American Institute of Steel Construction
ANSI	American National Standards Institute
ASTM	American Society for Testing Materials
BIM	Building Information Modeling
BOCA	Building Officials and Code Administrators
ICBO	International Conference of Building Officials
LEED	Leadership in Environmental and Energy Design (if applicable)
DOT	Department of Transportation
NFPA	National Fire Protection Association
OSHA	Occupational Safety and Health Administration
SMACNA	Sheet Metal & A/C Contractors National Association
UBC	Uniform Building Code
OSHA	Occupational Safety and Health Administration

END OF SECTION

01095 REFERENCE STANDARDS AND DEFINITIONS

1.1 RELATED DOCUMENTS

a. General provisions of the Contract, including General and Supplementary Conditions, other Division 1 Specification Sections and Drawings, apply to this Section.

1.2 DEFINITIONS

a. Basic Contract definitions are included in the General Conditions and Special Conditions.

b. Indicated: The term "indicated" refers to graphic representations, notes, or schedules on the drawings, other paragraphs or schedules in the specifications, and similar requirements in the Contract Documents. Where terms such as "shown", "noted", "scheduled" and "specified" are used, it is to help the reader locate the reference; no limitation on location is intended.

c. Regulation: The term "Regulations" includes laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, as well as rules, conventions, and agreements within the construction industry that control performance of the work.

d. Furnish: The term "furnish" is used to mean "supply and deliver to the project site, ready for unloading, unpacking, assembly, installation, and similar operations."

e. Install: The term "install" is used to describe operations at project site including the actual "unloading, unpacking, assembly, erection, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations."

f. Provide: The term "provide" means "to furnish and install, complete and ready for the intended use."

g. Installer: An "Installer" is the Contractor or an entity engaged by the Contractor, either as an employee, sub-contractor, or sub-sub-contractor, for performance of a particular construction activity, including installation, erection, application, and similar operations. Installers are required to be experienced in the operations they are engaged to perform.

h. Unless otherwise indicated, the term "experienced" when used with the term "Installer" means having a minimum of 5 previous projects similar in size and scope to this project, being familiar with the precautions required, and having compiled with requirements of the authority having jurisdiction.

i. Trades: Use of titles such as "carpentry" is not intended to imply that certain construction activities must be performed by accredited or unionized individuals of a corresponding generic name, such as "carpenter". It also does not imply that requirements specified apply exclusively to tradespersons of the corresponding generic name.

j. Assignment of Specialists: Certain Sections of the Specifications require that specific construction activities shall be performed by specialists who are recognized experts in the operations to be performed. The specialists must be engaged for those activities, and assignments are requirements over which the Contractor has no choice or option. Nevertheless, the ultimate responsibility for fulfilling Contract requirements remains with

the Contractor.

This requirement shall not be interpreted to conflict with enforcement of building codes and similar regulations governing the work. It is also not intended to interfere with local trade union jurisdictional settlements and similar conventions.

k. Project Site: The space available to the Trade Contractors for performance of construction activities, either exclusively or in conjunction with others performing other work as part of the Project. The extent of the Project Site is shown on the drawings and may or may not be identical with the description of the land upon which the Project is to be built.

l. Testing Laboratories: A "testing Laboratory" is an independent entity engaged to perform specific inspections or tests, either at the Project Site or elsewhere, and to report on and, if required, to interpret results of those inspections or tests.

1.3 SPECIFICATION FORMAT AND CONTENT EXPLANATION

a. Specification Format: The Specifications are organized into Divisions and Sections based on either the Construction Specifications Institute's 16-Division format or the MASTERFORMAT sections 020000-480000.

b. Specification Content: This Specification uses certain conventions in the use of language and the intended meaning of certain terms, words, and phrases when used in particular situations or circumstances. These conventions are explained as follows:

1) Abbreviated Language: Language used in Specifications and other Contract Documents is the abbreviated type. Implied words and meanings will be appropriately interpreted. Singular words will be interpreted as plural and plural words interpreted as singular where applicable and the full context of the Contract Documents so indicates.

2) Imperative and streamlined language is used generally in the Specifications. Requirements expressed in the imperative mood are to be performed by the Contractor. At certain locations in the text, for clarity, subjective language is used to describe responsibilities that must be fulfilled indirectly by the Contractor, or by others when so noted.

3) The words "shall be" shall be included by inference wherever a colon (:) is used within a sentence or phrase.

c. Summary References: The Summary Article of each Specification Section includes references to Work Included, Related Work Specified Elsewhere, Products Furnished but not Installed by this Section, and similar phrases. These listings are provided as a guide to the Contractor to assist the Contractor in locating related information within the Specification. No guarantee regarding the absolute completeness of these references is intended or may be inferred nor shall the presence, or lack thereof, of any reference relieve the Contractor of the final responsibility for proper completion of the work.

1.4 INDUSTRY STANDARDS

a. Applicability of Standards: Except where the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents. Such standards are made a part of the Contract Documents by reference.

b. Publication Dates: Where the date of issue of a referenced standard is not specified, comply with the latest referenced standard in effect at the time of Bid Opening.

c. Conflicting Requirements: Where compliance with two or more standards is specified, and the standards establish different or conflicting requirements for minimum quantities or quality levels, refer requirements that are different, but apparently equal, and uncertainties to the Architect for a decision before proceeding.

d. Copies of Standards: Each entity engaged in construction on the Project is required to be familiar with industry standards applicable to that entity's construction activity. Copies of applicable standards are not bound with the Contract Documents.

1) Where copies of standards are needed for performance of a required construction activity, the Contractor shall obtain copies directly from the publication source and maintain these standards, for reference by the Contractor, and Architect, in a convenient location within the temporary office.

e. Abbreviations and Names: Trade association names and titles of general standards are frequently abbreviated. Where acronyms or abbreviations are used in the Project Manual, they mean the recognized name of the Trade organization, standards generating organization, authority having jurisdiction, or other entity applicable. Refer to the "Encyclopedia of Associations", published by Gale Research Company, available in most libraries.

1.5 SUBMITTALS

a. Permits, Licenses, and Certificates: For the Owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, and similar documents, correspondence, and records established in conjunction with compliance with standards and regulations bearing upon performance of the work.

PART 2 PRODUCTS

Not applicable.

PART 3 EXECUTION

Not applicable.

END OF SECTION

01100 ALTERNATES

1.1 RELATED DOCUMENTS

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to work of this Section.

1.2 DEFINITIONS

1.2.1 Voluntary and Mandatory Alternates are defined as alternate products, materials, equipment, installations or systems for the work, which may, at the Owner's option, be selected to either add to or delete from the scope of the project.

1.2.2 Alternates may, or may not, substantially change scope and general character of the work, and must not be confused with "allowances", "unit prices", "change orders", "substitutions", and other similar provisions.

1.3 COORDINATION

1.3.1 Coordinate pertinent related work and modify surrounding work as required to properly integrate the work under each Alternate, and to provide the complete construction required by the plans and specifications. Each Alternate includes all related work required to provide the work described in the individual Alternate.

1.4 DESCRIPTION OF ALTERNATES

1.4.1 Refer to Section 00210 for a description of the basic change added to or deleted from the scope of the project.

1.4.2 The Owner reserves the right to select any Alternate following submission of the bid. If selected subsequent to the award and execution of the Agreement, the Alternate will be affected by Change Order and the sole consideration shall be the price quoted in the bid.

1.4.3 Each contractor should review each alternate and include a "deduct or add" amount on the trade contract proposal form. At the end of each alternate is a summary of the Work Categories affected by the alternate.

1.4.4 RELATED DOCUMENTS

a. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification sections, apply to work of this section.

1.4.5 DESCRIPTION OF REQUIREMENTS:

a. Definition: An alternate is an amount proposed by Bidders and stated on the Bid Form that will be added to or deducted from Base Bid amount if the Owner decides to accept a corresponding change in either scope of work or in products, materials, equipment, systems or installation methods described in Contract Documents. Alternate Bid Pricing shall be firm for 90 days from date of award.

b. Coordination: Coordinate related work and modify or adjust adjacent work as required to ensure that work affected by each accepted alternate is complete and fully integrated into the project.

c. Notification: Immediately following award of Contract, prepare and distribute to each party involved, notification of the status of each alternate. Indicate whether alternates have been accepted, rejected or deferred for construction at a later date. Include a complete description of negotiated modifications to alternates, if any.

d. Schedule: A "Schedule of Alternates" is included in Section 00210. Specification sections referenced in the Schedule contain requirements for materials and methods necessary to achieve the work described under each alternate.

1) Include as part of each alternate, miscellaneous devices, appurtenances and similar items incidental to or required for a complete installation whether or not mentioned as part of the alternate.

01110 VOLUNTARY ALTERNATES

1.1 Bidding of Voluntary Alternates is encouraged. It shall be understood that Voluntary Alternates cannot be considered as a basis for determining a low bid. Contractor may only be determined low bidder based upon the Contract Documents and specified bid alternates in Section 01100.

END OF SECTION

01150 MEASUREMENT AND PAYMENTS

1.1 DESCRIPTION

This Section describes the means and methods required for payment for work performed as an extra to the Contract.

1.2 CHANGES IN THE WORK

1.2.1 The Owner and Architect reserve the right to make changes in the work without notice to sureties or in any way rendering the Contract void.

1.2.2 Changes in the work will be described in Supplemental Instruction (SI), Construction Change Directive (CCD), Bulletins, Proposal Request, or Field Orders issued by the Architect or Construction Manager in accordance with the General Conditions and the Supplementary Conditions, and with procedures described in this Section.

1.2.3 Unless specified otherwise, Bulletins and Proposal Requests are not authorization to proceed with the changes described, and Supplemental Instructions, Construction Change Directives or Field Orders countersigned by the Owner are authorization to proceed. The Trade Contractor will be authorized to proceed with extra work by an approved quotation or signed Field Order.

1.2.4 No claims for additional compensation will be considered for changes in the work unless authorization to proceed has been given by a signed Construction Change Directive**,** Field Order or a Change Order issued by the Construction Manager.

1.2.5 Promptly submit to the Construction Manager, a written detailed quotation of the additional cost, credit or statement noting no change upon the receipt of each Construction Change Directive, Bulletin or Field Order.

1.2.6 Each quotation is subject to approval of the Construction Manager, Architect and the Owner, after which a Change Order will be issued to modify each Trade Contract.

1.2.7 Regard each Construction Change Directive, Bulletin or Field Order as a complete unit and enumerate in detail as to labor, materials and related item in the quotation. Provide additional information as requested by the Construction Manager, Architect and/or Owner.

1.2.8 Proceed promptly in accordance with, and upon receipt of a Change Order. The Contract Sum will be adjusted in accordance with pricing methods described in the General Conditions or as modified by the Supplementary Conditions and as specified in the contract.

END OF SECTION

01200 PROJECT MEETINGS

01215 PRE-CONSTRUCTION SITE INSPECTION

1.1 Each Trade Contractor shall be held to have visited the site of the proposed work before submitting his proposal and to have familiarized himself with all existing conditions affecting the execution of his work in this project. No allowance or extra consideration on behalf of the Trade Contractor will subsequently be made by reason of failure to observe the site conditions, nor on behalf of any subcontractor for the same reason.

01225 PROGRESS MEETINGS

1.1 At regular intervals, the Construction Manager shall hold meetings at the jobsite with the representatives of the various Trade Contractors engaged on the project, to coordinate the progress of the work. The Construction Manager shall notify all parties required to attend, the time and place of these meetings.

1.2 The Construction Manager shall conduct and keep a written record of all such meetings, and distribute copies of them to the Architect, Owner, and all Trade Contractors interested in the matters covered.

1.3 All Trade Contractors shall furnish to the Construction Manager's Field Representative, all available information concerning the conditions and progress of their work, including manpower used on a daily basis.

END OF SECTION

01310 CONSTRUCTION SCHEDULES

1.1 EXECUTION OF THE WORK

1.2 CONSTRUCTION PLANNING

Within five (5) days after the award of each Trade Contract, all Trade Contractors shall submit the following scheduling information:

1.2.1 A Procurement Status Report, in a format acceptable to the Construction Manager, which shall itemize all material and equipment, submittal and review requirements, fabrication and delivery lead times, and delivery requirements needed to meet the Trade Contractor's schedule as well as the overall project schedule.

1.2.2 Each Trade Contractor shall submit their own detailed schedule, in a format acceptable to the Construction Manager, which incorporates: the procurement information of Article 1.1.1-above, all known interfacing of other trades, the Trade Contractor's anticipated durations, and all other information the Trade Contractor feels is necessary to identify their requirements for the Construction Manager to coordinate with the Construction Manager's direction and scheduling.

1.3 CONSTRUCTION SCHEDULING

1.3.1 A detailed Construction Schedule will be prepared with the Trade Contractor's input immediately after award of bids and submittal of the above information. Section 00200 provides the "preliminary construction schedule" which describes the approximate durations of sequence of the projects. The completion dates provided are firm and must be achieved. It is intended that all bidders agree to accept the final schedule, and acknowledge that other Trade Contractor's work is paced by, or dependent upon, the various activities being able to commence and proceed with associated activities as scheduled. The approved Construction Schedule shall be regarded as a firm contractual commitment by all parties affected therein.

1.3.2 All Trade Contractors and their Trade Subcontractors recognize and shall accept modifications to the schedule which are reasonable, in the opinion of the Construction Manager for the general interest of the project, as a result of allowable time extensions (formally or informally approved) in any contract, and such modifications are inherent to the construction process and shall not qualify as a basis for extra compensation from the Construction Manager or Owner."

1.3.3 If a CPM network schedule is used to coordinate the work of the project, start and finish dates for each work activity will be furnished to the Trade Contractor to schedule his work. Periodically, these dates will be revised to reflect changed project conditions. The Construction Manager will attempt to schedule the start of the work of any Trade Contractor on the date for the activity, and the Trade Contractor agrees to cooperate in following that direction.

1.3.4 If it is apparent that a Trade Contractor is not going to complete his work in the time allotted, said Contractor must notify the Construction Manager within five (5) days after publication of the schedule. Adjustments may be made to accommodate a Trade Contractor, if the above notification is received and it is within the dates established.

Otherwise the schedule shall be deemed accepted by all parties and become the schedule for the Trade Contractor. Each Trade Contractor will be responsible to be familiar with the schedule and how it will effect or modify his operations, including his coordination with the activities of other Trade Contractors.

1.3.5 It is expressly agreed that time is of the essence for the completion of work under his contract, and the Trade Contractor agrees to perform the work within the time and in the manner specified or within the time extensions the Owner may grant; provided, however, that the Trade Contractor may be liable for any damages suffered by the Owner due to failure of the Trade Contractor to perform the specified work within the specified time.

1.3.6 The Trade Contractor, within five (5) days after being notified to commence work, agrees to commence work in the field of such points as the Construction Manager may designate, and to continue diligently to perform the work, and to fully complete all of his work to the satisfaction of the Construction Manager and Owner. The work shall be carried to completion with utmost speed.

1.3.7 If the Trade Contractor delays progress for any reason other than those allowed by the General Conditions, and refuses to adequately man the project or to work overtime, the Construction Manager may accelerate the work of subsequent Trade Contractors and backcharge all costs to the late Trade Contractor. All direction in this regard will be given in writing to the Trade Contractor.

END OF SECTION

01370 SCHEDULE OF VALUES

1.1 REQUIREMENTS: The Christman Company requires that all Pay Applications and related information (Schedule of Values) be processed through its proprietary Trade Contractor Portal. Trade Contractor agrees to comply with the requirements of the portal. This is your only method of submitting a payment application.

1.1.1 There is No Fee associated with using the Portal.

1.1.2 This also includes Compliance related information such as the Sworn Statement, supporting Waivers, and Insurance Certificates.

END OF SECTION

01400 QUALITY CONTROL

01410 TESTING LABORATORY SERVICES

1.1 TESTING LABORATORY SERVICES

1.1.1 GENERAL: All work (materials and installation procedures) as indicated in specifications, shall be tested and inspected by an independent testing and inspection agency, approved by the Architect/Engineer to provide the quality control requirements in accordance with these specifications. Results of these tests and inspections when performed in accordance with these specifications will not be disputed by either party. Failure of the Trade Contractor to provide quality control in accordance with this specification may result in the replacement of the work at the Trade Contractor's expense.

1.1.2 Owner Provided Testing – Refer to Section 00210 and work category descriptions for testing services provided by the Owner, if applicable.

1.2 TRADE CONTRACTOR'S RESPONSIBILITY

1.2.1 Unless identified otherwise, Trade Contractors are responsible for testing and/or balancing as defined in their work categories and/or designated specification sections.

1.3 TESTING & INSPECTION AGENCY RESPONSIBILITIES

1.3.1 Perform all testing and inspection of the work in accordance with these specifications. Furnish qualified personnel and sufficient equipment in a timely manner when required by the Trade Contractor and/or Architect/Engineer to perform all testing and inspection in accordance with these specifications. Provide written reports, electronically and at least one hard copy, in a timely manner of the work tested and inspected. The reports shall include complete material test results and for in place material, a sketch showing the exact location where the test was taken on the project site. The inspection and testing agency and its representatives are not authorized to revoke, alter, relax, enlarge or release any requirements of the contract documents, nor to approve or accept any portion of the work.

Work will be checked by representatives of the testing agencies as it progresses, but failure to detect any defective work or product will not in any way prevent later rejection when such defect is discovered, nor will it obligate the Owner to final acceptance. When it appears that the work or product furnished is in non-conformance with the contract documents, the representative of the testing agency will direct the attention of the Architect/Engineer and Trade Contractor to such non- conformance.

1.4 AUTHORITY OF THE ARCHITECT/ENGINEER

1.4.1 The Architect/Engineer may order from time to time additional tests and inspection beyond those required, if in his opinion, the subject work may not be meeting specification. The cost for these tests and inspections shall be born by the Trade Contractor if results indicate that work was NOT within the project specifications. The Architect/Engineer may terminate the testing and inspection agency. The Trade

Contractor shall then furnish to Construction Manager the name of an additional agency for approval. The Architect/Engineer may perform quality control tests and inspections.

END OF SECTION

Indoor Air Quality (IAQ) Management Plan - During Construction

Objective

Protect indoor air quality during construction for the safety of construction workers and for the assurance of a high quality indoor environment after building occupancy.

Plan

- Materials have been specified to minimize indoor air pollutants from material off-gassing. Subcontractors are to make every effort to meet the specified requirements for materials.
- Those materials and construction practices that do not specifically meet the requirements of the specifications, should be of the lowest toxicity available in the industry.
- For those materials and construction practices that introduce air quality concerns, use the following procedures to help prevent buildup of contaminates to the indoor environment.

Definitions

- Absorptive Materials: Gypsum board, acoustical ceiling tile and panels, carpet and carpet tile, materials containing/wrapped in fabrics, fibrous insulation/materials and other materials containing materials with similar absorptive characteristics.
- Contaminants: Gases (i.e. carbon monoxide, acetylene), paint, sealants and coating vapors, regulated pollutants, airborne mold and mildew, products that emit volatile organic compounds during installation, drying, or curing.
- Particulates: Dust, dirt, smoke, concrete dust, masonry dust, drywall dust, wood dust, silica, fiberglass and other airborne solid matter.

HVAC Protection

- Mechanical systems protection – all ductwork not being worked on should be covered to prevent the infiltration of particulate matter. Care should also be given to protect ductwork from collection of particulate matter during delivery to the site. All mechanical equipment that has openings where particulate matter could enter, should be covered at all times.
- If possible, avoid using permanently installed air handlers for temporary heating/cooling during construction – particularly during demolition.
- Do not store construction or waste materials in the mechanical room.
- Use temporary filtration media during construction to protect HVAC at each return air grille; filtration media shall have a Minimum Efficiency Reporting Value (MERV) of 8 as determined by ASHRAE 52.2 – 1999. Isolate the return side of the HVAC system from the surrounding environment as much as possible. Return side shall have the heaviest work areas dampered off and all return system openings sealed with plastic. Return side shall be shut down whenever possible during heavy construction and demolition.
- When the system is off, all supply ducts, equipment and openings should be sealed with plastic for further protection.
- Provide continuous ventilation rate of one air change per hour minimum during construction. Provide additional ventilation as may be necessary to protect workers' health and avoid the accumulation of volatile compounds, dust and other harmful airborne contamination.

- Filtration media must have a Minimum Efficiency Reporting Value (MERV) of 8.
- Maintain a list, and cut sheet, of each air filter used during construction and at the end of construction. Include the MERV value, manufacturer name and model number.

Source Control

- Subcontractors to use low emitting products as specified. When limited resources are available, materials should be used that have the low toxicity emissions available.
- Use electrically powered equipment when feasible and switch from diesel to bottled gas for equipment such as generators or fork lifts.
- High levels of contaminant odor generated during removal of contaminated soils - consult Construction Manager and testing consultant upon first discovery of a contaminant odor. Respirators may need to be worn.
- Gaseous vapors generated during temporary heating operations – contractors to utilize explosive gas detectors that detect harmful levels of carbon monoxide, propane, natural gas, and smoke. Use electric or steam heaters for temporary heat when possible.
- Concrete floor sealing, block sealing and waterproofing - utilize fans, open windows, and respirators.
- Other- Allow sufficient time for dissipation of odor after installation of materials with elevated concentrations of VOC's and other moisture related/containing materials (i.e. fluid applied coatings, adhesives).
- Exhaust pollution sources to the outside through an available exhaust system or portable fan vented to the outside. Depending on the nature of the material and the location of the exhaust, special filtration may or may not be necessary.
- If exhausting the pollution sources is not feasible, the use of a portable air cleaner may be effective.

Pathway Interruption

- Erect barriers to contain the construction area. The barriers should be selected based upon the worst case contributor to dust or odor escaping from the site.
- Locate trash dumpsters, recycling centers and pollutions sources at reasonable distances from the site, so as not to affect the air quality of the surrounding areas.
- Depending on the weather conditions, ventilate using 100% outside air to exhaust contaminated air directly to the outside during installation of VOC-emitting materials.
- Depressurize the work area allowing the air pressure differential between construction and clean areas to contain dust and odors.

Housekeeping

- Isolate areas with high particulate concentration using solid physical barriers from floor to ceiling (plastic sheeting or similar).
- Asbestos abatement- A certified abatement firm and testing consultant will be hired to handle these situations. No trades are to be present in areas while abatement activities are taking place. Areas being abated shall be separated from trades/Owner occupants by a solid physical barrier.
- Control dust and particulate concentration with wetting agents or sweeping compounds.

- If vacuum cleaners are being used for cleaning activities, use high efficiency particulate air filters in them.
- Remove spills of high VOC-emitting materials immediately.
- Use low-toxic cleaning supplies for surfaces, equipment and worker's personal use.
- Do not allow water to accumulate in the building envelope or anywhere on-site. Take care to remove the accumulated water as soon as possible and disinfect the area if necessary.
- Do not install any building materials that have become wet. If building materials do become wet then dry the materials out completely before they are covered up. Failure to do this will result in harmful mold growth which will be very expensive to remediate after the fact.
- When performing sanding operations for gypsum board assemblies, provide the following protection:

    1. Isolate the space
    2. Provide plastic sheet separation during sanding
    3. Close and seal all air system devices and ductwork
    4. Sequence construction to avoid contamination of other spaces with gypsum dust
    5. Provide worker protection

Scheduling

- Consult manufacturers for appropriate dry out times of materials prior to arrival on site. Factory aging of materials with strong odor emissions should be considered prior to delivery of materials on-site.
- Absorptive materials should be sequenced to arrive on-site when moisture and humidity levels are at acceptable levels based upon manufacturer's written/acceptable requirements.
- Products that do not meet the specified requirements, due to limited availability of materials, should be stored in dry, well ventilated areas for odor dissipation (off-gassing/conditioning).
- If absorbent materials must be stored in high humidity on site, protect absorbent materials with an impermeable moisture barrier, preferably a barrier containing recycled content.
- Upon completion of construction, replace all filtration media immediately prior to occupancy.
- After construction ends consideration should be given for conducting a baseline indoor air quality testing procedure for the affected space in the building.

Building Flush Out

- The Construction Manager, with the help of the Mechanical and Controls Contractors, will conduct a building flush out with new filtration media at 100% outside air after construction ends and prior to testing. The building flush out shall comply with the latest LEED requirements for the *Construction IAQ Management Plan – Before Occupancy*

Management & Enforcement of Plan

Construction Manager:

Superintendent shall give a copy of this plan to all subcontractors and shall reinforce the requirements of this plan on a daily basis and reserves the right to modify or change the plan at his or her discretion based on the current safety situation of the site. A testing consultant will be hired to monitor and report

air contaminants and ventilation effectiveness at the discretion of the Superintendent. Project Engineer will support Superintendent in duct protection inspections throughout building.

Photo Documentation:
The Project Superintendent or Project Engineer shall document implementation of the IAQ Plan by taking at least 6 photos on at least 3 different occasions throughout the project. These photos should show each of the IAQ strategies described in this plan.

Architect:
Review compliance with plan during weekly site visits.

Owner:
Reserves the right at any time to verify compliance and request a team meeting to review project safety goals at his/her discretion.

Resources:
These guidelines were developed through referencing the SMACNA IAQ Guidelines for Occupied Buildings under Construction and the USGBC LEED-NC for New Construction Reference Guide.

- www.smacna.org
- www.usgbc.org

01500 TEMPORARY FACILITIES

1.1 DESCRIPTION OF REQUIREMENTS

1.1.1 This section specifies requirements for temporary services and facilities, including such items as temporary utility services, temporary construction and support facilities, and project security and protection. Refer to Section 00210 for additional requirements.

1.1.2 USE CHARGES: No cost or usage charges for temporary services or facilities are chargeable to the Owner or Architect/Engineer. The Construction Manager is responsible for these charges where indicated. In all other cases the Trade Contractor requiring same is responsible for the charges incurred. Cost or use charges for temporary services or facilities will not be accepted as a basis of claims for a change order.

1.2 PROTECTION OF EXISTING FACILITIES

1.2.1 Each Trade Contractor shall provide and maintain proper shoring and bracing for existing underground utilities, sewers, and building foundations encountered during his excavation work, to protect them from collapse or other type of damage until such time as they are to be removed, incorporated into the new work, or can be properly backfilled upon completion of new work.

1.2.2 Each Trade Contractor shall provide and maintain proper shoring and bracing for existing structures and finishes encountered during the execution of his work to protect from collapse or other type of damage until such time as they are to be removed, incorporated into the new work, or can be properly backfilled upon completion of new work.

1.2.3 Each Trade Contractor shall provide and maintain temporary protection for new and existing work during the execution of his work to protect from dirt and damage. Any damage to new and/or existing work resulting from the lack of or inadequate temporary protection shall be this contractor's responsibility to restore.

01510 TEMPORARY UTILITIES

1.1 TEMPORARY ELECTRICAL POWER & LIGHTING

Unless identified otherwise, the following provisions shall apply:

1.1.1 The temporary electrical power and lighting will be installed and maintained by the Electrical Trade Contractor (WC 28). Refer to Section 00210 to verify if the Owner shall pay for all power consumed for the temporary electrical service.

1.1.2 All Trade Contractors shall obtain the power for their temporary electric requirements from the existing power source available on the site. All necessary lugs, transformers, disconnect switches, fuses, cable, posts, ground fault interrupters, etc., required for connection to the power source and distribution, including wires, cable, supports, etc., shall be provided by Trade Contractor, all as coordinated and approved by the Construction Manager. The Owner shall pay for all reasonable amounts of power consumed for the temporary electrical service. Electric heaters will not be allowed for heating temporary trailers and offices.

1.1.3 Any electrical requirements for power or lighting beyond those listed in this paragraph

shall be the responsibility of the Trade Contractor requiring them.

1.1.4 Overtime work requiring standby electricians shall be at the expense of the Trade Contractor requiring same. Installation of temporary electrical power and lighting shall be as scheduled by the Construction Manager.

1.1.5 Electric welder machines will not be allowed to be used without the express permission and approval of the Construction Manager and Owner. The Trade Contractor would have to pay for all equipment and materials required to provide the distribution and power supply if permission were granted to use electric welders, all as coordinated and approved by the Construction Manager.

1.1.6 All temporary electrical installations shall be in compliance with the latest National Electrical Code or OSHA, whichever is more stringent.

1.2 TEMPORARY HEAT

1.2.1 Unless identified otherwise, all equipment and labor for temporary heat after building enclosure shall be furnished by the Mechanical Trade Contractor (WC 27). Refer to Section 00210 to verify if energy will be supplied by the Owner when the heating equipment is connected to the existing power system.

1.3 COLD WEATHER PROTECTION

1.3.1 Unless identified otherwise, each Trade Contractor shall provide the temporary heat and protection necessary to allow his work to continue during cold weather. The building shall be considered to be enclosed when the exterior walls, roofing and temporary closures to all wall and roof openings are in place.

1.4 TEMPORARY TELEPHONE SERVICE

1.4.1 Each Trade Contractor shall provide temporary job site telephone service as required at his own expense.

1.4.2 Telephone numbers for summoning aid, such as the Police Department, the Fire Department, physicians, ambulances, and rescue squads from outside sources shall be conspicuously posted by the Construction Manager at the site of the work.

1.5 TEMPORARY POTABLE WATER SUPPLY

1.5.1 Unless identified otherwise, the Mechanical Trade Contractor (WC 27) shall furnish, install, maintain, and remove if necessary, a temporary water supply system as required. Refer to Section 00210 to verify if Owner shall pay for water usage fees when connected to the Owner's existing system.

1.6 TEMPORARY TOILET FACILITIES

1.6.1 The Construction Manager shall provide and maintain adequate toilet facilities in a clean and sanitary condition for the use of all Trade Contractors. The use of chemical toilet facilities will be permitted.

1.7 FIRST AID

1.7.1 The Trade Contractor shall provide a completely equipped first-aid kit, which shall be readily accessible at all times and shall be provided and maintained at the site of the work in a clean and orderly condition. The required number of employees who have been properly instructed shall be designated to be in charge of first aid work. At least one such employee shall be available at all times that the work is in progress.

1.8 TEMPORARY FIRE PROTECTION

1.8.1 Each Trade Contractor shall be responsible for temporary fire protection related to his own work.

1.8.2 Unless identified otherwise, The General Trades Contractor (WC 20) shall furnish fire extinguishers in accordance with OSHA, as required for the building. Each Trade Contractor shall furnish fire extinguishers in accordance with OSHA requirements when his work required additional extinguishers.

01520 CONSTRUCTION AIDS

1.1 HOISTING & SCAFFOLDING

1.1.1 All hoisting required in the performance of each Trade Contractor will be provided by that Contractor. If a crane is 125 tons or greater, or is a tower crane, only certified operators are allowed. Trade Contractor is responsible for providing required documentation of certification of operators PRIOR to start of work.

1.1.2 Each Trade Contractor shall provide his own scaffolding, which shall be in accordance with all OSHA safety requirements.

01530 BARRIERS

1.1 TEMPORARY SITE FENCE

1.1.1 The temporary site fencing will be provided by the Construction Manager unless otherwise specifically noted.

1.2 TEMPORARY BARRICADES, TRAFFIC CONTROL & TRAFFIC LIGHTS

1.2.1 Each Trade Contractor is responsible for the maintenance and replacement (when removed) of all temporary barricades, traffic control, and traffic lights. In addition, each Trade Contractor shall be responsible for installation of temporary barricades in accordance with MIOSHA requirements at openings created by that trade contractor.

01540 SECURITY

1.1 WATCHMAN

1.1.1 Unless identified otherwise, the services of a watchman will not be provided by either the Owner or the Construction Manager. Each Trade Contractor shall be responsible for, and make good any loss not covered by the Builder's Risk Insurance and shall be responsible for the associated deductible costs.

01550 ACCESS ROADS & PARKING AREAS

1.1 CONSTRUCTION PARKING

1.1.1 Refer to Section 00210 for parking requirements.

01560 SPECIAL CONTROLS

1.1 WORK INCLUDED: The work covered by this Section of the Specifications pertains to Special Controls.

1.1.1 LIMITING EXPOSURES OF WORK: Each Trade Contractor shall supervise performance of the work in such a manner and by such means which will ensure that none of the work, whether completed or in progress, will be subjected to harmful, dangerous, damaging or otherwise deleterious exposure during the construction period. Such exposures include, where applicable, but not by way of limitation the following:

- Excessive static or dynamic loading.
- Excessive internal or external pressures.
- Excessively high or low temperatures.
- Thermal shock.
- Excessively high or low humidity.
- Air contamination or pollution.
- Water or ice.
- Solvents.
- Chemicals.
- Light.
- Puncture.
- Abrasion.
- Heavy traffic.
- Soiling.
- Bacteria.
- Insect infestation.
- Combustion.
- Electrical current.
- High speed operation, improper lubrication, unusual wear or other misuse.
- Incompatible interface.
- Destructive testing.
- Misalignment.
- Excessive weathering.
- Unprotected storage.
- Improper shipping or handling.
- Theft and Vandalism.

1.2 SPECIAL CONTROLS DESCRIPTIONS

1.2.1 SPECIFICATIONS BY REFERENCE: Where reference is made in the specifications to standards of any technical society, association, governmental agency, etc., said specifications or standards shall apply and be binding as though fully repeated therein and are to be considered as a part of these specifications.

1.2.2 RELATED WORK: The contractor shall conduct his work in a manner to prevent air, water, and noise pollution by establishing adequate controls during the construction operations. All controls shall be in accordance with the applicable laws of the State of Michigan.

A. AIR POLLUTION: The open burning of combustible wastes from clearing and grubbing operations and of waste construction materials will not be permitted. The Contractor shall dispose of all such wastes at sanitary landfill(s) licensed by the Michigan Department of Natural Resources.

1) Dust Control: The contractor shall maintain all traveled areas in a safe, dust-free condition at all times. To accomplish this, the Contractor shall remove any tracked materials such as mud, dirt, etc. from construction and haul roads, furnish and apply chloride treatment to temporary roads, furnish and install temporary road patches or surfaces, or any approved methods or systems.

B. WATER POLLUTION: The contractor will be required to perform all construction operations in a manner that will conform to the requirements of Act 347, Soil Erosion and Sedimentation Control Act. Methods to be used are indicated herein (Items No. 1 thru No. 46) and referenced with numbers and symbols to the plans when special details are designated. The contractor shall also be required to perform all work in conformance with the requirements of Act 346, Inland Lakes and Streams. The permits for the construction will be obtained by the Owner, unless otherwise noted in the work category description.

C. NOISE POLLUTION: The contractor shall exercise judgment in the conduct of operations, which by nature result in excessive noise. All such operations shall be coordinated with the Construction Manager and Owner to avoid disruption to Owner operations.

D. CONSTRUCTION DEBRIS: All construction debris shall be removed from the construction site(s) at regular intervals and disposed of at sanitary landfill(s) licensed by State department having authority.

E. HOUSEKEEPING: The project work areas shall be maintained in a neat and clean condition and all debris and waste materials shall be removed from work areas on a daily basis.

1.2.3 VEHICULAR AND PEDESTRIAN TRAFFIC CONTROL: The contractor shall be responsible for providing, installing, and maintaining vehicular and pedestrian traffic control signs, lights, and barricades in conjunction with construction operations where applicable. Vehicular traffic control measures shall be in accordance with the Michigan Manual of Uniform Traffic Control Devices.

A. STREET CLOSING: No street or roadway may be closed to traffic without prior written permission of the governing body having jurisdiction over the street or roadway.

B. EXISTING TRAFFIC CONTROL SIGNS: Existing traffic control signs which conflict with construction operations may be temporarily removed. The contractor shall provide traffic control for the duration of the sign displacement and signs shall be replaced in the proper location immediately after construction

operations adjacent to the sign locations are completed.

01590 FIELD OFFICES

1.1 The Construction Manager shall maintain a temporary field office at the site, equipped with telephone, plan desk and plan files, properly heated and illuminated for his, the Architect's, and the Owner's exclusive use. Each Trade Contractor shall provide his own office as necessary. Temporary offices shall be arranged to avoid interfering with construction, and location shall be approved by the Construction Manager.

01595 SMOKING POLICY

1.1 Refer to Section 00210 for Smoking Policy. Failure to comply with this policy may result in the loss of smoking privileges for all construction personnel on the project, and/or dismissal from the site. There will be no smoking in the Construction Manager's field office.

END OF SECTION

01600 MATERIAL AND EQUIPMENT

01610 MOVING MATERIALS

1.1 If at any time it becomes necessary to move materials temporarily located on site, which is to enter into their final construction, the Trade Contractor furnishing the materials shall, when so directed by the Construction Manager, move them to another location at his own expense.

01620 STORAGE & PROTECTION

1.1 GENERAL

1.1.1 Each Trade Contractor shall use the area designated by the Construction Manager for storage of materials, etc., but shall confine this area to a minimum within Contract limits as shown on the plans. Storage beyond this area will not be permitted. Roof areas shall NOT be used for the storage of windows, removals, debris or any other construction items. Storage on the site is very limited and Trade Contractors shall provide for the bulk of materials remote from the site. Refer to Section 00210 for project specific requirements.

1.1.2 Each Trade Contractor shall provide suitable and sufficiently enclosed and covered spaces, with raised flooring, to protect materials and equipment from damage by weather or construction work.

01625 SALVAGING OF MATERIALS

1.1 GENERAL

1.1.1 If applicable, materials or equipment shown on drawing or specified herein to be salvaged but not reused, shall become the property of the Owner and each Trade Contractor shall deliver said items to location designated by the Construction Manager. All items not specified to be salvaged for reuse or delivered to the Owner, will be removed from the project site and disposed of legally.

01631 PRODUCTS AND SUBSTITUTIONS

1.1 SUMMARY

Specified Herein: General Requirements for Substitutions and Product Acceptance.

1.2 SUBSTITUTION SUBMITTALS

1.2.1 The following submittals shall be required for materials, assemblies, and component parts of assemblies where scheduled in the "Submittals" Section of Division 1, specified in the Trade Sections or required by the Construction Manager or the Architect as a condition precedent to acceptance of a proposal material, a statement of:

a. Product Certification
b. Manufacturer's review of documents and conditions of use.
c. Approval of proposed Applicator or Installer.
d. Proposal for on-site instruction.
e. Manufacturer's supervision of inspection.

1.2.2 Submittals shall be in same form as specified for Request for Acceptance of Materials described herein and, wherever practical should accompany such request.

1.2.3 Submit description of the complete system for each assembly listing all proposed components and acknowledging adjacent materials which are in contact with material or function as a part of the system.

1.2.4 Where one or more of these services are specified, they are considered to be an integral part of the new system. A proposal to delete any specified service will be considered as a reduction in Scope, subject to general conditions for changes in the work.

1.3 MODIFICATIONS

1.3.1 Letter of certification, or request for acceptance, shall indicate all modifications and clarifications to the Contract Documents, including additional instructions for installation or use, which are, in the opinion of the Manufacturer, necessary for proper performance.

1.3.2 If any of the services specified under this Section are not scheduled as a requirement but are normally recommended by the Manufacturer, notify the Construction Manager and the Architect of such recommendation.

1.3.3 Modifications and clarifications to the Contract Documents, which in the opinion of the Architect do not affect the finished quality of appearance of the Work, will be accepted, subject to the following conditions:

a. Conform to the functional intent of system design.
b. Accepted by all contracting parties, including Subcontractor and Manufacturer.
c. Include all costs in the original bid price for adjustments to the scope of the Work including the work of other trades.

1.3.4 Modification which affect the scope of the work, or the work of other trades, and for any reason can not be settled prior to bidding, will be considered under the terms of the General Conditions as Changes in the Work.

1.4 PROTECTION CERTIFICATION

1.4.1 Product certification is a statement by the manufacturer that to the best of its knowledge, the material has not failed to perform when previously used for similar purposes and under similar conditions of use.

1.4.2 Obtain and submit statements from manufacturers and fabricators of materials, assemblies and component parts of assemblies that the product as delivered conforms to their published data.

1.4.3 Obtain manufacturer's approval for all variations from published recommendations for installation, operation and conditions of use.

1.4.4 It shall be the duty of the supplier of any material on this Work to submit evidence, upon request, that his material is in compliance with the applicable codes, ordinances and standards referenced therein, in the method in which the material is used in this project.

1.5 GENERAL REQUIREMENTS FOR SUBSTITUTIONS

1.5.1 The Contract Documents indicate and call for certain articles, devices, products, fixtures, materials and work by named manufacturers. The Contract shall be based on materials and work manufactured and supplied by those named.

1.5.2 Definitions:

a. Specified Manufacturers or Materials: Those named in the Contract Documents.
b. Substitutions: Manufacturers or materials, which are not named in the Contract Documents.

1.5.3 Trade Contractor's Responsibility: Manufacturers and trade names are specified to establish a standard. The fact that a product is named does not constitute a guarantee by the Architect that the named Manufacturers have agreed to provide or to modify their product in order to meet all requirements of the Contract Documents. It is the responsibility of the Trade Contractor to obtain assurances from its suppliers that the product it proposes to use will meet all requirements of the Contract Documents. The fact that a material or Manufacturer is a substitution shall not act to either increase or decrease the Trade Contractor's responsibility for performance.

1.5.4 Substitutions During Bidding:

a. Substitutions shall be included in the proposal under the following conditions only and shall follow all requirements of "Acceptance of Substitutions". Paragraph 1.5.6.
b. When the Trade Contractor knows of another product of equal or better quality and performance, which is more readily available.
c. When the trade contractor has had unsatisfactory experience with one or more of the specified products or has reason to believe that the specified manufacturer will not provide the necessary guarantees or assume responsibility for performance.

1.5.5 Substitutions After Contract:

a. Substitutions proposed after execution of the Contract will, if approved by the Architect, be handled in accordance with Article 12 "Changes in the Work" as modified and supplemented herein. A **Request for Change** is sufficient authorization for the Trade Contractor's issuance of a purchase order.
b. A change of Manufacturer or product previously approved will be considered and handled as a Change in the Work.
c. Increases in the cost of materials or Work resulting from the failure of the Trade

Contractor to issue a purchase order within the time limits stated in the specified manufacturer's original proposal shall be the sole responsibility of the Trade Contractor and shall not be grounds for a substitution or an increase in the Contract Sum.

1.5.6 Acceptance of Substitutions:

a. Substitutions will be considered for any manufacturer except where only one manufacturer is listed.

b. In all cases where substitutions are proposed by the trade contractor, it shall be the sole responsibility of the trade contractor to provide adequate data and samples as required by the Architect to evaluate the substitution.

c. Request for acceptance of substitution shall be presented not less than seven (7) days in advance of the date on which a decision by the Architect is required and shall:

1) Include all information required by this Specification.
2) State the reason for the substitution.
3) Include accurate cost data if the substitute material involves a change in the Contract Sum, or if so requested by the Architect.
4) Provide or make arrangements for the Manufacturer to provide complete data describing the proposed substitution, including samples and itemized comparison with the specified materials, and work, if requested by the Architect.

d. The Architect shall not be obliged to justify his reason for rejecting a proposed substitution.

e. In the event that a substitution is accepted conditionally on the Contractor's agreement to assume full responsibility for equality and performance, the Contract shall provide a full value warranty and agree to make good all damages resulting from the failure of the substitute product.

1.6 ACCEPTANCE OF MATERIALS AND MANUFACTURERS

1.6.1 Standard Materials:

a. Architect's acceptance applies to the Manufacturer only and shall not act to permit any deviation from other requirements of the Specifications.

b. Acceptance will be based on the Manufacturer's specifications at time of issuance of Bidding Documents. Deviations from such specifications shall be considered as a substitution.

c. Requests for acceptance shall be in tabular form stating Specification paragraph and material selected, except as otherwise provided.

d. Shop Drawings shall not indicate any material for which acceptance has not been received, unless accompanied by a separate request for approval. In no case shall Architect's review and return of Shop Drawings constitute and acceptance of

either specified or substitute manufacturers or materials.

1.6.2 Special Materials

a. Special materials are materials, which are specified as requiring supervision or technical services by the manufacturer for proper installation.

b. Request for acceptance of special materials shall include a letter from the manufacturer which letter shall contain all information required hereinafter.

1.6.3 Materials Involving Supplementary Warranty or Maintenance Contract:

a. These materials shall be submitted as a request for acceptance over the signature of a qualified technical representative in the direct employment of the manufacturer or such other person as the manufacturer may authorize in writing. Request for acceptance shall contain the following information:

1) Name of project.
2) Name of Contractor, Subcontractor or other party to whom material is furnished.
3) Reference to Specification Section and Article where material is specified and other Contract Documents necessary for identification.
4) Statement of acceptance of documents, conditions, and performance requirements.
   i. Statement that documents as issued are in accordance with manufacturer's recommendations for use of specified materials, or
   ii. Recommended modification of detail, use, application or for substitution of different product by same manufacturer as being more suitable for the performance requirements of the warranty.
5) Statement that detailed installation instructions will be provided.
6) Extent of job site technical services, consultants or instructors proposed, if any.
7) Statement that warranty will be provided.
8) Special provisions required to keep warranty in force.

b. Requests for acceptance may be in the form of a letter including the above items and addressed to the subcontractor responsible for installation of the material, or may be according to a sample form of Material Proposal, provided by the Architect.

c. Upon receipt of the manufacturer's proposal, the subcontractor shall add his own statement agreeing to comply with the manufacturer's requirements and warranting his own workmanship.

d. The contractor shall submit letter of endorsement and copies of all documents, including letters of comment, to the Architect for approval. In the event that the request for approval recommends a change in the work, modification of detail, or substitution of material, the contractor shall indicate his concurrence with the change as being within the scope of the contract or indicate the change in the Contract Sum for making such change, or state his objections to the change.

1.7 AIR POLLUTION CONTROL

1.7.1 Request for approval of equipment, which may generate air pollutants, shall be accompanied by certification of compliance with approvals from all State and Local Air Pollution Control Authorities having jurisdiction.

1.7.2 Request shall state that manufacturer has provided all information and complied with all requirements of the above agencies including requirements for in place monitoring and measurements.

1.8 INSPECTION AND TESTING

1.8.1 In accordance with Sections of this Division applying to Laboratory Tests and Inspections, the Owner has the option to employ independent inspectors for certain portions of the Work and to have materials tested by an Independent Testing Laboratory.

1.8.2 In addition to necessary samples of materials, manufacturer shall provide information and data required by the laboratories and inspectors for the proper performance of their work.

1.8.3 Where certification by Independent Testing Laboratory is required to demonstrate compliance with a specified standard (ASTM, ANSI or similar), Laboratory Reports shall be dated not more than two years prior to submittal and shall refer to the issue of said standard current as of the issue date of the Contract Documents. Later issue or similar standards superseding the standards will be accepted subject approval by the Architect.

END OF SECTION

1700 PROJECT CLOSEOUT

1.1 DESCRIPTION OF REQUIREMENTS

1.1.1 DEFINITIONS: Project closeout is the term used to describe certain collective project requirements, indicating completion of the Work that are to be fulfilled near the end of the Contract time in preparations for final acceptance and occupancy of the Work by the Owner, as well as final payment to each Trade Contractor and the normal termination of the Contract.

a. Specific requirements for individual units of work are included in the appropriate sections in Divisions 2 through 42.

1.2 PREREQUISITES FOR SUBSTANTIAL COMPLETION

1.2.1 GENERAL: Complete the following before requesting the Construction Manager to coordinate inspections for certification of substantial completion, either for the entire Work or for portions of the Work. List known exceptions in the request.

a. In the progress payment request that coincides with, the date substantial completion is claimed, show either 100% completion for the portion of the Work claimed as "substantially complete", or list incomplete items, the value of incomplete work, and reasons for the Work being incomplete.
b. Include supporting documentation for completion as indicated in these contract documents.
c. Advise Construction Manager of pending insurance change-over requirements.
d. Submit special warranties, workmanship/maintenance bonds, maintenance agreements, final certifications, and similar documents.
e. Obtain and submit releases enabling the Owner's full, unrestricted use of the Work and access to services and utilities. Where required, include occupancy permits, operating certificates and similar releases.
f. Submit record drawings, maintenance manuals, final project photographs, damage or settlement survey, property survey, and similar final record information.
g. Deliver tools, spare parts, extra stocks of material and similar physical items to Construction Manager.
h. Make the final change-over of locks and transmit keys to the Construction Manager. Advise the Construction Manager's personnel of the change over in security provisions.
i. Complete start up testing of systems, and instruction of the Owner's operating and maintenance personnel. Discontinue or change over and remove temporary facilities and services from the project site, along with construction tools and facilities, mockups, and similar elements.
j. Complete final cleaning up requirements, including touch-up painting of marred surfaces.
k. Touch-up and otherwise repair and restore marred exposed finishes.
l. Submit a statement showing an accounting of change-over requirements.

1.2.2 INSPECTION PROCEDURES: Upon receipt of the Trade Contractor's request for inspection, the Architect/Engineer will either proceed with inspection or advise the Construction Manager of unfilled prerequisites.

a. Following the initial inspection, the Architect/Engineer will either prepare the certificate of substantial completion, or will advise the Construction Manager of work which must be performed before the certificate will be issued. The Architect/Engineer will repeat the inspection when requested and when assured that the Work has been substantially completed.

b. Results of the completed inspection will form the initial "punchlist" for final acceptance.

1.3 PREREQUISITES FOR FINAL ACCEPTANCE

1.3.1 GENERAL: Complete the following before requesting the Architect / Engineer's final inspection for certification of final acceptance, and final payment as required by the General Conditions. List known exceptions, if any, in the request.

a. Submit the final payment request with final releases and supporting documentation not previously submitted and accepted. Include certificates of insurance for products and completed operations where required.
b. Submit an updated final statement, accounting for final additional changes to the Contract Sum.
c. Submit a certified copy of the Architect/Engineer's final punchlist of itemized work to be completed or corrected, stating that each item has been completed or otherwise resolved for acceptance and has been endorsed and dated by the Architect/Engineer.
d. Submit consent of surety.
e. Submit a final liquidated damages settlement statement, acceptable to the Owner where applicable.
f. Submit evidence of final, continuing insurance coverage complying with insurance requirements.

1.3.2 REINSPECTION PROCEDURE: The Architect/Engineer will reinspect the Work upon receipt of the Construction Manager's notice that the work, including punchlist items resulting from earlier inspections, has been completed, except for these items whose completion has been delayed because of circumstances that are acceptable to the Architect/Engineer.

a. Upon completion of reinspection, the Architect/Engineer will either prepare a certificate of final acceptance, or will advise the Construction Manager of work that is incomplete or of obligations that have not been fulfilled, but are required for final acceptance.
b. If necessary, the reinspection procedure will be repeated.

1.4 RECORD DOCUMENT SUBMITTALS

1.4.1 GENERAL: Specific requirements for record documents are indicated in the individual sections of these specifications. Other requirements are indicated in the General Conditions. General submittal requirements are indicated in the various "submittals" sections.

a. Do not use record documents for construction purposes; protect from deterioration and loss provide access to record documents for the Architect/Engineer's reference during normal working hours.

1.4.2 Record Drawings: Maintain a record set contract drawings and shop drawings in a clean, undamaged condition. Mark up the set of record documents to show the actual installation where the installed work varies substantially from the work as originally shown. Mark whichever drawing is most capable of showing the actual "field" condition fully and accurately; however, where shop drawings are used for mark up, record a cross reference at the corresponding location on the working drawings. Give particular attention to concealed work that would be difficult to measure and record at a later date.

a. Mark record sets with red erasable pencil and, where feasible, use other colors to distinguish between variations in separate categories of work.
b. Mark up new information, which is known to be important to the Owner, but for some reason was not shown on either contract drawings or shop drawings.
c. Note related change order numbers where applicable.
d. Organize record drawing sheets into manageable sets, bind with durable paper cover sheets, and print suitable titles, dates and other identification on the cover of each set.
e. At the completion of the Trade Contractor's work, submit record sets of drawings to the Construction Manager showing all record drawing conditions.

1.4.3 RECORD SPECIFICATIONS: Maintain one complete copy of the Project Manual, including specifications addenda, bulletins, and one copy of other written constriction documents such as change orders and similar modifications issued in printed form during construction. Mark these documents to show substantial variations in the actual work performed in comparison with the text of the specifications and modifications as issued. Give particular attention to substitutions, selection of options and similar information on work where it is concealed or cannot otherwise be readily discerned at a later date by direct observation. Note related record drawing information and product data, where applicable.

a. Upon completion of the Work, submit record specifications to the Construction Manager for the Owner's records.

1.4.4 RECORD PRODUCT DATA: Maintain one copy of each product data submittal. Mark these documents to show significant variations in the actual Work performed in comparison with the submitted information. Give particular attention to concealed products and portions of the Work, which cannot otherwise be readily discerned at a later date by direct observation. Note related change orders and markup of record drawings and specifications.

a. Upon completion of mark up, submit complete sets of record product data to the Construction Manager for the Owner's records.

1.4.5 MISCELLANEOUS RECORD SUBMITTALS: Refer to other sections of the specifications for requirements of miscellaneous record keeping and submittals in connection with the actual performance of the Work. Immediately prior to the date or dates of substantial completion, complete miscellaneous records and place in good order, properly identified and bound or filed, ready for continued use and reference. Submit to Construction Manager for the Owner's records.

1.4.6 MISCELLANEOUS MANUALS; Organize operating and maintenance date into suitable sets of manageable size. Bind data into individual binders properly identified and indexed. Unless identified otherwise, bind each set of data in a heavy duty 3 ring vinyl covered binder, with pocket folders for folded sheet information. Mark the appropriate identification on both front and spine of each binder. 3-ring vinyl covered binder, with pocket folders for folded sheet information. Mark the appropriate identification on both front and spine of each binder.

a. Include the following types of information in operation and maintenance manuals:
   - Emergency instructions.
   - Spare parts listing.
   - Copies of warranties.
   - Wiring diagrams.
   - Recommended "turn around" cycles.
   - Inspection procedures.

- Shop drawings and product data.

2.1 EXECUTION

2.2 CLOSEOUT PROCEDURES

2.2.1 GENERAL OPERATING AND MAINTENANCE INSTRUCTIONS: Arrange for each installer of operating equipment and other work that requires regular or continuing maintenance, to meet at the site with the Owner's personnel to provide necessary basic instruction in the proper operation and maintenance of the entire Work. Where installers are not experienced in the required procedures, include instruction by the manufacturer's representatives.

a. As part of this instruction provide a detailed review of the following items:
   - Maintenance manuals.
   - Record documents.
   - Spare parts and materials.
   - Tools.
   - Lubricants.
   - Fuels.
   - Identification systems.
   - Control sequences.
   - Hazards.
   - Cleaning.
   - Warranties, bonds, maintenance agreements and similar continuing commitments.

b. As part of this instruction for operating equipment demonstrate the following procedures:
   - Start-up.
   - Shut down.
   - Noise and vibration adjustments.

2.3 FINAL CLEANING

2.3.1 GENERAL: Special cleaning requirements for specific units of Work are included in the appropriate sections of the specifications. General Cleaning during the regular progress of the Work is required by the General Conditions and Subcontract Agreements.

2.3.2 CLEANING: Provide final cleaning of the Work at the time indicated. Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit of work to the condition expected from a normal, commercial building cleaning and maintenance program. Comply with the manufacturer's instructions for operations.

Complete the following cleaning operations before requesting the Architect /Engineer's inspection for certification of substantial completion:

a. Remove labels which are not required as permanent labels.
b. Clean transparent materials, including mirrors and glass in doors and windows, to a polished condition. Remove substances, which are noticeable as vision obscuring materials. Replace chipped or broken glass and other damaged transparent materials.
c. Clean exposed exterior and interior hard surfaced finishes to a dust free condition, free of dust, stains, films and similar noticeable distracting substances. Leave concrete floors broom clean. Vacuum carpeted surfaces.
d. Wipe surfaces of mechanical and electrical equipment clean. Remove excess

lubrication and other substances. Clean plumbing fixtures to a sanitary condition. Clean light fixtures and lamps.

e. Clean the project site, including landscape development areas, of rubbish, litter and other foreign substances. Sweep paved areas to a broom clean condition; remove stains, spills and other foreign deposits. Rake grounds that are neither paved nor planted, to a smooth even textured surface.

2.3.3 REMOVAL OF PROTECTION: Remove temporary protection devices and facilities, which were installed during the course of the work to protect previously, completed work during remainder of the construction period.

2.3.4 COMPLIANCE: Comply with safety standards and governing regulations for cleaning operation. Do not burn waste materials at site. Do not bury debris or excess materials on Owner's property. Do not discharge volatile or other harmful or dangerous materials into drainage systems. Remove waste materials from the site and dispose of in a lawful manner.

a. Where extra materials of value remaining after completion of associated work have become Owner's property, dispose of these materials to the Owner's best advantage as directed.

END OF SECTION

01740 WARRANTIES

PART 1 - GENERAL

1.1 SUMMARY

1.1.1 Specified Herein: Warranties and continuing services required to be provided by manufacturers of materials and systems where required for proper performance.

1.1.2 The word "Guarantee" when appearing in any Contract Document or construction correspondence shall be defined as warranty in accordance with Article 3.5 of the General Conditions.

1.2 SUBMITTALS

1.2.1 Submit warranties in accordance with Article 3.5 of the General Conditions as modified by Supplementary Conditions and additional requirements specified under the individual Trade Sections.

1.2.2 Required types of warranties and additional services are scheduled and listed in the Trade Sections.

1.2.3 In all cases where "Special Warranties" or "Service Contracts" are required, the request for approval of materials will be accepted by the Owner and the Architect on the understanding that manufacturer agrees to provide the specified warranty or other service unless stated otherwise in the request.

1.2.4 The Owner will not be bound to accept any limitations or variations from the specified warranty, which were not filed with the request for acceptance and accepted prior to purchase of materials.

1.2.5 Warranties shall be submitted prior to request for payment for 100% completion in each case, shall acknowledge the responsibilities defined under Supplementary Conditions and shall include:

a. Manufacturer's warranty that all materials comply with its published standards, comply with the requirements of the Specifications and where specified, are adequate for the proposed use.
b. Subcontractor's warranty that all workmanship complies with the requirements of the Specifications and of the manufacturer.
c. Contractor's warranty covering the entire work and accepting responsibility for all limitations imposed by the manufacturer or subcontractor except where such limitations have been previously accepted by the Architect.
d. Certification and verification of previously submitted information including statement of all limitations, required maintenance and similar conditions of the warranty.

1.3 STANDARD WARRANTIES

1.3.1 A standard warranty is a warranty whose terms are essentially the same as normally

offered by the manufacturer of standard with the industry.

1.3.2 General Conditions require that standard warranties apply as a minimum requirement notwithstanding the fact that submittal of a copy of the warranty is not required.

1.3.3 Unless otherwise specified, a standard warranty shall be for a period on two (2) years from Date of Substantial Completion.

1.3.4 Contractor shall obtain and furnish to the Owner from each manufacturer of materials or equipment incorporated into the Work a warranty at least as favorable to Owner as that customarily given by such manufacturer to others. Contractor shall inform itself as to any conditions precedent to the effectiveness of each manufacturer's warranty and comply with all such conditions (or obtain waivers thereof from the manufacturer) so that such warranty shall be fully effective. If any event occurs which might invalidate any manufacturer's warranty, contractor shall promptly notify the Owner and the Architect.

1.3.5 All warranty periods shall commence on the Date of Substantial Completion except that, if it is discovered after said date that certain work or materials were not in fact in conformance with the requirements of the Contract Documents, the applicable warranty period shall re-commence from the completion of the repair or replacement of such Work to make it so conform.

1.3.6 The fact that a manufacturer's warranty differs in its terms from those of the contractor or any subcontractor, the acceptance by the Owner of any warranty of a manufacturer or subcontractor, or the fact that the Owner has claimed initially on such warranty, shall not in any way release contractor from his warranty obligations under the contract.

1.4 SPECIAL WARRANTIES

1.4.1 A special warranty is one whose terms, in addition to the standard coverage offered by the manufacturer, contain other special provisions, including:

a. Acknowledgment of specified list of items, which shall be specifically noted as being covered by the warranty.
b. Acknowledgment of specific conditions for use or exposure.
c. Extension of warranty to waive standard exceptions or to extend limits including time.
d. Requirements for specific performance by other trades including method of separation and protection from, or assurance of compatibility with, adjacent materials.
e. Assemblies and systems, which may include products of other manufacturers.
f. Conditions where certain performance criteria are specified and must be either acknowledged or actual limits are required to be determined by performance testing subject to Owner's review and acceptance.
g. Conditions where manufacturer's continuing involvement such as maintenance or advisory service is required.

1.4.2 Maintenance Service During Warranty Period:

a. Reference to routine maintenance required to be performed by the Owner during

the warranty period shall be listed in the original submittal of proposed warranty.

b. All other administration and maintenance service required during the warranty period, including installation of items repaired or replaced under the terms of the warranty shall be included in the original Contract.

1.5 SERVICE CONTRACTS

1.5.1 Required types of Service Contract Proposals are scheduled under Schedule or Required Submittals and are listed in the Trade Sections.

1.5.2 Where specified, the subcontractor or manufacturer originally supplying services and skills required for proper maintenance and agreeing to maintain availability of replacement parts and materials.

1.5.3 The Service Contract is in addition to, and independent of, the Warranty and shall not act to either extend the Warranty or to reduce the contractor's responsibilities thereunder.

1.5.4 Unless otherwise specified or agreed, Service Contracts shall be written for a period of five (5) years starting with the termination of similar services included under the warranty and shall include cancellation privilege annually when exercised at least 60 days prior to anniversary date.

1.5.5 The contractor shall:

a. Prior to submittal of manufacturer of subcontractor for approval, verify that specified service is available and will be offered.
b. Secure from the manufacturer of subcontractor a bona fide proposal to perform the specified services.
c. When so directed, assist the Architect in obtaining proposals for the performance of the specified services by other competent parties.

1.6 ADVISORY AND INSPECTION SERVICE

1.6.1 Advisory and Inspection Service consists of:

a. Periodic inspection on a regular scheduled basis. Include schedule of proposed inspections of the agreement.

b. All necessary information, including special training, where required to adequately instruct Owner's maintenance personnel in preventive maintenance repairs and treatments. If such maintenance work is recommended:

1) Obtain or submit price quotations for recommended work.

2) When so instructed by the Owner, make all necessary arrangements for the performance of the Work.

1.6.2 Parts and Materials Agreement:

a. Where standard commercially available parts of materials are suitable for maintenance or repair, inform Owner concerning trade name or description and location where they may be obtained.

b. Where parts or materials are not readily available maintain replacement stocks at a location as required to prevent undue delay in repairs or loss of use of equipment pending delivery.

1.7 MAINTENANCE SERVICE

1.7.1 A Maintenance Service Contract is an agreement that in addition to Advisory and Inspection Service, the Manufacturer will provide, or otherwise make available through his agent, a regular maintenance service program scheduled during normal working hours.

1.7.2 Proposals shall schedule proposed times for servicing and list the services to be performed.

1.7.3 Maintenance service of equipment shall be performed solely by the original Equipment Contractor and shall not be assigned or transferred to any agent or subcontractor without the approval of the Owner.

1.7.4 Repairs:

a. Permanent repairs shall be started within seven (7) days after notification by the Owner.

b. In the event that emergency and permanent repairs are not started within the specified time limits, or if the work is stopped without the Owner's consent, the Owner shall have the same options to have repairs performed by others as specified under Warranties without invalidating this agreement.

1.7.5 Equipment maintenance shall include systematic examinations, and adjustments and lubrication of all equipment. The Equipment Maintenance Contractor shall repair and replace electrical and mechanical parts whenever required using only genuine standard parts recommended or produced by the manufacturer of the equipment.

1.7.6 Addition work when so directed by the Owner shall be included under the work of the Maintenance Contract and the Contractor shall be reimbursed at the current prevailing rate for the cost of materials, labor and services. Such additional work shall include:

a. Repairs or replacement required as a result of negligence, abuse, or other actions contrary to the Equipment Contractor's operating instructions.
b. Improvement or additional equipment required by the Owner, Insurance Companies, or Governmental Authorities.
c. Except for emergency service, the additional cost for overtime work based on the difference between regular and overtime labor when the Owner requests that such work be performed outside of regular working and so authorized in writing.

1.7.7 Additional requirements for specific maintenance contracts are specified in the various Trade Sections.

1.8 EMERGENCY CALL-BACK SERVICE

1.8.1 Emergency Call-Back Service is an agreement to provide rescue and repair service on an emergency basis where required for the protection of life and property.

1.8.2 Owner's agreement to permit manufacturers to assign agreement to an agent does not relieve manufacturer of responsibility to verify that service remains available for the specified time.

1.8.3 Agreement shall remain in effect for the lifetime of all Warranties, Service Contracts and for such longer time as may be specified or agreed.

1.8.4 Service shall be available on a 24 hour, 7-day basis and shall be performed within the following time limit after notification of emergency unless otherwise specified. Maintain emergency telephone number on file with the Owner for nights and weekends.

1.9 CERTIFICATION

1.9.1 Product Certification: See Division 1, Section titled "Material and Equipment".

1.9.2 Workmanship Certification is a statement by the applicator or installer that all materials and workmanship in connection with the system have been furnished and installed in complete conformance with Contract Documents, and with the manufacturer's specifications and requirements for the particular type of use specified.

1.9.3 A product certification where specified as a requirement shall be in a form similar to the following:

> "We, the (Manufacturing Company), certify that the complete system as detailed and specified can be installed and will perform in accordance with the requirements of the specifications and the ASTM Standards referenced therein for the guarantee period of one year or such longer period as may be negotiated between the Owner and the (Manufacturing Company).
>
> Upon completion of the Project we will inspect the work and certify to the Owner that the system as installed is in accordance with the Manufacturer's requirements or indicated in writing what remedial action is necessary in order that it does so conform."

END OF SECTION

017419 CONSTRUCTION WASTE MANAGEMENT

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.

B. 017419-1 TCC Waste Management Plan

C. 017419-2 TCC LEED Misc Waste Diversion Form

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for the following:

2. Salvaging non-hazardous demolition and construction waste.
2. Disposing of non-hazardous demolition and construction waste.

B. Related Sections include the following:

2. Division 1 Section "Summary of Multiple Contracts" for coordination of responsibilities for waste management.

2. Division 1 Section "Temporary Facilities and Controls" for environmental-protection measures during construction, and location of waste containers at Project site.

2. Division 02 Section "Structure Demolition" for disposition of waste resulting from demolition of buildings, structures, and site improvements[, and for disposition of hazardous waste].

2. Division 02 Section "Selective Structure Demolition" for disposition of waste resulting from partial demolition of buildings, structures, and site improvements.

2. Division 04 Section "Unit Masonry" for disposal requirements for masonry waste.

2. Division 04 Section "Stone Masonry" for disposal requirements for excess stone and stone waste.

2. Division 31 Section "Site Clearing" for disposition of waste resulting from site clearing and removal of above- and below-grade improvements.

1.3 DEFINITIONS

A. Construction Waste: Building and site improvement materials and other solid waste resulting from construction, remodeling, renovation, or repair operations. Construction waste includes packaging.

B. Demolition Waste: Building and site improvement materials resulting from demolition or selective demolition operations.

C. Disposal: Removal off-site of demolition and construction waste and subsequent sale, recycling, reuse, or deposit in landfill or incinerator acceptable to authorities having jurisdiction.

D. Recycle: Recovery of demolition or construction waste for subsequent processing in preparation for reuse.

E. Salvage: Recovery of demolition or construction waste and subsequent sale or reuse in another facility.

F. Salvage and Reuse: Recovery of demolition or construction waste and subsequent incorporation into the Work.

1.4 PERFORMANCE REQUIREMENTS

A. General: Achieve end-of-Project rates for salvage/recycling of 75 percent by weight of total non-hazardous solid waste generated by the Work. Practice efficient waste management in the use of materials in the course of the Work. Use all reasonable means to divert construction and demolition waste from landfills and incinerators. Facilitate recycling and salvage of materials

2. Demolition Waste:

a. Asphaltic concrete paving.
b. Concrete.
c. Concrete reinforcing steel.
d. Brick.
e. Concrete masonry units.
f. Wood studs.
g. Wood joists.
h. Plywood and oriented strand board.
i. Wood paneling.
j. Wood trim.
k. Structural and miscellaneous steel.
l. Rough hardware.
m. Roofing.
n. Insulation.
o. Doors and frames.
p. Door hardware.

q. Windows.
r. Glazing.
s. Metal studs.
t. Gypsum board.
u. Acoustical tile and panels.
v. Carpet.
w. Carpet pad.
x. Demountable partitions.
y. Equipment.
z. Cabinets.
aa. Plumbing fixtures.
bb. Piping.
cc. Supports and hangers.
dd. Valves.
ee. Sprinklers.
ff. Mechanical equipment.
gg. Refrigerants.
hh. Electrical conduit.
ii. Copper wiring.
jj. Lighting fixtures.
kk. Lamps.
ll. Ballasts.
mm. Electrical devices.
nn. Switchgear and panel boards.
oo. Transformers.

2. Construction Waste:
   a. Masonry and CMU.
   b. Lumber.
   c. Wood sheet materials.
   d. Wood trim.
   e. Metals.
   f. Roofing.
   g. Insulation.
   h. Carpet and pad.
   i. Gypsum board.
   j. Piping.
   k. Electrical conduit.
   l. Packaging: Regardless of salvage/recycle goal indicated above, salvage or recycle 100 percent of the following uncontaminated packaging materials:

      1) Paper.
      2) Cardboard.
      3) Boxes.
      4) Plastic sheet and film.
      5) Polystyrene packaging.
      6) Wood crates.
      7) Plastic pails.

1.5 ACTION SUBMITTALS

A. Comply with Section 017419.1 Waste Management Project Specific Plan or submit an equally comprehensive Waste Management Plan.

1.6 QUALITY ASSURANCE

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

B. Regulatory Requirements: Comply with hauling and disposal regulations of authorities having jurisdiction.

C. Waste Management Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination." Review methods and procedures related to waste management including, but not limited to, the following:

2. Review and discuss waste management plan including responsibilities of Waste Management Coordinator.
2. Review requirements for documenting quantities of each type of waste and its disposition.
2. Review and finalize procedures for materials separation and verify availability of containers and bins needed to avoid delays.
2. Review procedures for periodic waste collection and transportation to recycling and disposal facilities.
2. Review waste management requirements for each trade.

1.7 WASTE MANAGEMENT PLAN

A. General: Comply with Section 017419.1 Waste Management Project Specific Plan in the following section, or submit an equally comprehensive Waste Management Plan.

B. Cost/Revenue Analysis: Indicate total cost of waste disposal as if there was no waste management plan and net additional cost or net savings resulting from implementing waste management plan. Include the following:

2. Total quantity of waste.
2. Estimated cost of disposal (cost per unit). Include hauling and tipping fees and cost of collection containers for each type of waste.
2. Total cost of disposal (with no waste management).
2. Revenue from salvaged materials.
2. Revenue from recycled materials.
2. Savings in hauling and tipping fees by donating materials.
2. Savings in hauling and tipping fees that are avoided.
2. Handling and transportation costs. Include cost of collection containers for each type of waste.

2. Net additional cost or net savings from waste management plan.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

1.1 PLAN IMPLEMENTATION

A. General: Implement waste management plan as approved by Construction Manager. Provide handling, containers, storage, signage, transportation, and other items as required to implement waste management plan during the entire duration of the Contract.

2. Comply with Division 1 Section "Temporary Facilities and Controls" for operation, termination, and removal requirements.

B. Waste Management Coordinator: Engage a waste management coordinator to be responsible for implementing, monitoring, and reporting status of waste management work plan.

C. Training: Train workers, subcontractors, and suppliers on proper waste management procedures, as appropriate for the Work occurring at Project site.

2. Distribute waste management plan to everyone concerned within three days of submittal return.
2. Distribute waste management plan to entities when they first begin work on-site. Review plan procedures and locations established for salvage, recycling, and disposal.

D. Site Access and Temporary Controls: Conduct waste management operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.

2. Designate and label specific areas on Project site necessary for separating materials that are to be salvaged, recycled, reused, donated, and sold.
2. Comply with Division 1 Section "Temporary Facilities and Controls" for controlling dust and dirt, environmental protection, and noise control.

1.2 SALVAGING DEMOLITION WASTE

A. Salvaged Items for Reuse in the Work:

2. Clean salvaged items.
2. Pack or crate items after cleaning. Identify contents of containers.
2. Store items in a secure area until installation.
2. Protect items from damage during transport and storage.

2. Install salvaged items to comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make items functional for use indicated.

B. Salvaged Items for Sale and Donation: Not permitted on Project site.

C. Salvaged Items for Owner's Use:

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

D. Doors and Hardware: Brace open end of door frames. Except for removing door closers, leave door hardware attached to doors.

E. Equipment: Drain tanks, piping, and fixtures. Seal openings with caps or plugs. Protect equipment from exposure to weather.

F. Plumbing Fixtures: Separate by type and size.

G. Lighting Fixtures: Separate lamps by type and protect from breakage.

H. Electrical Devices: Separate switches, receptacles, switchgear, transformers, meters, panelboards, circuit breakers, and other devices by type.

1.3 DISPOSAL OF WASTE

A. General: Except for items or materials to be salvaged, recycled, or otherwise reused, remove waste materials from Project site and legally dispose of them in a landfill or incinerator acceptable to authorities having jurisdiction.

2. Except as otherwise specified, do not allow waste materials that are to be disposed of accumulate on-site.
2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.

B. Burning: Do not burn waste materials.

C. Burning: Burning of waste materials is permitted only at designated areas on Owner's property, provided required permits are obtained. Provide full-time monitoring for burning materials until fires are extinguished.

D. Disposal: Transport waste materials and dispose of at designated spoil areas on Owner's property.

E. Disposal: Transport waste materials off Owner's property and legally dispose of them.

END OF SECTION

SECTION 018119 – INDOOR AIR REQUIREMENTS

PART 1 – GENERAL

1.2. SECTION INCLUDES
- A. Overview of indoor air quality requirements and procedures, including product/material selection.

1.3. DEFINITIONS
- A. Volatile Organic Compounds (VOCs): Organic chemicals that produce vapors readily at room temperature and normal atmospheric pressure (e.g. gasoline, solvents, etc.). VOCs react with sunlight and nitrogen to form ground-level ozone, a chemical that has detrimental effect on human health, agricultural crops, forests, soil, groundwater and ecosystems.
- B. Carpet and Rug Institute (CRI) Green Label: a program established by the national trade association representing the carpet and rug industry to identify carpet products that have been tested by an independent laboratory and have met the criteria for low VOC emissions.

1.4. REFERENCES
- A. Sheet Metal and Air Conditioning Contractors' National Association (SMACNA). IAQ
  - a. Guidelines for Occupied Buildings Under Construction. Second Edition, 2007.
- B. ASHRAE. ANSI/ASHRAE 52.2-1999: Method of Testing General Ventilation Air-Cleaning Devices for Removal Efficiency by Particle Size.
- C. EPA. EPA Compendium of Methods for the Determination of Air Pollutants in Indoor Air.
- D. State of California. South Coast Air Quality Management District (SCAQMD) Rule 1168. January 2005 (as amended).
- E. State of California. South Coast Air Quality Management District (SCAQMD) Rule 1113. January 2004 (as amended).
- F. Green Seal. Paints (GS-11). January 1997. May 1993.
- G. Green Seal. Anti-Corrosive Paints (GC-03). January 1997.
- H. U.S. Green Building Council. "Indoor Environmental Quality Credit 3: Construction IAQ
  - a. Management Plan and Credit 4: Low-Emitting Materials" Leadership in Energy and Design
  - b. Environmental Design Reference Guide for Green Building Design and Construction, 2009 Edition. USGBC. "Materials & Resources Credit 2: Construction Waste Management". Leadership in Energy and Environmental Design Reference Guide for Green Building Design and Construction, 2009 Edition.
- I. California Department of Health Services Standard Practice for the Treating of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers, including 2004 Addenda.

1.5. OBJECTIVES
- A. Meet or exceed the recommended Design Approaches of the Sheet Metal and Air Conditioning Contractors National Association (SMACNA) IAQ Guidelines for Occupied Buildings under Construction, 2nd Edition, 2007, Chapter 3.
- B. Protect construction workers and future building occupants from indoor air quality problems resulting from construction activities and building materials.

C. Reduce the production and circulation of pollutants during construction.
D. Protect equipment and absorptive materials stored and installed on-site from moisture, dust and dirt accumulation during construction.
E. Prepare the building for occupancy following construction and prior to occupancy.

1.6. DESCRIPTION OF WORK
A. The site superintendent (or other person designated by the Contractor) shall be responsible for all aspects of LEED coordination during construction related to indoor air quality management.
B. Reference 018119-1 TCC Indoor Air Quality Management Plan – During Construction for the required Best Management Practices for Contractors and Sub-Contractors.

1.7. LEED START-UP MEETING
A. Prior to mobilization on-site, the Contractor shall hold a start-up meeting with the Architect to review indoor air quality management requirements. This meeting shall include a review of:
1. Indoor air quality management objectives.
2. Indoor air quality management requirements and procedures.
3. Indoor air quality management documentation and submittals.

1.8. LEED COORDINATION MEETING
A. Prior to start of construction, the Contractor (in conjunction with the Architect) shall hold a coordination meeting with the construction team to explain the indoor air quality management requirements to the Sub-Contractors. This meeting shall include a review of:
1. Indoor air quality management objectives.
2. Indoor air quality management requirements and procedures.
3. Indoor air quality management documentation and submittals.

1.9. SUBMITTALS
A. Product VOC Identification
1. Collect supporting documentation (MSDSs, product data sheets, letter from manufacturers, etc.) to document VOC emission rates for all adhesives, sealants, paints and coatings that are applied onsite and fall within the building weather barrier.
2. Submit completed supporting product literature to the Contractor and Or Architect for review at least 14 days prior to ordering.
B. Low Emitting Flooring Systems
1. Collect supporting documentation (letters from manufacturers, product literature, etc.) for all carpet and hard surface flooring products used in the building.
2. Submit completed supporting product literature to the Contractor and Or Architect for review at least 14 days prior to ordering..
C. IAQ Management Inspection Log
1. Contractor / Subcontractor shall keep a completed log. The log shall commence when the building is enclosed and carry through to building turnover.
D. Photo Documentation Checklist
1. Photographs shall be provided as specified in the checklist.
2. Photographs will be taken on **six** different occasions during construction to prove continuous compliance.

2. PART 2 - PRODUCTS

2.1. GENERAL

A. The VOC content limits listed in this section may be amended from time to time by their governing bodies. In the event that the VOC limits listed below are higher than the VOC limits in effect at the date of application for building permit, the VOC limits in effect at the date of application for building permit shall be used.

B. Reference SECTION 016119 LEED PRODUCT REQUIREMENTS for product Indoor Air Quality / Emission requirements and acceptable levels.

3. PART 3 - EXECUTION

3.1. POLUTANT SOURCE IDENTIFICATION

A. Identify potential sources of indoor air pollutants on the construction site.

B. Any construction activity or material that produces odor and/or dust is considered a source of air pollutants. Pollutant sources include, but are not limited to:

C. Materials that produce detectable odor:

Paints	Coatings	Grouts
Stains	Adhesives	Epoxy Flooring
Sealants	Caulking	Solvents
Pesticides	Fuels	Cleaning Products

D. Materials that create dust:

Concrete Products	Drywall	Wood Products
Acoustical Ceiling Tile	Insulation	Ceramic Tile

E. Equipment that emit products of combustion or create odor and/or dust:

Generators	Compressors	Cutting Tools / Saws
Touché / Welders	Vehicles	Portable Heaters

F. Construction activities that disrupt pollutants:

Demolition	Repair	Renovation

G. Other

Demolition	Repair	Renovation

3.2. MINIMIZE POLLUTANTS

A. Reference 018119-1 TCC Indoor Air Quality Management Plan – During Construction

B. Additional measures include but are not limited for the minimization of pollutants generated inside the building from the sources identified under article 3.1:

1. Smoking shall be prohibited inside the building at all times during construction and within 25 feet of building entrances once enclosed.
2. Fuelling up equipment outside the building.
3. Storing gasoline or solvents outside the building.
4. Restricting outdoor vehicular/equipment traffic and operation where emissions can enter the building.
5. Reducing on-site emissions by using equipment that burns propane/natural gas or is powered by electricity.
6. Exhausting pollutant sources directly outside using temporary or permanent ventilation equipment. Where exhaust is not feasible, locally re-circulate air through a portable air cleaner.
7. Collecting and bagging sawdust from woodworking tools.

8. Covering and/or sealing all indoor sources of odor and dust.
9. Using painting techniques that minimize odor (e.g roller instead of spraying).
10. Using cleaning practices that minimize dust (e.g. vacuum instead of sweeping).
11. Using cleaning products that minimize pollution, fumes, VOC's, etc.
12. Prohibiting the burning of garbage.

3.3. HOUSEKEEPING MEASURES

A. Prevent the accumulation of moisture, dust and dirt in the building from the sources identified under article 3.1 using the following measures:
    1. Frequently cleaning interior surfaces to minimize dust and dirt accumulation.
        a) Note: Localized cleaning should occur immediately after a construction activity is completed and/or at the end of each day. A full building clean-up must be performed at least once a week.
B. Promptly clean all spills (fuels, lubricants, paints, adhesives, etc.).
C. Clean or remove excess products.
    1. All Pollutant Containment, Housekeeping and HVAC protection measures will be reviewed by the Contractor and / or Architect during site visits.
        a) All deficiencies identified by the Contractor and / or Architect must be remedied and documented in the IAQ Management Inspection Log within 48 hours of notification.
        b) The Contractor shall clean or replace any equipment or materials that is incorrectly stored or improperly protected at no extra cost to the contract.

3.4. REMOVAL OF PROTECTION MEASURES

A. All products/materials installed as a part of indoor air quality management measures shall be removed prior to building turnover. Any remedial work required as a result of removing the measures is the responsibility of the Contractor.

END OF SECTION 018119

TECHNICAL SPECIFICATIONS

FOR

PATTENGILL MODULAR CLASSROOM BUILDING
BID PACK 03
LANSING SCHOOL DISTRICT
LANSING, MICHIGAN

APRIL 19, 2024

A/E NO. 2616-05

OWNER
LANSING SCHOOL DISTRICT
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GEOTECHNICAL EVALUATION REPORT

PATTENGILL ELEMENTARY MODULAR ADDITION
LANSING, MICHIGAN

SME Project No. 095629.00
April 19, 2024

SME

2663 Eaton Rapids Road
Lansing, MI 48911-6310

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April 19, 2024

Lansing School District
c/o Mr. Marc A. Alexa
Vice President
Plante Moran Cresa
3000 Town Center, Suite 100
Southfield, Michigan 48075

Via E-mail: Marc.Alexa@plantemoran.com

RE: Geotechnical Evaluation Report
Pattengill Elementary Modular Addition
815 North Fairview Avenue
Lansing, Michigan 48912
SME Project No. 095629.00

Dear Mr. Alexa:

We have completed our geotechnical evaluation for the subject project. This report presents the results of our observations and analyses, and our geotechnical engineering recommendations based on the information disclosed by the borings.

We appreciate the opportunity to be of service. If you have questions or require additional information, please contact me.

Sincerely,

SME

Bradford L. Ewart II, PE
Senior Project Manager / Senior Consultant

Enclosure: SME Geotechnical Evaluation Report; Dated April 19, 2024

TABLE OF CONTENTS

1. INTRODUCTION

This report presents the results of the geotechnical evaluation performed by SME for the Pattengill Elementary Modular Addition project in Lansing, Michigan. We performed this evaluation in general accordance with the scope of services outlined in SME Proposal No. P00397.24, dated February 2, 2024. Lansing School District authorized our services for this evaluation.

To assist with our evaluation and preparation of this report, SME was provided with the following:

- Preliminary drawings (Sheet Nos. C0.0, C2.0, C4.0, C6.0, C7.0, C8.0, and C9.0) for the "Pattengill Lansing School District" prepared by Kingscott and Spalding DeDecker and sent to SME via email on February 27, 2024.
- A plan set for the "Renovations for: Lansing School District Fairview Additions and Renovations" project dated January 13, 2017, and prepared by C2AE.

1.1 SITE CONDITIONS AND PROJECT DESCRIPTION

The project site is located at the existing Pattengill Biotechnical Magnet School at 815 North Fairview Avenue in Lansing, Michigan. The site currently consists of the existing school building, playgrounds, grass covered areas, sidewalks, and a paved parking lot (see Image 1 below). The approximate location of the site is depicted on the Location Map inset on the Boring Location Diagram (Figure No. 1) included in Appendix A.

An existing, underground storm sewer extends below the footprint of the proposed building. We understand that the storm sewer will be abandoned and completely removed from below the proposed building footprint. A current topographic survey was not provided. However, based on the grading plans (Sheets Nos. C-104 and C-105) from the referenced 2017 plan set, we assume existing ground surface elevations within the proposed building footprint vary between approximately 860 and 861 feet.

IMAGE 1: Current aerial image of the site.

The project will consist of the design and construction of a new pre-fabricated modular building on the west side of the property. The building will be a single-story structure containing classrooms and other related school features with a plan area of approximately 16,340 square feet. The building will include steel framing with beams that span between exterior load bearing perimeter walls and interior pier foundations. A crawl space that will extend about 4 feet below exterior grades will be provided below the building. A concrete "mud mat" will be placed as the floor of the crawl space. The finished floor elevation (FFE) for the proposed building addition will be approximately 861.8 feet. Based on the assumed existing site topography and depth of the crawl space, we anticipate fills of less than about 1 foot and cuts of less than about 3 feet will be required to establish the finish floor and crawl space elevations, respectively. We anticipate maximum column loads of 30 kips and maximum wall loads of 3 kips per linear foot.

2. EVALUATION PROCEDURES

2.1 FIELD EXPLORATION

SME completed six borings, B101 through B103 and HA1 through HA3 at the site on February 19, 2024. Borings B101 through B103 extended to 35 feet below the ground surface and HA1 through HA3 extended 5 to 10 feet below the ground surface. The approximate as-drilled locations of the borings are depicted on Figure No.1.

SME determined the number, locations, and depths of the planned borings. SME staked the locations of the borings in the field using existing site features and estimated existing ground surface elevations at the boring locations to the nearest one-foot based on the grading information included in the referenced 2017 drawings.

Borings B101 through B103 were drilled using a rotary-type drill rig and were advanced using continuous-flight augers. The borings included soil sampling based upon the Split-Barrel Sampling procedure. The N_{60}-values reported on the boring logs represent the Standard Penetration Test (SPT) resistances, normalized for drill rig hammer efficiency, which is also reported on the boring logs. The driller sealed portions of recovered split-barrel samples in glass jars.

Borings HA1 through HA3 were performed by an SME engineer by manually advancing a 3¼-inch-diameter auger bucket, attached to a steel rod and handle assembly, into the subgrade. The engineer sealed portions of the recovered auger samples in plastic bags.

Groundwater level measurements were recorded during and immediately after completion of each boring. The boreholes were backfilled with auger cuttings after completion. Long-term groundwater levels were not obtained from the borings.

Soil samples recovered from the field exploration were returned to the SME laboratory for further observation and testing.

2.2 LABORATORY TESTING

The general laboratory testing program consisted of performing visual soil classification on recovered samples in general accordance with ASTM D-2488. Moisture content and hand penetrometer tests were performed on portions of cohesive samples obtained. The Laboratory Testing Procedures in Appendix B provide descriptions of the laboratory tests. Based on the laboratory testing, we assigned a group symbol to the various soil strata encountered based on the Unified Soil Classification System (USCS).

Upon completion of the laboratory testing, boring logs were prepared including information on materials encountered, penetration resistances, pertinent field observations made during the drilling operations, and the results of the laboratory tests. The approximate existing ground surface elevations at the boring locations are also provided on the boring logs. Explanations of symbols and terms used on the boring logs are provided on the Boring Log Terminology sheet included in Appendix A. The boring logs are included in Appendix A.

Soil samples are normally retained in our laboratory for 60 days and then disposed, unless instructed otherwise.

3. SUBSURFACE CONDITIONS

3.1 SOIL CONDITIONS

The surficial conditions encountered at the current boring locations generally consisted of surficial topsoil overlying existing sand and clay fill, underlain by natural clays, sands and silts.

The existing fill soils were encountered to depths ranging from 6.6 to 8.5 feet below the existing ground surface, corresponding to approximate elevations 852.5 to 854.4 feet. However, existing fill extended to the explored depth (5 feet) of boring HA3, which terminated at approximate elevation 856 feet. The existing sand fill was encountered in a medium dense to dense condition and the existing clay fill exhibited very stiff to hard consistencies. B101 encountered asphalt and brick debris fragments in addition to roots fibers.

The natural clays and cohesive silts exhibited stiff to hard consistencies and the natural sands and non-cohesive silts were encountered in a medium dense to very dense condition.

The soil profile described above and included on the boring logs is a generalized description of the conditions encountered. The stratification depths described above and shown on the boring logs are intended to indicate a zone of transition from one soil type to another. They are not intended to show exact depths of change from one soil type to another. The soil descriptions are based on visual classification of the soils encountered. Soil conditions may vary between or away from the boring locations. Please refer to the boring logs for the soil conditions at the specific boring locations.

Thickness measurements of surficial topsoil reported on boring logs (B101 through B103) should be considered approximate since mixing of these materials can occur in small diameter boreholes. Therefore, if accurate thickness measurements are required, we recommend performing additional evaluations such as additional hand augers.

It is sometimes difficult to distinguish between fill and natural soils based on samples and cuttings from small-diameter boreholes, especially when portions of the fill do not contain man-made materials, debris, topsoil or organic layers, and when the fill appears similar in composition to the local natural soils. Therefore, consider the delineation of fill described on the boring logs approximate only. A more comprehensive evaluation of the extent and composition of the fill could be made by reviewing former site topography plans, aerials photographs, and other historic site records and by observing test pit excavations.

3.2 GROUNDWATER CONDITIONS

Groundwater was not encountered during or upon completion of drilling at the boring locations, which extended to approximate elevations 826 to 856 feet.

Based on the permeable nature of the sands encountered near the terminal depths of borings B101 and B102, we judge the site groundwater level was below the explored depth of the borings at the time of drilling.

Expect hydrostatic groundwater levels, perched groundwater conditions, and the potential rate of infiltration into excavations to fluctuate throughout the year, based on variations in precipitation, evaporation, run-off, and other factors. The groundwater levels indicated by the borings represent conditions at the time the readings were taken. The actual groundwater levels at the time of construction may vary. If more information regarding groundwater levels at this site is required, then we recommend performing additional subsurface assessment(s).

4. ANALYSIS AND RECOMMENDATIONS

4.1 SITE PREPARATION AND EARTHWORK

4.1.1 EXISTING FILL CONSIDERATIONS

Due to the risks of excessive total and differential foundation settlement, we do not recommend supporting shallow footings on or above the existing fill. Therefore, the existing fill should be removed from beneath proposed shallow footings. Based on the condition of the existing fill encountered within the proposed building addition area, we believe the existing fill can be considered for support of the crawl space floor slab (i.e., “mud mat”). However, due to the quantity and spacing of the proposed shallow footings, the depth of the existing fill, and the earthwork required to remove the existing storm sewer beneath the proposed building, removing the existing fill beneath the entire building footprint rather than just below proposed footings may expedite site preparation.

If the existing fill is left in place beneath the building crawl space, there are inherent risks of greater than typical settlement and poor structural performance. These risks can be eliminated by removing the fill beneath the floor slab and replacing the fill with engineered fill. The risks associated with generally leaving the existing fill in-place can be significantly reduced, but not completely eliminated, by thoroughly evaluating the condition of the fill during construction, remediating unsuitable fill materials that are identified, and improving the subgrade as recommended in the following report sections. We believe the risks of poor structural performance associated with constructing floor slabs over the existing fill at this site could include a risk of differential floor settlements and the associated cracking of floor slabs at-grade.

The depths of the existing fill could vary between or away from the boring locations. We recommend earthwork contractors provide bids that include unit prices for removal of existing fill and replacement with engineered fill. We anticipate a majority of the existing fill can be reused as engineered fill. However, the contractor should segregate differing fill soils (i.e., sands and clays) during excavation and be prepared to moisture condition the clayey soils as needed to allow for proper compaction during engineered fill placement.

The recommendations provided in the following report sections are based on the assumption that existing fill will be removed beneath the footing areas and will either be removed or left in place beneath the building crawl space if the Owner is willing to accept the risks of poor structural performance of the crawl space floor slab.

4.1.2 GENERAL SITE SUBGRADE PREPARATION

Reroute existing utilities around the proposed building addition footprints. Remove and backfill all abandoned utilities with granular engineered fill to the design subgrade level.

The proposed structures and areas to receive engineered fill should be cleared of existing topsoil, pavements, unsuitable existing fill, trees, roots, vegetation, and other deleterious materials to expose suitable inorganic subgrade soils. We recommend the clearing and stripping extend a minimum of 10 feet beyond the limits of the proposed structure footprints.

After clearing and stripping, and after cuts are made to design subgrade levels, we recommend the subgrade soils be subjected to a comprehensive proofrolling program. The purpose of proofrolling is to locate areas of unsuitably loose or soft subgrade. Perform proofrolling with a fully-loaded, tandem-axle truck or other similar pneumatic-tired construction equipment. Areas of unsuitable (i.e., wet, loose or soft) subgrade revealed during proofrolling need to be mechanically improved (compacted) in-place. If it is not possible to compact the unsuitable subgrade, it may be necessary to remove the unsuitable soils and replace them with engineered fill.

Based on the borings, after stripping the surficial materials, we expect the earthwork contractor will generally encounter sand and clay soils near the ground surface. The predominantly clayey profile of the site will be susceptible to “holding water” and will experience subgrade disturbance if accumulations of precipitation are allowed to pond on the site. Due to the poorly-draining nature of the clayey subgrade, the near-surface soils are at an elevated risk to experience significant pumping and/or rutting when exposed to construction traffic. We recommend shaping the site to facilitate surface water control toward the non-structural areas of the site. Summer construction is desirable at this site in an attempt to reduce the amount of subgrade disturbance and required improvements.

The subgrade soils are sensitive to disturbance when exposed to water. If the subgrade is exposed to water, it may be necessary to improve the disturbed subgrade or remove and replace the soils with engineered fill, crushed aggregate or crushed concrete.

After the exposed subgrade is evaluated (as described above) and improved as necessary, engineered fill may be placed on the exposed subgrade to establish final subgrade levels. See Section 4.1.4 of this report for materials and compaction requirements for engineered fill.

4.1.3 SUBGRADE PREPARATION FOR FLOOR SLABS

We anticipate the final subgrade for the proposed school addition crawl space floor slab will consist of existing fill overlying natural soils, or engineered fill placed over natural soils. These soils are generally considered suitable for support of grade slabs, provided the subgrade is properly prepared and engineered fill is properly placed and compacted, and the Owner is willing to accept the risks associated with constructing floor slabs over existing fill, as described in this report.

Prior to concrete placement for floor slabs, the building pad subgrade should again be observed and tested for suitability of floor slab support. The purpose of the re-evaluation is to identify areas of subgrade that were disturbed during construction activities and verify subgrade conditions are suitable for floor slab support. The re-evaluation of the subgrade should consist of a thorough proofroll unless the area is not accessible with proper proofrolling equipment. Otherwise, the evaluation of the exposed subgrade should consist of density testing or the use of appropriate hand-operated equipment such as hand augers and cone penetrometers. Unsuitable subgrade indicated by SME should be recompacted or removed and replaced with engineered fill.

We recommend the top 4 inches of the slab subbase consist of an approved granular material. The purpose of this is to provide a leveling surface for construction of the slab and a moisture capillary break between the slab and the underlying soils. MDOT Class II granular material is recommended for this purpose. Alternately, an approved aggregate such as MDOT 21AA dense-graded aggregate may be used in lieu of the granular material. The advantage of using an aggregate is that it provides better protection of the subgrade than granular material and a more stable working platform for construction of the slab. However, a thicker layer of aggregate may be needed to provide a stable construction platform, depending on the condition of subgrade soils during construction and the type of construction equipment to traffic the prepared subgrade. The granular material or aggregate should also be compacted per the "Engineered Fill Requirements" section of this report.

We recommend a vapor retarder be provided below the floor slab if the slab is to receive an impermeable floor finish/seal or a floor covering which would act as a vapor barrier. The location of the vapor retarder (relative to the subbase) should be determined by the Architect/Engineer based on the intended floor usage, planned finishes, and in accordance with ACI recommendations.

Slabs should be separated by isolation joints from structural walls and columns bearing on their own footings to permit relative movement.

The slab-on-grade subgrade soils should be protected from frost during winter construction. Frozen soils should be thawed and compacted or removed and replaced prior to slab-on-grade construction.

4.1.4 ENGINEERED FILL REQUIREMENTS

Engineered fill placed within the construction area, including utility trench backfill, must be an approved material, free of frozen soil, organics, cobbles and boulders, construction debris, particle sizes that will hinder compaction, expansive and/or chemically active materials, and other unsuitable materials. We recommend spreading the fill in level layers not exceeding 9 inches in loose thickness and compacting each layer to a minimum of 95 percent of the maximum dry density as determined in accordance with the Modified Proctor test. Perform in-place soil density tests to verify each lift of engineered fill complies with the minimum compaction requirement. We recommend sand fill be compacted with a smooth drum vibratory roller or vibratory plate compactors including either walk-behind types, or plate compactors mounted on a backhoe or excavator (hoe-pac). Clay fill should be compacted with a sheepsfoot roller at a moisture content between the optimum and two percent below the optimum.

Based on the information from the borings, the existing natural sands and clays and most of the existing fill soils are generally suitable for use as engineered fill provided these soils meet the requirements listed in the previous paragraph. We do not recommend silts or topsoil for use as engineered fill. Imported fill should meet the requirements of MDOT Class II granular material.

The sands containing appreciable amounts of clay, designated with USCS group symbols “CL/SC” or “SC,” and clays are moisture-sensitive and could be difficult to compact, particularly when moisture contents are above the optimum moisture content. Soils containing appreciable amounts of clay or silt are also difficult to compact in confined areas, such as in utility trenches and foundation excavations, where smaller, walk-behind type compaction equipment is used. The contractor should be prepared to separate soils containing appreciable amounts of clay and/or silt from the cleaner sands and to moisture-condition soils by aerating and drying overly wet soils or adding water to overly dry soils so that the required density can be achieved during compaction. Waste unsuitable soils to non-structural areas of the site or properly dispose of them off-site. Use clays and clayey sands in open areas where compaction is achieved with large equipment and where moisture conditioning is feasible. During wetter/colder periods of the year, we expect it will be necessary to import granular fill to the site and waste the clayey/silty soils to non-structural areas of the site.

In utility trenches or foundation excavations, and in other areas where compaction is accomplished primarily by smaller plate compaction equipment, an approved granular material containing relatively low amounts of silt or clay, such as MDOT Class II granular material, should be used as backfill. Require thinner lift sizes to achieve the required density in areas where smaller compaction equipment is used. Use MDOT Class II granular material in areas requiring drainage or where the fill will serve as a capillary separation. The sands with a USCS group symbol of “SP” are anticipated to meet the gradational requirements of MDOT Class II granular material. However, if the contractor wishes to reuse existing sands for this application, they must segregate cleaner sands from clays and silty sands during construction. If mixing of soils occurs, the resulting fill should not be used where MDOT Class II granular material is specified. Further, require gradation analyses of on-site soils during construction to verify conformance with MDOT Class II granular material criteria.

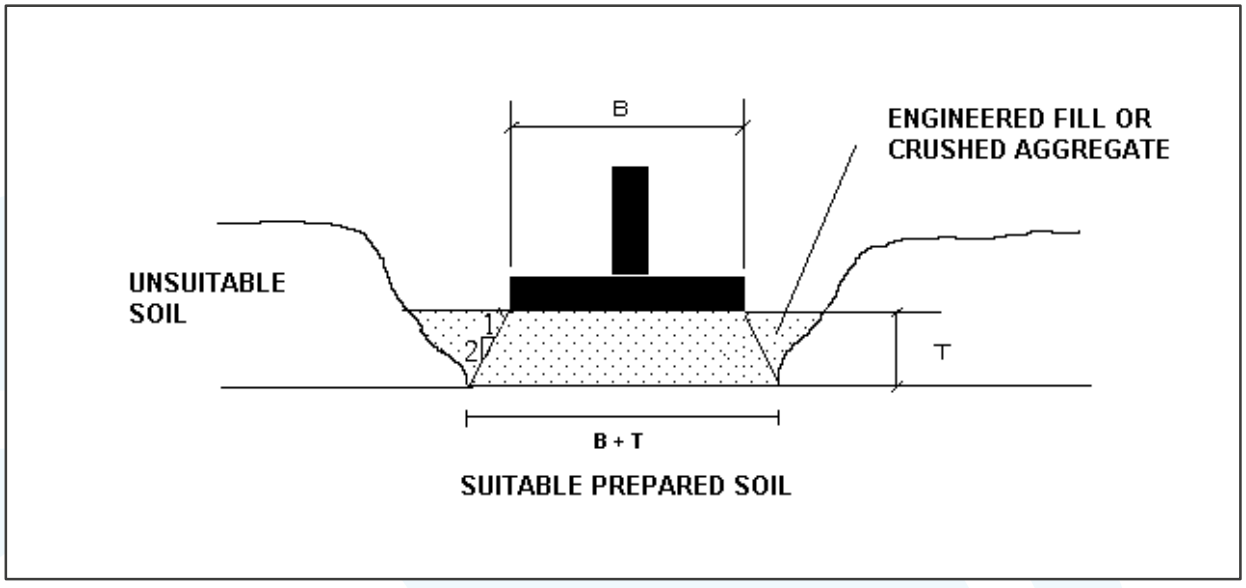
If required to stabilize subgrades, we recommend using an approved coarse crushed aggregate or crushed concrete that is a well-graded, nominal 1- to 3-inch diameter material with a maximum of 7 percent passing the No. 200 sieve. The coarse crushed material concrete should be compacted using a steel-drum vibratory roller, a static roller (in the case of disturbed subgrades), or by tamping the layers using a backhoe or excavator bucket, if the material is placed in trenches or other confined areas. The crushed aggregate should be compacted until it is stable. If a granular material is proposed for placement above the crushed aggregate, then the crushed aggregate should be choked with a layer of at least 6 inches of dense-graded aggregate such as MDOT 21AA or covered by a non-woven geotextile separator fabric per the MDOT Standards Specification for Construction, prior to placement of the granular material.

4.2 SHALLOW FOUNDATIONS

We recommend supporting the proposed elementary school building addition on shallow spread foundations bearing on suitable natural soils, or on engineered fill placed over suitable natural soils. We recommend a maximum net allowable soil bearing pressures of 3,000 pounds per square-foot (psf) (global safety factor of 3 or more) for design of shallow foundations for the building addition bearing on the soils described above. An SME representative must be onsite during foundation construction to observe and test the subgrade, and verify the soils are representative of the conditions encountered at the borings. Suitable natural soils were generally encountered below the surficial materials and existing fills between depths of about 6.6 and 8.5 feet.

We estimate total settlement for shallow spread or continuous foundations using the recommended maximum net allowable bearing pressure and bearing on suitable soils, as described above, should be 1- inch or less and differential settlements should not exceed about one-half the total settlement for similarly loaded foundations. We base the settlement estimates on the available boring information, the estimated structural loads, our experience with similar structures and soil conditions, and field verification of suitable bearing soils by SME.

Once each foundation area is exposed, SME must observe and test the foundation subgrades to verify suitable bearing conditions are present. Existing fill and unsuitable natural soils encountered in foundation areas should be undercut to expose underlying suitable natural soils. Foundations can then be constructed to bear directly at this lower level where suitable subgrade is encountered, or the design foundation bearing level can be reestablished using engineered fill or crushed aggregate placed as backfill in the undercut excavation. Where backfilling to the design foundation bearing level is performed, including if the existing fill is undercut from the entire building footprint, the undercut excavation to remove unsuitable soils should extend laterally on a two vertical to one horizontal slope from the edge of the foundation. Please refer to the following Typical Foundation Undercutting Diagram.



TYPICAL FOUNDATION UNDERCUTTING DIAGRAM

Foundations should be situated a minimum of 42 inches below final site grade in unheated areas for protection against frost action during normal winters. Interior foundations in heated areas can be constructed at shallower levels on suitable soils just below the floor slab. However, the foundations and proposed bearing soils should be protected from freezing during construction if work occurs in the winter months.

For frost heave considerations, vertical excavation sidewalls must be maintained during foundation concrete placement and not be allowed to “mushroom out” at the top. If vertical earthen sidewalls cannot be maintained, it will be necessary to slope back the foundation excavations and form foundation sidewalls to maintain vertical faces for foundations and reduce the potentially adverse effects resulting from frost heave.

For bearing capacity and settlement considerations, we recommend continuous (wall) foundations have a minimum width of 18 inches and isolated (column) foundations have a minimum dimension of 30 inches. In cases where structural loading is light, the minimum recommended foundation size, and not the design bearing pressure, may govern the size of the foundation.

To verify the exposed bearing soils are suitable for support of the design bearing pressure, the foundation subgrades must be evaluated and tested by SME during construction. The recommendations of this report are contingent on SME verifying that the assumed soil conditions, based on the borings, are consistent with the actual conditions at the site. In our experience, and as supported by our industry, maintaining the continuity of the same geotechnical engineer from design through construction benefits the Owner and project team by reducing the risks of problems and extra construction costs that can occur if the design recommendations are not properly understood or implemented during construction.

4.3 BELOW-GRADE WALLS AND DRAINAGE

Below-grade walls that will extend about 4 feet below exterior grades will be included for the proposed crawl space.

We recommend the below-grade walls be backfilled with MDOT Class II granular material. Below-grade wall backfill should be compacted to a minimum of 95 percent of the maximum dry density as determined by the Modified Proctor test. Care should be exercised during compaction of the wall backfill to avoid overstressing the walls. Positive surface drainage should also be established away from exterior below-grade walls and roof downspouts should not be discharged onto the ground surface above exterior below-grade walls.

For a drained granular backfill and a level finish surface behind the below-grade walls, we recommend an at-rest fluid pressure of 55 pcf for design.

Lateral pressures due to surcharge loading, such as adjacent floor or column loads, traffic loads, sloping ground, or parking loads, must be added to the above lateral earth pressures for design. We recommend using horizontal coefficient of 0.5 for at-rest conditions to calculate loads on walls due to surcharges. Use of these values require a granular wall backfill. Surcharge loads should be modeled as a uniform pressure distribution applied to the entire wall height. The below-grade wall recommendations are based on properly placed and compacted granular backfill that meets the gradational requirements of MDOT Class II granular material.

The earth pressure presented above are for a drained backfill. To reduce the potential for the build-up of hydrostatic pressure behind exterior below-grade walls, we recommend foundation drains be installed along the (exterior side) perimeter of the exterior below-grade walls along the base of the walls. The drains should consist of a minimum 6-inch-diameter perforated plastic drainpipe, wrapped with a filter fabric and surrounded by 6-inches of a filter material, such as pea gravel (MDOT 34G or MDOT 34R), wrapped with a filter fabric. The drains should be discharged to a gravity drainage outlet (i.e., storm drain), if feasible, or other suitable outlet. We recommend the design include provisions for access to the drains for cleaning and maintenance.

4.3 SEISMIC SITE CLASS

Based on the subsurface information obtained from the borings located within the proposed structural footprints to a maximum depth of 35 feet, seismic site Class D applies to this site in accordance with the 2015 Michigan Building Code (MBC) referencing Table 20.3-1 in ASCE Standard ASCE/SEI 7-10.

4.4 CONSTRUCTION CONSIDERATIONS

Groundwater seepage in excavations to remove existing fill and shallow footing excavations is not anticipated to be a significant factor during construction. However, seepage from perched groundwater sources and/or stormwater runoff could be encountered. If encountered, we anticipate these accumulations can be controlled using conventional sump pit and pumping methods.

The contractor must take precautions to protect adjacent existing structures, pavements, and utilities during construction. Care must be exercised during the excavating and compacting operations so excessive vibrations do not cause settlement of nearby existing structures, pavements, and utilities, and to avoid undermining existing foundations, floor slabs, pavements, or utilities when performing excavations for the proposed construction.

Remove ponded surface water and prevent run-off from reaching foundation excavations and areas of prepared subgrade. We recommend the contractor establish positive surface drainage at the onset of construction to mitigate the potential for subgrade disturbance. To reduce the potential of subgrade disturbance across the site, restrict construction traffic to dedicated areas of the site, and do not allow random trafficking across the entire site.

A majority of the subgrade soils at this site will be sensitive to disturbance, especially when these soils become wet and/or trafficked. If the subgrade is overly saturated and/or disturbed, it will be necessary to disc, aerate, and recompact the disturbed soils, or to remove and replace the disturbed soils with engineered fill, crushed aggregate, or crushed concrete. To protect areas of prepared subgrade from disturbance, placement of crushed aggregate or crushed concrete, possibly with a geotextile for separation, could be required.

The need for moisture conditioning (i.e., aerating and drying) existing soils, and the success of moisture conditioning, will be dependent on the weather conditions at the time of construction. During cold and wet periods of the year, the subgrade soils may become saturated and disturbed, and it may not be feasible to sufficiently dry the soils so they are stable and can be adequately compacted. If these conditions occur, it will be necessary for the contractor to import greater quantities of granular fill (sand) to use as engineered fill on the site. Consider the potential effects of soil moisture conditions during the anticipated construction season when developing the project earthwork budget and schedule.

The contractor must provide a safely sloped excavation or an adequately constructed and braced shoring system in accordance with federal, state, and local safety regulations for individuals working in an excavation that may expose them to the danger of moving ground. If material is stored or heavy equipment is operated near an excavation, use appropriate shoring to resist the extra pressure due to the superimposed loads.

Handling, transportation and disposal of excavated materials and groundwater need to be performed in accordance with applicable environmental regulations.

5. SIGNATURES

PREPARED BY:

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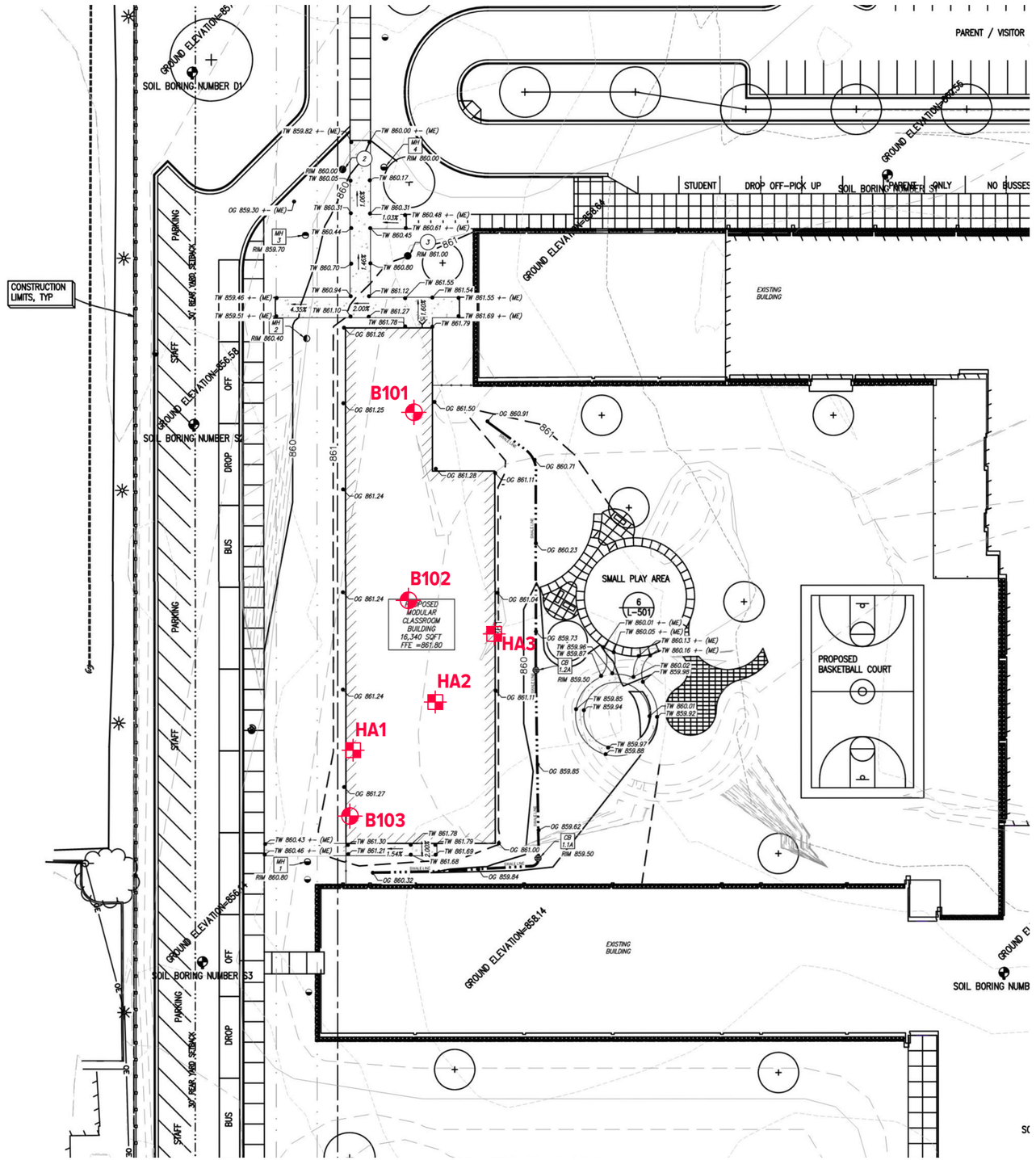
REVIEWED BY:

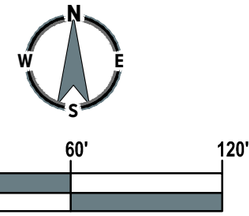
Paul E. Anderson

Paul E. Anderson, PE
Senior Project Engineer

APPENDIX A

BORING LOCATION DIAGRAM (FIGURE NO. 1)
BORING LOG TERMINOLOGY
BORING LOGS (B101 THROUGH B103 AND HA1 THROUGH HA3)

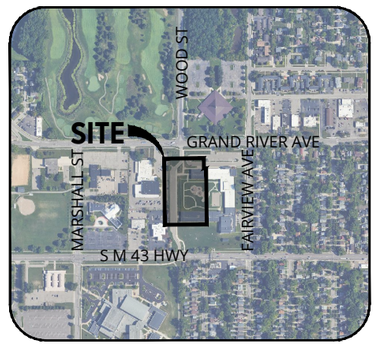




GRAPHIC SCALE: 1" = 60'

LEGEND

- APPROXIMATE BORING LOCATION
- APPROXIMATE HAND AUGER LOCATION



LOCATION MAP

NOT TO SCALE

NOTES:
1. AERIAL IMAGE TAKEN FROM GOOGLE EARTH PRO WITH AN IMAGE DATE OF 8-2-2023.
2. BASE DRAWING INFORMATION TAKEN FROM A DRAWING TITLED "PATTENGIL ES - C8.0 - GRADING" (SHEET C8.0) WITH A LATEST REVISION DATE OF FEBRUARY 23, 2024, PREPARED BY KINGSCOTT.

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Project
PATTENGILL ELEMENTARY MODULAR ADDITION

Project Location
LANSING, MICHIGAN

Sheet Name
BORING LOCATION DIAGRAM

No.	Revision Date

Date 2-26-2024
CADD MNR
Designer ARC
Scale AS NOTED
Project 095629.00
Figure No. 1

PLOT DATE: Mar 04, 2024 - 2:22pm - matt.nowakrochford \\sme-inc\pz\WIP\095629.00\CAD\Design Files\BLD\Rev0\095629.00-BLD.dwg

BORING LOG TERMINOLOGY

UNIFIED SOIL CLASSIFICATION AND SYMBOL CHART

COARSE-GRAINED SOIL (more than 50% of material is larger than No. 200 sieve size.)			
GRAVEL More than 50% of coarse fraction larger than No. 4 sieve size	Clean Gravel (Less than 5% fines)	GW	Well-graded gravel; gravel-sand mixtures, little or no fines
		GP	Poorly-graded gravel; gravel-sand mixtures, little or no fines
	Gravel with fines (More than 12% fines)	GM	Silty gravel; gravel-sand-silt mixtures
		GC	Clayey gravel; gravel-sand-clay mixtures
SAND 50% or more of coarse fraction smaller than No. 4 sieve size	Clean Sand (Less than 5% fines)	SW	Well-graded sand; sand-gravel mixtures, little or no fines
		SP	Poorly graded sand; sand-gravel mixtures, little or no fines
	Sand with fines (More than 12% fines)	SM	Silty sand; sand-silt-gravel mixtures
		SC	Clayey sand; sand–clay-gravel mixtures
FINE-GRAINED SOIL (50% or more of material is smaller than No. 200 sieve size)			
SILT AND CLAY Liquid limit less than 50%		ML	Inorganic silt; sandy silt or gravelly silt with slight plasticity
		CL	Inorganic clay of low plasticity; lean clay, sandy clay, gravelly clay
		OL	Organic silt and organic clay of low plasticity
SILT AND CLAY Liquid limit 50% or greater		MH	Inorganic silt of high plasticity, elastic silt
		CH	Inorganic clay of high plasticity, fat clay
		OH	Organic silt and organic clay of high plasticity
HIGHLY ORGANIC SOIL		PT	Peat and other highly organic soil

OTHER MATERIAL SYMBOLS

Topsoil, Void, Sandstone, Asphalt Concrete, Glacial Till, Siltstone, Aggregate Base, Coal, Limestone, Portland Cement Concrete, Shale, Fill

LABORATORY CLASSIFICATION CRITERIA

GW	$C_U = \frac{D_{60}}{D_{10}}$ greater than 4; $C_C = \frac{D_{30}^2}{D_{10} \times D_{60}}$ between 1 and 3	
GP	Not meeting all gradation requirements for GW	
GM	Atterberg limits below "A" line or PI less than 4	Above "A" line with PI between 4 and 7 are borderline cases requiring use of dual symbols
GC	Atterberg limits above "A" line with PI greater than 7	
SW	$C_U = \frac{D_{60}}{D_{10}}$ greater than 6; $C_C = \frac{D_{30}^2}{D_{10} \times D_{60}}$ between 1 and 3	
SP	Not meeting all gradation requirements for SW	
SM	Atterberg limits below "A" line or PI less than 4	Above "A" line with PI between 4 and 7 are borderline cases requiring use of dual symbols
SC	Atterberg limits above "A" line with PI greater than 7	

Determine percentages of sand and gravel from grain-size curve. Depending on percentage of fines (fraction smaller than No. 200 sieve size), coarse-grained soils are classified as follows:

Less than 5 percent……GW, GP, SW, SP
More than 12 percent……GM, GC, SM, SC
5 to 12 percent……Cases requiring dual symbols

- SP-SM or SW-SM (SAND with Silt or SAND with Silt and Gravel)
- SP-SC or SW-SC (SAND with Clay or SAND with Clay and Gravel)
- GP-GM or GW-GM (GRAVEL with Silt or GRAVEL with Silt and Sand)
- GP-GC or GW-GC (GRAVEL with Clay or GRAVEL with Clay and Sand)

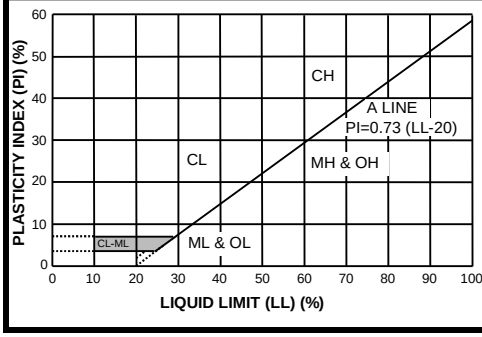
If the fines are CL-ML:

- SC-SM (SILTY CLAYEY SAND or SILTY CLAYEY SAND with Gravel)
- SM-SC (CLAYEY SILTY SAND or CLAYEY SILTY SAND with Gravel)
- GC-GM (SILTY CLAYEY GRAVEL or SILTY CLAYEY GRAVEL with Sand)

PARTICLE SIZES

Boulders	-	Greater than 12 inches
Cobbles	-	3 inches to 12 inches
Gravel- Coarse	-	3/4 inches to 3 inches
Fine	-	No. 4 to 3/4 inches
Sand- Coarse	-	No. 10 to No. 4
Medium	-	No. 40 to No. 10
Fine	-	No. 200 to No. 40
Silt and Clay	-	Less than (0.074 mm)

PLASTICITY CHART



VISUAL MANUAL PROCEDURE

When laboratory tests are not performed to confirm the classification of soils exhibiting borderline classifications, the two possible classifications would be separated with a slash, as follows:

For soils where it is difficult to distinguish if it is a coarse or fine-grained soil:

- SC/CL (CLAYEY SAND to Sandy LEAN CLAY)
- SM/ML (SILTY SAND to SANDY SILT)
- GC/CL (CLAYEY GRAVEL to Gravelly LEAN CLAY)
- GM/ML (SILTY GRAVEL to Gravelly SILT)

For soils where it is difficult to distinguish if it is sand or gravel, poorly or well-graded sand or gravel; silt or clay; or plastic or non-plastic silt or clay:

- SP/GP or SW/GW (SAND with Gravel to GRAVEL with Sand)
- SC/GC (CLAYEY SAND with Gravel to CLAYEY GRAVEL with Sand)
- SM/GM (SILTY SAND with Gravel to SILTY GRAVEL with Sand)
- SW/SP (SAND or SAND with Gravel)
- GP/GW (GRAVEL or GRAVEL with Sand)
- SC/SM (CLAYEY to SILTY SAND)
- GM/GC (SILTY to CLAYEY GRAVEL)
- CL/ML (SILTY CLAY)
- ML/CL (CLAYEY SILT)
- CH/MH (FAT CLAY to ELASTIC SILT)
- CL/CH (LEAN to FAT CLAY)
- MH/ML (ELASTIC SILT to SILT)

DRILLING AND SAMPLING ABBREVIATIONS

2ST	–	Shelby Tube – 2" O.D.
3ST	–	Shelby Tube – 3" O.D.
AS	–	Auger Sample
GS	–	Grab Sample
LS	–	Liner Sample
NR	–	No Recovery
PM	–	Pressuremeter
RC	–	Rock Core diamond bit. NX size, except where noted
SB	–	Split Barrel Sample 1-3/8" I.D., 2" O.D., except where noted
VS	–	Vane Shear
WS	–	Wash Sample

OTHER ABBREVIATIONS

WOH	–	Weight of Hammer
WOR	–	Weight of Rods
SP	–	Soil Probe
PID	–	Photo Ionization Device
FID	–	Flame Ionization Device

DEPOSITIONAL FEATURES

Parting	–	as much as 1/16 inch thick
Seam	–	1/16 inch to 1/2 inch thick
Layer	–	1/2 inch to 12 inches thick
Stratum	–	greater than 12 inches thick
Pocket	–	deposit of limited lateral extent
Lens	–	lenticular deposit
Hardpan/Till	–	an unstratified, consolidated or cemented mixture of clay, silt, sand and/or gravel, the size/shape of the constituents vary widely
Lacustrine	–	soil deposited by lake water
Mottled	–	soil irregularly marked with spots of different colors that vary in number and size
Varved	–	alternating partings or seams of silt and/or clay
Occasional	–	one or less per foot of thickness
Frequent	–	more than one per foot of thickness
Interbedded	–	strata of soil or beds of rock lying between or alternating with other strata of a different nature

DESCRIPTION OF RELATIVE QUANTITIES

The visual-manual procedure uses the following terms to describe the relative quantities of notable foreign materials, gravel, sand or fines:

Trace	–	particles are present but estimated to be less than 5%
Few	–	5 to 10%
Little	–	15 to 25%
Some	–	30 to 45%
Mostly	–	50 to 100%

CLASSIFICATION TERMINOLOGY AND CORRELATIONS

Cohesionless Soils

Relative Density	N_{60} (N-Value) (Blows per foot)
Very Loose	0 to 4
Loose	5 to 10
Medium Dense	11 to 30
Dense	31 to 50
Very Dense	51 to 80
Extremely Dense	Over 81

Cohesive Soils

Consistency	N_{60} (N-Value) (Blows per foot)	Undrained Shear Strength (kips/ft^2)
Very Soft	<2	0.25 or less
Soft	2 - 4	> 0.25 to 0.50
Medium	5 - 8	> 0.50 to 1.0
Stiff	9 - 15	> 1.0 to 2.0
Very Stiff	16 - 30	> 2.0 to 4.0
Hard	> 30	> 4.0 or greater

Standard Penetration 'N-Value' = Blows per foot of a 140-pound hammer falling 30 inches on a 2-inch O.D. split barrel sampler, except where noted. N60 values as reported on boring logs represent raw N-values corrected for hammer efficiency only.

SME

BORING B101

BORING DEPTH: 35 FEET

PROJECT NAME: Pattengill Elementary Modular Addition

PROJECT NUMBER: 095629.00

CLIENT: Lansing School District

PROJECT LOCATION: Lansing, Michigan

DATE STARTED: 2/19/24 **COMPLETED:** 2/19/24

BORING METHOD: Hollow-stem Augers

DRILLER: CR **RIG NO.:** 552 (CME 55)

LOGGED BY: SMM **CHECKED BY:** ARC

ELEVATION: 861± FT

ELEVATION (FEET)	DEPTH (FEET)	PROFILE DESCRIPTION	SAMPLE TYPE/NO. INTERVAL	RECOVERY LENGTH (INCHES)	SPT BLOWS PER SIX INCHES
860	0	0.7 8 inches of TOPSOIL 860.3			
		FILL- Fine to Medium CLAYEY SAND- Few Gravel- Brown- Moist- Dense (SC)	SB1	18	3 13 17
		4.0 857.0	SB2	18	8 10 11
855	5	FILL- Fine to Medium SAND- Occasional Root Fibers- Occasional Brick and Asphalt Fragments- Dark Brown- Moist- Medium Dense (SP)	SB3	18	6 6 7
		8.0 853.0	SB4	18	2 3 4
850	10	Sandy LEAN CLAY- Occasional Sand and Silt Seams- Brown and Gray- Very Stiff to Hard (CL)	SB5	18	3 5 6
845	15				
			SB6	18	3 3 5
840	20	22.0 839.0			
		Fine to Medium SAND- Brown- Moist- Medium Dense (SP)	SB7	18	3 4 4
835	25				
			SB8	18	7 10 10
	30				

HAMMER EFFICIENCY: 82%
DATE: 9/29/2022
N_{60} --

DRY DENSITY (pcf) -- ■
90 100 110 120

MOISTURE & ATTERBERG LIMITS (%)
PL MC LL
10 20 30 40

SHEAR STRENGTH (KSF)
1 2 3 4
▽ HAND PENE.
TORVANE SHEAR
UNC. COMP.
VANE SHEAR (PK)
VANE SHEAR (REM)
TRIAXIAL (UU)

REMARKS

GROUNDWATER & BACKFILL INFORMATION

GROUNDWATER WAS NOT ENCOUNTERED

BACKFILL METHOD: Auger Cuttings

NOTES:
1. The indicated stratification lines are approximate. The in-situ transitions between materials may be gradual.
2. The colors depicted on the symbolic profile are solely for visualization purposes and do not necessarily represent the in-situ colors encountered.
3. Ground surface elevation was assumed based on grading plans from previous site development.

(Continued Next Page)

SME

BORING B101

BORING DEPTH: 35 FEET

PROJECT NAME: Pattengill Elementary Modular Addition

PROJECT NUMBER: 095629.00

CLIENT: Lansing School District

PROJECT LOCATION: Lansing, Michigan

ELEVATION (FEET)	DEPTH (FEET)	SYMBOLIC PROFILE	ELEVATION: 861± FT PROFILE DESCRIPTION	SAMPLE TYPE/NO. INTERVAL	RECOVERY LENGTH (INCHES)	SPT BLOWS PER SIX INCHES	HAMMER EFFICIENCY: 82% DATE: 9/29/2022 N_{60} -- ○ (10 20 30 40)	DRY DENSITY (pcf) -- ■ (90 100 110 120) MOISTURE & ATTERBERG LIMITS (%) PL MC LL (10 20 30 40)	▽ HAND PENE. ⊠ TORVANE SHEAR ● UNC. COMP. ⊡ VANE SHEAR (PK) × VANE SHEAR (REM) ⊕ TRIAXIAL (UU) SHEAR STRENGTH (KSF) (1 2 3 4)	REMARKS
830	30		Fine to Medium SAND- Brown- Moist- Medium Dense (SP) *(continued)* 32.0 / 829.0							
			Fine SILTY SAND- Occasional Clay Layers- Gray- Moist- Dense (SM) 35.0 / 826.0	SB9	18	10 12 14	36			
825	35		END OF BORING AT 35.0 FEET.							
	40									
820										
	45									
815										
	50									
810										
	55									
805										
	60									
800										
	65									
795										
	70									

SME

BORING B102

BORING DEPTH: 35 FEET

PROJECT NAME: Pattengill Elementary Modular Addition

PROJECT NUMBER: 095629.00

CLIENT: Lansing School District

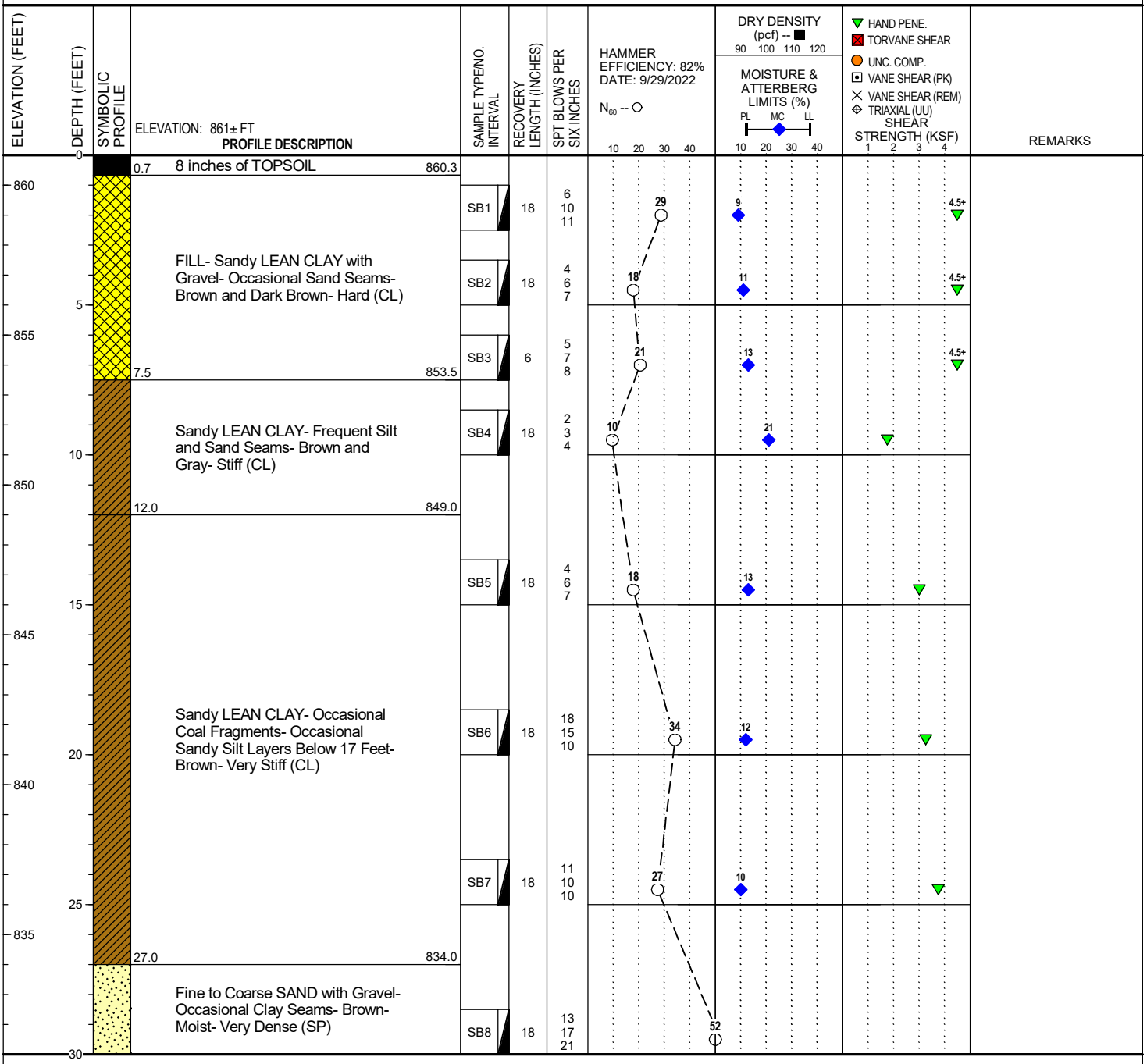
PROJECT LOCATION: Lansing, Michigan

DATE STARTED: 2/19/24 **COMPLETED:** 2/19/24

BORING METHOD: Hollow-stem Augers

DRILLER: CR **RIG NO.:** 552 (CME 55)

LOGGED BY: SMM **CHECKED BY:** ARC



GROUNDWATER & BACKFILL INFORMATION

GROUNDWATER WAS NOT ENCOUNTERED

BACKFILL METHOD: Auger Cuttings

NOTES:
1. The indicated stratification lines are approximate. The in-situ transitions between materials may be gradual.
2. The colors depicted on the symbolic profile are solely for visualization purposes and do not necessarily represent the in-situ colors encountered.
3. Ground surface elevation was assumed based on grading plans from previous site development.

(Continued Next Page)

SME

BORING B102

BORING DEPTH: 35 FEET

PROJECT NAME: Pattengill Elementary Modular Addition

PROJECT NUMBER: 095629.00

CLIENT: Lansing School District

PROJECT LOCATION: Lansing, Michigan

ELEVATION (FEET)	DEPTH (FEET)	SYMBOLIC PROFILE	ELEVATION: 861± FT PROFILE DESCRIPTION	SAMPLE TYPE/NO. INTERVAL	RECOVERY LENGTH (INCHES)	SPT BLOWS PER SIX INCHES	HAMMER EFFICIENCY: 82% DATE: 9/29/2022 N_{60} -- ○	DRY DENSITY (pcf) -- ■ MOISTURE & ATTERBERG LIMITS (%) PL MC LL	HAND PENE. ▽ TORVANE SHEAR ⊠ UNC. COMP. ● VANE SHEAR (PK) ⊡ VANE SHEAR (REM) × TRIAXIAL (UU) ⌖ SHEAR STRENGTH (KSF)	REMARKS
830	30		Fine to Coarse SAND with Gravel- Occasional Clay Seams- Brown- Moist- Very Dense (SP) *(continued)*							
	32.0		829.0							
			Fine SILTY SAND- Few Gravel- Gray- Moist- Very Dense (SM)	SB9	18	12 18 20	52			
825	35		826.0 END OF BORING AT 35.0 FEET.							
820	40									
815	45									
810	50									
805	55									
800	60									
795	65									
	70									

SME

BORING B103

BORING DEPTH: 35 FEET

PROJECT NAME: Pattengill Elementary Modular Addition

PROJECT NUMBER: 095629.00

CLIENT: Lansing School District

PROJECT LOCATION: Lansing, Michigan

DATE STARTED: 2/19/24 **COMPLETED:** 2/19/24

BORING METHOD: Hollow-stem Augers

DRILLER: CR **RIG NO.:** 552 (CME 55)

LOGGED BY: SMM **CHECKED BY:** ARC

ELEVATION (FEET)	DEPTH (FEET)	PROFILE DESCRIPTION	SAMPLE TYPE/NO. INTERVAL	RECOVERY LENGTH (INCHES)	SPT BLOWS PER SIX INCHES
860	0	ELEVATION: 861± FT			
	0.7	8 inches of TOPSOIL			
		FILL- Fine to Coarse SAND with Gravel- Frequent Clay Seams- Brown, Gray and Dark Brown- Moist- Medium Dense (SP)	SB1	18	7 10 11
	3.0		SB2	18	6 8 13
855	5	FILL- Fine to Medium SAND with Gravel- Brown- Moist- Medium Dense (SP)	SB3	18	7 11 11
	7.0				
	8.5	FILL- Sandy LEAN CLAY- Occasional Root Fibers- Gray, Brown and Dark Brown- Very Stiff (CL)	SB4	18	1 1 2
850	10	Sandy LEAN CLAY- Occasional Sand Seams- Brown- Stiff (CL)			
	12.0		SB5	18	11 19 21
845	15	Sandy SILT- Brown- Moist- Very Dense (ML)			
	17.0		SB6	18	5 6 6
840	20	Sandy LEAN CLAY- Trace Silt- Brown- Very Stiff (CL)			
			SB7	18	4 5 8
835	25				
	26.0				
		Sandy LEAN CLAY- Trace Silt- Gray- Stiff (CL)	SB8	18	3 5 5
	30				

HAMMER EFFICIENCY: 82%
DATE: 9/29/2022
N_{60} -- ○

DRY DENSITY (pcf) -- ■
90 100 110 120

MOISTURE & ATTERBERG LIMITS (%)
PL MC LL
10 20 30 40

SHEAR STRENGTH (KSF)
1 2 3 4
▽ HAND PENE.
⊠ TORVANE SHEAR
● UNC. COMP.
⊡ VANE SHEAR (PK)
× VANE SHEAR (REM)
⊕ TRIAXIAL (UU)

REMARKS

GROUNDWATER & BACKFILL INFORMATION

GROUNDWATER WAS NOT ENCOUNTERED

	DEPTH (FT)	ELEV (FT)
CAVE-IN OF BOREHOLE AT:	15.0	846.0

BACKFILL METHOD: Auger Cuttings & EPCO Hole Plug

NOTES:
1. The indicated stratification lines are approximate. The in-situ transitions between materials may be gradual.
2. The colors depicted on the symbolic profile are solely for visualization purposes and do not necessarily represent the in-situ colors encountered.
3. Ground surface elevation was assumed based on grading plans from previous site development.

(Continued Next Page)

SME

BORING B103

BORING DEPTH: 35 FEET

PROJECT NAME: Pattengill Elementary Modular Addition

PROJECT NUMBER: 095629.00

CLIENT: Lansing School District

PROJECT LOCATION: Lansing, Michigan

ELEVATION (FEET)	DEPTH (FEET)	SYMBOLIC PROFILE	ELEVATION: 861± FT PROFILE DESCRIPTION	SAMPLE TYPE/NO. INTERVAL	RECOVERY LENGTH (INCHES)	SPT BLOWS PER SIX INCHES	HAMMER EFFICIENCY: 82% DATE: 9/29/2022 N_{60} -- ○ (10 20 30 40)	DRY DENSITY (pcf) -- ■ (90 100 110 120) MOISTURE & ATTERBERG LIMITS (%) PL MC LL (10 20 30 40)	HAND PENE. ▽ TORVANE SHEAR ⊠ UNC. COMP. ● VANE SHEAR (PK) ⊡ VANE SHEAR (REM) ✕ TRIAXIAL (UU) ⌖ SHEAR STRENGTH (KSF) (1 2 3 4)	REMARKS
830	30		Sandy LEAN CLAY- Trace Silt- Gray- Stiff (CL) *(continued)*							
			32.0 / 829.0							
			CLAYEY SILT- Gray- Hard (ML/CL)	SB9	18	10 15 20	○ 48	◆ 9	▽ 4.5+	
	35		35.0 / 826.0							
			END OF BORING AT 35.0 FEET.							
825										
	40									
820										
	45									
815										
	50									
810										
	55									
805										
	60									
800										
	65									
795										
	70									

SME

BORING HA 1

BORING DEPTH: 10 FEET

PROJECT NAME: Pattengill Elementary Modular Addition
PROJECT NUMBER: 095629.00
CLIENT: Lansing School District
PROJECT LOCATION: Lansing, Michigan

DATE STARTED: 2/19/24 **COMPLETED:** 2/19/24 **BORING METHOD:** Hand Auger

FIELD REPRESENTATIVE: PLG **EQUIPMENT:** Hand Auger **LOGGED BY:** PLG **CHECKED BY:** ARC

ELEVATION: 861± FT

ELEVATION (FEET)	DEPTH (FEET)	PROFILE DESCRIPTION	SAMPLE TYPE/NO. INTERVAL	BLOWS PER SIX INCHES
860	0	0.8 TOPSOIL- Fine to Medium CLAYEY SAND- Frequent Roots- Dark Brown- Moist (SC) 860.3	AS1	
			AS2	
855	5	FILL- Sandy LEAN CLAY- Occasional Silt Seams- Few Gravel- Brown- Very Stiff (CL)		
		8.5 852.5		
		Sandy LEAN CLAY- Frequent Silt and Sand Seams- Trace Gravel- Brown- Moist (CL)	AS3	
850	10	10.0 851.0 END OF BORING AT 10.0 FEET.		
845	15			
840	20			
835	25			
	30			

DYNAMIC CONE PENETROMETER (DCP) -- O
10 20 30 40

DRY DENSITY (pcf) -- ■
90 100 110 120

MOISTURE & ATTERBERG LIMITS (%)
PL MC LL
10 20 30 40

HAND PENE.
TORVANE SHEAR
UNC. COMP.
VANE SHEAR (PK)
VANE SHEAR (REM)
TRIAXIAL (UU)
SHEAR STRENGTH (KSF)
1 2 3 4

REMARKS

Sample was too disturbed to perform a shear strength test.

GROUNDWATER & BACKFILL INFORMATION

GROUNDWATER WAS NOT ENCOUNTERED

BACKFILL METHOD: Auger Cuttings

NOTES:
1. The indicated stratification lines are approximate. The in-situ transitions between materials may be gradual.
2. The colors depicted on the symbolic profile are solely for visualization purposes and do not necessarily represent the in-situ colors encountered.
3. Ground surface elevation was assumed based on grading plans from previous site development.

SME

BORING HA 2

BORING DEPTH: 10 FEET

PROJECT NAME: Pattengill Elementary Modular Addition

PROJECT NUMBER: 095629.00

CLIENT: Lansing School District

PROJECT LOCATION: Lansing, Michigan

DATE STARTED: 2/19/24 **COMPLETED:** 2/19/24 **BORING METHOD:** Hand Auger

FIELD REPRESENTATIVE: PLG **EQUIPMENT:** Hand Auger **LOGGED BY:** PLG **CHECKED BY:** ARC

ELEVATION (FEET)	DEPTH (FEET)	PROFILE DESCRIPTION	SAMPLE TYPE/NO.	BLOWS PER SIX INCHES
860	0	ELEVATION: 861± FT		
	0 – 1.5	TOPSOIL- Fine to Medium CLAYEY SAND- Frequent Roots- Dark Brown- Moist (SC)	AS1	
	1.5 – 2.6	FILL- Fine to Medium SAND- Trace Silt and Gravel- Occasional Clay and Topsoil Seams- Brown and Dark Brown- Moist (SP)	AS2	
	2.6 – 3.4	FILL- Sandy LEAN CLAY- Few Gravel- Brown and Dark Brown- Very Stiff (CL)	AS3	
855	5	FILL- Fine to Medium SAND with Silt and Gravel- Brown- Moist (SP-SM)	AS4	
	6.6 – 10.0	Sandy LEAN CLAY to Fine to Medium CLAYEY SAND- Few Silt- Brown- Moist (CL/SC)	AS5	
			AS6	
850	10	END OF BORING AT 10.0 FEET.		
845	15			
840	20			
835	25			
	30			

DYNAMIC CONE PENETROMETER (DCP) -- O

DRY DENSITY (pcf) -- ■

MOISTURE & ATTERBERG LIMITS (%)

SHEAR STRENGTH (KSF)

▽ HAND PENE.
⊠ TORVANE SHEAR
● UNC. COMP.
⊡ VANE SHEAR (PK)
× VANE SHEAR (REM)
⊕ TRIAXIAL (UU)

REMARKS

Sample AS5 was too disturbed to perform a shear strength test.

Sample AS6 was too disturbed to perform a shear strength test.

GROUNDWATER & BACKFILL INFORMATION

GROUNDWATER WAS NOT ENCOUNTERED

BACKFILL METHOD: Auger Cuttings

NOTES:
1. The indicated stratification lines are approximate. The in-situ transitions between materials may be gradual.
2. The colors depicted on the symbolic profile are solely for visualization purposes and do not necessarily represent the in-situ colors encountered.
3. Ground surface elevation was assumed based on grading plans from previous site development.

SME

BORING HA 3

BORING DEPTH: 5 FEET

PROJECT NAME: Pattengill Elementary Modular Addition
PROJECT NUMBER: 095629.00
CLIENT: Lansing School District
PROJECT LOCATION: Lansing, Michigan

DATE STARTED: 2/19/24 **COMPLETED:** 2/19/24 **BORING METHOD:** Hand Auger

FIELD REPRESENTATIVE: PLG **EQUIPMENT:** Hand Auger **LOGGED BY:** PLG **CHECKED BY:** ARC

ELEVATION: 861± FT

ELEVATION (FEET)	DEPTH (FEET)	PROFILE DESCRIPTION	SAMPLE TYPE/NO. INTERVAL	BLOWS PER SIX INCHES
860	0	TOPSOIL- Fine to Medium CLAYEY SAND- Frequent Roots- Dark Brown- Moist (SC)	AS1	
	1.4 / 859.6			
		FILL- Fine to Medium SAND with Gravel- Trace Silt- Brown- Moist (SP)	AS2	
	5.0 / 856.0			
855	5	END OF BORING AT 5.0 FEET.		
850	10			
845	15			
840	20			
835	25			
	30			

DYNAMIC CONE PENETROMETER (DCP) -- O
10 20 30 40

DRY DENSITY (pcf) -- ■
90 100 110 120

MOISTURE & ATTERBERG LIMITS (%)
PL MC LL
10 20 30 40

SHEAR STRENGTH (KSF)
▽ HAND PENE.
⊠ TORVANE SHEAR
● UNC. COMP.
⊡ VANE SHEAR (PK)
× VANE SHEAR (REM)
⊕ TRIAXIAL (UU)
1 2 3 4

REMARKS: Auger refusal at a depth of 5 feet.

GROUNDWATER & BACKFILL INFORMATION

GROUNDWATER WAS NOT ENCOUNTERED

BACKFILL METHOD: Auger Cuttings

NOTES:
1. The indicated stratification lines are approximate. The in-situ transitions between materials may be gradual.
2. The colors depicted on the symbolic profile are solely for visualization purposes and do not necessarily represent the in-situ colors encountered.
3. Ground surface elevation was assumed based on grading plans from previous site development.

APPENDIX B

IMPORTANT INFORMATION ABOUT YOUR GEOTECHNICAL-ENGINEERING REPORT
GENERAL COMMENTS
LABORATORY TESTING PROCEDURES

Important Information about This

Geotechnical-Engineering Report

Subsurface problems are a principal cause of construction delays, cost overruns, claims, and disputes.

While you cannot eliminate all such risks, you can manage them. The following information is provided to help.

The Geoprofessional Business Association (GBA) has prepared this advisory to help you – assumedly a client representative – interpret and apply this geotechnical-engineering report as effectively as possible. In that way, you can benefit from a lowered exposure to problems associated with subsurface conditions at project sites and development of them that, for decades, have been a principal cause of construction delays, cost overruns, claims, and disputes. If you have questions or want more information about any of the issues discussed herein, contact your GBA-member geotechnical engineer. Active engagement in GBA exposes geotechnical engineers to a wide array of risk-confrontation techniques that can be of genuine benefit for everyone involved with a construction project.

Understand the Geotechnical-Engineering Services Provided for this Report

Geotechnical-engineering services typically include the planning, collection, interpretation, and analysis of exploratory data from widely spaced borings and/or test pits. Field data are combined with results from laboratory tests of soil and rock samples obtained from field exploration (if applicable), observations made during site reconnaissance, and historical information to form one or more models of the expected subsurface conditions beneath the site. Local geology and alterations of the site surface and subsurface by previous and proposed construction are also important considerations. Geotechnical engineers apply their engineering training, experience, and judgment to adapt the requirements of the prospective project to the subsurface model(s). Estimates are made of the subsurface conditions that will likely be exposed during construction as well as the expected performance of foundations and other structures being planned and/or affected by construction activities.

The culmination of these geotechnical-engineering services is typically a geotechnical-engineering report providing the data obtained, a discussion of the subsurface model(s), the engineering and geologic engineering assessments and analyses made, and the recommendations developed to satisfy the given requirements of the project. These reports may be titled investigations, explorations, studies, assessments, or evaluations. Regardless of the title used, the geotechnical-engineering report is an engineering interpretation of the subsurface conditions within the context of the project and does not represent a close examination, systematic inquiry, or thorough investigation of all site and subsurface conditions.

Geotechnical-Engineering Services are Performed for Specific Purposes, Persons, and Projects, and At Specific Times

Geotechnical engineers structure their services to meet the specific needs, goals, and risk management preferences of their clients. A geotechnical-engineering study conducted for a given civil engineer will not likely meet the needs of a civil-works constructor or even a different civil engineer. Because each geotechnical-engineering study is unique, each geotechnical-engineering report is unique, prepared *solely* for the client.

Likewise, geotechnical-engineering services are performed for a specific project and purpose. For example, it is unlikely that a geotechnical-engineering study for a refrigerated warehouse will be the same as one prepared for a parking garage; and a few borings drilled during a preliminary study to evaluate site feasibility will not be adequate to develop geotechnical design recommendations for the project.

Do not rely on this report if your geotechnical engineer prepared it:

- for a different client;
- for a different project or purpose;
- for a different site (that may or may not include all or a portion of the original site); or
- before important events occurred at the site or adjacent to it; e.g., man-made events like construction or environmental remediation, or natural events like floods, droughts, earthquakes, or groundwater fluctuations.

Note, too, the reliability of a geotechnical-engineering report can be affected by the passage of time, because of factors like changed subsurface conditions; new or modified codes, standards, or regulations; or new techniques or tools. *If you are the least bit uncertain* about the continued reliability of this report, contact your geotechnical engineer before applying the recommendations in it. A minor amount of additional testing or analysis after the passage of time – if any is required at all – could prevent major problems.

Read this Report in Full

Costly problems have occurred because those relying on a geotechnical-engineering report did not read the report in its entirety. Do not rely on an executive summary. Do not read selective elements only. *Read and refer to the report in full.*

You Need to Inform Your Geotechnical Engineer About Change

Your geotechnical engineer considered unique, project-specific factors when developing the scope of study behind this report and developing the confirmation-dependent recommendations the report conveys. Typical changes that could erode the reliability of this report include those that affect:

- the site's size or shape;
- the elevation, configuration, location, orientation, function or weight of the proposed structure and the desired performance criteria;
- the composition of the design team; or
- project ownership.

As a general rule, *always* inform your geotechnical engineer of project or site changes – even minor ones – and request an assessment of their impact. *The geotechnical engineer who prepared this report cannot accept*

responsibility or liability for problems that arise because the geotechnical engineer was not informed about developments the engineer otherwise would have considered.

Most of the "Findings" Related in This Report Are Professional Opinions

Before construction begins, geotechnical engineers explore a site's subsurface using various sampling and testing procedures. *Geotechnical engineers can observe actual subsurface conditions only at those specific locations where sampling and testing is performed.* The data derived from that sampling and testing were reviewed by your geotechnical engineer, who then applied professional judgement to form opinions about subsurface conditions throughout the site. Actual sitewide-subsurface conditions may differ – maybe significantly – from those indicated in this report. Confront that risk by retaining your geotechnical engineer to serve on the design team through project completion to obtain informed guidance quickly, whenever needed.

This Report's Recommendations Are Confirmation-Dependent

The recommendations included in this report – including any options or alternatives – are confirmation-dependent. In other words, they are <u>not</u> final, because the geotechnical engineer who developed them relied heavily on judgement and opinion to do so. Your geotechnical engineer can finalize the recommendations *only after observing actual subsurface conditions* exposed during construction. If through observation your geotechnical engineer confirms that the conditions assumed to exist actually do exist, the recommendations can be relied upon, assuming no other changes have occurred. *The geotechnical engineer who prepared this report cannot assume responsibility or liability for confirmation-dependent recommendations if you fail to retain that engineer to perform construction observation.*

This Report Could Be Misinterpreted

Other design professionals' misinterpretation of geotechnical-engineering reports has resulted in costly problems. Confront that risk by having your geotechnical engineer serve as a continuing member of the design team, to:

- confer with other design-team members;
- help develop specifications;
- review pertinent elements of other design professionals' plans and specifications; and
- be available whenever geotechnical-engineering guidance is needed.

You should also confront the risk of constructors misinterpreting this report. Do so by retaining your geotechnical engineer to participate in prebid and preconstruction conferences and to perform construction-phase observations.

Give Constructors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can shift unanticipated-subsurface-conditions liability to constructors by limiting the information they provide for bid preparation. To help prevent the costly, contentious problems this practice has caused, include the complete geotechnical-engineering report, along with any attachments or appendices, with your contract documents, *but be certain to note conspicuously that you've included the material for information purposes only.* To avoid misunderstanding, you may also want to note that "informational purposes" means constructors have no right to rely on the interpretations, opinions, conclusions, or recommendations in the report. Be certain that constructors know they may learn about specific project requirements, including options selected from the report, *only* from the design drawings and specifications. Remind constructors that they may perform their own studies if they want to, and *be sure to allow enough time* to permit them to do so. Only then might you be in a position to give constructors the information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions. Conducting prebid and preconstruction conferences can also be valuable in this respect.

Read Responsibility Provisions Closely

Some client representatives, design professionals, and constructors do not realize that geotechnical engineering is far less exact than other engineering disciplines. This happens in part because soil and rock on project sites are typically heterogeneous and not manufactured materials with well-defined engineering properties like steel and concrete. That lack of understanding has nurtured unrealistic expectations that have resulted in disappointments, delays, cost overruns, claims, and disputes. To confront that risk, geotechnical engineers commonly include explanatory provisions in their reports. Sometimes labeled "limitations," many of these provisions indicate where geotechnical engineers' responsibilities begin and end, to help others recognize their own responsibilities and risks. *Read these provisions closely.* Ask questions. Your geotechnical engineer should respond fully and frankly.

Geoenvironmental Concerns Are <u>Not</u> Covered

The personnel, equipment, and techniques used to perform an environmental study – e.g., a "phase-one" or "phase-two" environmental site assessment – differ significantly from those used to perform a geotechnical-engineering study. For that reason, a geotechnical-engineering report does not usually provide environmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. *Unanticipated subsurface environmental problems have led to project failures.* If you have not obtained your own environmental information about the project site, ask your geotechnical consultant for a recommendation on how to find environmental risk-management guidance.

Obtain Professional Assistance to Deal with Moisture Infiltration and Mold

While your geotechnical engineer may have addressed groundwater, water infiltration, or similar issues in this report, the engineer's services were not designed, conducted, or intended to prevent migration of moisture – including water vapor – from the soil through building slabs and walls and into the building interior, where it can cause mold growth and material-performance deficiencies. Accordingly, ***proper implementation of the geotechnical engineer's recommendations will <u>not</u> of itself be sufficient to prevent moisture infiltration. Confront the risk of moisture infiltration*** by including building-envelope or mold specialists on the design team. ***Geotechnical engineers are <u>not</u> building-envelope or mold specialists.***

GEOPROFESSIONAL BUSINESS ASSOCIATION

Telephone: 301/565-2733
e-mail: info@geoprofessional.org www.geoprofessional.org

GENERAL COMMENTS

BASIS OF GEOTECHNICAL REPORT

REVIEW OF DESIGN DETAILS, PLANS, AND SPECIFICATIONS

REVIEW OF REPORT INFORMATION WITH PROJECT TEAM

FIELD VERIFICATION OF GEOTECHNICAL CONDITIONS

PROJECT INFORMATION FOR CONTRACTOR

THIRD PARTY RELIANCE/REUSE OF THIS REPORT

LABORATORY TESTING PROCEDURES

VISUAL ENGINEERING CLASSIFICATION

MOISTURE CONTENT

HAND PENETROMETER TESTS

TORVANE SHEAR TESTS

LOSS-ON-IGNITION (ORGANIC CONTENT) TESTS

ATTERBERG LIMITS TESTS

Passionate People Building
and Revitalizing our World

SME

SECTION 013300
ARCHITECT'S SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes administrative and procedural requirements for submitting RFI's, Shop Drawings, Product Data, Samples, and other submittals.

1.2 DEFINITIONS

A. Action Submittals: Written and graphic information that requires Architect's responsive action.

B. Informational Submittals: Written information that does not require Architect's responsive action. Submittals may be rejected for not complying with requirements.

1.3 SUBMITTAL PROCEDURES

A. General: Electronic copies of CAD Drawings of the Contract Documents will be provided by Architect for Contractor's use in preparing submittals. See 1.4 below.

B. All submittals must be in electronic form. Paper copies are not acceptable unless specifically listed. The architect will review, stamp and return an electronic document for the contractor's use. Copies of the reviewed shop drawings shall be provided by the contractor for distribution as required by the Construction Manager.

C. Each submittal item shall be submitted in its entirety as one complete package including all information required to fully review the item. Material sample, data, warranty and maintenance information, and drawings shall come as one package. Submittals missing required components and / or without product selections identified will be rejected without review.

D. Compliance Certificate: Refer to the attached Compliance Certificate. Compliance Certificates are to be used by contractors to indicate the products/devices intended for use in this project without the need and time for product data submittals. Contractors shall use Compliance Certificates whenever possible to expedite the work and limit paper work. Items listed on the form must be approved products listed in the specifications. No substitutions allowed. Select one (1) source for each category, sign this sheet, and submit as the contractor's commitment to use products required by the contract documents. No further product data submittals are required for this section. Physical sample, color samples, or layout shop drawings must be submitted where required by the specification. Refer to the attached specification list for sections that are subject to this certificate. **NOTE: Not all specification sections listed below will apply to the project listed above. There might not be specification sections included that are in the**

project listed above, in that case coordinate with architect at post bid interview for submittal requirements.

E. 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. 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.

F. Submittals Schedule: Comply with requirements in Division 1 Section "Construction Progress Documentation" for list of submittals and time requirements for scheduled performance of related construction activities.

G. Processing Time: Allow enough 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. RFI's, request for information: Allow 5 working days for initial response for each RFI. Allow additional time if coordination with subsequent RFI is required, or when additional information is need for the response.

2. Shop drawings, sample, and product data:

    a. Initial Review: Allow 15 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.

    b. Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.

    c. Resubmittal Review: Allow 15 days for review of each resubmittal.

    d. Sequential Review: where sequential review of submittals by Architect's consultants, Owner, or other parties is indicated, allow 21 days for initial review of each submittal.

    e. Submissions that are large or of multiple submissions or requires detailed or lengthy review by the Architect or his consultant may require additional time.

    f. Submissions for products or material that require a long lead time for delivery shall be noted as such and marked "Top Priority" so the architect may expedite the process. The architect will expedite reviews when the contractor legitimately can't submit within a reasonable time due to construction schedule. Failure to submit in a timely manner or to allow sufficient time for initial review and resubmittal reviews may result in project delays, additional service charges by the architect, or other penalties for the contractor.

H. Identification: Place a permanent label or title block on each submittal for identification.

1. Indicate name of firm or entity that prepared each submittal on label or title block.
2. Provide a space approximately 6 by 8 inches on label or beside title block to record Contractor's review and approval markings and action taken by Architect.
3. Include the following information on label for processing and recording action taken:

    a. Project name.
    b. Date.
    c. Name and address of Architect.
    d. Name and address of Contractor.
    e. Name and address of subcontractor.
    f. Name and address of supplier.
    g. Name of manufacturer.
    h. Submittal number or other unique identifier, including revision identifier.

        1) Submittal number shall use Specification Section number followed by a decimal point and then a sequential number (e.g., 06100.01). Resubmittals shall include an alphabetic suffix after another decimal point (e.g., 06100.01.A).

    i. Number and title of appropriate Specification Section.
    j. Drawing number and detail references, as appropriate.
    k. Location(s) where product is to be installed, as appropriate.
    l. Other necessary identification.

I. Deviations: Highlight, encircle, or otherwise specifically identify deviations from the Contract Documents on submittals.

J. Additional Copies: Unless additional copies are required for final submittal, and unless Architect observes noncompliance with provisions in the Contract Documents, initial submittal may serve as final submittal.

1. Additional copies submitted for maintenance manuals will not be marked with action taken and will be returned.

K. Transmittal: Package each submittal individually and appropriately for transmittal and handling. Transmit each submittal using a transmittal form including electronic submittals. Architect will discard submittals received from sources other than the Construction Manager. Architect will return any submittal with a transmittal, which doesn’t fully list, and properly identify the enclosed items.

L. 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 " Review or reviewed with comments."

M. Distribution: Furnish copies of reviewed submittals to the Construction Manager, manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.

1.4 CONTRACTOR'S USE OF ARCHITECT'S CAD FILES

A. General: At Contractor's written request, copies of Architect's CAD files will be provided to the Contractor for Contractor's use in connection with Project, subject to the following conditions:

1. The Architect will provide, electronic data files, compatible with AutoCAD for contractor's convenience and use in the preparation of shop drawings. **Refer to Terms and Conditions at the end of this specification.** Requests for electronic data shall be in written form through the architect. Prior to the release of electronic files, the Architect will require a signed waiver of release. Contractors should allow a minimum of 1-week for this process.

PART 2 - RFI'S – REQUEST FOR INFORMATION

1. All RFI's shall be submitted to the Architect in electronic form. PDF's and Word files are acceptable.

2. PDF RFI forms shall include an editable text area for response, date, and signature.

3. RFI's shall be distributed by e-mail. E-mail title shall be specific to job name, and RFI number. This is mandatory for proper tracking.

4. Faxed and Hand written RFI's are not acceptable and will be rejected.

PART 3 - PRODUCTS

3.1 ACTION SUBMITTALS

A. General: Prepare and submit Action Submittals required by individual Specification Sections.

1. Submittal Types:
   a. Shop Drawing
   b. Product Data
   c. Sample
   d. Other

B. Kingscott Review Stamp Statement: "Reviewed only for the limited purpose of checking for conformance with the design concept expressed in the Contract Documents. Dimensions, quantities, accuracy, assembly methods, installation methods, coordination with other trades and field verification are the responsibility of the contractor."

1. The following Actions will be taken:
   a. Reviewed with no exceptions
   b. Reviewed with Exceptions
   c. Revise and resubmit
   d. Rejected

C. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.

1. Use the Material Compliance form when permitted and whenever possible to save time and paper work.
2. If information must be specially prepared for submittal because standard data are not suitable for use, submit as Shop Drawings, not as Product Data.
3. Mark each copy of each submittal to show which products and options are applicable. Unmarked submittals will be rejected. Failure to mark appropriate products will result in rejection of the submittal.
4. Include the following information, as applicable:

    a. Manufacturer's written recommendations.
    b. Manufacturer's product specifications.
    c. Manufacturer's installation instructions.
    d. Manufacturer's catalog cuts.
    e. Wiring diagrams showing factory-installed wiring.
    f. Printed performance curves.
    g. Operational range diagrams.
    h. Compliance with specified referenced standards.
    i. Testing by recognized testing agency.

5. Number of Copies: Submit one electronic copy of Product Data, unless otherwise indicated. Architect will return one electronic copy. See the Constriction Manager's submittal requirements for final record and distribution copy requirements.

D. 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, unless submittal of Architect's CAD Drawings is otherwise permitted.

1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:

    a. Dimensions.
    b. Identification of products.
    c. Fabrication and installation drawings.
    d. Roughing-in and setting diagrams.
    e. Wiring diagrams showing field-installed wiring, including power, signal, and control wiring.
    f. Shop work manufacturing instructions.
    g. Templates and patterns.
    h. Schedules.
    i. Notation of coordination requirements.
    j. Notation of dimensions established by field measurement.
    k. Relationship to adjoining construction clearly indicated.
    l. Seal and signature of professional engineer if specified.
    m. Wiring Diagrams: Differentiate between manufacturer-installed and field-installed wiring.

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 40 inches.
3. Number of Copies: Submit one opaque (bond) copy, and one electronic copy of each submittal. Architect will return one electronic copy for printing and distribution.

E. Samples: **Submit Physical 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 appropriate Specification Section.

3. 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.
4. 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. **Scanned color charts, samples, etc. will be REJECTED. Send physical samples, color charts, etc. as described in each specification section.**

    a. Number of Samples: Submit one full set 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.

5. Samples for Verification: Submit full-size units or Samples of size indicated, prepared from same material to be used for the Work, cured and finished in manner specified, and physically identical with material or product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection**. Scanned color charts, samples, etc., will be REJECTED. Send physical samples, color charts, etc. as described in each specification section.**

    a. Number of Samples: Submit three sets of Samples. Architect will retain one Sample set; remainder will be returned. Mark up and retain one returned Sample set as a Project Record Sample.

3.2 DELEGATED DESIGN

A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.

1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Architect.

B. Delegated-Design Submittal: In addition to Shop Drawings, Product Data, and other required submittals, submit four copies of a statement, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional.

1. Indicate that products and systems comply with performance and design criteria in the Contract Documents. Include list of codes, loads, and other factors used in performing these services.

PART 4 - EXECUTION

4.1 CONTRACTOR'S REVIEW

A. 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 prior to submission for review. It is the contractor's responsibility to review and identify major discrepancy with the contract dements, and significant missing information. Documents with discrepancies and substantially missing information shall be returned for revisions prior to submission to the Construction Manager.

B. Mark with approval stamp before submitting to the Construction Manager.

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.

4.2 CONSTRUCTION MANAGER'S REVIEW

A. 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 prior to submission for review. It is the Construction Manager's responsibility to review and identify major discrepancy with the contract dements, and significant missing information. Documents with discrepancies and substantially missing information shall be returned for revisions prior to submission to the Architect.

B. Mark with approval stamp before submitting to Architect.

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 approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.

4.3 ARCHITECT'S ACTION

A. General: Architect will not review submittals that do not bear Contractor's and Construction Managers approval stamp, and have not been fully reviewed and will return them without action.

B. Action Submittals: Architect will review each submittal, make marks to indicate corrections or modifications required, and return it. Architect will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action taken, as follows:

1. Reviewed with no exceptions.
2. Reviewed with exceptions.
3. Revise and resubmit.
4. Rejected.

C. Partial submittals are not acceptable, will be considered non-responsive, and will be returned without review.

D. Incomplete submittals with substantial missing information, will be considered non-responsive, and will be returned without review.

E. Non-complaint submittals, will be considered non-responsive, and will be returned without review.

F. Submittals not required by the Contract Documents will not be reviewed and will be discarded.

SUMBITTALS REQUESTED BY SPECIFICATION SECTION						
This is a general guide, but may vary by project.						
Given the age of digital submittal, product information and images, and multiple files can be compiled into one complete product data page. When this complete product data sheet is submitted, it becomes an acceptable option to help limit physical samples and paper.						
SECTION. NO.	SECTION TITLE	PRODUCT DATA	SAMPLE	SHOP DRAWINGS	MATERIAL COMPLIANCE	TESTING
033000	CAST-IN-PLACE CONCRETE	X		X		X
042000	UNIT MASONRY/BRICK	X	X (BRICK)			
047200	CAST STONE	X	X			
051200	STRUCTURAL STEEL FRAMING			X		
052100	STEEL JOIST			X		
053100	STEEL DECKING				X	
054000	COLD-FORMED METAL FRAMING			X		
055000	METAL FABRICATIONS			X		
055113	METAL PAN STAIRS			X		
055213	PIPE AND TUBE			X		
061000	ROUGH CARPENTRY				X	
061053	MISCELLANEOUS ROUGH CARPENTRY				X	
061063	EXTERIOR ROUGH CARPENTRY				X	
061600	SHEATHING				X	
061753	SHOP-FABRICATED WOOD TRUSSES			X		
062013	EXTERIOR FINISH CARPENTRY		X		X	
062023	INTERIOR FINISH CARPENTRY		X		X	
071326	SELF-ADHERING SHEET	X			X	
072100	THERMAL INSULATION	X			X	
072119	FOAMED-IN-PLACE INSULATION	X			X	
072500	WEATHER BARRIERS	X			X	
072600	VAPOR RETARDERS	X			X	
073113	ASPHALT SHINGLES		X			

SECTION. NO.	SECTION TITLE	PRODUCT DATA	SAMPLE	SHOP DRAWINGS	MATERIAL COMPLIANCE	TESTING
074113.16	STANDING-SEAM METAL ROOF PANELS		X			
074213.13	FORMED METAL WALL PANELS		X	X		
074213.19	INSULATED METAL WALL PANELS		X	X		
075323	ETHYLENE-PROPYLENE-DIENE-MONOMER (EPDM) ROOFING			X		
075423	THERMOPLASTIC POLYOLEFIN (TPO) ROOFING			X		
076200	SHEET METAL FLASHING AND TRIM		X			
077100	ROOF SPECIALTIES	X			X	
077129	MANUFACTURED ROOF EXPANSION JOINTS	X			X	
077200	ROOF ACCESSORIES	X			X	
078413	PENETRATION FIRESTOPPING				X	
078443	JOINT FIRESTOPPING				X	
079200	JOINT SEALANTS	X	X			
079219	ACOUSTICAL JOINT SEALANTS	X	X			
081213	HOLLOW METAL DOORS AND FRAMES			X		
081416	FLUSH WOOD DOORS		X	X		
083113	ACCESS DOORS AND FRAMES				X	
083313	COILING COUNTER DOORS			X		
083323	OVERHEAD COILING DOORS			X		
083513	FOLDING DOORS			X		
083613	SECTIONAL DOORS			X		

SECTION. NO.	SECTION TITLE	PRODUCT DATA	SAMPLE	SHOP DRAWINGS	MATERIAL COMPLIANCE	TESTING
084113	ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS		X	X		
084413	GLAZED ALUMINUM CURTAIN WALLS		X	X		
084523	FIBERGLASS-SANDWICH-PANEL ASSEMBLIES	X			X	
085113	ALUMINUM WINDOWS		X	X		
087100	DOOR HARDWARE			X		
088000	GLAZING	X			X	
088300	MIRRORS				X	
089119	FIXED LOUVERS		X	X		
092116.23	GYPSUM BOARD SHAFT WALL ASSEMBLIES				X	
092216	NON-STRUCTURAL METAL FRAMING				X	
092900	GYPSUM BOARD				X	
093013	CERAMIC TILE	X			X	
095113	ACOUSTICAL PANEL CEILING				X	
096513	RESILIENT BASE & ACCESSORIES				X	
096516	RESILIENT SHEET VINYL	X				
096519	RESILIENT TILE FLOORING	X				
096566	RESILIENT ATHLETIC FLOORING	X				
096813	TILE CARPET	X				
096816	SHEET CARPET	X				
097200	WALL COVERINGS	X				
098433	SOUND ABSORBING WALL UNITS	X				
098436	SOUND ABSORBING CEILING UNITS	X				
099113	EXTERIOR PAINTING		X			
099123	INTERIOR PAINTING		X			
099600	HIGH PERFORMANCE COATINGS		X			

SECTION. NO.	SECTION TITLE	PRODUCT DATA	SAMPLE	SHOP DRAWINGS	MATERIAL COMPLIANCE	TESTING
101100	VISUAL DISPLAY BOARDS			X	X	
101200	DISPLAY CASES			X	X	
101423	PANEL SIGNAGE		X	X		
102113	TOILET COMPARTMENTS	X		X		
102116	SHOWER AND DRESSING COMPARTMENTS	X		X		
102123	CUBICAL CURTAINS AND TRACK	X			X	
102800	TOILET, BATH, AND LAUNDRY ACCESSORIES (CONTRACTOR TO VERIFY QUANTITIES				X	
104413	FIRE PROTECTION CABINETS				X	
104416	FIRE EXTINGUISHERS				X	
105113	METAL LOCKERS		X	X		
105613	METAL SHELVING				X	
105626	MOBILE STORAGE SHELVING			X	X	
113100	RESIDENTIAL APPLIANCES				X	
115123	LIBRARY STACK SYSTEMS		X	X		
115213	PROJECTION SCREENS				X	
115313	LABORATORY FUME HOODS		X	X		
116143	STAGE CURTAINS		X	X		
116623	GYMNASIUM EQUIPMENT		X	X		
126600	TELESCOPING STANDS		X	X		
122113	HORIZONTAL BLINDS	X				
122413	VERTICLE BLINDS	X				
122413	ROLLER SHADES (OPERABLE SHOP DRAWINGS)	X		X	X	

SECTION. NO.	SECTION TITLE	PRODUCT DATA	SAMPLE	SHOP DRAWINGS	MATERIAL COMPLIANCE	TESTING
123___	CASEWORK AND COUNTERTOPS		X	X		
124816	ENTRANCE FLOOR GRILLS	X				

Material Compliance Form

Kingscott
259 East Michigan, Suite 308
Kalamazoo, MI 49007
800.632.7815 | kingscott.com

Name of Building:

Owner:

Bid Package #:

A/E #:

Cc:

Material Compliance Submittal Section:

This document is to be used by this contractor to indicate the products/devices intended for use in this project without the need for product data submittals. Items listed are approved products in the specifications. No substitutions allowed. Select one (1) source for each category, sign this sheet, and submit as the contractor's commitment to use products required by the contract documents. **No further product data submittals are required for this section. However, physical sample, color samples, or layout shop drawings must be submitted where required by the specification.**

As contractor for work specified under the section named above, I agree to use only the products/devices listed below that were listed in the specification section.

Contractor:

Date:

Print Name:

Title:

Signature: _____

Filled out by Contractor

Notary:

County:

Date Commission Expires:

Name:

Signature: _____

Filled out by Contractor and Notary used from Contractor

Reviewed By: Construction Manager, Inc.

Date:

Print Name:

Signature: _____

Filled out by Construction Manager

Reviewed By: Kingscott Associates, Inc.

Date:

Print Name:

Signature: _____

Filled out by Architect

List the manufacturer's name and model number(s) for each item being submitted in this division. Provide all relevant information not covered by the model number to show full compliance with each requirement of the specification. This will include but is not limited to color, finish, size, thickness and all other selectable option. Note: Use location for each listed item when several different products in this division are used in specific locations.

Specification Section:	Manufacturer's Name:	Model Number:
096519	Shaw Commercial	Uncommon Ground 6 #0188V (LVT-1)
096519	Shaw Commercial	Skyline #02560 (LVT-2)
095113	Armstrong	#1713 (CP-1)
095113	Armstrong	#3101 (CP-2)
095113	Armstrong	Armstrong Prelude XL (ME-1 grid)
095113	Armstrong	Armstrong Axiom Classic Trim (ME-2 grid and trim)

Material Compliance Form

Kingscott
259 East Michigan, Suite 308
Kalamazoo, MI 49007
800.632.7815 | kingscott.com

Name of Building:

Owner:

Bid Package #:

A/E #:

Cc:

Material Compliance Submittal Section:

This document is to be used by this contractor to indicate the products/devices intended for use in this project without the need for product data submittals. Items listed are approved products in the specifications. No substitutions allowed. Select one (1) source for each category, sign this sheet, and submit as the contractor's commitment to use products required by the contract documents. **No further product data submittals are required for this section. However, physical sample, color samples, or layout shop drawings must be submitted where required by the specification**.

As contractor for work specified under the section named above, I agree to use only the products/devices listed below that were listed in the specification section.

Contractor:

Date:

Print Name:

Title:

Signature: _____

Notary:

County:

Date Commission Expires:

Print Name:

Signature: _____

Reviewed By: Construction Manager, Inc.

Date:

Print Name:

Signature: _____

Reviewed By: Kingscott Associates, Inc.

Date:

Print Name:

Signature: _____

List the manufacturer's name and model number(s) below for each item being submitted in this division. Provide all relevant information not covered by the model number to show full compliance with each requirement of the specification. This will include but is not limited to color, finish, size, thickness and all other selectable option. Note: Use location for each listed item when several different products in this division are used in specific locations.

Specification Section:	Manufacturer's Name:	Model Number:

Kingscott
259 East Michigan, Suite 308
Kalamazoo, MI 49007
800.632.7815 | kingscott.com

Electronic Media Authorization

Signed waiver required prior to release

Project Name: _____ KAI Project# _____

Name : _____ Company: _____

Address: _____

City, State, Zip: _____

Phone: _____ Email: _____

Autocad file version: _____

Signature: _____ Date: _____

By signing, you are agreeing to the Terms and Conditions on the following page

Documents Requested: KAI DWG # Issued Date on DWG

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SECTION 033000
CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Concrete materials.
2. Steel reinforcement.
3. Concrete materials.
4. Admixtures.
5. Fiber reinforcement.
6. Vapor retarders.
7. Curing materials.
8. Accessories.
9. Repair materials.

1.2 DEFINITIONS

A. Cementitious Materials: Portland cement or blended hydraulic cement alone or in combination with one or more of the following:

1. Fly ash, slag cement, other pozzolans, and silica fume; materials subject to compliance with requirements.

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

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Require representatives of each entity directly concerned with cast-in-place concrete to attend, including the following:

a. Contractor's superintendent.
b. Independent testing agency responsible for inspections and acceptance testing of concrete at Project site.
c. Ready-mix concrete manufacturer.
d. Concrete Subcontractor.
e. Special concrete finish Subcontractor.

2. Review the following:

a. Special inspection and testing and inspecting agency procedures for field quality control.
b. Construction joints, control joints, isolation joints, and joint-filler strips.
c. Semirigid joint fillers.
d. Vapor-retarder installation.
e. Anchor rod and anchorage device installation tolerances.
f. Cold- and hot-weather concreting procedures.
g. Concrete finishes and finishing.
h. Curing procedures.
i. Forms and form-removal limitations.
j. Methods for achieving specified floor and slab flatness and levelness.
k. Floor and slab flatness and levelness measurements.
l. Concrete repair procedures.
m. Concrete protection.
n. Initial curing of standard-cured and field curing of field-cured test cylinders (ASTM C31)
o. Protection of field cured field test cylinders.
p. Distribution of test reports.

1.4 ACTION SUBMITTALS

A. Product Data:

1. Portland cement.
2. Blended hydraulic cement.
3. Performance-based hydraulic cement.
4. Fly ash.
5. Slag cement.
6. Silica fume.
7. Aggregates.
8. Admixtures.
9. Fiber reinforcement.
10. Vapor retarders.
11. Curing materials.
12. Joint fillers.
13. Repair materials.

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.

C. Shop Drawings:

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

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

D. Steel Reinforcement Shop Drawings: Placing Drawings that detail fabrication, bending, and placement. Include bar sizes, length, material, grade, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, splices and laps, mechanical connections, tie spacings, hoop spacing, and supports for concrete reinforcement.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For the following:

1. Installer: Include copies of applicable ACI certificates.
2. Ready-mixed concrete manufacturer.
3. Testing Agency: Include documentation indicating compliance with ASTM E329 or ASTM C1077 and copies of applicable ACI certificates for testing technicians or ACI Concrete Construction Special Inspector - MH, ASCC.

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

1. Cementitious materials.
2. Admixtures.
3. Fiber reinforcement.
4. Curing compounds.
5. Bonding agents.
6. Adhesives.
7. Vapor retarders.
8. Semirigid joint filler.
9. Joint-filler strips.
10. Repair materials.

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

1. Portland cement.
2. Blended hydraulic cement.
3. Performance-based hydraulic cement.
4. Fly ash.
5. Slag cement.
6. Silica fume.
7. Aggregates.
8. Admixtures.

D. Preconstruction Test Reports: For each mix design.

E. Field quality-control reports.

F. Minutes of preinstallation conference.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: A qualified Installer who employs Project personnel qualified as an ACI-certified Concrete Flatwork Associate and Concrete Flatwork Finisher and a supervisor

who is a certified ACI Advanced Concrete Flatwork Finisher/Technician or an ACI Concrete Flatwork Finisher with experience installing and finishing concrete.

B. Ready-Mixed Concrete Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C94 requirements for production facilities and equipment.

1. Manufacturer's production facilities and delivery vehicles certified in accordance with NRMCA's certification requirements.

C. Laboratory Testing Agency Qualifications: A testing agency qualified in accordance with ASTM C1077 and ASTM E329 for testing indicated and employing an ACI-certified Concrete Quality Control Technical Manager.

1. Personnel performing laboratory tests to be an ACI-certified Concrete Strength Testing Technician and Concrete Laboratory Testing Technician, Level 1. Testing agency laboratory supervisor tests to be an ACI-certified Concrete Laboratory Testing Technician, Level 2.

D. Field Quality-Control Testing Agency Qualifications: An independent agency, qualified in accordance with ASTM C1077 and ASTM E329 for testing indicated.

1. Personnel conducting field tests on plastic concrete properties are to be qualified as an ACI Concrete Field Testing Technician, Grade 1, in accordance with policies from ACI CPP 610.1 or an equivalent certification program.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Comply with ASTM C94 and ACI 301.

1.8 FIELD CONDITIONS

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

1. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
2. When air temperature has fallen to, or is expected to fall below 40 deg F during the protection period, maintain delivered concrete mixture temperature within the temperature range required by ACI 301.
3. Do not use frozen materials or materials containing ice or snow.
4. Do not place concrete in contact with surfaces less than 35 deg F, other than reinforcing steel.
5. 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 ACI 305.1, and as follows:

1. Maintain concrete temperature at time of discharge to not exceed 95 deg F.

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 STANDARDS

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

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.

B. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.

2.3 STEEL REINFORCEMENT

A. Reinforcing Bars: ASTM A615, Grade 60, deformed.

B. Plain Steel Welded-Wire Reinforcement: ASTM A1064, plain, flat sheets, size and gage as indicated on drawings.

C. 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."

D. Tie Wire: Annealed, minimum 16 gage.

2.4 CONCRETE MATERIALS

A. Source Limitations:

1. Obtain all concrete mixtures from a single ready-mixed concrete manufacturer for entire Project.
2. Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant.
3. Obtain aggregate from single source.
4. Obtain each type of admixture from single source from single manufacturer.

B. Cementitious Materials:

1. Portland Cement: ASTM C150, Type I, Type II, Type I/II.
2. Blended Hydraulic Cement: ASTM C595.

3. Performance-Based Hydraulic Cement: ASTM C1157.
4. Fly Ash: ASTM C618, Class C or F
5. Slag Cement: ASTM C989, Grade 100 or 120.
6. Silica Fume: ASTM C1240 amorphous silica.

C. Normal-Weight Aggregates:

1. Coarse Aggregate: ASTM C33, coarse aggregate or better, graded. Provide aggregates from a single source.
2. Maximum Coarse-Aggregate Size: per design mix requirements.
3. Fine Aggregate: ASTM C33, free of materials with deleterious reactivity to alkali in cement.

2.5 ADMIXTURES

A. Air-Entraining Admixture: ASTM C260.

B. Chemical Admixtures: Certified by manufacturer to be compatible with other admixtures that do not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.

1. Water-Reducing Admixture: ASTM C494, Type A.
2. Retarding Admixture: ASTM C494, Type B.
3. Water-Reducing and -Retarding Admixture: ASTM C494, Type D.
4. High-Range, Water-Reducing Admixture: ASTM C494, Type F.
5. High-Range, Water-Reducing and -Retarding Admixture: ASTM C494, Type G.

C. Mixing Water for Concrete Mixtures and Water Used to Make Ice: ASTM C1602.

2.6 FIBER REINFORCEMENT

A. Synthetic Macrofiber: Synthetic macrofibers complying with ASTM C1116, Type III, 1 to 2-1/4 inches long.

2.7 VAPOR RETARDERS

A. Sheet Vapor Retarder, Class A: ASTM E1745, Class A, except with maximum water-vapor permeance of 0.01 or lower. Include manufacturer's recommended thickness and adhesive or pressure-sensitive tape.

2.8 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 C171, polyethylene film burlap-polyethylene sheet.

D. Water: Potable water that does not cause staining of the surface.

E. Clear, Waterborne, Membrane-Forming, Dissipating Curing Compound: ASTM C309, Type 1, Class B.

F. Clear, Waterborne, Membrane-Forming, Nondissipating Curing Compound: ASTM C309, Type 1, Class B.

G. Clear, Solvent-Borne, Membrane-Forming, Curing and Sealing Compound: ASTM C1315, Type 1, Class A.

2.9 ACCESSORIES

A. Expansion- and Isolation-Joint-Filler Strips: ASTM D1751, asphalt-saturated cellulosic fiber or ASTM D1752, cork or self-expanding cork.

B. Semirigid Joint Filler: Two-component, semirigid, 100 percent solids, in accordance with ASTM D2240.

C. Bonding Agent: ASTM C1059, Type II, nonredispersible, acrylic emulsion or styrene butadiene.

D. Epoxy Bonding Adhesive: ASTM C88, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class suitable for application temperature and of grade and class to suit requirements, and as follows:

1. Types I and II, nonload bearing, Types IV and V, load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.

2.10 CONCRETE MIXTURE, GENERAL

A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, in accordance with ACI 301.

1. Use a qualified testing agency for preparing and reporting proposed mixture designs, based on laboratory trial mixtures.

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

1. Fly Ash or Other Pozzolans: 25 percent by mass.
2. Slag Cement: 50 percent by mass.
3. Silica Fume: 10 percent by mass.
4. Total of Fly Ash or Other Pozzolans, Slag Cement, and Silica Fume: 50 percent by mass, with fly ash or pozzolans not exceeding 25 percent by mass and silica fume not exceeding 10 percent by mass.

5. Total of Fly Ash or Other Pozzolans and Silica Fume: 35 percent by mass with fly ash or pozzolans not exceeding 25 percent by mass and silica fume not exceeding 10 percent by mass.

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

2.11 CONCRETE MIXTURES

A. Footings: Proportion normal-weight concrete mixture as follows:

1. Minimum Compressive Strength: 3000 psi at 28 days.
2. Maximum w/cm Ratio: 0.49
3. Slump Limit: 4 inches, plus or minus 1 inch.
4. Air Content: 6 percent, plus or minus 1 inch.
5. Maximum Aggregate Size: 1 1/2 inch.

B. Interior Slabs-on-Grade: Proportion normal-weight concrete mixture as follows:

1. Minimum Compressive Strength: 4000 psi at 28 days.
2. Maximum w/cm Ratio: 0.46
3. Slump Limit: 4 inches, plus or minus 1 inch.
4. Maximum Aggregate Size: 3/4 inch.

2.12 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete in accordance with ASTM C94 and furnish delivery ticket.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verification of Conditions:

1. Before placing concrete, verify that installation of concrete forms, accessories, reinforcement, and embedded items is complete and that required inspections have been performed.
2. Do not proceed until unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Provide reasonable auxiliary services to accommodate field testing and inspections, acceptable to testing agency, including the following:

1. Daily access to the Work.
2. Incidental labor and facilities necessary to facilitate tests and inspections.

3. Secure space for storage, initial curing, and field curing of test samples, including source of water and continuous electrical power at Project site during site curing period for test samples.
4. Security and protection for test samples and for testing and inspection equipment at Project site.

3.3 TOLERANCES

A. Comply with ACI 117.

3.4 FORMWORK INSTALLATION

A. Design, erect, shore, brace, and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads.

B. Construction formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.

C. Construct form tight enough to prevent loss of concrete mortar.

D. Fabricate form for easy removal without hammering or prying against concrete surfaces.

E. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris before placing concrete.

F. Coat contact surfaces of forms with form-release agent, according to manufacturer’s written instructions, before placing concrete.

3.5 INSTALLATION OF EMBEDDED ITEMS

A. Place and secure anchorage devices and other embedded items required for adjoining Work that is attached to or supported by cast-in-place concrete.

1. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
2. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of ANSI/AISC 303.

3.6 INSTALLATION OF VAPOR RETARDERS

A. Sheet Vapor Retarders: Place, protect, and repair sheet vapor retarder in accordance with ASTM E1643 and manufacturer's written instructions.

1. Install vapor retarder with longest dimension parallel with direction of concrete pour.
2. Face laps away from exposed direction of concrete pour.
3. Lap vapor retarder over footings and grade beams not less than 6 inches, sealing vapor retarder to concrete.

4. Lap joints 6 inches and seal with manufacturer's recommended tape.
5. Terminate vapor retarder at the top of floor slabs, grade beams, and pile caps, sealing entire perimeter to floor slabs, grade beams, foundation walls, or pile caps.
6. Seal penetrations in accordance with vapor retarder manufacturer's instructions.
7. Protect vapor retarder during placement of reinforcement and concrete.

    a. Repair damaged areas by patching with vapor retarder material, overlapping damages area by 6 inches on all sides and sealing to vapor retarder.

3.7 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 would reduce bond to concrete.

C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum cover. Do not tack weld crossing reinforcing bars.

D. Set wire ties with ends directly into concrete, not toward exposed concrete surfaces.

E. Preserve clearance between bars of not less than 1 ich, not less than on bar diameter, or not less than 1-1/3 times size of large aggregate, whichever is greater.

F. Provide concrete coverage in accordance with ACI 318.

G. Install welded wire reinforcement in longest practicable lengths on bar supports spaced to minimize sagging. Lap edges and end 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.

H. Splices: Lap splices as indicated on Drawings.
   1. Bars indicated to be continuous, and all vertical bars shall be lapped not less than 36 bar diameters at splices, or 24 inches, whichever is greater.
   2. Stagger splices in accordance with ACI 318.

3.8 INSTALLATION OF CAST-IN-PLACE CONCRETE

A. Before placing concrete, verify that installation of formwork, reinforcement, embedded items, and vapor retarder is complete and that required inspections are completed.

   1. Immediately prior to concrete placement, inspect vapor retarder for damage and deficient installation, and repair defective areas.
   2. Provide continuous inspection of vapor retarder during concrete placement and make necessary repairs to damaged areas as Work progresses.

B. Notify Architect and testing and inspection agencies 24 hours prior to commencement of concrete placement.

C. Do not add water to concrete during delivery, at Project site, or during placement unless approved by Architect in writing, but not to exceed the amount indicated on the concrete delivery ticket.

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

D. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete is placed on concrete that has hardened enough to cause seams or planes of weakness.

1. If a section cannot be placed continuously, provide construction joints as indicated.
2. Deposit concrete to avoid segregation.
3. Deposit concrete in horizontal layers of depth not to exceed formwork design pressures and in a manner to avoid inclined construction joints.
4. Consolidate placed concrete with mechanical vibrating equipment in accordance with ACI 301.

E. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.

1. Do not place concrete floors and slabs in a checkerboard sequence.
2. Consolidate concrete during placement operations, so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
3. Maintain reinforcement in position on chairs during concrete placement.
4. Screed slab surfaces with a straightedge and strike off to correct elevations.
5. Level concrete, cut high areas, and fill low areas.
6. Slope surfaces uniformly to drains where required.
7. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess bleedwater appears on the surface.
8. Do not further disturb slab surfaces before starting finishing operations.

3.9 INSTALLATION OF JOINTS

A. Construct joints true to line, with faces perpendicular to surface plane of concrete in accordance with ACI 224 and with approval of Architect.

B. Construction Joints: Coordinate with floor slab pattern and concrete placement sequence.

1. Install so strength and appearance of concrete are not impaired, at locations indicated on Drawings or as approved by Architect.
2. Place joints perpendicular to main reinforcement.

a. Continue reinforcement across construction joints unless otherwise indicated.

3. Form keyed joints as indicated. Embed keys at least 1-1/2 inches into concrete.
4. Locate joints for beams, slabs, joists, and girders at third points of spans. Offset joints in girders a minimum distance of twice the beam width from a beam-girder intersection.

5. Locate horizontal joints in walls and columns at underside of floors, slabs, beams, and girders and at the top of footings or floor slabs.
6. Space vertical joints in walls [as indicated on Drawings] <Insert spacing>. Unless otherwise indicated on Drawings, locate vertical joints beside piers integral with walls, near corners, and in concealed locations where possible.
7. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
8. Use epoxy-bonding adhesive at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.

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

1. Grooved Joints: Form control joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8 inch. Repeat grooving of control joints after applying surface finishes. Eliminate groover tool marks on concrete surfaces.
2. Sawed Joints: Form control joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch wide joints into concrete when cutting action does not tear, abrade, or otherwise damage surface and before concrete develops random cracks.

D. Isolation Joints in Slabs-on-Ground: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.

1. Extend joint-filler strips full width and depth of joint, terminating flush with finished concrete surface unless otherwise indicated on Drawings.
2. Terminate full-width joint-filler strips not less than 1/2 inch or more than 1 inch below finished concrete surface, where joint sealants.
3. Install joint-filler strips in lengths as long as practicable. Where more than one length is required, lace or clip sections together.

E. Doweled Joints:

1. Install dowel bars and support assemblies at joints where indicated on Drawings.
2. Lubricate or asphalt coat one-half of dowel bar length to prevent concrete bonding to one side of joint.

3.10 APPLICATION OF FINISHING FLOORS AND SLABS

A. Comply with ACI 302.1R recommendations for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.

B. Float Finish:

1. When bleedwater sheen has disappeared and concrete surface has stiffened sufficiently to permit operation of specific float apparatus, consolidate concrete surface with power-driven floats or by hand floating if area is small or inaccessible to power-driven floats.

2. Repeat float passes and restraightening until surface is left with a uniform, smooth, granular texture and complies with ACI 117 tolerances for conventional concrete.

3.11 APPLICATION OF FINISHING FORMED SURFACES

A. As-Cast Surface Finishes:

1. ACI 301 Surface Finish SF-1.0: As-cast concrete texture imparted by form-facing material.

    a. Patch voids larger than 1-1/2 inches wide or 1/2 inch deep.
    b. Remove projections larger than 1 inch.
    c. Tie holes do not require patching.
    d. Surface Tolerance: ACI 117, Class D.
    e. Apply to concrete surfaces not exposed to public view.

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

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

3.12 INSTALLATION OF MISCELLANEOUS CONCRETE ITEMS

A. Filling in:

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

B. Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and by troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.

3.13 APPLICATION OF CONCRETE CURING

A. Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.

1. Comply with ACI 301 for cold weather protection during curing.
2. Comply with ACI 301 and ACI 305.1 for hot-weather protection during curing.
3. Maintain moisture loss no more than 0.2 lb/sq. ft. x h, calculated in accordance with ACI 305R, before and during finishing operations.

B. Curing Formed Surfaces: Comply with ACI 308.1 as follows:

1. Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces.
2. Cure concrete containing color pigments in accordance with color pigment manufacturer's instructions.
3. If forms remain during curing period, moist cure after loosening forms.
4. If removing forms before end of curing period, continue curing for remainder of curing period as follows:

    a. Continuous Fogging: Maintain standing water on concrete surface until final setting of concrete.
    b. Continuous Sprinkling: Maintain concrete surface continuously wet.
    c. Absorptive Cover: Pre-dampen absorptive material before application; apply additional water to absorptive material to maintain concrete surface continuously wet.
    d. Water-Retention Sheeting Materials: Cover exposed concrete surfaces with sheeting material, taping, or lapping seams.
    e. Membrane-Forming Curing Compound: Apply uniformly in continuous operation by power spray or roller in accordance with manufacturer's written instructions.

C. Curing Unformed Surfaces: Comply with ACI 308.1.

3.14 INSTALLATION OF JOINT FILLING

A. Prepare, clean, and install joint filler in accordance with manufacturer's written instructions.

1. Defer joint filling until concrete has aged at least six month(s).

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 deep in formed joints.

D. Overfill joint, and trim joint filler flush with top of joint after hardening.

3.15 INSTALLATION OF CONCRETE SURFACE REPAIRS

A. Defective Concrete:

1. Repair and patch defective areas when approved by Architect.
2. Remove and replace concrete that cannot be repaired and patched to meet specification requirements.

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 sieve, using only enough water for handling and placing.

C. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks in excess of 0.01 inch spalls, air bubbles exceeding surface finish limits, honeycombs, rock pockets, fins and other projections on the surface exceeding surface finish limits, 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 in any dimension to solid concrete.

    a. Limit cut depth to 3/4 inch.
    b. Make edges of cuts perpendicular to concrete surface.
    c. Clean, dampen with water, and brush-coat holes and voids with bonding agent.
    d. Fill and compact with patching mortar before bonding agent has dried.
    e. 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.

    a. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching.
    b. Compact mortar in place and match surrounding surface.

3. Repair defects on concealed formed surfaces that will affect concrete's durability and structural performance, as determined by Architect.

D. Repairing Unformed Surfaces:

1. Test unformed surfaces, such as floors and slabs, for finish, and verify surface tolerances specified for each surface.

    a. Correct low and high areas.
    b. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.

2. Repair finished surfaces containing surface defects, including spalls, popouts, honeycombs, rock pockets, crazing, and cracks in excess of 0.01 inch wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width.
3. After concrete has cured at least 14 days, correct high areas by grinding.
4. Correct localized low areas during, or immediately after, completing surface-finishing operations by adding patching mortar.

    a. Finish repaired areas to blend into adjacent concrete.

5. Correct other low areas scheduled to receive floor coverings with a repair underlayment.

    a. Prepare, mix, and apply repair underlayment and primer in accordance with manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.
    b. Feather edges to match adjacent floor elevations.

6. Correct other low areas scheduled to remain exposed with repair topping.

    a. Cut out low areas to ensure a minimum repair topping depth of 1/4 inch to match adjacent floor elevations.
    b. Prepare, mix, and apply repair topping and primer in accordance with manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.

7. Repair defective areas, except random cracks and single holes 1 inch or less in diameter, by cutting out and replacing with fresh concrete.

    a. Remove defective areas with clean, square cuts, and expose steel reinforcement with at least a 3/4-inch clearance all around.
    b. Dampen concrete surfaces in contact with patching concrete and apply bonding agent.
    c. Mix patching concrete of same materials and mixture as original concrete, except without coarse aggregate.
    d. Place, compact, and finish to blend with adjacent finished concrete.
    e. Cure in same manner as adjacent concrete.

8. Repair random cracks and single holes 1 inch or less in diameter with patching mortar.

    a. Groove top of cracks and cut out holes to sound concrete, and clean off dust, dirt, and loose particles.
    b. Dampen cleaned concrete surfaces and apply bonding agent.
    c. Place patching mortar before bonding agent has dried.
    d. Compact patching mortar and finish to match adjacent concrete.
    e. 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 to perform field tests and inspections and prepare testing and inspection reports.

B. Testing Agency: Owner will engage a qualified testing and inspecting agency to perform tests and inspections and to submit reports.

1. Testing agency to be responsible for providing curing facility for initial curing of strength test specimens on-site and verifying that test specimens are cured in accordance with standard curing requirements in ASTM C31.
2. Testing agency to immediately report to Architect, Contractor, and concrete manufacturer any failure of Work to comply with Contract Documents.
3. Testing agency to report results of tests and inspections, in writing, to Owner, Architect, Contractor, and concrete manufacturer within 48 hours of inspections and tests.

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

1) Project name.
2) Name of testing agency.
3) Names and certification numbers of field and laboratory technicians performing inspections and testing.
4) Name of concrete manufacturer.
5) Date and time of inspection, sampling, and field testing.
6) Date and time of concrete placement.
7) Location in Work of concrete represented by samples.
8) Date and time sample was obtained.
9) Truck and batch ticket numbers.
10) Design compressive strength at 28 days.
11) Concrete mixture designation, proportions, and materials.
12) Field test results of fresh concrete, including slump or slump flow, air content, temperature and density.
13) Information on storage and curing of samples at the Project site, including curing method and maximum and minimum temperatures during initial curing period.
14) Type of fracture and compressive break strengths at seven days and 28 days.

4. Provide a space and source of power or other resources for curing and access to test specimens by the testing agency.

C. Delivery Tickets: comply with ASTM C94.

D. Inspections:

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

E. Concrete Tests: Testing of composite samples of fresh concrete obtained in accordance with ASTM C172 to be performed in accordance with the following requirements:

1. Testing Frequency: Obtain one composite sample for each day's pour of each concrete mixture exceeding 5 cu. yd., but less than 25 cu. yd., plus one set for each additional 50 cu. yd. or fraction thereof.

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

2. Slump: ASTM C143:

a. One test at point of delivery for each composite sample, but not less than one test for each day's pour of each concrete mixture.
b. Perform additional tests as needed.

3. Slump Flow: ASTM C1611:

a. One test at point of delivery for each composite sample when strength test specimens are cast, but not less than one test for each day's pour of each concrete mixture.
b. Perform additional tests as needed.

4. Air Content: ASTM C231 pressure method, for normal-weight concrete

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

5. Concrete Temperature: ASTM C1064:

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

6. Concrete Density: ASTM C138:

a. One test for each composite sample when strength test specimens are cast.

7. Compression Test Specimens: ASTM C31:

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

8. Compressive-Strength Tests: ASTM C39.

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

9. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, Contractor to evaluate operations and provide corrective procedures for protecting and curing in-place concrete.
10. Strength of each concrete mixture will be satisfactory if every average of any three consecutive compressive-strength tests of standard cured cylinders equals or exceeds specified compressive strength, and no compressive-strength test value falls below specified compressive strength by more than 500 psi if specified compressive strength is 5000 psi, or no compressive strength test value is less than 10 percent of specified compressive strength if specified compressive strength is greater than 5000 psi.

11. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.
12. Additional Tests:

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

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

3.17 PROTECTION

A. Protect concrete surfaces as follows:

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

END OF SECTION 033000

SECTION 042000
UNIT MASONRY

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Concrete masonry units.
2. Brick.
3. Mortar and grout materials.
4. Mortar and grout mixes.
5. Reinforcement.
6. Ties and anchors.
7. Embedded flashing.
8. Accessories.

B. Products Installed but not Furnished under This Section:

1. Steel lintels in unit masonry.
2. Steel shelf angles for supporting unit masonry.
3. Cavity wall insulation adhered to masonry backup.

1.2 DEFINITIONS

A. CMU(s): Concrete masonry unit(s).

B. Reinforced Masonry: Masonry containing reinforcing steel in grouted cells.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For the following:

1. Masonry Units: Indicate sizes, profiles, coursing, and locations of special shapes.

2. Reinforcing Steel: Indicate bending, lap lengths, and placement of unit masonry reinforcing bars. Comply with ACI 315R. Indicate elevations of reinforced walls.
3. Fabricated Flashing: Detail corner units, end-dam units, and other special applications.

C. Samples for Initial Selection:

1. Standard CMU.
2. Field brick, in the form of straps of five or more bricks.
3. Accent brick, in the form of straps of five or more bricks.
4. Colored mortar.
5. Weep/cavity vents.

D. Samples for Verification: For each type and color of the following:

1. Standard CMU.
2. Field brick.
3. Accent brick.
4. Special brick shapes.
5. Pigmented and colored-aggregate mortar. Make Samples using same sand and mortar ingredients to be used on Project.
6. Weep/cavity vents.
7. Cavity drainage material.
8. Accessories embedded in masonry.

1.5 INFORMATIONAL SUBMITTALS

A. List of Materials Used in Constructing Mockups: List generic product names together with manufacturers, manufacturers' product names, model numbers, lot numbers, batch numbers, source of supply, and other information as required to identify materials used. Include mix proportions for mortar and grout and source of aggregates.

1. Submittal is for information only. Receipt of list does not constitute approval of deviations from the Contract Documents unless such deviations are specifically brought to the attention of Architect and approved in writing.

B. Material Certificates: For each type of the following:

1. Masonry units.

a. Include data on material properties and material test reports substantiating compliance with requirements.
b. For brick, include size-variation data verifying that actual range of sizes falls within specified tolerances.
c. For exposed brick, include test report for efflorescence in accordance with ASTM C67.
d. For surface-coated brick, include test report for durability of surface appearance after 50 cycles of freezing and thawing in accordance with ASTM C67.
e. For masonry units used in structural masonry, include data and calculations establishing average net-area compressive strength of units.

2. Cementitious materials. Include name of manufacturer, brand name, and type.

3. Mortar admixtures.
4. Preblended, dry mortar mixes. Include description of type and proportions of ingredients.
5. Grout mixes. Include description of type and proportions of ingredients.
6. Reinforcing bars.
7. Joint reinforcement.
8. Anchors, ties, and metal accessories.

C. Qualification Statements: For testing agency.

D. Mix Designs: For each type of mortar and grout. Include description of type and proportions of ingredients.

1. Include test reports for mortar mixes required to comply with property specification. Test in accordance with ASTM C109 for compressive strength, ASTM C1506 for water retention, and ASTM C91 for air content.
2. Include test reports, in accordance with ASTM C1019, for grout mixes required to comply with compressive strength requirement.

E. Statement of Compressive Strength of Masonry: For each combination of masonry unit type and mortar type, provide statement of average net-area compressive strength of masonry units, mortar type, and resulting net-area compressive strength of masonry determined in accordance with TMS 602.

F. Cold-Weather and Hot-Weather Procedures: Detailed description of methods, materials, and equipment to be used to comply with requirements.

1.6 QUALITY ASSURANCE

A. Qualifications:

1. Installers: All masonry flashing installers must complete the International Masonry Institute Flashing Upgrade training course.
2. Testing Agency Qualifications: Qualified in accordance with ASTM C1093 for testing indicated.

1.7 MOCKUPS

A. Wall Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.

1. Build mockup of typical wall area as directed by Architect.
2. Build mockups for typical exterior wall in sizes approximately 60 inches long by 48 inches high by full thickness, including face and backup wythes and accessories, or larger as required to show all stone and masonry materials in wall assembly.

a. Include a sealant-filled joint at least 16 inches long in exterior wall mockup.
b. Include through-wall flashing installed for a 24-inch length in corner of exterior wall mockup approximately 16 inches down from top of mockup, with a 12-inch length of flashing left exposed to view (omit masonry above half of flashing).

c. Include veneer anchors, flashing, cavity drainage material, and weep holes in exterior masonry-veneer wall mockup.

3. Where masonry is to match existing, erect mockups adjacent and parallel to existing surface.
4. Clean one-half of exposed faces of mockups with masonry cleaner as indicated.
5. Protect accepted mockups from the elements with weather-resistant membrane.
6. Approval of mockups is for color, texture, and blending of masonry units; relationship of mortar and sealant colors to masonry unit colors; tooling of joints; and aesthetic qualities of workmanship.
   a. Approval of mockups is also for other material and construction qualities specifically approved by Architect in writing.
   b. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations by Change Order.
7. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Store masonry units on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied. If units become wet, do not install until they are dry.

B. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.

C. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.

D. Deliver preblended, dry mortar mix in moisture-resistant containers. Store preblended, dry mortar mix in delivery containers on elevated platforms in a dry location or in covered weatherproof dispensing silos.

E. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

1.9 FIELD CONDITIONS

A. Protection of Masonry: During construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.

1. Extend cover a minimum of 24 inches down both sides of walls, and hold cover securely in place.
2. Where one wythe of multiwythe masonry walls is completed in advance of other wythes, secure cover a minimum of 24 inches down face next to unconstructed wythe, and hold cover in place.

B. Do not apply uniform floor or roof loads for at least 12 hours and concentrated loads for at least three days after building masonry walls or columns.

C. 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 from mortar splatter by spreading coverings 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 onto completed masonry.

D. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace unit masonry damaged by frost or by freezing conditions. Comply with cold-weather construction requirements contained in TMS 602.

1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F and higher and will remain so until masonry has dried, but not less than seven days after completing cleaning.

E. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in TMS 602.

PART 2 - PRODUCTS

2.1 SOURCE LIMITATIONS

A. Obtain exposed masonry units, cementitious mortar components, and mortar aggregate from single source, producer, or manufacturer.

B. For exposed masonry units and cementitious mortar components, obtain each color and grade from single source with resources to provide materials of consistent quality in appearance and physical properties.

2.2 UNIT MASONRY, GENERAL

A. Masonry Standard: Comply with TMS 602, except as modified by requirements in the Contract Documents.

B. Defective Units: Referenced masonry unit standards may allow a certain percentage of units to contain chips, cracks, or other defects exceeding limits stated. Do not use units where such defects are exposed in the completed Work and will be within 20 ft. vertically and horizontally of a walking surface.

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

2.3 CONCRETE MASONRY UNITS

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

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

B. CMUs: ASTM C90, normal weight.

1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 2500 psi.
2. Size (Width): Manufactured to dimensions 3/8 inch less than nominal dimensions.
3. Exposed Faces: Provide color and texture matching the range represented by Architect's sample.

2.4 BRICK

A. General: Provide shapes indicated and as follows, with exposed surfaces matching finish and color of exposed faces of adjacent units:

1. For ends of sills and caps and for similar applications that would otherwise expose unfinished brick surfaces, provide units without cores or frogs and with exposed surfaces finished.
2. Provide special shapes for applications where stretcher units cannot accommodate special conditions, including those at corners, movement joints, bond beams, sashes, and lintels.

B. Clay Face Brick: Facing brick complying with ASTM C216, Grade SW or Type FBS.

1. Brick 1: Belden Brick Whirlpool Special Blend, Norman size.
2. Brick 2: Belden Brick Whirlpool Special Blend, utility size.
3. Brick 3: Glen-Gary Ebonite, utility size, velour finish.
4. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 4950 psi.
5. Initial Rate of Absorption: Less than 30 g/30 sq. in. per minute when tested in accordance with ASTM C67.
6. Efflorescence: Provide brick that has been tested in accordance with ASTM C67 and is rated "not effloresced."
7. Surface Coating: Brick with colors or textures produced by application of coatings withstand 50 cycles of freezing and thawing in accordance with ASTM C67 with no observable difference in the applied finish when viewed from 10 ft.
8. Application: Use where brick is exposed unless otherwise indicated.
9. Where shown to "match existing," provide face brick matching color range, texture, and size of existing adjacent brickwork.
10. Color and Texture: As selected by Architect.

2.5 MORTAR AND GROUT MATERIALS

A. Portland Cement: ASTM C150, Type I or II, except Type III may be used for cold-weather construction. Provide natural color or white cement as required to produce mortar color indicated.

1. Alkali content will not be more than 0.1 percent when tested in accordance with ASTM C114.

B. Hydrated Lime: ASTM C207, Type S.

C. Portland Cement-Lime Mix: Packaged blend of portland cement and hydrated lime containing no other ingredients.

D. Masonry Cement: ASTM C91.

E. Mortar Cement: ASTM C1329.

F. Mortar Pigments: Natural and synthetic iron oxides and chromium oxides, compounded for use in mortar mixes and complying with ASTM C979. Use only pigments with a record of satisfactory performance in masonry mortar.

G. Colored Cement Products: Packaged blend made from portland cement and hydrated lime or masonry cement and mortar pigments, all complying with specified requirements, and containing no other ingredients.

1. Formulate blend as required to produce color indicated or, if not indicated, as selected from manufacturer's standard colors.
2. Pigments do not exceed 10 percent of portland cement by weight.
3. Pigments do not exceed 5 percent of masonry cement or mortar cement by weight.

H. Preblended Dry Mortar Mix: Packaged blend made from portland cement and hydrated lime, masonry cement, or mortar cement, sand, and admixtures and complying with ASTM C1714.

I. Aggregate for Mortar: ASTM C144.

J. Aggregate for Grout: ASTM C404.

K. Cold-Weather Admixture: Nonchloride, noncorrosive, accelerating admixture complying with ASTM C494, Type C or ASTM C1384, and recommended by manufacturer for use in masonry mortar of composition indicated.

L. Water-Repellent Admixture: Liquid water-repellent mortar admixture intended for use with CMUs containing integral water repellent from same manufacturer.

M. Water: Potable.

2.6 REINFORCEMENT

A. Uncoated-Steel Reinforcing Bars: ASTM A615 or ASTM A996, Grade 60.

B. Reinforcing Bar Positioners: Wire units designed to fit into mortar bed joints spanning masonry unit cells and to hold reinforcing bars in center of cells. Units are formed from 0.148-inch steel wire, hot-dip galvanized after fabrication. Provide units designed for number of bars indicated.

C. Masonry-Joint Reinforcement, General: ASTM A951.

1. Interior Walls: Hot-dip galvanized carbon steel.
2. Exterior Walls: Hot-dip galvanized carbon steel.
3. Wire Size for Side Rods: 0.148-inch diameter.
4. Wire Size for Cross Rods: 0.148-inch diameter.
5. Wire Size for Veneer Ties: 0.148-inch diameter.
6. Spacing of Cross Rods, Tabs, and Cross Ties: Not more than 16 inches o.c.
7. Provide in lengths of not less than 10 ft., with prefabricated corner and tee units.

D. Masonry-Joint Reinforcement for Single-Wythe Masonry: Ladder type with single pair of side rods.

E. Masonry-Joint Reinforcement for Multiwythe Masonry:
1. Ladder type with one side rod at each face shell of hollow masonry units more than 4 inches wide, plus one side rod at each wythe of masonry 4 inches wide or less.
2. Tab type, either ladder or truss design, with one side rod at each face shell of backing wythe and with rectangular tabs sized to extend at least halfway through facing wythe, but with at least 5/8-inch cover on outside face.
3. Adjustable (two-piece) type, either ladder or truss design, with one side rod at each face shell of backing wythe and with separate adjustable ties with pintle-and-eye connections having a maximum horizontal play of 1/16 inch and maximum vertical adjustment of 1-1/4 inches. Size ties to extend at least halfway through facing wythe but with at least 5/8-inch cover on outside face. Ties have hooks or clips to engage a continuous horizontal wire in the facing wythe.

2.7 TIES AND ANCHORS

A. General: Ties and anchors extend at least 1-1/2 inches into veneer but with at least a 5/8-inch cover on outside face.

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

1. Hot-Dip Galvanized, Carbon-Steel Wire: ASTM A1064, with ASTM A153, Class B-2 coating.
2. Stainless Steel Wire: ASTM A580, Type 304 or Type 316.
3. Galvanized-Steel Sheet: ASTM A653, Commercial Steel, G60 zinc coating.
4. Steel Sheet, Galvanized after Fabrication: ASTM A1008, Commercial Steel, with ASTM A153, Class B coating.
5. Stainless Steel Sheet: ASTM A240 or ASTM A666, Type 304 or Type 316.
6. Steel Plates, Shapes, and Bars: ASTM A36.
7. Stainless Steel Bars: ASTM A276 or ASTM A666, Type 304.

C. Individual Wire Ties: Rectangular units with closed ends and not less than 4 inches wide.

1. Z-shaped ties with ends bent 90 degrees to provide hooks not less than 2 inches long for masonry constructed from solid units.
2. Where wythes do not align or are of different materials, use adjustable ties with pintle-and-eye connections having a maximum adjustment of 1-1/4 inches.
3. Wire: Fabricate from 3/16-inch-diameter, hot-dip galvanized steel.

D. Partition Top Anchors: 0.105-inch-thick metal plate with a 3/8-inch-diameter metal rod 6 inches long welded to plate and with closed-end plastic tube fitted over rod that allows rod to move in and out of tube. Fabricate from steel, hot-dip galvanized after fabrication, or stainless steel.

E. Rigid Anchors: Fabricate from steel bars 1-1/2 inches wide by 1/4 inch thick by 24 inches long, with ends turned up 2 inches or with cross pins unless otherwise indicated.

1. Corrosion Protection: Hot-dip galvanized to comply with ASTM A153.

F. Adjustable Masonry-Veneer Anchors:

1. General: Provide anchors that allow vertical adjustment but resist a 100 lbf load in both tension and compression perpendicular to plane of wall without deforming or developing play in excess of 1/16 inch.
2. Fabricate wire ties from 0.187-inch-diameter, hot-dip galvanized-steel wire unless otherwise indicated.
3. Provide anchorage system consisting of single barrel screw and looped wire ties.

2.8 EMBEDDED FLASHING

A. Metal Flashing: Provide metal flashing complying with SMACNA's "Architectural Sheet Metal Manual" and as follows:

1. Stainless Steel: ASTM A240 or ASTM A666, Type 304, 0.016 inch thick.
2. Fabricate continuous flashings in sections 96 inches long minimum, but not exceeding 12 ft. Provide splice plates at joints of formed, smooth metal flashing.
3. Fabricate through-wall metal flashing embedded in masonry from stainless steel, with ribs at 3-inch intervals along length of flashing to provide an integral mortar bond.
4. Fabricate through-wall flashing with drip edge unless otherwise indicated. Fabricate by extending flashing 1/2 inch out from wall, with outer edge bent down 30 degrees and hemmed.

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

1. Copper-Laminated Flashing: 7 oz./sq. ft. copper sheet bonded between two layers of glass-fiber cloth. Use only where flashing is fully concealed in masonry.
   a. Accessories: Provide preformed corners, and dams, other special shapes, and seaming materials produced by flashing manufacturer.

C. Applications: Unless otherwise indicated:

1. Where flashing is indicated to receive counterflashing, use metal flashing.
2. Where flashing is indicated to be turned down at or beyond the wall face, use metal flashing.

3. Where flashing is partly exposed and is indicated to terminate at the wall face, use metal flashing with a drip edge or flexible flashing with a metal drip edge metal flashing or flexible flashing.
4. Where flashing is fully concealed, use metal flashing or flexible flashing.

D. Solder and Sealants for Sheet Metal Flashings:

1. Solder for Stainless Steel: ASTM B32, Grade Sn96, with acid flux of type recommended by stainless steel sheet manufacturer.
2. Elastomeric Sealant: ASTM C920, chemically curing urethane sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and remain watertight.

E. Adhesives, Primers, and Seam Tapes for Flashings: Flashing manufacturer's standard products or products recommended by flashing manufacturer for bonding flashing sheets to each other and to substrates.

F. Termination Bars for Flexible Flashing: Stainless steel bars 1/8 inch by 1 inch.

2.9 ACCESSORIES

A. Compressible Filler: Premolded filler strips complying with ASTM D1056, Grade 2A1; compressible up to 35 percent; of width and thickness indicated; formulated from neoprene.

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

C. Weep/Cavity Vents: Use one of the following unless otherwise indicated:

1. Cellular Plastic Weep/Vent: One-piece, flexible extrusion made from UV-resistant polypropylene copolymer, full height and width of head joint and depth 1/8 inch less than depth of outer wythe, in color selected from manufacturer's standard.
2. Mesh Weep/Vent: Free-draining mesh; made from polyethylene strands, full height and width of head joint and depth 1/8 inch less than depth of outer wythe; in color selected from manufacturer's standard.

D. Cavity Drainage Material: Free-draining mesh, made from polymer strands that will not degrade within the wall cavity.

1. Configuration: Provide one of the following:
   a. Strips, not less than 1-1/2 inches thick and 10 inches high, with dovetail-shaped notches 7 inches deep designed to catch mortar droppings and prevent weep holes from clogging with mortar.

2.10 MORTAR AND GROUT MIXES

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

1. Do not use calcium chloride in mortar or grout.
2. Use portland cement-lime, masonry cement, or mortar cement mortar unless otherwise indicated.
3. Add cold-weather admixture (if used) at same rate for all mortar that will be exposed to view, regardless of weather conditions, to ensure that mortar color is consistent.

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

C. Mortar for Unit Masonry: Comply with ASTM C270, Proportion or Property Specification. Provide the following types of mortar for applications stated unless another type is indicated or needed to provide required compressive strength of masonry.

1. For masonry below grade or in contact with earth, use Type M.
2. For concrete masonry above grade, use Type S.
3. For brick masonry above grade, use Type N.

D. Pigmented Mortar: Use colored cement product or select and proportion pigments with other ingredients to produce color required. Do not add pigments to colored cement products.

1. Pigments do not exceed 10 percent of portland cement by weight.
2. Pigments do not exceed 5 percent of masonry cement or mortar cement by weight.
3. Mix to match Architect's sample.

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

1. Mix to match Architect's sample.

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

1. Use grout of type indicated or, if not otherwise indicated, of type (fine or coarse) that will comply with TMS 602 for dimensions of grout spaces and pour height.
2. Proportion grout in accordance with ASTM C476, Table 1 or paragraph 4.2.1.2 for specified 28-day compressive strength indicated, but not less than 3000 psi.
3. Provide grout with a slump of 8 to 11 inches as measured in accordance with ASTM C143.

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 the Work.

1. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
2. Verify that foundations are within tolerances specified.

3. Verify that reinforcing dowels are properly placed.
4. Verify that substrates are free of substances that impair mortar bond.

B. Before installation, examine rough-in and built-in construction for piping systems to verify actual locations of piping connections.

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

3.2 INSTALLATION, GENERAL

A. Thickness: Build cavity and composite walls and other masonry construction to full thickness shown. Build single-wythe walls to actual widths of masonry units, using units of widths indicated.

B. Build chases and recesses to accommodate items specified in this and other Sections.

C. Leave openings for equipment to be installed before completing masonry. After installing equipment, complete masonry to match construction immediately adjacent to opening.

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

E. Select and arrange units for exposed unit masonry to produce a uniform blend of colors and textures. Mix units from several pallets or cubes as they are placed.

F. Matching Existing Masonry: Match coursing, bonding, color, and texture of existing masonry.

G. Wetting of Brick: Wet brick before laying if initial rate of absorption exceeds 30 g/30 sq. in. per minute when tested in accordance with ASTM C67. Allow units to absorb water so they are damp but not wet at time of laying.

3.3 TOLERANCES

A. Dimensions and Locations of Elements:

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

B. Lines and Levels:

1. For bed joints and top surfaces of bearing walls, do not vary from level by more than 1/4 inch in 10 ft., or 1/2-inch maximum.
2. For conspicuous horizontal lines, such as lintels, sills, parapets, and reveals, do not vary from level by more than 1/8 inch in 10 ft., 1/4 inch in 20 ft., or 1/2-inch maximum.

3. For vertical lines and surfaces, do not vary from plumb by more than 1/4 inch in 10 ft., 3/8 inch in 20 ft., or 1/2-inch maximum.
4. For conspicuous vertical lines, such as external corners, door jambs, reveals, and expansion and control joints, do not vary from plumb by more than 1/8 inch in 10 ft., 1/4 inch in 20 ft., or 1/2-inch maximum.
5. For lines and surfaces, do not vary from straight by more than 1/4 inch in 10 ft., 3/8 inch in 20 ft., or 1/2-inch maximum.
6. For vertical alignment of exposed head joints, do not vary from plumb by more than 1/4 inch in 10 ft., or 1/2-inch maximum.
7. For faces of adjacent exposed masonry units, do not vary from flush alignment by more than 1/16 inch except due to warpage of masonry units within tolerances specified for warpage of units.

C. Joints:

1. For bed joints, do not vary from thickness indicated by more than plus or minus 1/8 inch, with a maximum thickness limited to 1/2 inch.
2. For exposed bed joints, do not vary from bed-joint thickness of adjacent courses by more than 1/8 inch.
3. For head and collar joints, do not vary from thickness indicated by more than plus 3/8 inch or minus 1/4 inch.
4. For exposed head joints, do not vary from thickness indicated by more than plus or minus 1/8 inch. Do not vary from adjacent bed-joint and head-joint thicknesses by more than 1/8 inch.
5. For exposed bed joints and head joints of stacked bond, do not vary from a straight line by more than 1/16 inch from one masonry unit to the next.

3.4 LAYING MASONRY WALLS

A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint thicknesses and for accurate location of openings, movement-type joints, returns, and offsets. Avoid using less-than-half-size units, particularly at corners, jambs, and, where possible, at other locations.

B. Lay concealed masonry with all units in a wythe in running bond or bonded by lapping not less than 4 inches. Bond and interlock each course of each wythe at corners. Do not use units with less-than-nominal 4-inch horizontal face dimensions at corners or jambs.

C. Stopping and Resuming Work: Stop work by stepping back units in each course from those in course below; do not tooth. When resuming work, clean masonry surfaces that are to receive mortar, remove loose masonry units and mortar, and wet brick if required before laying fresh masonry.

D. Built-in Work: As construction progresses, build in items specified in this and other Sections. Fill in solidly with masonry around built-in items.

E. Fill space between steel frames and masonry solidly with mortar unless otherwise indicated.

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

G. Fill cores in hollow CMUs with grout 24 inches under bearing plates, beams, lintels, posts, and similar items unless otherwise indicated.

H. Build nonload-bearing interior partitions full height of story to underside of solid floor or roof structure above unless otherwise indicated.

1. Install compressible filler in joint between top of partition and underside of structure above.
2. Fasten partition top anchors to structure above and build into top of partition. Grout cells of CMUs solidly around plastic tubes of anchors, and push tubes down into grout to provide 1/2-inch clearance between end of anchor rod and end of tube. Space anchors 48 inches o.c. unless otherwise indicated.
3. Wedge nonload-bearing partitions against structure above with small pieces of tile, slate, or metal. Fill joint with mortar after dead-load deflection of structure above approaches final position.

3.5 MORTAR BEDDING AND JOINTING

A. Lay CMUs and brick as follows:

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

B. Lay solid masonry units[and hollow brick] with completely filled bed and head joints; butter ends with sufficient mortar to fill head joints and shove into place. Do not deeply furrow bed joints or slush head joints.

C. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness unless otherwise indicated.

D. Cut joints flush where indicated to receive waterproofing, cavity wall insulation, and air barriers unless otherwise indicated.

3.6 ANCHORED MASONRY VENEERS

A. Anchor masonry veneers to wall framing and concrete and masonry backup with masonry-veneer anchors to comply with the following requirements:

1. Fasten screw-attached anchors through sheathing to wall framing and to concrete and masonry backup with metal fasteners of type indicated. Use two fasteners unless anchor design only uses one fastener.
2. Embed connector sections and continuous wire in masonry joints.
3. Locate anchor sections to allow maximum vertical differential movement of ties up and down.

4. Space anchors as indicated, but not more than 16 inches o.c. vertically and 24 inches o.c. horizontally, with not less than one anchor for each 2.67 sq. ft. of wall area. Install additional anchors within 12 inches of openings and at intervals, not exceeding 24 inches, around perimeter.

B. Provide airspace between back of masonry veneer and face of sheathing or insulation.

1. Keep airspace clean of mortar droppings and other materials during construction. Bevel beds away from airspace, to minimize mortar protrusions into airspace. Do not attempt to trowel or remove mortar fins protruding into airspace.

3.7 MASONRY-JOINT REINFORCEMENT

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

1. Space reinforcement not more than 16 inches o.c.
2. Space reinforcement not more than 8 inches o.c. in foundation walls and parapet walls.
3. Provide reinforcement not more than 8 inches above and below wall openings and extending 24 inches beyond openings in addition to continuous reinforcement.

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

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

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

E. Cut and bend reinforcing units as directed by manufacturer for continuity at[corners,] returns, offsets, column fireproofing, pipe enclosures, and other special conditions.

3.8 ANCHORING MASONRY TO STRUCTURAL STEEL AND CONCRETE

A. Anchor masonry to structural steel and concrete, where masonry abuts or faces structural steel or concrete, to comply with the following:

1. Provide an open space between masonry and structural steel or concrete unless otherwise indicated. Keep open space free of mortar and other rigid materials.
2. Anchor masonry with anchors embedded in masonry joints and attached to structure.
3. Space anchors as indicated, but not more than 24 inches o.c. vertically and 36 inches o.c. horizontally.

3.9 CONTROL AND EXPANSION JOINTS

A. General: Install control- and expansion-joint materials in unit masonry as masonry progresses. Do not allow materials to span control and expansion joints without provision to allow for in-plane wall or partition movement.

B. Form control joints in concrete masonry using one of the following methods:

1. Fit bond-breaker strips into hollow contour in ends of CMUs on one side of control joint. Fill resultant core with grout, and rake out joints in exposed faces for application of sealant.
2. Install preformed control-joint gaskets designed to fit standard sash block.
3. Install interlocking units designed for control joints. Install bond-breaker strips at joint. Keep head joints free and clear of mortar, or rake out joint for application of sealant.
4. Install temporary foam-plastic filler in head joints, and remove filler when unit masonry is complete for application of sealant.

C. Form expansion joints in brick as follows:

1. Build flanges of metal expansion strips into masonry. Lap each joint 4 inches in direction of water flow. Seal joints below grade and at junctures with horizontal expansion joints if any.
2. Build flanges of factory-fabricated, expansion-joint units into masonry.
3. Build in compressible joint fillers where indicated.

3.10 FLASHING, WEEP HOLES, AND CAVITY VENTS

A. General: Install embedded flashing and weep holes in masonry at shelf angles, lintels, ledges, other obstructions to downward flow of water in wall, and where indicated.

B. Install flashing as follows unless otherwise indicated:

1. Prepare masonry surfaces so they are smooth and free from projections that could puncture flashing. Where flashing is within mortar joint, place through-wall flashing on sloping bed of mortar and cover with mortar. Before covering with mortar, seal penetrations in flashing with adhesive, sealant, or tape as recommended by flashing manufacturer.
2. At multiwythe masonry walls, including cavity walls, extend flashing through outer wythe, and through inner wythe to within 1/2 inch of the interior face of wall in exposed masonry. Where interior face of wall is to receive furring or framing, carry flashing completely through inner wythe and turn flashing up approximately 2 inches on interior face.
3. At masonry-veneer walls, extend flashing through veneer, across airspace behind veneer, and up face of sheathing at least 8 inches; with upper edge tucked under water-resistive barrier, lapping at least 4 inches.
4. At lintels, extend flashing 6 inches minimum, to edge of next full unit at each end. At heads and sills, extend flashing 6 inches minimum, to edge of next full unit and turn ends up not less than 2 inches to form end dams.
5. Install metal flashing termination beneath flexible flashing at exterior face of wall. Stop flexible flashing 1/2 inch back from outside face of wall, and adhere flexible flashing to top of metal flashing termination.
6. Cut flexible flashing off flush with face of wall after masonry wall construction is completed.

C. Install reglets and nailers for flashing and other related construction where they are indicated to be built into masonry.

D. Install weep holes in exterior wythes and veneers in head joints of first course of masonry immediately above embedded flashing.

1. Use specified weep/cavity vent products to form weep holes.
2. Space weep holes 24 inches o.c. unless otherwise indicated.
3. Cover cavity side of weep holes with plastic insect screening at cavities insulated with loose-fill insulation.

E. Place cavity drainage material in cavities to comply with configuration requirements for cavity drainage material in "Accessories" Article.

F. Install cavity vents in head joints in exterior wythes at spacing indicated. Use [specified weep/cavity vent products] [or] [open-head joints] to form cavity vents.

1. Close cavities off vertically and horizontally with blocking in manner indicated. Install through-wall flashing and weep holes above horizontal blocking.

3.11 REINFORCED UNIT MASONRY

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

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

B. Placing Reinforcement: Comply with requirements in TMS 602.

C. Grouting: Do not place grout until entire height of masonry to be grouted has attained enough strength to resist grout pressure.

1. Comply with requirements in TMS 602 for cleanouts and for grout placement, including minimum grout space and maximum pour height.
2. Limit height of vertical grout pours to not more than 12.67 ft.

3.12 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections. Allow inspectors access to scaffolding and work areas as needed to perform tests and inspections. Retesting of materials that fail to comply with specified requirements will be at Contractor's expense.

B. Inspections: Special inspections in accordance with Michigan Building Code and TMS 402.

1. Begin masonry construction only after inspectors have verified proportions of site-prepared mortar.

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

C. Testing Prior to Construction: One set of tests.

D. Testing Frequency: One set of tests for each 5000 sq. ft. of wall area or portion thereof.

E. Clay Masonry Unit Test: For each type of unit provided, in accordance with ASTM C67 for compressive strength.

F. Concrete Masonry Unit Test: For each type of unit provided, in accordance with ASTM C140 for compressive strength.

G. Mortar Aggregate Ratio Test (Proportion Specification): For each mix provided, in accordance with ASTM C780.

H. Mortar Test (Property Specification): For each mix provided, in accordance with ASTM C780. Test mortar for [mortar air content] [and] [compressive strength].

I. Grout Test (Compressive Strength): For each mix provided, in accordance with ASTM C1019.

3.13 REPAIRING, POINTING, AND CLEANING

A. Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Install new units to match adjoining units; install in fresh mortar, 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 sealant application, where indicated.

C. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before 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.
2. Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes. Obtain Architect's approval of sample cleaning before proceeding with cleaning of masonry.
3. Protect adjacent stone and nonmasonry surfaces from contact with cleaner by covering them with liquid strippable masking agent or polyethylene film and waterproof masking tape.
4. Wet wall surfaces with water before applying cleaners; remove cleaners promptly by rinsing surfaces thoroughly with clear water.
5. Clean brick by bucket-and-brush hand-cleaning method described in BIA Technical Notes 20.

6. Clean concrete masonry by applicable cleaning methods indicated in NCMA TEK 8-4A.
7. Clean masonry with a proprietary acidic masonry cleaner applied according to manufacturer's written instructions.

3.14 MASONRY WASTE DISPOSAL

A. Salvageable Materials: Unless otherwise indicated, excess masonry materials are Contractor's property. At completion of unit masonry work, remove from Project site.

B. Excess Masonry Waste: Remove excess clean masonry waste that cannot be used as fill, as described above or recycled, and other masonry waste, and legally dispose of off Owner's property.

END OF SECTION 042000

SECTION 047200
CAST STONE MASONRY

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. Window sill trim units
2. Accessories.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Samples:

1. For each color and texture of cast stone required, 4 inches in size.

1.4 INFORMATIONAL SUBMITTALS

A. Material test reports.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: A qualified manufacturer of cast stone units similar to those indicated for this Project, that has sufficient production capacity to manufacture required units, and is a plant certified by CSI.

PART 2 - PRODUCTS

2.1 CAST STONE UNITS

A. Available Manufacturers:

1. Arriscraft International.
2. Continental Cast Stone Manufacturing, Inc.
3. Edwards Cast Stone Company.
4. Pineapple Grove Designs.
5. Rockcast, Division of Reading Rock, Inc.
6. Stonco.
7. Sun Precast Co., Inc.
8. Superior Precast Products.

B. Cast Stone Units: Comply with ASTM C1364.

1. Units are manufactured using the manufacturer's selected method.

C. Fabricate units with sharp arris and accurately reproduced details, with indicated texture on all exposed surfaces unless otherwise indicated.

1. Slope exposed horizontal surfaces 1:12 to drain unless otherwise indicated.
2. Provide raised fillets at backs of sills and at ends indicated to be built into jambs.
3. Provide drips on projecting elements unless otherwise indicated.

D. Cure Units as Follows:

1. Cure units in enclosed, moist curing room at 95 percent relative humidity and temperature of 100 deg F for 12 hours or 70 deg F for 16 hours.
2. Keep units damp and continue curing to comply with one of the following:

a. No fewer than five days at mean daily temperature of 70 deg F or above.

E. Acid etch units after curing to remove cement film from surfaces to be exposed to view.

F. Colors and Textures: **As selected by Architect from manufacturer’s full range of standard colors to match color and texture of existing building window sill units.**

2.2 ACCESSORIES

A. Anchors: Type and size indicated, fabricated from Type 304 stainless steel complying with ASTM A240/A240M, ASTM A276/A276M, or ASTM A666

2.3 MORTAR MIXES

A. Comply with requirements in Section 042000 "Unit Masonry" for mortar mixes.

PART 3 - EXECUTION

3.1 SETTING CAST STONE IN MORTAR

A. Set cast stone as indicated in TMS 604.

B. Install cast stone units to comply with requirements in Section 042000 "Unit Masonry."

C. Set cast stone as indicated on Drawings. Set units accurately in locations indicated, with edges and faces aligned according to established relationships and indicated tolerances.

D. Set units in full bed of mortar with full head joints unless otherwise indicated.

1. Fill dowel holes and anchor slots with mortar.
2. Fill collar joints solid as units are set.
3. Build concealed flashing into mortar joints as units are set.
4. Keep head joints in copings and between other units with exposed horizontal surfaces open to receive sealant.

E. Rake out joints for pointing with mortar to depths of not less than 3/4 inch. Rake joints to uniform depths with square bottoms and clean sides. Scrub faces of units to remove excess mortar as joints are raked.

F. Point mortar joints by placing and compacting mortar in layers not greater than 3/8 inch. Compact each layer thoroughly and allow it to become thumbprint hard before applying next layer.

G. Tool exposed joints slightly concave when thumbprint hard. Use a smooth plastic jointer larger than joint thickness.

H. Provide sealant joints at head joints of copings and other horizontal surfaces; at expansion, control, and pressure-relieving joints; and at locations indicated.

1. Keep joints free of mortar and other rigid materials.
2. Prepare and apply sealant of type and at locations indicated to comply with applicable requirements in Section 079200 "Joint Sealants."

3.2 INSTALLATION TOLERANCES

A. Variation from Plumb: Do not exceed 1/8 inch in 10 ft. maximum.

B. Variation from Level: Do not exceed 1/8 inch in 10 ft. maximum.

C. Variation in Joint Width: Do not vary joint thickness more than 1/8 inch in 36 inches or one-fourth of nominal joint width, whichever is less.

D. Variation in Plane between Adjacent Surfaces (Lipping): Do not vary from flush alignment with adjacent units or adjacent surfaces indicated to be flush with units by more than 1/16 inch, except where variation is due to warpage of units within tolerances specified.

3.3 ADJUSTING AND CLEANING

A. Remove and replace stained and otherwise damaged units and units not matching approved Samples. Cast stone may be repaired if methods and results are approved by Architect.

B. Replace units in a manner that results in cast stone matching approved Samples, complying with other requirements, and showing no evidence of replacement.

C. In-Progress Cleaning: Clean cast stone as work progresses.

1. Remove mortar fins and smears before tooling joints.
2. Remove excess sealant immediately, including spills, smears, and spatter.

D. Final Cleaning: After mortar is thoroughly set and cured, clean exposed cast stone as follows:

1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
2. Test cleaning methods on sample; leave one sample uncleaned for comparison purposes. Obtain Architect's approval of sample cleaning before proceeding with cleaning of cast stone.
3. Protect adjacent surfaces from contact with cleaner by covering them with liquid strippable masking agent or polyethylene film and waterproof masking tape.
4. Wet surfaces with water before applying cleaners; remove cleaners promptly by rinsing thoroughly with clear water.
5. Clean cast stone with proprietary acidic cleaner applied according to manufacturer's written instructions.

END OF SECTION 047200

SECTION 071413

HOT FLUID-APPLIED RUBBERIZED ASPHALT WATERPROOFING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Hot fluid-applied, rubberized-asphalt waterproofing membrane.
2. Molded-sheet drainage panels.

B. Related Requirements:

1. Section 075556 "Fluid-Applied Protected Membrane Roofing" for hot fluid-applied, rubberized-asphalt roofing.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product. Include manufacturer's written instructions for evaluating, preparing, and treating substrate, technical data, and tested physical and performance properties of waterproofing.

1.3 INFORMATIONAL SUBMITTALS

1.4 QUALITY ASSURANCE

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

1.5 DELIVERY, STORAGE, AND HANDLING

A. Store liquid materials in their original undamaged containers in a clean, dry, protected location and within the temperature range required by waterproofing manufacturer.

B. Remove and replace liquid materials that cannot be applied within their stated shelf life.

C. Protect stored materials from direct sunlight.

1.6 FIELD CONDITIONS

A. Weather Limitations: Apply waterproofing within the range of ambient and substrate temperatures recommended by waterproofing manufacturer. Do not apply waterproofing to a damp or wet substrate, or when temperature is below zero deg F.

1. Do not apply waterproofing in snow, rain, fog, or mist.

B. Maintain adequate ventilation during application and curing of waterproofing materials.

1.7 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace waterproofing and sheet flashings that do not comply with requirements or that fail to remain watertight within specified warranty period.

1. Warranty includes removing and reinstalling protection board, drainage panels, insulation, pedestals, and pedestal-mounted pavers on plaza decks.
2. Warranty insulation retains 80 percent of original published thermal value.
3. Warranty pavers do not dish or warp and do not crack, split, or disintegrate in freeze-thaw conditions.
4. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 WATERPROOFING MEMBRANE

A. Hot Fluid-Applied, Rubberized-Asphalt Waterproofing Membrane: Single component; 100 percent solids; hot fluid-applied, rubberized asphalt.

1. Manufacturers: Subject to compliance with requirements, provide products by the following:
   a. Carlisle Coatings Waterproofing Inc.

2.2 ACCESSORIES

A. General: Accessory materials recommended by waterproofing manufacturer for intended use and compatible with waterproofing.

B. Primer: ASTM D41/D41M, asphaltic primer.

2.3 MOLDED-SHEET DRAINAGE PANELS

A. Nonwoven-Geotextile-Faced, Molded-Sheet Drainage Panel: Manufactured composite subsurface drainage panels consisting of a nonwoven, needle-punched geotextile facing with an apparent opening size not exceeding No. 70 sieve, laminated to one side with a polymeric film

bonded to the other side of a studded, nonbiodegradable, molded-plastic-sheet drainage core, with a vertical flow rate of 9 to 15 gpm/ft..

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.

1. Verify that concrete has cured and aged for minimum time period recommended by waterproofing manufacturer.
2. Verify that substrate is visibly dry and free of moisture. Test for capillary moisture by plastic sheet method in accordance with ASTM D4263.

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

3.2 PREPARATION

A. Clean and prepare substrates according to manufacturer's written instructions. Provide clean, dust-free, and dry substrate for waterproofing application.

B. Mask off adjoining surfaces not receiving waterproofing to prevent spillage and overspray affecting other construction.

C. Close off deck drains and other deck penetrations to prevent spillage and migration of waterproofing fluids.

D. Remove grease, oil, form-release agents, paints, curing compounds, and other penetrating contaminants or film-forming coatings from concrete.

1. Abrasive blast clean concrete surfaces uniformly to expose top surface of fine aggregate in accordance with ASTM D4259 with a self-contained, recirculating, blast-cleaning apparatus. Remove material to provide a sound surface free of laitance, glaze, efflorescence, curing compounds, concrete hardeners, or form-release agents. Remove remaining loose material and clean surfaces in accordance with ASTM D4258.

E. Remove fins, ridges, and other projections, and fill honeycomb, aggregate pockets, and other voids.

3.3 JOINTS, CRACKS, AND TERMINATIONS

A. Prepare and treat substrates to receive waterproofing membrane, including joints and cracks, deck drains, corners, and penetrations according to manufacturer's written instructions.

1. Rout and fill joints and cracks in substrate. Before filling, remove dust and dirt in accordance with ASTM D4258.

2. Adhere strip of elastomeric sheet to substrate in a layer of hot rubberized asphalt. Extend elastomeric sheet a minimum of 6 inches on each side of moving joints and cracks or joints and cracks exceeding 1/8 inch thick, and beyond deck drains and penetrations. Apply second layer of hot fluid-applied, rubberized asphalt over elastomeric sheet.
3. Embed strip of reinforcing fabric into a layer of hot rubberized asphalt. Extend reinforcing fabric a minimum of 6 inches on each side of nonmoving joints and cracks not exceeding 1/8 inch thick, and beyond roof drains and penetrations.
    a. Apply second layer of hot fluid-applied, rubberized asphalt over reinforcing fabric.

B. At expansion joints and discontinuous deck-to-wall or deck-to-deck joints, bridge joints with elastomeric sheet extended a minimum of 6 inches on each side of joints and adhere to substrates in a layer of hot rubberized asphalt. Apply second layer of hot fluid-applied, rubberized asphalt over elastomeric sheet.

3.4 INSTALLATION OF FLASHING

A. Install elastomeric sheets at terminations of waterproofing membrane according to manufacturer's written instructions.

B. Prime substrate with asphalt primer.

C. Install elastomeric sheet and adhere to deck and wall substrates in a layer of hot rubberized asphalt.

D. Extend elastomeric sheet up walls or parapets a minimum of 8 inches above plaza-deck pavers and 6 inches onto deck to be waterproofed.

E. Install termination bars and mechanically fasten to top of elastomeric flashing sheet at terminations and perimeter of waterproofing.

3.5 INSTALLATION OF HOT FLUID-APPLIED, RUBBERIZED ASPHALT WATERPROOFING MEMBRANE

A. Apply primer, at manufacturer's recommended rate, over prepared substrate and allow it to dry.

B. Heat and apply rubberized asphalt according to manufacturer's written instructions.

1. Heat rubberized asphalt in an oil- or air-jacketed melter with mechanical agitator specifically designed for heating rubberized asphalt.

C. Start application with manufacturer's authorized representative present.

D. Unreinforced Membrane: Apply hot rubberized asphalt to substrates and adjoining surfaces indicated. Spread to form a uniform, unreinforced, seamless membrane, 180-mil average thickness, but not less than 125 mils thick.

E. Apply waterproofing over prepared joints and up wall terminations and vertical surfaces to heights indicated or required by manufacturer.

F. Cover waterproofing with protection course with overlapped joints before membrane is subject to backfilling construction or vehicular traffic.

3.6 INSTALLATION OF MOLDED-SHEET DRAINAGE PANELS

A. Place and secure molded-sheet drainage panels, with geotextile facing away from wall or deck substrate according to manufacturer's written instructions. Use methods that do not penetrate waterproofing. Lap edges and ends of geotextile to maintain continuity. Protect installed molded-sheet drainage panels during subsequent construction.

1. For vertical applications, install protection course before installing drainage panels.

3.7 CLEANING AND PROTECTION

A. Protect waterproofing from damage and wear during remainder of construction period.

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

C. Clean spillage and soiling from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

END OF SECTION 071413

SECTION 072119

FOAMED-IN-PLACE INSULATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Closed-cell spray polyurethane foam insulation.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.3 INFORMATIONAL SUBMITTALS

A. Field Quality-Control Submittals:

1. Field quality-control reports.

B. Qualification Statements: For Installer.

1.4 QUALITY ASSURANCE

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

PART 2 - PRODUCTS

2.1 CLOSED-CELL SPRAY POLYURETHANE FOAM INSULATION

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

1. Manufacturers: Subject to compliance with requirements, provide products by the following:
   a. Carlisle Spray Foam Insulation.

b. Gaco; Holcim Building Envelope.
c. Johns Manville; a Berkshire Hathaway company.
d. NCFI Polyurethanes; a division of Barnhardt Manufacturing Company.

2. Surface-Burning Characteristics: Comply with ASTM E84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
a. Flame-Spread Index: or less.
b. Smoke-Developed Index: or less.

PART 3 - EXECUTION

3.1 PREPARATION

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

3.2 INSTALLATION

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

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

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

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

E. Install barrier material.

1. Do not cover insulation prior to any required spray foam insulation inspections.

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

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

3.3 FIELD QUALITY CONTROL

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

3.4 PROTECTION

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

END OF SECTION 072119

SECTION 076200
SHEET METAL FLASHING AND TRIM

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 sheet metal flashing and trim:

1. Manufactured reglets.
2. Formed roof drainage system.
3. Formed low-slope roof flashing and trim.
4. Formed wall flashing and trim.
5. Formed equipment support flashing.

B. Related Sections include the following:

1. Division 4 Section "Unit Masonry Assemblies" for installing through-wall flashing, reglets, and other sheet metal flashing and trim.
2. Division 5 Section "Architectural Joint Systems" for manufactured sheet metal expansion-joint covers.
3. Division 6 Section "Miscellaneous Rough Carpentry" for wood nailers, curbs, and blocking.
4. Division 7 Section "Metal Wall Panels" for factory-formed metal wall panels and flashing and trim not part of sheet metal flashing and trim.
5. Division 7 Section "EPDM Membrane Roofing" for installing sheet metal flashing and trim integral with roofing membrane.
6. Division 7 Section "Roof Accessories" for set-on-type curbs, equipment supports, roof hatches, vents, and other manufactured roof accessory units.
7. Division 7 Section "Joint Sealants" for field-applied sheet metal flashing and trim sealants.

1.3 PERFORMANCE REQUIREMENTS

A. General: Install sheet metal flashing and trim to withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failing, rattling, leaking, and fastener disengagement.

B. Thermal Movements: Provide sheet metal flashing and trim 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 sheet metal and trim 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.

C. Water Infiltration: Provide sheet metal flashing and trim that do not allow water infiltration to building interior.

1.4 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. Sheet Metal Flashing: 12 inches long. Include fasteners, cleats, clips, closures, and other attachments.
2. Trim: 12 inches long. Include fasteners and other exposed accessories.

1.5 QUALITY ASSURANCE

A. Sheet Metal Flashing and Trim Standard: Comply with SMACNA's "Architectural Sheet Metal Manual." Conform to dimensions and profiles shown unless more stringent requirements are indicated.

B. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination."

1. Meet with Owner, Architect, Owner's insurer if applicable, Installer, and installers whose work interfaces with or affects sheet metal flashing and trim including installers of roofing materials, roof accessories, unit skylights, and roof-mounted equipment.
2. Review methods and procedures related to sheet metal flashing and trim.

3. Examine substrate conditions for compliance with requirements, including flatness and attachment to structural members.
4. Document proceedings, including corrective measures and actions required, and furnish copy of record to each participant.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver sheet metal flashing materials and fabrications undamaged. Protect sheet metal flashing and trim materials and fabrications during transportation and handling.

B. Unload, store, and install sheet metal flashing materials and fabrications in a manner to prevent bending, warping, twisting, and surface damage.

C. Stack materials on platforms or pallets, covered with suitable weathertight and ventilated covering. Do not store sheet metal flashing and trim materials in contact with other materials that might cause staining, denting, or other surface damage.

1.7 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 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Products: Subject to compliance with requirements, provide one of the products specified.

2.2 UNDERLAYMENT MATERIALS

A. Polyethylene Sheet: 6-mil- thick polyethylene sheet complying with ASTM D 4397.

2.3 MISCELLANEOUS MATERIALS

A. General: Provide materials and types of fasteners, solder, welding rods, protective coatings, separators, sealants, and other miscellaneous items as required for complete sheet metal flashing and trim installation.

B. Fasteners: Wood screws, annular threaded nails, self-tapping screws, self-locking rivets and bolts, and other suitable fasteners designed to withstand design loads.

1. Exposed Fasteners: Heads matching color of sheet metal by means of plastic caps or factory-applied coating.
2. Fasteners for Flashing and Trim: Blind fasteners or self-drilling screws, gasketed, with hex washer head.
3. Blind Fasteners: High-strength aluminum or stainless-steel rivets.
4. Spikes and Ferrules: Same material as gutter; with spike with ferrule matching internal gutter width.

C. Sealing Tape: Pressure-sensitive, 100 percent solids, polyisobutylene compound sealing tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape.

D. 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.

E. Butyl Sealant: ASTM C 1311, single-component, solvent-release butyl rubber sealant, polyisobutylene plasticized, heavy bodied for hooked-type expansion joints with limited movement.

F. Epoxy Seam Sealer: Two-part, noncorrosive, aluminum seam-cementing compound, recommended by aluminum manufacturer for exterior nonmoving joints, including riveted joints.

G. Bituminous Coating: Cold-applied asphalt 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.

H. Asphalt Roofing Cement: ASTM D 4586, asbestos free, of consistency required for application.

2.4 MANUFACTURED SHEET METAL FLASHING AND TRIM

A. Reglets: Units of type, material, and profile indicated, formed to provide secure interlocking of separate reglet and counterflashing pieces, and compatible with flashing indicated.

1. Available Manufacturers:

    a. Cheney Flashing Company, Inc.
    b. Fry Reglet Corporation.
    c. Heckmann Building Products Inc.
    d. Hickman, W. P. Company.
    e. Keystone Flashing Company, Inc.
    f. Sandell Manufacturing Company, Inc.

2. Material: Stainless steel, 0.0187 inch thick.
3. Surface-Mounted Type: Provide with slotted holes for fastening to substrate, with neoprene or other suitable weatherproofing washers, and with channel for sealant at top edge.
4. Concrete Type: Provide temporary closure tape to keep reglet free of concrete materials, special fasteners for attaching reglet to concrete forms, and guides to ensure alignment of reglet section ends.

5. Masonry Type: Provide with offset top flange for embedment in masonry mortar joint.
6. Flexible Flashing Retainer: Provide resilient plastic or rubber accessory to secure flexible flashing in reglet where clearance does not permit use of standard metal counterflashing or where Drawings show reglet without metal counterflashing.
7. Counterflashing Wind-Restraint Clips: Provide clips to be installed before counterflashing to prevent wind uplift of counterflashing lower edge.

2.5 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 in thickness or weight needed to comply with performance requirements, but not less than that specified for each application and metal.

C. Fabricate sheet metal flashing and trim without excessive oil canning, buckling, and tool marks and true to line and levels indicated, with exposed edges folded back to form hems.

1. Seams for Aluminum: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with epoxy seam sealer. Rivet joints for additional strength.

D. Sealed Joints: Form nonexpansion but movable joints in metal to accommodate elastomeric sealant to comply with SMACNA recommendations.

E. 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.

F. Conceal fasteners and expansion provisions where possible on exposed-to-view sheet metal flashing and trim, unless otherwise indicated.

G. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal.

1. Thickness: As recommended by SMACNA's "Architectural Sheet Metal Manual" and FMG Loss Prevention Data Sheet 1-49 for application but not less than thickness of metal being secured.

2.6 LOW-SLOPE ROOF SHEET METAL FABRICATIONS

A. Roof Edge Flashing (Gravel Stop) and Fascia Caps: Fabricate in minimum 96-inch- long, but not exceeding 10-foot- long, sections. Furnish with 6-inch- wide joint cover plates.

1. Joint Style: Butt, with 12-inch- wide concealed backup plate.

B. Copings: Fabricate in minimum 96-inch- long, but not exceeding 10-foot- long, sections. Fabricate joint plates of same thickness as copings. Furnish with continuous cleats to support edge

of external leg and drill elongated holes for fasteners on interior leg. Miter corners, seal, and solder or weld watertight.

1. Joint Style: Butt, with 12-inch- wide concealed backup plate.
2. Fabricate copings from the following material:

    a. Aluminum: 0.050 inch thick.

C. Roof to Sheet Metal Roof Edging Transition Expansion-Joint Cover: Fabricate from the following material:

1. Aluminum: 0.050 inch thick.

D. Base Flashing: Fabricate from the following material:

1. Aluminum: 0.040 inch thick.

E. Counterflashing: Fabricate from the following material:

1. Aluminum: 0.0320 inch thick.

F. Flashing Receivers: Fabricate from the following material:

1. Aluminum: 0.0320 inch thick.

G. Roof-Penetration Flashing: Fabricate from the following material:

1. Aluminum: 0.0320 inch thick.

H. Roof-Drain Flashing: Fabricate from the following material:

1. Aluminum: 0.0320 inch thick.

2.7 WALL SHEET METAL FABRICATIONS

A. Through-Wall Flashing: Fabricate continuous flashings in minimum 96-inch- long, but not exceeding 12 foot long, sections, under copings, at shelf angles, and where indicated. Fabricate discontinuous lintel, sill, and similar flashings to extend 6 inches beyond each side of wall openings. Form with 2-inch- high end dams. Fabricate from the following material:

1. Stainless Steel: 0.0156 inch thick.

B. Openings Flashing in Frame Construction: Fabricate head, sill, jamb, and similar flashings to extend 4 inches beyond wall openings. Form head and sill flashing with 2-inch- high end dams. Fabricate from the following material:

1. Aluminum: 0.0320 inch thick.

C. Wall Expansion-Joint Cover: Fabricate from the following material:

1. Aluminum: 0.040 inch thick.

2.8 MISCELLANEOUS SHEET METAL FABRICATIONS

A. Equipment Support Flashing: Fabricate from the following material:

1. Aluminum: 0.0320 inch thick.

2.9 FINISHES

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Appearance of Finished Work: 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 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, to verify actual locations, dimensions and other conditions affecting performance of work.

1. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.
2. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

A. General: Anchor sheet metal flashing and trim and other components of the Work securely in place, with provisions for thermal and structural movement. Use fasteners, solder, welding rods, protective coatings, separators, sealants, and other miscellaneous items as required to complete sheet metal flashing and trim system.

1. Torch cutting of sheet metal flashing and trim is not permitted.

B. Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, including non-arsenic treated lumber protect against galvanic action by painting contact surfaces with bituminous coating or by other permanent separation as recommended by fabricator or manufacturers of dissimilar metals.

C. Install exposed sheet metal flashing and trim without excessive oil canning, buckling, and tool marks.

D. Install sheet metal flashing and trim true to line and levels indicated. Provide uniform, neat seams with minimum exposure of solder, welds, and elastomeric sealant.

E. Install sheet metal flashing and trim to fit substrates and to result in watertight performance. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.

1. Space cleats not more than 12 inches apart. Anchor each cleat with two fasteners. Bend tabs over fasteners.

F. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet with no joints allowed within 24 inches of corner or intersection. Where lapped or bayonet-type expansion provisions cannot be used or would not be sufficiently watertight, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with elastomeric sealant concealed within joints.

G. 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. Galvanized or Prepainted, Metallic-Coated Steel: Use stainless-steel fasteners.
2. Aluminum: Use aluminum or stainless-steel fasteners.

H. 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. 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 either way. Adjust setting proportionately for installation at higher ambient temperatures. Do not install sealant-type joints at temperatures below 40 deg F.
2. Prepare joints and apply sealants to comply with requirements in Division 7 Section "Joint Sealants."

I. Soldered Joints: Clean surfaces to be soldered, removing oils and foreign matter. Pretin edges of sheets to be soldered to a width of 1-1/2 inches except where pretinned surface would show in finished Work.

J. Aluminum Flashing: Rivet or weld joints in uncoated aluminum where necessary for strength.

3.3 ROOF FLASHING INSTALLATION

A. General: Install sheet metal roof flashing and trim to comply with performance requirements**,** sheet metal manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, set units true to line, and level as indicated. Install work with laps, joints, and seams that will be permanently watertight.

B. Roof Edge Flashing: Anchor to resist uplift and outward forces according to recommendations in FMG Loss Prevention Data Sheet 1-49 for specified wind zone and as indicated.

1. Interlock bottom edge of roof edge flashing with continuous cleats anchored to substrate at 24-inch centers.

C. Copings: Anchor to resist uplift and outward forces according to recommendations in FMG Loss Prevention Data Sheet 1-49 for specified wind zone and as indicated.

1. Interlock exterior bottom edge of coping with continuous cleats anchored to substrate at 16-inch centers.
2. Anchor interior leg of coping with screw fasteners and washers at 18-inch centers.

D. Pipe or Post Counterflashing: Install counterflashing umbrella with close-fitting collar with top edge flared for elastomeric sealant, extending a minimum of 4 inches over base flashing. Install stainless-steel draw band and tighten.

E. Counterflashing: Coordinate installation of counterflashing with installation of base flashing. Insert counterflashing in reglets or receivers and fit tightly to base flashing. Extend counterflashing 4 inches over base flashing. Lap counterflashing joints a minimum of 4 inches and bed with elastomeric sealant.

F. Roof-Penetration Flashing: Coordinate installation of roof-penetration flashing with installation of roofing and other items penetrating roof. Install flashing as follows:

1. Turn lead flashing down inside vent piping, being careful not to block vent piping with flashing.
2. Seal with elastomeric sealant and clamp flashing to pipes penetrating roof except for lead flashing on vent piping.

3.4 MISCELLANEOUS FLASHING INSTALLATION

A. Overhead-Piping Safety Pans: Suspend pans from pipe and install drain line to plumbing waste or drain line.

B. Equipment Support Flashing: Coordinate installation of equipment support flashing with installation of roofing and equipment. Weld or seal flashing with elastomeric sealant to equipment support member.

3.5 CLEANING AND PROTECTION

A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.

B. Clean and neutralize flux materials. Clean off excess solder and sealants.

C. Remove temporary protective coverings and strippable films as 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 Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Copings.
2. Reglets and counterflashings.
3. Roof Edge Fascia

B. Related Requirements:

1. Section 061053 "Miscellaneous Rough Carpentry" for wood nailers, curbs, and blocking.
2. Section 076200 "Sheet Metal Flashing and Trim" for custom- and site-fabricated sheet metal flashing and trim.
3. Section 077129 "Manufactured Roof Expansion Joints" for manufactured roof expansion-joint cover assemblies.
4. Section 077200 "Roof Accessories" for set-on-type curbs, equipment supports, roof hatches, vents, and other manufactured roof accessory units.
5. Section 079200 "Joint Sealants" for field-applied sealants between roof specialties and adjacent materials.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Shop Drawings: For roof specialties.

1. Include plans, elevations, expansion-joint locations, keyed details, and attachments to other work. Distinguish between plant- and field-assembled work.
2. Include details for expansion and contraction; locations of expansion joints, including direction of expansion and contraction.

3. Indicate profile and pattern of seams and layout of fasteners, cleats, clips, and other attachments.
4. Detail termination points and assemblies, including fixed points.
5. Include details of special conditions.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For manufacturer.

B. Product Certificates: For each type of roof specialty.

C. Product Test Reports: For copings, for tests performed by a qualified testing agency.

D. Sample Warranty: For manufacturer's special warranty.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: A qualified manufacturer offering products meeting requirements that are FM Approvals listed for specified class.

B. Source Limitations: Obtain roof specialties approved by manufacturer providing roofing-system warranty specified in Section.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Do not store roof specialties in contact with other materials that might cause staining, denting, or other surface damage. Store roof specialties away from uncured concrete and masonry.

B. Protect strippable protective covering on roof specialties from exposure to sunlight and high humidity, except to extent necessary for the period of roof-specialty installation.

1.7 FIELD CONDITIONS

A. Field Measurements: Verify profiles and tolerances of roof-specialty substrates by field measurements before fabrication, and indicate measurements on Shop Drawings.

B. Coordination: Coordinate roof specialties with flashing, trim, and construction of parapets, roof deck, roof and wall panels, and other adjoining work to provide a leakproof, secure, and noncorrosive installation.

PART 2 - PRODUCTS

2.1 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. FM Approvals' Listing: Manufacture and install copings that are listed in FM Approvals' "RoofNav" and approved for windstorm classification, Class 1-90. Identify materials with FM Approvals' markings.

C. SPRI Wind Design Standard: Manufacture and install copings tested according to SPRI ES-1 and capable of resisting the following design pressures:

1. Design Pressure: As indicated on Drawings.

D. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes to prevent 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 calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change (Range): 180 deg F, material surfaces.

2.2 COPINGS

A. Metal Copings: Manufactured coping system consisting of metal coping cap in section lengths not exceeding 12 feet, concealed anchorage; with corner units, end cap units, and concealed splice plates with finish matching coping caps.

1. Metallic-Coated Steel Sheet Coping Caps: Zinc-coated (galvanized) steel, nominal 0.034-inch thickness.

a. Surface: Smooth, flat finish.
b. Finish: Three-coat fluoropolymer.
c. Color: **Dark Bronze (or Black) to match color of existing coping caps on the building.**

2. Corners: Factory mitered and continuously welded or mechanically clinched and sealed watertight.
3. Coping-Cap Attachment Method: Snap-on or face leg hooked to continuous cleat with back leg fastener exposed, fabricated from coping-cap material.

a. Snap-on Coping Anchor Plates: Concealed, galvanized-steel sheet, 12 inches wide, with integral cleats.
b. Face-Leg Cleats: Concealed, continuous galvanized-steel sheet.

B. Roof-Edge Fascia: Manufactured, two-piece, roof-edge fascia consisting of snap-on metal fascia cover in section lengths not exceeding 12 feet and a continuous metal receiver with integral drip-edge cleat to engage fascia cover and secure single-ply roof membrane. Provide matching corner units.

1. Metallic-Coated Steel Sheet Fascia Covers: Zinc-coated (galvanized) steel, nominal 0.034-inch thickness.

    a. Surface: Smooth, flat finish.
    b. Finish: Three-coat fluoropolymer.
    c. Color: **Dark Bronze (or Black) to match color of existing coping caps on the building.**

2. Corners: Factory mitered and continuously welded or mechanically clinched and sealed watertight.
3. Splice Plates: Concealed, of same material, finish, and shape as fascia cover.
4. Receiver: Manufacturer's standard material and thickness.
5. Corners: Factory mitered and continuously welded or mechanically clinched and sealed watertight.

2.3 REGLETS AND COUNTERFLASHINGS

A. Reglets: Manufactured units formed to provide secure interlocking of separate reglet and counterflashing pieces, from the following exposed metal:
1. Stainless Steel: 0.025 inch thick.
2. Corners: Factory mitered and continuously welded.
3. Surface-Mounted Type: Provide reglets with slotted holes for fastening to substrate, with neoprene or other suitable weatherproofing washers, and with channel for sealant at top edge.
4. Masonry Type, Embedded: Provide reglets with offset top flange for embedment in masonry mortar joint.

B. Counterflashings: Manufactured units of heights to overlap top edges of base flashings by 4 inches and in lengths not exceeding 12 feet designed to snap into reglets or through-wall-flashing receiver and compress against base flashings with joints lapped, from the following exposed metal:
1. Stainless Steel: 0.025 inch thick.

C. Accessories:

1. Flexible-Flashing Retainer: Provide resilient plastic or rubber accessory to secure flexible flashing in reglet where clearance does not permit use of standard metal counterflashing or where reglet is provided separate from metal counterflashing.
2. Counterflashing Wind-Restraint Clips: Provide clips to be installed before counterflashing to prevent wind uplift of counterflashing lower edge.

D. Stainless-Steel Finish: No. 2B (bright, cold rolled, unpolished).

2.4 MATERIALS

A. Stainless-Steel Sheet: ASTM A 240/A 240M or ASTM A 666, Type 304.

2.5 MISCELLANEOUS MATERIALS

A. Fasteners: Manufacturer's recommended fasteners, suitable for application and designed to meet performance requirements. Furnish the following unless otherwise indicated:

1. Exposed Penetrating Fasteners: Gasketed screws with hex washer heads matching color of sheet metal.
2. Fasteners for Copper Sheet: Copper, hardware bronze, or passivated Series 300 stainless steel.
3. Fasteners for Aluminum: Aluminum or Series 300 stainless steel.
4. Fasteners for Stainless-Steel Sheet: Series 300 stainless steel.
5. Fasteners for Zinc-Coated (Galvanized) Steel Sheet: Series 300 stainless steel or hot-dip zinc-coated steel according to ASTM A 153/A 153M or ASTM F 2329.

B. Butyl Sealant: ASTM C 1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for hooked-type joints with limited movement.

2.6 FINISHES

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Appearance of Finished Work: Noticeable variations in same piece are unacceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

D. Coil-Coated Galvanized-Steel Sheet Finishes:

1. High-Performance Organic Finish: Prepare, pretreat, and apply coating to exposed metal surfaces to comply with ASTM A 755/A 755M and coating and resin manufacturers' written instructions.

a. Three-Coat Fluoropolymer: AAMA 62D. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in both color coat and clear top coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, to verify actual locations, dimensions, and other conditions affecting performance of the Work.

B. Examine walls, roof edges, and parapets for suitable conditions for roof specialties.

C. Verify that substrate is sound, dry, smooth, clean, sloped for drainage where applicable, and securely anchored.

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

3.2 INSTALLATION, 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, solder, protective coatings, separators, underlayments, sealants, and other miscellaneous items as required to complete roof-specialty systems.

1. Install roof specialties level, plumb, true to line and elevation; with limited oil-canning and without warping, jogs in alignment, buckling, or tool marks.
2. Provide uniform, neat seams with minimum exposure of solder and sealant.
3. Install roof specialties to fit substrates and to result in weathertight performance. Verify shapes and dimensions of surfaces to be covered before manufacture.
4. Torch cutting of roof specialties is not permitted.
5. Do not use graphite pencils to mark metal surfaces.

B. Metal Protection: Protect metals against galvanic action by separating dissimilar metals from contact with each other or with corrosive substrates by painting contact surfaces with bituminous coating or by other permanent separation as recommended by manufacturer.

1. Coat concealed side of stainless-steel roof specialties with bituminous coating where in contact with wood, ferrous metal, or cementitious construction.
2. Bed flanges in thick coat of asphalt roofing cement where required by manufacturers of roof specialties for waterproof performance.

C. Expansion Provisions: Allow for thermal expansion of exposed roof specialties.

1. Space movement joints at a maximum of 12 feet with no joints within 18 inches of corners or intersections unless otherwise indicated on Drawings.
2. When ambient temperature at time of installation is between 40 and 70 deg F, set joint members for 50 percent movement each way. Adjust setting proportionately for installation at higher ambient temperatures.

D. Fastener Sizes: Use fasteners of sizes that penetrate substrate not less than recommended by fastener manufacturer to achieve maximum pull-out resistance.

E. Seal concealed joints with butyl sealant as required by roofing-specialty manufacturer.

F. Seal joints as required for weathertight construction. Place sealant to be completely concealed in joint. Do not install sealants at temperatures below 40 deg F.

3.3 COPING INSTALLATION

A. Install cleats, anchor plates, and other anchoring and attachment accessories and devices with concealed fasteners.

B. Anchor copings with manufacturer's required devices, fasteners, and fastener spacing to meet performance requirements.

1. Interlock face-leg drip edge into continuous cleat anchored to substrate at manufacturer's required spacing that meets performance requirements. Anchor back leg of coping with screw fasteners and elastomeric washers at manufacturer's required spacing that meets performance requirements.

3.4 REGLET AND COUNTERFLASHING INSTALLATION

A. General: Coordinate installation of reglets and counterflashings with installation of base flashings.

B. Embedded Reglets: See Section 042000 "Unit Masonry" for installation of reglets.

C. Surface-Mounted Reglets: Install reglets to receive flashings where flashing without embedded reglets is indicated on Drawings. Install at height so that inserted counterflashings overlap 4 inches over top edge of base flashings.

D. Counterflashings: Insert counterflashings into reglets or other indicated receivers; ensure that counterflashings overlap 4 inches over top edge of base flashings. Lap counterflashing joints a minimum of 4 inches and bed with butyl sealant. Fit counterflashings tightly to base flashings.

3.5 CLEANING AND PROTECTION

A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.

B. Clean and neutralize flux materials. Clean off excess solder and sealants.

C. Remove temporary protective coverings and strippable films as roof specialties are installed. On completion of installation, clean finished surfaces, including removing unused fasteners, metal filings, pop rivet stems, and pieces of flashing. Maintain roof specialties in a clean condition during construction.

D. Replace roof specialties that have been damaged or that cannot be successfully repaired by finish touchup or similar minor repair procedures.

END OF SECTION 077100

SECTION 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 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes joint sealants for the following applications:

1. Exterior joints in the following vertical surfaces and horizontal nontraffic surfaces:

   a. Construction joints in cast-in-place concrete.
   b. Joints between plant-precast architectural concrete units.
   c. Control and expansion joints in unit masonry.
   d. Joints in dimension stone cladding.
   e. Joints in glass unit masonry assemblies.
   f. Joints between metal panels.
   g. Joints between different materials listed above.
   h. Perimeter joints between materials listed above and frames of doors, windows, and louvers.
   i. Control and expansion joints in ceilings and other overhead surfaces.
   j. Other joints as indicated.

2. Exterior joints in the following horizontal traffic surfaces:

   a. Isolation and contraction joints in cast-in-place concrete slabs.
   b. Tile control and expansion joints.
   c. Joints between different materials listed above.
   d. Other joints as indicated.

3. Interior joints in the following vertical surfaces and horizontal nontraffic surfaces:

   a. Control and expansion joints on exposed interior surfaces of exterior walls.
   b. Perimeter joints of exterior openings where indicated.
   c. Tile control and expansion joints.
   d. Vertical joints on exposed surfaces of interior unit masonry, concrete, walls, acoustic isolation joints and partitions.
   e. Acoustic isolation joints.

f. Joints on underside of plant-precast structural concrete planks.
g. Perimeter joints between interior wall surfaces and frames of interior doors, windows and elevator entrances.
h. Joints between plumbing fixtures and adjoining walls, floors, and counters.
i. Other joints as indicated.

4. Interior joints in the following horizontal traffic surfaces:

a. Isolation joints in cast-in-place concrete slabs.
b. Control and expansion joints in tile flooring.
c. Other joints as indicated.

B. Related Sections include the following:

1. Division 4 Section "Unit Masonry Assemblies" for masonry control and expansion joint fillers and gaskets.
2. Division 8 Section "Glazing" for glazing sealants.
3. Division 9 Section "Gypsum Board Assemblies" for sealing perimeter joints of gypsum board partitions to reduce sound transmission.
4. Division 9 Section "Ceramic Tile" for sealing tile joints.
5. Division 9 Section "Acoustical Panel Ceilings" for sealing edge moldings at perimeters of acoustical ceilings.

1.3 PERFORMANCE REQUIREMENTS

A. Provide elastomeric joint sealants that establish and maintain watertight and airtight continuous joint seals without staining or deteriorating joint substrates.

B. Provide joint sealants for interior applications that establish and maintain airtight and water-resistant continuous joint seals without staining or deteriorating joint substrates.

1.4 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. Warranties: Special warranties specified in this Section.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Manufacturer's authorized Installer who is approved or licensed for installation of elastomeric sealants required for this Project.

B. Source Limitations: Obtain each type of joint sealant through one source from a single manufacturer.

1.6 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. Contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

1.7 WARRANTY

A. Special Installer's Warranty: Installer's standard form in which Installer agrees to repair or replace elastomeric 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 elastomeric sealant manufacturer agrees to furnish elastomeric 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: Twenty years from date of Substantial Completion.

C. Special warranties specified in this Article exclude deterioration or failure of elastomeric joint sealants from the following:

1. Movement of the structure resulting in stresses on the sealant exceeding sealant manufacturer's written specifications for sealant elongation and compression caused by structural settlement or errors attributable to design or construction.
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 MANUFACTURERS

A. Products: Subject to compliance with requirements, provide one of the products listed in other Part 2 articles.

2.2 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 sealant manufacturer, based on testing and field experience.

B. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range.

2.3 ELASTOMERIC JOINT SEALANTS

A. Elastomeric Sealants: Comply with ASTM C 920 and other requirements indicated for each liquid-applied chemically curing sealant specified, including those referencing ASTM C 920 classifications for type, grade, class, and uses related to exposure and joint substrates.

B. Stain-Test-Response Characteristics: Where elastomeric 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.

C. Suitability for Immersion in Liquids. Where elastomeric sealants are indicated for Use I for joints that will be continuously immersed in liquids, provide products that have undergone testing according to ASTM C 1247 and qualify for the length of exposure indicated by reference to ASTM C 920 for Class 1 or 2. Liquid used for testing sealants is deionized water, unless otherwise indicated.

D. Suitability for Contact with Food: Where elastomeric sealants are indicated for joints that will come in repeated contact with food, provide products that comply with 21 CFR 177.2600.

E. Single-Component Mildew-Resistant Neutral-Curing Silicone Sealant **ES-2**:

1. Available Products:

    a. Pecora Corporation; 898.
    b. Tremco; Tremsil 600.

2. Type and Grade: S (single component) and NS (nonsag).
3. Class: 25.
4. Use Related to Exposure: NT (nontraffic).
5. Uses Related to Joint Substrates: G, A, and, as applicable to joint substrates indicated, O.

    a. Use O Joint Substrates: Coated glass, color anodic aluminum, aluminum coated with a high-performance coating, galvanized steel and ceramic tile.

F. Multicomponent Nonsag Urethane Sealant **ES-1**:

1. Available Products:

    a. Pecora Corporation; Dynatrol II.
    b. Tremco; Dymeric 511.
    c. Tremco; Vulkem 922.

2. Type and Grade: M (multicomponent) and NS (nonsag).

3. Class: 25.
4. Use Related to Exposure: NT (nontraffic).
5. Uses Related to Joint Substrates: M, A, and, as applicable to joint substrates indicated, O.

    a. Use O Joint Substrates: Color anodic aluminum, aluminum coated with a high-performance coating, galvanized steel, brick, granite, limestone, marble, ceramic tile and wood.

6. Color: As selected by Architect from manufacturer's full line of available colors.

    a. At control joints in brick, as selected to match adjacent brick color.

2.4 LATEX JOINT SEALANTS

A. Latex Sealant **LS-1**: Comply with ASTM C 834, Type P, Grade NF.

B. Available Products:

1. Bostik Findley; Chem-Calk 600.
2. Pecora Corporation; AC-20+.
3. Sonneborn, Division of ChemRex Inc.; Sonolac.
4. Tremco; Tremflex 834.

2.5 ACOUSTICAL JOINT SEALANTS

A. Acoustical Sealant for Exposed and Concealed Joints **ACS-1**: Manufacturer's standard nonsag, paintable, nonstaining latex sealant complying with ASTM C 834 and the following:

1. 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.
2. Available Products:

    a. Pecora Corporation; AC-20 FTR Acoustical and Insulation Sealant.
    b. United States Gypsum Co.; SHEETROCK Acoustical Sealant.

B. Acoustical Sealant for Concealed Joints **ACS-1**: Manufacturer's standard, nondrying, nonhardening, nonskinning, nonstaining, gunnable, synthetic-rubber sealant recommended for sealing interior concealed joints to reduce airborne sound transmission.

1. Available Products:

    a. Pecora Corporation; BA-98.
    b. Tremco; Tremco Acoustical Sealant.

C. Applications: Interior joints at masonry, gypsum drywall and between each other including all interior joints not indicated otherwise.

D. Applications: Interior joints at base sound sealant, gypsum drywall and masonry, concrete and between each other, including all interior joints in an acoustically rated wall assembly not indicated otherwise.

2.6 JOINT-SEALANT BACKING

A. General: Provide sealant backings of material and type 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, Type C (closed-cell material with a surface skin), and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance:

C. Elastomeric Tubing Sealant Backings: Neoprene, butyl, EPDM, or silicone tubing complying with ASTM D 1056, nonabsorbent to water and gas, and capable of remaining resilient at temperatures down to minus 26 deg F. Provide products with low compression set and of size and shape to provide a secondary seal, to control sealant depth, and to otherwise contribute to optimum sealant performance.

D. 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 where such adhesion would result in sealant failure. Provide self-adhesive tape where applicable.

2.7 MISCELLANEOUS MATERIALS

A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.

B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.

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, blast cleaning, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air. Porous joint substrates include the following:

    a. Concrete.
    b. Masonry.
    c. Unglazed surfaces of ceramic tile.

3. Remove laitance and form-release agents from concrete.
4. Clean nonporous surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants. Nonporous joint substrates include the following:

    a. Metal.
    b. Glass.
    c. Porcelain enamel.
    d. Glazed surfaces of ceramic tile.

B. Joint Priming: Prime joint substrates, where recommended in writing by joint-sealant manufacturer, based on 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 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. Acoustical Sealant Application Standard: Comply with recommendations in ASTM C 919 for use of joint sealants in acoustical applications as applicable to materials, applications, and conditions indicated.

D. Install sealant backings of type indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.

1. Do not leave gaps between ends of sealant backings.
2. Do not stretch, twist, puncture, or tear sealant backings.
3. Remove absorbent sealant backings that have become wet before sealant application and replace them with dry materials.

E. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.

F. 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.

G. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified 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 configuration per Figure 5A in ASTM C 1193, unless otherwise indicated.
4. Provide flush joint configuration where indicated per Figure 5B in ASTM C 1193.
5. Provide recessed joint configuration of recess depth and at locations indicated per Figure 5C in ASTM C 1193.

    a. Use masking tape to protect surfaces adjacent to recessed tooled joints.

3.4 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.

3.5 PROTECTION

A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from original work.

END OF SECTION 079200

SECTION 089119
LOUVERS AND VENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Fixed, extruded-aluminum louvers.
2. Blank-off panels for louvers.

B. Related Sections:

1. Division 07 Section “Joint Sealants” for sealant installed in perimeter joints between louver frames and adjoining construction.
2. Division 23 Sections for louvers that are a part of mechanical equipment.

1.3 DEFINITIONS

A. Louver Terminology: Definitions of terms for metal louvers contained in AMCA 501 apply to this Section unless otherwise defined in this Section or in referenced standards.

B. Horizontal Louver: Louver with horizontal blades; i.e., the axes of the blades are horizontal.

C. Drainable-Blade Louver: Louver with blades having gutters that collect water and drain it to channels in jambs and mullions, which carry it to bottom of unit and away from opening.

1.4 PERFORMANCE REQUIREMENTS

A. Structural Performance: Louvers shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated without permanent deformation of louver components, noise or metal fatigue caused by louver blade rattle or flutter, or permanent damage to fasteners and anchors. Wind pressures shall be considered to act normal to the face of the building.

1. Wind Loads: Determine loads based on a uniform pressure of 30 lbf/sq. ft., acting inward or outward.
2. Thermal Movements: Provide louvers that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, overstressing of components, and other detrimental effects:

    a. Temperature Change (Range): 120 deg. F., ambient; 180 deg. F., material surfaces.

B. Air-Performance, Water Penetration, and Air Leakage Ratings: Provide louvers complying with performance requirements indicated, as demonstrated by testing manufacturer's stock units 48 inches wide by 48 inches high. Test units according to AMCA 500.

1. Perform testing on unpainted, cleaned, degreased units.
2. Perform water-penetration testing in louvers without screens.

1.5 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: For louvers and accessories. Include plans, elevations, sections, details, and attachments to other work. Show frame profiles and blade profiles, angles, and spacing.

C. Samples for Verification: For each type of metal finish required.

1.6 QUALITY ASSURANCE

A. Source Limitations: Obtain louvers and vents from single source from a single manufacturer where indicated to be of same type, design, or factory-applied color finish.

B. Welding: Qualify procedures and personnel according to the following:

1. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum."

C. SMACNA Standard: Comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" for fabrication, construction details, and installation procedures.

1.7 PROJECT CONDITIONS

A. Field Measurements: Verify actual dimensions of openings by field measurements before fabrication.

1. Established Dimensions: Where field measurements cannot be made without delaying the work, establish opening dimensions and proceed with fabricating louvers without field measurements. Coordinate construction to ensure that actual opening dimensions correspond to established dimensions.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Aluminum Extrusions: ASTM B 221, Alloy 6063-T5, T-52, or T6.

B. Aluminum Sheet: ASTM B 209, Alloy 3003 or 5005 with temper as required for forming, or as otherwise recommended by metal producer for required finish.

C. Fasteners: Use types and sizes to suit unit installation conditions.

1. Use Phillips flat-head screws for exposed fasteners unless otherwise indicated.

D. Postinstalled Fasteners for Concrete and Masonry: Torque-controlled expansion anchors, made from stainless-steel components, with capability to sustain, without failure, a load equal to 4 times the loads imposed, for concrete, or 6 times the load imposed, for masonry, as determined by testing per ASTM E 488, conducted by a qualified independent testing agency.

E. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.

2.2 FABRICATION, GENERAL

A. Assemble louvers in factory to minimize field splicing and assembly. Disassemble units as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.

B. Vertical Assemblies: Where height of louver units exceeds fabrication and handling limitations, fabricate units to permit field-bolted assembly with close-fitting joints in jambs and mullions, reinforced with splice plates.

1. Continuous Vertical Assemblies: Fabricate units without interrupting blade-spacing pattern.
2. Horizontal Mullions: Provide horizontal mullions at joints unless continuous vertical assemblies are indicated.

C. Maintain equal louver blade spacing, including separation between blades and frames at head and sill, to produce uniform appearance.

D. Fabricate frames, including integral sills, to fit in openings of sizes indicated, with allowances made for fabrication and installation tolerances, adjoining material tolerances, and perimeter sealant joints.

1. Frame Type: Channel unless otherwise indicated.

E. Include supports, anchorages, and accessories required for complete assembly.

F. Provide extended sills for recessed louvers.

G. Join frame members to each other and to fixed louver blades with fillet welds, threaded fasteners, or both, as standard with louver manufacturer unless otherwise indicated or size of louver assembly makes bolted connections between frame members necessary.

2.3 FIXED, EXTRUDED-ALUMINUM LOUVERS

A. Horizontal, Drainable-Blade Louver:

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

    a. Airolite Company, LLC (The).
    b. Arrow United Industries; a division of Mestek, Inc.
    c. Cesco Products; a division of Mestek, Inc.
    d. Construction Specialties, Inc.
    e. Greenheck Fan Corporation.
    f. Industrial Louvers, Inc.
    g. Ruskin Company; Tomkins PLC.

2. Louver Depth: 4 inches.
3. Frame and Blade Nominal Thickness: Not less than 0.080 inch.
4. Mullion Type: Exposed.
5. Louver Performance Ratings:

    a. Free Area: Not less than 45% of louver opening.

6. AMCA Seal: Mark units with AMCA Certified Ratings Seal.

2.4 LOUVER SCREENS

A. General: Provide screen at each exterior louver.

1. Screen Location for Fixed Louvers: Interior face.
2. Screening Type: Bird screening.

B. Secure screen frames to louver frames with stainless-steel machine screws, spaced a maximum of 6 inches from each corner and at 12 inches o.c.

C. Louver Screen Frames: Fabricate with mitered corners to louver sizes indicated.

1. Metal: Same kind and form of metal as indicated for louver to which screens are attached. Reinforce extruded-aluminum screen frames at corners with clips.
2. Finish: Same finish as louver frames to which louver screens are attached.
3. Type: Rewirable frames with a driven spline or insert.

D. Louver Screening for Aluminum Louvers:

1. Bird Screening: Aluminum, 1/2-inch- square mesh, 0.063-inch wire. Insert other screening materials as required, including bronze and glass fiber.

2.5 BLANK-OFF PANELS

A. General: Fabricate blank-off panels from materials and to sizes indicated to comply with the following requirements:

1. Finish: Same as finish applied to louvers.
2. Attach blank-off panels to back of louver frames with stainless steel sheet metal screws.

B. Insulated, Blank-Off Panels: Laminated panels consisting of insulating core surfaced on back and front with metal sheets and attached to back of louver.

1. Thickness: 2 inches.
2. Metal Facing Sheets: Aluminum sheet, not less than 0.032-inch nominal thickness.
3. Insulating Core: Manufacturers standard having a “U” value of 0.125 or less.
4. Edge Treatment: Trim perimeter edges of blank-off panels with louver manufacturer's standard extruded-aluminum-channel frames, not less than 0.080-inch nominal thickness, with corners mitered and with same finish as panels.
5. Seal perimeter joints between panel faces and louver frames with gaskets or sealant.

2.6 FABRICATION

A. Fabricate frames, including integral sills, to fit in openings of sizes indicated, with allowances made for fabrication and installation tolerances, adjoining material tolerances, and perimeter sealant joints.

1. Frame Type: Exterior flange unless otherwise indicated.

B. Include supports, anchorages, and accessories required for complete assembly.

C. Provide extended sills for recessed louvers.

2.7 FINISHES, GENERAL

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

2.8 ALUMINUM FINISHES

A. Finish louvers after assembly.

B. Clear Anodic Finish: AAMA 611, AA-M12C22A42/A44, Class I, 0.018 mm or thicker.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and openings, with Installer present, 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 PREPARATION

A. Coordinate setting drawings, diagrams, templates, instructions, and directions for installation of anchorages that are to be embedded in concrete or masonry construction. Coordinate delivery of such items to Project site.

3.3 INSTALLATION

A. Locate and place louvers and vents level, plumb, and at indicated alignment with adjacent work.

B. Use concealed anchorages where possible. Provide brass or lead washers fitted to screws where required to protect metal surfaces and to make a weathertight connection.

C. Form closely fitted joints with exposed connections accurately located and secured.

D. Provide perimeter reveals and openings of uniform width for sealants and joint fillers, as indicated.

E. Repair finishes damaged by cutting, welding, soldering, and grinding. Restore finishes so no evidence remains of corrective work. Return items that cannot be refinished in the field to the factory, make required alterations, and refinish entire unit or provide new units.

F. Protect unpainted galvanized and nonferrous-metal surfaces that will be in contact with concrete, masonry, or dissimilar metals from corrosion and galvanic action by applying a heavy coating of bituminous paint or by separating surfaces with waterproof gaskets or nonmetallic flashing.

G. Install concealed gaskets, flashings, joint fillers, and insulation as louver installation progresses, where weathertight louver joints are required. Comply with Division 07 Section "Joint Sealants" for sealants applied during louver installation.

3.4 ADJUSTING AND CLEANING

A. Test operation of adjustable louvers and adjust as needed to produce fully functioning units that comply with requirements.

B. Clean exposed surfaces of louvers and vents that are not protected by temporary covering, to remove fingerprints and soil during construction period. Do not let soil accumulate during construction period.

C. Before final inspection, clean exposed surfaces with water and a mild soap or detergent not harmful to finishes. Thoroughly rinse surfaces and dry.

D. Restore louvers and vents damaged during installation and construction so no evidence remains of corrective work. If results of restoration are unsuccessful, as determined by Architect, remove damaged units and replace with new units.

1. Touch up minor abrasions in finishes with air-dried coating that matches color and gloss of, and is compatible with, factory-applied finish coating.

END OF SECTION 089119

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.

B. See Division 9 “Ceramic Tiling” Specification for metal transitions.

1.2 SUMMARY

A. Section Includes:

1. Resilient base.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product with selected color(s) indicated.

1.4 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Furnish not less than 10 linear feet for every 500 linear feet or fraction thereof, of each type, color, pattern, and size of resilient product installed.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Store resilient products and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F or more than 90 deg F.

1.6 FIELD CONDITIONS

A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg For more than 95 deg F in spaces to receive resilient products during the following time 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 PERFORMANCE REQUIREMENTS

A. FloorScore Compliance: Resilient base shall comply with requirements of FloorScore certification.

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

2.2 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. Adhesives shall have a VOC content of 50 g/L or less.
2. Adhesives shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

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. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.

C. Do not install resilient products until they are the same temperature as the space where they are to be installed.

1. At least 48 hours in advance of installation, move resilient products and installation materials into spaces where they will be installed.

D. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient products.

3.3 RESILIENT BASE INSTALLATION

A. Comply with manufacturer's written instructions for installing resilient base.

B. Apply resilient base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.

C. Install resilient base in lengths as long as practical without gaps at seams and with tops of adjacent pieces aligned.

D. Tightly adhere resilient base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.

E. Do not stretch resilient base during installation.

F. On masonry surfaces or other similar irregular substrates, fill voids along top edge of resilient base with manufacturer's recommended adhesive filler material.

G. Job-Formed Corners:

1. Outside Corners: Use straight pieces of maximum lengths possible and form with returns not less than 3 inches in length.

    a. Form without producing discoloration (whitening) at bends.

2. Inside Corners: Use straight pieces of maximum lengths possible and form with returns not less than 3 inches in length.

    a. Miter or cope corners to minimize open joints.

3.4 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 exposed 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.

3.5 RESILIENT WALL BASE SCHEDULE

A. Resilient Wall Base **(RB-1)**: Where this designation is indicated, provide the following:

1. Product: Roppe
2. Color & Pattern: 150 Dark Grey
3. Type (ASTM F 1861): Type TV (vinyl, thermoplastic)
4. Group: Group 2 (solid, layer)
5. Style: Cove (with top set toe)
6. Minimum Thickness: 0.125 inches
7. Height: 4 inches
8. Lengths: Coils in manufacturer’s standard length
9. Outside Corners: Job formed
10. Inside Corners: Job formed
11. Finish: Satin, Smooth.

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 tile.

1.3 RELATED REQUIREMENTS:

Section 096513 "Resilient Base and Accessories" and Section 096519 "Resilient Tile Flooring" for resilient wall base and accessories installed.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

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.

2. Flooring contractor will be responsible for the proper product installation, including floor preparation in all the areas indicated in the drawings to receive LVT.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Store floor tile and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F or more than 90 deg F. Store floor tiles on flat surfaces.

1.9 FIELD CONDITIONS

A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F or more than 95 deg F in spaces to receive floor tile during the following periods:

1. 72 hours before installation.
2. During installation.
3. 72 hours after installation.

B. After installation and until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F or more than 95 deg F.

C. Close spaces to traffic during floor tile installation.

D. Close spaces to traffic for 72 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 E648 or NFPA 253 by a qualified testing agency.

1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.

2.2 LUXURY VINYL FLOOR TILE **(LVT-#)**

1. Interface
    a. Manufacturer's Rep:
        1) Charles Timmerman
        2) Email: Chuck.Timmerman@interface.com
        3) Mobile: 616-481-1719

B. Studio Set: **LVT-1**

1. Product: Studio Set
2. Color: A00701 Silverlight
3. Product Construction: High Performance Luxury Vinyl Tile
4. Class / ASTM F1700 Class III Printed Vinyl Tile
5. Wear Layer Thickness: 22 mil
6. Total Thickness: 4.5 mm
7. Backing Class Commercial Grade
8. Finish: Ceramor™
9. Nominal Dimensions: 25 cm x 1 m (9.845 in x 39.38 in)
10. Warranty: 15 year Standard LVT Warranty
11. Installation: Ashlar

C. Studio Set: **LVT-2**

1. Product: Studio Set
2. Color: TBD
3. Product Construction: High Performance Luxury Vinyl Tile
4. Class / ASTM F1700 Class III Printed Vinyl Tile
5. Wear Layer Thickness: 22 mil
6. Total Thickness: 4.5 mm
7. Backing Class Commercial Grade
8. Finish: Ceramor™
9. Nominal Dimensions: 25 cm x 1 m (9.845 in x 39.38 in)
10. Warranty: 15 year Standard LVT Warranty
11. Installation: Ashlar

2.3 INSTALLATION MATERIALS

A. Trowelable Leveling and Patching Compounds: Latex-modified, portland-cement-based or blended hydraulic-cement-based formulation provided or approved by floor tile manufacturer for applications indicated.

B. Adhesives: Commercialon® Premium Modular/LVT Pressure Sensitive Adhesive, a premium modular flooring adhesive specifically formulated for bonding J+J Flooring's Luxury Vinyl Tile to the floor

1. Adhesives shall comply with the following limits for VOC content:
    a. Composition Tile Adhesives: 50 g/L or less.
2. Adhesives shall be manufacturer's recommended for 5 lbs and water/1000 sq. ft.

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.

2. Examine and verify that sub-floor surfaces are smooth and flat within tolerances specified for that type of work and are ready to receive flooring.

3. Verify that wall surfaces are smooth and flat within the tolerances specified for that type of work, are dust-free, and are ready to receive flooring.

4. Verify that sub-floor surfaces are dust-free and free of substances that could impair bonding of adhesive materials to sub-floor surfaces.

5. Verify that concrete sub-floor surfaces are dry enough and ready for flooring installation by testing for moisture emission rate and alkalinity in accordance with ASTM F 710; obtain instructions if test results are not within limits recommended by manufacturer and adhesive materials manufacturer.

6. Verify that required floor-mounted utilities are in correct location.

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 F710.

1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by floor tile manufacturer. Do not use solvents.
3. Alkalinity and Adhesion Testing: Perform tests recommended by floor tile manufacturer. Proceed with installation only after substrate alkalinity falls within range on pH scale recommended by manufacturer in writing, but not less than 5 or more than 10 pH.
4. Moisture Testing: Perform tests so that each test area does not exceed 200 sq. ft. and perform no fewer than three tests in each installation area and with test areas evenly spaced in installation areas.

a. Anhydrous Calcium Chloride Test: ASTM F1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. in 24 hours.

b. Relative Humidity Test: Using in-situ probes, ASTM F2170. Proceed with installation only after substrates have a maximum 75 percent relative humidity level measurement.

C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.
1. Coordinate building expansion joint trim with flooring.

D. Do not install floor tiles until materials are the same temperature as space where they are to be installed.

1. At least 72 hours in advance of installation, move resilient floor tile and installation materials into spaces where they will be installed.

E. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient floor tile.

3.3 FLOOR TILE INSTALLATION

A. Comply with manufacturer's written instructions for installing floor tile.

B. Lay out floor tiles from center marks established with principal walls, discounting minor offsets, so tiles at opposite edges of room are of equal width. Adjust as necessary to avoid using cut widths that equal less than one-half tile at perimeter.

1. Lay tiles square with room axis.

2. See Color Layout plans for details.

C. Match floor tiles for color and pattern by selecting tiles from cartons in the same sequence as manufactured and packaged, if so numbered. Discard broken, cracked, chipped, or deformed tiles.

1. Lay tiles in pattern of colors and sizes indicated on color layout drawings.

D. Scribe, cut, and fit floor tiles to butt neatly and tightly to vertical surfaces and permanent fixtures including built-in furniture, cabinets, pipes, outlets, and door frames.
1. Install at base cabinet interior without toe kicks.

E. Extend floor tiles into toe spaces, door reveals, closets, and similar openings. Extend floor tiles to center of door openings.

F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on floor tiles as marked on substrates. Use chalk or other nonpermanent marking device.

G. Install floor tiles on covers for telephone and electrical ducts, building expansion-joint covers, and similar items in installation areas. Maintain overall continuity of color and pattern between pieces of tile installed on covers and adjoining tiles. Tightly adhere tile edges to substrates that abut covers and to cover perimeters.

H. Adhere floor tiles to substrates using a full spread of adhesive 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 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. Walk-Off carpet

B. Related Requirements:

   1. Section 096513 "Resilient Base and Accessories" and Section 096519 "Resilient Tile Flooring" 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.

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.

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 10 percent of amount installed for each type indicated, but not less than 10 sq. yd.

1.8 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who is certified by the International Certified Floorcovering Installers Association at the Master II certification level.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Comply with the Carpet and Rug Institute's CRI 104.

1.10 FIELD CONDITIONS

A. Comply with the Carpet and Rug Institute's CRI 104 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.

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: 15 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 CARPET TILE **WALK-OFF CARPET (AT VESTIBULE LOCATIONS)**

A. Interface
1. Pattern: Step Repeat Collection
2. Color: 104940 Iron
3. Backing: GlasBac
4. Manufacturer's Rep:
a. Charles Timmerman
b. Email: Chuck.Timmerman@interface.com
c. Mobile: 616-481-1719

B. Product Number: 1388602500

C. Product Construction: Tufted Textured

D. Loop Yarn System: 100% Recycled Content Nylon

E. Yarn Manufacturer: Aqual

F. Dye Method: 100% Solution Dyed

G. Preservative Protection: InterSept®

H. Tufted Yarn Weight: 26 oz/yd²

I. Machine Gauge: 1/12

J. Pile Height: 0.20 in

K. Pile Thickness: 0.14 in

L. Stitches: 10.00 /in

M. Pile Density: 6,545 oz/yd³

N. Size: 19.69 in x 19.69 in

O. Adhesive: Manufacture Standard

P. Flooring Radiant Panel: (ASTM E-648) Passes

Q. Smoke Density: (ASTM E-662) ≤ 450

R. Flammability Passes Methenamine Pill Test (DOC-FF1-70)

S. Lightfastness (AATCC 16 - E) ≥ 4.0 @ 60 AFU's

T. Static (AATCC - 134) < 3.0 KV

U. Installation Method: Monolithic

V. Warranty: 15 year Standard

2.3 INSTALLATION ACCESSORIES

W. Trowelable Leveling and Patching Compounds: Latex-modified, hydraulic-cement-based formulation provided or recommended by carpet tile manufacturer.

X. Adhesives: Water-resistant, mildew-resistant, nonstaining, pressure-sensitive type to suit products and subfloor conditions indicated, that comply with flammability requirements for installed carpet tile, and are recommended by carpet tile manufacturer for releasable installation.

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 Slabs: Verify that finishes comply with requirements specified in Section 033000 "Cast-in-Place Concrete" and that surfaces are free of cracks, ridges, depressions, scale, and foreign deposits.

1. Moisture Testing: Perform tests so that each test area does not exceed 200 sq. ft. and perform no fewer than three tests in each installation area and with test areas evenly spaced in installation areas.

a. Anhydrous Calcium Chloride Test: ASTM F1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft.in 24 hours.
b. Relative Humidity Test: Using in situ probes, ASTM F2170. Proceed with installation only after substrates have a maximum 75 percent relative humidity level measurement.
c. Perform additional moisture tests recommended in writing by adhesive and carpet tile manufacturers. Proceed with installation only after substrates pass testing.

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

3.2 PREPARATION

A. General: Comply with the Carpet and Rug Institute's CRI 104 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 inchwide or wider, and protrusions more than 1/32 inch unless more stringent requirements are required by manufacturer's written instructions.

C. Concrete Substrates: Remove coatings, including curing compounds, and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, without using solvents. Use mechanical methods recommended in writing by adhesive and carpet tile manufacturers.

D. Broom and vacuum clean substrates to be covered immediately before installing carpet tile.

3.3 INSTALLATION

A. General: Comply with the Carpet and Rug Institute's CRI 104, Section 10, "Carpet Tile," and with carpet tile manufacturer's written installation instructions.

B. Installation Method: As recommended in writing by carpet tile manufacturer.

C. Maintain dye-lot integrity. Do not mix dye lots in same area.

D. Maintain pile-direction patterns recommended in writing by carpet tile manufacturer.

E. 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.

F. Extend carpet tile into toe spaces, door reveals, closets, open-bottomed obstructions, removable flanges, alcoves, and similar openings.

G. 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, nonstaining marking device.

H. Install pattern parallel to walls and borders.

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 the Carpet and Rug Institute's CRI 104, Section 13.7.

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 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 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, finishes, and accessories for visual display units.
2. Provide data on surface materials.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For visual display units to include in maintenance manuals.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver factory-fabricated visual display units completely assembled in one piece. If dimensions exceed maximum manufactured unit size, or if unit size is impracticable to ship in one piece, provide two or more pieces with joints in locations indicated on approved Shop Drawings.

1.8 FIELD CONDITIONS

A. Environmental Limitations: Do not deliver or install visual display units until spaces are enclosed and weathertight, wet-work in spaces is complete and dry, work above ceilings is complete, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

1.9 WARRANTY

A. Special Warranty for Porcelain-Enamel Face Sheets: 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 exhibit crazing, cracking, or flaking.

2. Warranty Period: Life of the building.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Surface-Burning Characteristics: Comply with ASTM E84; 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.

2.2 VISUAL DISPLAY BOARD ASSEMBLY **VDB**

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

1. CIG-JAN Products, Ltd.
2. Claridge Products and Equipment, Inc.
3. Egan Visual, Inc.
4. Marsh Industries, Inc.
5. PolyVision Corporation
6. Architect’s pre-approved equal.

B. Visual Display Board Assembly: Factory fabricated.

1. Assembly: Markerboard.
2. Corners: Square
3. Width: As indicated on Drawings.
4. Height: As indicated on Drawings.
5. Mounting Method: Direct to Wall / Mechanical Method. No Adhesive.

C. Markerboard Panel: Porcelain-enamel-faced markerboard panel on core indicated.

1. Color: White.

D. Aluminum Frames and Trim: Fabricated from not less than 0.062-inch-thick, extruded aluminum; standard size and shape.

1. Aluminum Finish: Clear anodic finish.

E. Joints: Make joints only where total length exceeds maximum manufactured length. Fabricate with minimum number of joints, balanced around center of board, as acceptable to Architect.

F. Combination Assemblies: Provide manufacturer's standard exposed trim between abutting sections of visual display panels.

G. Display Rail: Manufacturer's standard, extruded-aluminum display rail with plastic-impregnated-cork insert, end stops, and continuous paper holder, designed to hold accessories.

1. Size: 2 inches high by length indicated on Drawings.
2. Map Hooks and Clips: Two map hooks with flexible metal clips for every 48 inches of display rail or fraction thereof.
3. Flag Holder: One for each room.
4. Magnetic Marker Cup: White
5. Tackboard Insert Color: To Match Forbo Bulletin Board #2182 Potato Skin
6. Aluminum Color: Match finish of visual display assembly trim.

2.3 MATERIALS

A. Porcelain-Enamel Face Sheet: PEI-1002, with face sheet manufacturer's standard two- or three-coat process.
1. Provide CeramaP3 or equal.

B. Plastic-Impregnated-Cork Sheet: 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.

C. Polyester Fabric: Nondirectional weave, 100 percent polyester; weighing not less than 15 oz./sq.yd.; with surface-burning characteristics indicated.

D. Hardboard: ANSI A135.4, tempered.

E. Particleboard: ANSI A208.1, Grade M-1.

F. Extruded Aluminum: ASTM B221, Alloy 6063.

G. Adhesives for Field Application: Mildew-resistant, nonstaining adhesive for use with specific type of panels, sheets, or assemblies; and for substrate application; as recommended in writing by visual display unit manufacturer.

H. Primer/Sealer: Mildew-resistant primer/sealer complying with requirements in Section 099123 "Interior Painting" and recommended in writing by visual display unit manufacturer for intended substrate.

2.4 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM/NOMMA 500 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 unacceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.5 ALUMINUM FINISHES

A. Clear Anodic Finish: AAMA 611, AA-M12C22A31, Class II, 0.010 mm or thicker.

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 of the Work.

B. Examine walls and partitions for proper preparation and backing for visual display units.

C. 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, such as dirt, mold, and mildew, that could impair the performance of and affect the smooth, finished surfaces of visual display boards.

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 units and wall surfaces.

D. Prime wall surfaces indicated to receive visual display units and as recommended in writing by primer/sealer manufacturer and visual display unit manufacturer.

3.3 INSTALLATION

A. General: Install visual display surfaces in locations and at mounting heights indicated on Drawings, or if not indicated, at heights indicated below. Keep perimeter lines straight, level, and plumb. Provide grounds, clips, backing materials, adhesives, brackets, anchors, trim, and accessories necessary for complete installation.

B. Factory-Fabricated Visual Display Board Assemblies: Adhere to wall surfaces with egg-size adhesive gobs at 16 inches o.c., horizontally and vertically.

C. Factory-Fabricated Visual Display Board Assemblies: Attach concealed clips, hangers, and grounds to wall surfaces and to visual display board assemblies with fasteners at not more than 16 inches o.c. Secure tops and bottoms of boards to walls.

D. Visual Display Board Assembly Mounting Heights: Install visual display units at mounting heights indicated on Drawings.

3.4 CLEANING AND PROTECTION

A. Clean visual display units in accordance with manufacturer's written instructions. Attach one removable cleaning instructions label to visual display unit in each room.

B. Touch up factory-applied finishes to restore damaged or soiled areas.

C. Cover and protect visual display units after installation and cleaning.

END OF SECTION 101100

SECTION 101423.16
ROOM-IDENTIFICATION PANEL 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 room-identification signs that are directly attached.

1.3 DEFINITIONS

A. Accessible: In accordance with the accessibility standard.

1.4 COORDINATION

A. Furnish templates for placement of sign-anchorage devices embedded in permanent construction by other installers.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For room-identification 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 , including raised characters and Braille, and layout for each sign at least .

C. 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. Room-Identification Signs: Full-size Sample .
2. Full-size Samples, if approved, will be returned to Contractor for use in Project.

D. Product Schedule: For room-identification signs. Use same designations indicated on Drawings or specified.

E. Selection Samples: Where colors are not specified, submit two sets of color selection charts or chips.

1.6 FIELD CONDITIONS

A. Field Measurements: Verify locations of anchorage devices embedded in permanent construction by other installers by field measurements before fabrication, and indicate measurements on Shop Drawings.

1.7 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 USDOJ's "2010 ADA Standards for Accessible Design" the ABA standards of the Federal agency having jurisdiction and ICC A117.1 .

2.2 ROOM-IDENTIFICATION SIGNS

A. Room-Identification Sign : Sign with smooth, uniform surfaces; with message and characters having uniform faces, sharp corners, and precisely formed lines and profiles; and as follows:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. APCO Graphics, Inc.; Equal
   b. ASI Sign Systems, Inc.; InTac Series
   c. Inpro Corporation; Equal
   d. Takeform; Fusion
2. Laminated-Sheet Sign: Photopolymer face sheet with raised graphics laminated to acrylic backing sheet to produce composite sheet.
   a. Composite-Sheet Thickness: Manufacturer's standard for size of sign .
   b. Surface-Applied Graphics: Applied vinyl film .
   c. Color(s): Panel Plate/ Back Plate - SW Cityscape 7067, Lettering – White

3. Sign-Panel Perimeter: Finish edges smooth.
    a. Edge Condition : Square cut .
    b. Corner Condition in Elevation: Square .
4. Mounting: Surface mounted to wall with concealed fasteners
5. Text and Typeface: Accessible raised characters and Braille typeface as selected by Architect from manufacturer's full range and variable content as scheduled . Finish raised characters to contrast with background color, and finish Braille to match background color.

2.3 SIGN MATERIALS

A. Acrylic Sheet: ASTM D 4802, category as standard with manufacturer for each sign, Type UVF (UV filtering).

B. Vinyl Film: UV-resistant vinyl film with pressure-sensitive, permanent adhesive; die cut to form characters or images as indicated on Drawings.

C. Paints and Coatings for Sheet Materials: Inks, dyes, and paints that are recommended by manufacturer for optimum adherence to surface and are UV and water resistant for colors and exposure indicated.

2.4 ACCESSORIES

A. Fasteners and Anchors: Manufacturer's standard as required for secure anchorage of signs, noncorrosive and compatible with each material joined, and complying with the following:

1. Use concealed fasteners and anchors unless indicated to be exposed.
2. A. Provide back plate for signs to be mounted on glass

2.5 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. Conceal connections if possible; otherwise, locate connections where they are inconspicuous.
4. 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.

B. Signs with Changeable Message Capability: Fabricate signs to allow insertion of changeable messages as follows:

1. For slide-in changeable inserts, fabricate slot without burrs or constrictions that inhibit function. Furnish initial changeable insert. Subsequent changeable inserts are by Owner .

2.6 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.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Install signs using mounting methods indicated and according to manufacturer's written instructions.

1. Install signs level, plumb, true to line, and at locations and heights indicated, with sign surfaces free of distortion and other defects in appearance.
2. Install signs so they do not protrude or obstruct according to the accessibility standard.
3. Before installation, verify that sign surfaces are clean and free of materials or debris that would impair installation.

B. Accessibility: Install signs in locations on walls and according to the accessibility standard .

C. Mounting Methods:

1. 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. Place sign in position, and push to engage tape adhesive.

D. For all glass mounted signage, provide matching back plate on opposite side to conceal mounting method.

3.2 ADJUSTING AND CLEANING

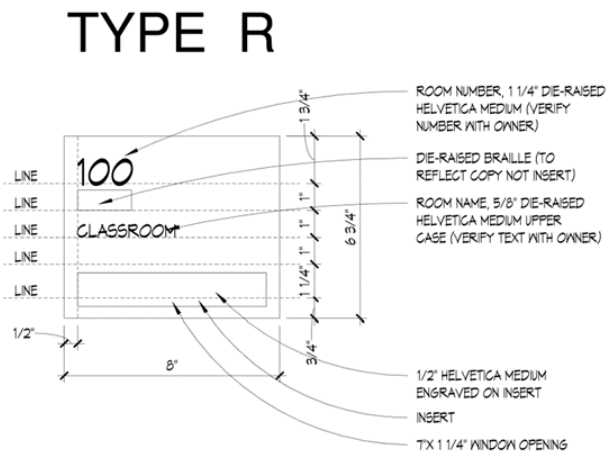
A. Remove and replace damaged or deformed signs and signs that do not comply with specified requirements. Replace signs with damaged or deteriorated finishes or components that cannot be successfully repaired by finish touchup or similar minor repair procedures.

B. Remove temporary protective coverings and strippable films as signs are installed.

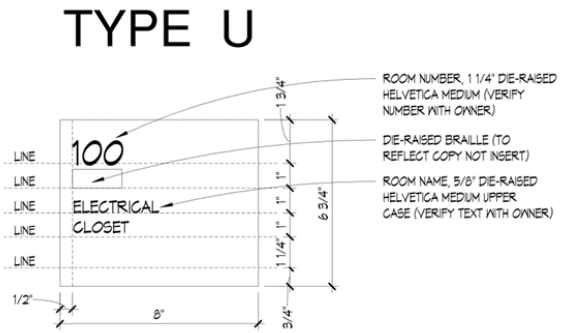
C. On completion of installation, clean exposed surfaces of signs according to manufacturer's written instructions, and touch up minor nicks and abrasions in finish. Maintain signs in a clean condition during construction and protect from damage until acceptance by Owner.

3.3 SCHEDULE

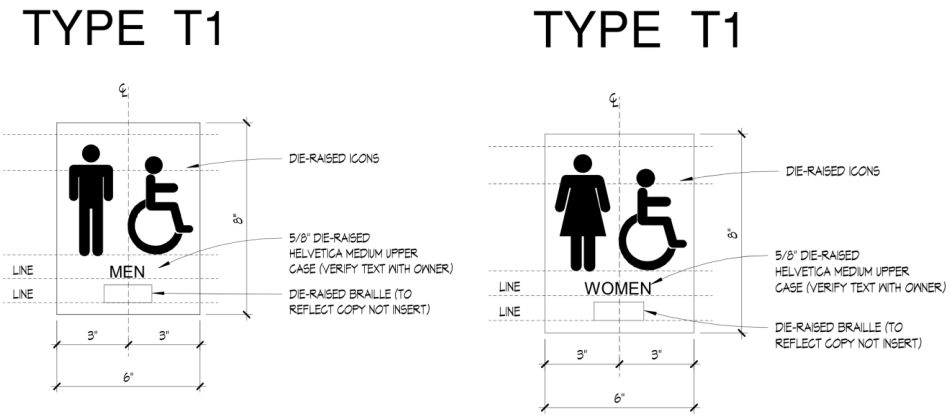
A. Type R



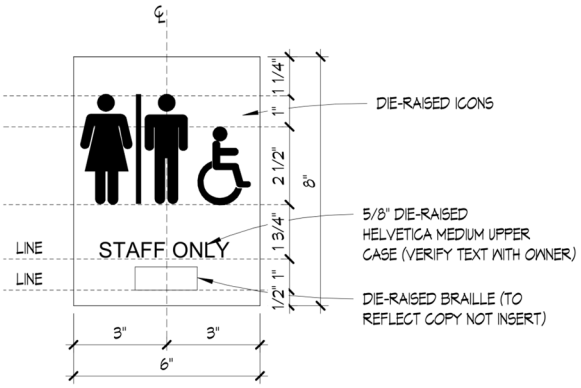
B. Type U



C. Type T1



D. Type T2



END OF SECTION 101423.16

SECTION 105113
METAL LOCKERS

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. All welded metal, corridor lockers with slopped tops.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site .

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of metal locker and bench.

B. Shop Drawings: For metal lockers.

1. Include plans, elevations, sections, and attachment details.
2. Show locker trim and accessories.
3. Include locker identification system and numbering sequence.

C. Samples: For each color specified, in manufacturer's standard size.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Sample Warranty: For special warranty.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For adjusting, repairing, and replacing locker doors and latching mechanisms to include in maintenance manuals.

1.7 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. The following metal locker hardware items equal to 10 percent of amount installed for each type and finish installed, but no fewer than five units:
    a. Locks.
    b. Blank identification plates.
    c. Hooks.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Do not deliver metal lockers until spaces to receive them are clean, dry, and ready for their installation.

1.9 FIELD CONDITIONS

A. Field Measurements: Verify actual dimensions of recessed openings by field measurements before fabrication.

1.10 COORDINATION

A. Coordinate sizes and locations of wood bases for metal lockers.

B. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of work specified in other Sections to ensure that metal lockers can be supported and installed as indicated.

1.11 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of metal lockers that fail in materials or workmanship, excluding finish, within specified warranty period.

1. Failures include, but are not limited to, the following:
   a. Structural failures.
   b. Faulty operation of latches and other door hardware.
2. Damage from deliberate destruction and vandalism is excluded.
3. Warranty Period for Welded Metal Lockers: 10 years from date of Substantial Completion.

1.12 PRODUCTS - MANUFACTURERS

A. Source Limitations: Obtain metal lockers and accessories from single source from single locker manufacturer.

1. Obtain locks from single lock manufacturer.

1.13 PERFORMANCE REQUIREMENTS

A. Accessibility Standard: For lockers and locker benches indicated to be accessible, comply with applicable provisions in the ADA standards of the Federal agency having jurisdiction and ICC A117.1 .

B. Basis-of-Design Product: Subject to compliance with requirements, Republic - Metal Storage Lockers or comparable product by the following.
1. DeBourgh Mfg. Co.; Worley Lockers.
2. List Industries Inc.; Lockers.
3. Lyon Workspace Products, LLC; Lockers.
4. Penco Products, Inc.
5. Republic Storage Systems Company; Lockers.

C. Material: Cold-rolled steel sheet.

D. Body: Assembled by riveting or bolting body components together. Fabricate from unperforated steel sheet as follows:

1. Tops, Bottoms, and Intermediate Dividers: 0.024-inchnominal thickness, with single bend at sides.
2. Backs and Sides: 0.024-inchnominal thickness, with full-height, double-flanged connections.
3. Shelves: 0.024-inchnominal thickness, with double bend at front and single bend at sides and back.

E. Frames: Channel formed; fabricated from 0.060-inchnominal-thickness steel sheet; lapped and factory welded at corners; with top and bottom main frames factory welded into vertical main frames. Form continuous, integral door strike full height on vertical main frames.

1. Cross Frames between Tiers: Channel formed and fabricated from same material as main frames; welded to vertical main frames.
2. Frame Vents: Fabricate face frames with vents.

F. Doors: One piece; fabricated from 0.060-inchnominal-thickness steel sheet; formed into channel shape with double bend at vertical edges and with right-angle single bend at horizontal edges.

1. Doors less than 12 inches wide may be fabricated from 0.048-inchnominal-thickness steel sheet.
2. Doors for box lockers less than 15 inches wide may be fabricated from 0.048-inchnominal-thickness steel sheet.
3. Reinforcement: Manufacturer's standard reinforcing angles, channels, or stiffeners for doors more than 15 inches wide; welded to inner face of doors.
4. Stiffeners: Manufacturer's standard full-height stiffener fabricated from 0.048-inchnominal-thickness steel sheet; welded to inner face of doors.
5. Sound-Dampening Panels: Manufacturer's standard, designed to stiffen doors and reduce sound levels when doors are closed, of die-formed metal with full perimeter flange and sound-dampening material; welded to inner face of doors.

6. Door Style: Vented panel as follows:

    a. Concealed Vents: Slotted perforations top and bottom horizontal return flanges of doors.

G. Body: Assembled by riveting or bolting body components together. Fabricate from unperforated steel sheet with thicknesses as follows:

    1) Tops, Bottoms, and Intermediate Dividers: 0.024-inch nominal thickness, with single bend at sides.
    2) Backs and Sides: 0.024-inchnominal thickness, with full-height, double-flanged connections.
    3) Shelves: 0.024-inchominal thickness, with double bend at front and single bend at sides and back.

H. Frames: Channel formed; fabricated from 0.060-inchnominal-thickness steel sheet; lapped and factory welded at corners; with top and bottom main frames factory welded into vertical main frames. Form continuous, integral, full-height door strikes on vertical main frames.

1) Cross Frames between Tiers: Channel formed and fabricated from same material as main frames; welded to vertical main frames.
2) Frame Vents: Fabricate face frames with vents.

I. Hinges: Welded to door and attached to door frame with rivets that are completely concealed and tamper resistant when door is closed; fabricated to swing 180 degrees.

1. Continuous Hinges: Manufacturer's standard, steel continuous hinge.

J. Recessed Door Handle and Latch: Stainless-steel cup with integral door pull, recessed so locking device does not protrude beyond face of door; pry and vandal resistant.

1. Multipoint Latching: Finger-lift latch control designed for use with built-in combination locks; positive automatic latching and prelocking.

a. Latch Hooks: Equip doors 48 inchesand higher with three latch hooks and doors less than 48 incheshigh with two latch hooks; fabricated from 0.105-inchnominal-thickness steel sheet; welded or riveted to full-height door strikes; with resilient silencer on each latch hook.
b. Latching Mechanism: Manufacturer's standard, rattle-free latching mechanism and moving components isolated with vinyl or nylon to prevent metal-to-metal contact, and incorporating a prelocking device that allows locker door to be locked while door is open and then closed without unlocking or damaging lock or latching mechanism.

K. Locks: Built-in combination locks.

L. Equipment: Equip each metal locker with identification plate and the following unless otherwise indicated:

1. Single-Tier Units: Shelf, one double-prong ceiling hook, and two single-prong wall hooks.

2. Filler Panels: Fabricated from 0.048-inchnominal-thickness steel sheet.
3. Boxed End Panels: Fabricated from 0.060-inchnominal-thickness steel sheet.
4. Finished End Panels: Fabricated from 0.024-inchnominal-thickness steel sheet.
5. Center Dividers: Fabricated from 0.024-inchnominal-thickness steel sheet.
6. Steel Zee Base: Fabricated from 16 gauge steel 4" high.

M. Finish: Baked enamel or powder coat.

N. Locker Schedule:

1. **MLW-#**: Single Stack Locker w/ slopped top: 12" x 12"D x 72"
   a. **MLW-1**: Republic - quiet corridor lockers/ single tier
      1) Colors: selected from manufacturer standard colors
   b. Accessories:

1) Continuous Sloping Tops: Fabricated from 0.048-inchnominal-thickness steel sheet.

2) Closures: Vertical-end type.

c. Sloping-top corner fillers, mitered.

d. End Panels: as needed.

1.14 LOCKS

A. Built-in combination locks.

1.15 FABRICATION

A. Fabricate metal lockers square, rigid, without warp, and with metal faces flat and free of dents or distortion. Make exposed metal edges safe to touch and free of sharp edges and burrs.

1. Form body panels, doors, shelves, and accessories from one-piece steel sheet unless otherwise indicated.
2. Provide fasteners, filler plates, supports, clips, and closures as required for complete installation.

B. Fabricate each metal locker with an individual door and frame; individual top, bottom, and back; and common intermediate uprights separating compartments.

C. Equipment: Provide each locker with an identification plate and the following equipment:

1. Single-Tier Units: Shelf, one double-prong ceiling hook, and two single-prong wall hooks.
2. Double-Tier Units: One double-prong ceiling hook and two single-prong wall hooks.

D. Welded Construction: Factory preassemble metal lockers by welding all joints, seams, and connections; with no bolts, nuts, screws, or rivets used in assembly of main locker groups. Factory weld main locker groups into one-piece structures. Grind exposed welds smooth and flush.

E. Accessible Lockers: Fabricate as follows:

1. Locate bottom shelf no lower than 15 inches above the floor.
2. Where hooks, coat rods, or additional shelves are provided, locate no higher than 48 inches above the floor.

F. Continuous Sloping Tops: Fabricated in lengths as long as practical, without visible fasteners at splice locations; finished to match lockers.

1. Sloping-top corner fillers, mitered.

G. Recess Trim: Fabricated with minimum 2-1/2-inch face width and in lengths as long as practical; finished to match lockers.

H. Filler Panels: Fabricated in an unequal leg angle shape; finished to match lockers. Provide slip-joint filler angle formed to receive filler panel.

I. Boxed End Panels: Fabricated with 1-inch- wide edge dimension, and designed for concealing fasteners and holes at exposed ends of nonrecessed metal lockers; finished to match lockers.

1. Provide one-piece panels for double-row (back-to-back) locker ends.

J. Center Dividers: Full-depth, vertical partitions between bottom and shelf; finished to match lockers.

1.16 ACCESSORIES

A. Fasteners: Zinc- or nickel-plated steel, slotless-type, exposed bolt heads; with self-locking nuts or lock washers for nuts on moving parts.

B. Anchors: Material, type, and size required for secure anchorage to each substrate.

1. Provide nonferrous-metal or hot-dip galvanized anchors and inserts on inside face of exterior walls for corrosion resistance.
2. Provide toothed-steel or lead expansion sleeves for drilled-in-place anchors.

PART 2 - EXECUTION

2.1 EXAMINATION

A. Examine walls and floors or support bases, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.

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

2.2 INSTALLATION

A. Install lockers level, plumb, and true; shim as required, using concealed shims.

1. Anchor locker runs at ends and at intervals recommended by manufacturer, but not more than 36 inches o.c. Using concealed fasteners, install anchors through backup reinforcing plates, channels, or blocking as required to prevent metal distortion.
2. Anchor single rows of metal lockers to walls near top and bottom of lockers .
3. Anchor back-to-back metal lockers to floor.

B. Welded Lockers: Connect groups together with manufacturer's standard fasteners, with no exposed fasteners on face frames.

C. Equipment:

1. Attach hooks with at least two fasteners.
2. Attach door locks on doors using security-type fasteners.
3. Identification Plates: Identify metal lockers with identification indicated on Drawings.
    a. Attach plates to each locker door, near top, centered, with at least two aluminum rivets.

D. Trim: Fit exposed connections of trim, fillers, and closures accurately together to form tight, hairline joints, with concealed fasteners and splice plates.

1. Attach recess trim to recessed metal lockers with concealed clips.
2. Attach filler panels with concealed fasteners. Locate filler panels where indicated on Drawings.
3. Attach sloping-top units to metal lockers, with closures at exposed ends.
4. Attach boxed end panels using concealed fasteners to conceal exposed ends of nonrecessed metal lockers.

2.3 ADJUSTING

A. Clean, lubricate, and adjust hardware. Adjust doors and latches to operate easily without binding.

B. Adjust built-in locks to prevent binding of dial or key and ensure smooth operation prior to substantial completion.

C. Touch-up with factory-supplied paint and repair or replace damaged products before substantial completion.

2.4 PROTECTION

A. Protect metal lockers from damage, abuse, dust, dirt, stain, or paint. Do not permit use during construction.

B. Touch up marred finishes, or replace metal lockers that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by locker manufacturer.

END OF SECTION 105113

SECTION 122413
ROLLER WINDOW SHADES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Manually operated roller shades with single rollers.

B. Related Requirements:

1. Section 061053 "Miscellaneous Rough Carpentry" for wood blocking and grounds for mounting roller shades and accessories.
2. Section 079200 "Joint Sealants" for sealing the perimeters of installation accessories for light-blocking shades with a sealant.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, features, finishes, and operating instructions for roller shades.

B. Shop Drawings: Show fabrication and installation details for roller shades, including shadeband materials, their orientation to rollers, and their seam and batten locations.

C. Product Schedule: For roller shades.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For roller shades to include in maintenance manuals.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Fabricator of products.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver roller shades in factory packages, marked with manufacturer, product name, and location of installation using same designations indicated on Drawings.

1.7 FIELD CONDITIONS

A. Environmental Limitations: Do not install roller shades until construction and finish work in spaces, including painting, is complete and dry and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

B. Field Measurements: Where roller shades are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on Shop Drawings. Allow clearances for operating hardware of operable glazed units through entire operating range. Notify Architect of installation conditions that vary from Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain roller shades from single source from single manufacturer.

2.2 MANUALLY OPERATED SHADES WITH SINGLE ROLLERS

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

1. Draper, Inc.
2. Hunter Douglas Contract
3. Mechoshade Systems, Inc.
4. Springs Window Fashions, SWF Contract.
5. Creative Windows, Ann Arbor, MI
6. Architect’s Pre-Approved Equal

B. Chain-and-Clutch Operating Mechanisms: With continuous-loop bead chain and clutch that stops shade movement when bead chain is released; permanently adjusted and lubricated.

1. Bead Chains: Stainless steel.

a. Loop Length: Full length of roller shade.

b. Limit Stops: Provide upper and lower ball stops.
c. Chain-Retainer Type: Clip, jamb mount.

C. Rollers: Corrosion-resistant steel or extruded-aluminum tubes of diameters and wall thicknesses required to accommodate operating mechanisms and weights and widths of shadebands indicated without deflection. Provide with permanently lubricated drive-end assemblies and idle-end assemblies designed to facilitate removal of shadebands for service.

1. Roller Drive-End Location: Per schedule at the end of part 3.
2. Direction of Shadeband Roll: Regular, from back (exterior face) of roller.
3. Shadeband-to-Roller Attachment: Manufacturer's standard method.

D. Mounting Hardware: Brackets or endcaps, corrosion resistant and compatible with roller assembly, operating mechanism, installation accessories, and mounting location and conditions indicated.

E. Roller-Coupling Assemblies: Coordinated with operating mechanism and designed to join up to three inline rollers into a multiband shade that is operated by one roller drive-end assembly.

F. Shadebands:

1. Shadeband Bottom (Hem) Bar: Steel or extruded aluminum.

a. Type: Enclosed in sealed pocket of shadeband material.
b. Color and Finish: As selected by Architect from manufacturer's full range.

G. Installation Accessories:
1. Front Fascia: Aluminum extrusion that conceals front and underside of roller and operating mechanism and attaches to roller endcaps without exposed fasteners.
a. Fascia, Fascia With Top and Back Cover - Aluminum fascia (4") with top or back cover (4") to conceal shade mechanism from front, sides, and top/back
b. Shapes and heights of fasciae vary among manufacturers.
c. Shape: L-shaped.
d. Height: Manufacturer's standard height required to conceal roller and shadeband assembly when shade is fully open, but not less than 4 inches.

2. Endcap Covers: To cover exposed endcaps.
3. Installation Accessories Color and Finish: Clear Aluminum Color/Tone

2.3 SHADEBAND MATERIALS

A. Shadeband Material Flame-Resistance Rating: Comply with NFPA 701. Testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

B. Light-Filtering Fabric: Woven fabric, stain and fade resistant.

1. Source: Roller shade manufacturer.
2. Type: PVC-coated polyester.
3. Weave: Basketweave.

4. Thickness: 0.030 inch
5. Roll Width: 32, 88, or 104 inches.
6. Orientation on Shadeband: Up the bolt.
7. Openness Factor: 3 percent
8. Color: As selected by Architect from manufacturer's full range.

2.4 ROLLER SHADE FABRICATION

A. Product Safety Standard: Fabricate roller shades to comply with WCMA A 100.1, including requirements for flexible, chain-loop devices; lead content of components; and warning labels.

B. Unit Sizes: Fabricate units in sizes to fill window and other openings as follows, measured at 74 deg F:

1. Between (Inside) Jamb Installation: Width equal to jamb-to-jamb dimension of opening in which shade is installed less 1/4 inch per side or 1/2-inch total, plus or minus 1/8 inch. Length equal to head-to-sill or -floor dimension of opening in which shade is installed less 1/4 inch, plus or minus 1/8 inch.
2. Outside of Jamb Installation: Width and length as indicated, with terminations between shades of end-to-end installations at centerlines of mullion or other defined vertical separations between openings.

C. Shadeband Fabrication: Fabricate shadebands without battens or seams to extent possible, except as follows:

1. Vertical Shades: Where width-to-length ratio of shadeband is equal to or greater than 1:4, provide battens and seams at uniform spacings along shadeband length to ensure shadeband tracking and alignment through its full range of movement without distortion of the material.
2. Railroaded Materials: Railroad material where material roll width is less than the required width of shadeband and where indicated. Provide battens and seams as required by railroaded material to produce shadebands with full roll-width panel(s) plus, if required, one partial roll-width panel located at top of shadeband.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, operational clearances, locations of connections to building electrical system, and other conditions affecting performance of the Work.

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

3.2 ROLLER SHADE INSTALLATION

A. Install roller shades level, plumb, and aligned with adjacent units according to manufacturer's written instructions.

B. Roller Shade Locations: As indicated on Equipment Drawings.

3.3 ADJUSTING

A. Adjust and balance roller shades to operate smoothly, easily, safely, and free from binding or malfunction throughout entire operational range.

3.4 CLEANING AND PROTECTION

A. Clean roller shade surfaces, after installation, according to manufacturer's written instructions.

B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure that roller shades are without damage or deterioration at time of Substantial Completion.

C. Replace damaged roller shades that cannot be repaired, in a manner approved by Architect, before time of Substantial Completion.

ROLLER SHADE SCHEDULE ON DRAWING SHEET A8.1 EQUIPMENT DETAILS

SECTION 21 0500
COMMON WORK RESULTS FOR FIRE SUPPRESSION

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Above ground piping.

B. Buried piping.

C. Escutcheons.

D. Incoming fire service backflow preventer.

E. Fire department connections.

F. Mechanical couplings.

G. Pipe hangers and supports.

H. Pipe sleeves.

I. Pipe sleeve-seal systems.

1.2 RELATED REQUIREMENTS

A. Section 07 8400 - Firestopping.

B. Section 21 0523 - General-Duty Valves for Water-Based Fire-Suppression Piping.

C. Section 21 0553 - Identification for Fire Suppression Piping and Equipment: Piping identification.

D. Section 21 1300 - Fire-Suppression Sprinkler Systems: Sprinkler systems design.

1.3 PERFORMANCE REQUIREMENTS

A. Sprinkler system equipment, specialties, accessories, installation, and testing shall comply with the following:

1. NFPA 13 - Standard for the Installation of Sprinkler Systems

B. Delegated Design: Engage a qualified Fire Protection professional engineer, as defined in Section 014000 "Quality Requirements," to design project sprinkler systems. Base calculations on results of fire-hydrant flow test. Flow test shall be performed within one year of construction start.

C. Coordinate fire supporession design and scope with CM and the modular building manufacturer.

D. Hydraulic Design Criteria: Sprinkler system design shall be approved by authorities having jurisdiction, Owner's Insurance Underwriter (where applicable) and shall be designed according to the following:

1. Margin of Safety for Available Water Flow and Pressure: 10 percent, including losses through water-service piping, valves, and backflow preventers, or 10 psi, whichever is greater.

2. Sprinkler Occupancy Hazard Classifications: Refer to Drawings.

3. Minimum Density for Automatic-Sprinkler Piping Design: Refer to Drawings.

4. Maximum Protection Area per Sprinkler: According to the latest NFPA 13 standard, UL listing and as specified on Drawings.

5. Total Combined Hose-Stream Demand Requirement: According to latest NFPA 13 standard unless otherwise indicated on drawings.

6. Water velocity in the piping system shall not exceed the following:

   a. Underground mains: 16 ft/sec.

   b. Aboveground mains: 32 ft/sec.

   c. Sprinkler branch lines: 20 ft/sec.

7. Water supply noted on the drawings. If not, Contractor shall make flow test to ascertain water flow.

1.4 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Delegated-Design Submittal: For all sprinkler systems indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1. Shop Drawings and Hydraulic Calculations:

   a. Indicate pipe materials used, jointing methods, supports, floor and wall penetration seals.

   b. Indicate installation, layout, weights, mounting and support details, and piping connections.

   c. Shop drawings shall be submitted to the Architect/Engineer, AHJ and Owner's Insurance Underwriter (where applicable) for review and approval.

C. Product Data: For each type of product.

1. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

2. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each fire-department or pump test header connection.

3. Grooved joint couplings and fittings shall be shown on drawings and product submittals, and be specifically identified with the applicable Victaulic style number.

D. Shop Drawings, Product Data and Hydraulic calculations shall be reviewed as one package; review of submittals shall not start until Engineer has all product data, hydraulic calculations and shop drawings.

1.5 QUALITY ASSURANCE

A. Requirements of Regulatory Agencies:

1. Provide fire protection work per the mandatory code requirements, standards of NFPA, and the requirements of the Owner's Insurance Underwriter, where applicable, except where more stringent requirements are indicated, as modified and supplemented by the Contract Documents. The NFPA requirements include the appendices and supplements.

2. The provisions and recommendations of the NFPA constitute mandatory minimum requirements for work specified herein. No payment will be made by the Owner for extra charges for work added in order to comply with NFPA Standards and Owner's Insurance Underwriter requirements, where applicable.

B. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.

C. Installer's responsibilities include designing, fabricating, and installing sprinkler systems and providing professional engineering services needed to assume engineering responsibility. Base calculations on results of fire-hydrant flow test.

1. Engineering Responsibility: Preparation of working plans, calculations, and field test reports by a qualified Fire Protection engineer.

D. All grooved couplings, fittings, valves, and specialties shall be the products of a single manufacturer. Grooving tools shall be of the same manufacturer as the grooved components.

1. All castings used for couplings housings, fittings, or valve and specialty bodies shall be date stamped for quality assurance and traceability.

E. Comply with UL (DIR) requirements.

F. Valves: Bear UL (DIR) product listing label or marking. Provide manufacturer's name and pressure rating marked on valve body.

G. Products Requiring Electrical Connection: Listed and classified as suitable for the purpose specified and indicated.

H. Pipe: Each length of pipe shall be legibly identified at mill by paint, stenciling or raised symbols identifying manufacturer and class type or schedule of pipe. Copper pipe shall be identified at 3 foot intervals.

I. Fittings: To be identified by manufacturer by permanently attached tags, imprints or other approved means indicating class of wall thickened and material.

1.6 DEVIATIONS FROM BASIS OF DESIGN MANUFACTURER

A. Should the Division 21 Contractors submit equipment by a Manufacturer other than that indicated as the Basis of Design on the Drawings, Contractor shall then be responsible for evaluating the impacts of the proposed Manufacturer's equipment, even if the Manufacturer is listed in the specifications as an approved equal. This includes the proposed Manufacturer's electrical, architectural and structural requirements and their subsequent impacts on the current design (roof openings, curbs, structural support, etc.) and coordination of any differing dimensions and clearances with all other trades.

1.7 DELIVERY, STORAGE AND HANDLING

A. Deliver and store valves in shipping containers, with labeling in place.

B. Provide temporary protective coating on cast iron and steel valves.

C. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.

PART 2 PRODUCTS

2.1 GENERAL REQUIREMENTS

A. Sprinkler-based System:

1. Comply with NFPA 13.

B. Welding Materials and Procedures: Comply with ASME BPVC-IX.

C. Provide system pipes, fittings, sleeves, escutcheons, seals, and other related accessories.

2.2 BURIED PIPING

A. Steel Pipe: ASTM A53/A53M Schedule 40 or ASTM A135/A135M Schedule 10, black, with AWWA C105/A21.5 polyethylene jacket, or double layer, half-lapped polyethylene tape.

1. Steel Fittings: ASME B16.9, wrought steel, buttwelded, ASME B16.25, buttweld ends, ASTM A234/A234M, wrought carbon steel or alloy steel, ASME B16.5, steel flanges and fittings, or ASME B16.11, forged steel socket welded and threaded; with double layer, half-lapped polyethylene tape.

2. Cast Iron Fittings: ASME B16.1, flanges and flanged fittings.

3. Joints: Welded in accordance with AWS D1.1/D1.1M.

4. Casing: Closed glass cell insulation.

B. Ductile Iron Pipe: AWWA C151/A21.51.

1. Fittings: AWWA C110/A21.10, standard thickness.

2. Joints: AWWA C111/A21.11, styrene-butadiene rubber (SBR) or vulcanized SBR gasket.

3. Mechanical Couplings: Shaped composition sealing gasket, steel bolts, nuts, and washers.

2.3 ABOVE GROUND PIPING

A. Steel Pipe: ASTM A53 Schedule 40 or ASTM A135/A135M Schedule 10, black.

1. Cast Iron Fittings: ASME B16.1, flanges and flanged fittings and ASME B16.4, threaded fittings.

2. Malleable Iron Fittings: ASME B16.3, threaded fittings and ASTM A47/A47M.

3. Ductile iron Fittings: ASTM A536, Grade 65-45-12. In applicable sizes, fittings shall be short pattern, with flow equal to standard pattern fittings.

a. Basis of Design: Victaulic FireLock.

4. Mechanical Grooved Couplings: Two ductile iron housing clamps to engage and lock, "C" shaped elastomeric sealing gasket, ASTM A449 compliant steel bolts, nuts; galvanized for galvanized pipe.

a. Rigid Type: Housings cast with offsetting, angle-pattern, bolt pads to provide system rigidity and support and hanging in accordance with NFPA-13, fully installed at visual pad-to-pad offset contact. Couplings that require exact gapping at specific torque ratings are not permitted.

1) Installation-Ready for complete installation without field disassembly.

2) Basis of Design: Victaulic Style 009N and 107N.

b. Flexible Type: For use in locations where vibration attenuation and stress relief are required.

1) Basis of Design: Victaulic Installation-Ready Style 177 or Style 77.

c. Installation-Ready gaskets are center-leg, with pipe stop to ensure proper groove engagement, alignment, and pipe insertion depth.

5. Installation-Ready fittings for Schedule 40 10 grooved end steel piping in fire protection applications sizes NPS 1-□ thru 2½ (DN 32 thru DN 65). Fittings shall consist of a ductile iron housing conforming to ASTM A-536, Grade 65-45-12, with Installation-Ready ends, orange enamel coated, red enamel coated or galvanized. Fittings complete with prelubricated Grade "E" EPDM Type 'A' gasket; and ASTM A449 electroplated steel bolts and nuts. System shall be UL listed for a working pressure of 300 psi (2065 kPa) and FM approved for working pressure 365 psi (2517kPa).

6. Mechanical Formed Fittings: Carbon steel housing with integral pipe stop and O-ring pocked and O-ring, uniformly compressed into permanent mechanical engagement onto pipe.

2.4 PIPE SLEEVES

A. Vertical Piping:

1. Sleeve Length: 1 inch above finished floor.

2. Provide sealant for watertight joint.

B. Plastic, Sheet Metal, or Moisture-Resistant Fiber: Pipe passing through interior walls, partitions, and floors, unless steel or brass sleeves are specified below.

C. Pipe Passing Through Below Grade Exterior Walls:

1. Zinc-coated or cast-iron pipe.

2. Provide watertight space with link rubber or modular seal between sleeve and pipe on both pipe ends.

D. Pipe Passing Through Concrete Beam Flanges, except where Brass Pipe Sleeves are Specified:

1. Galvanized steel pipe or black iron pipe with asphalt coating.

2. Connect sleeve with floor plate except in mechanical rooms.

E. Pipe Passing Through Mechanical, Laundry, and Animal Room Floors above Basement:

1. Galvanized steel pipe or black iron pipe with asphalt coating.

2. Connect sleeve with floor plate except in mechanical rooms.

F. Clearances:

1. Provide allowance for insulated piping.

2. Wall, Floor, Floor, Partitions, and Beam Flanges: 1 inch greater than external; pipe diameter.

3. Rated Openings: Caulked tight with firestopping material complying with ASTM E814 in accordance with Section 07 8400 to prevent the spread of fire, smoke, and gases.

2.5 PIPE SLEEVE-SEAL SYSTEMS

A. Modular Mechanical Seals:

1. Elastomer-based interlocking links to continuously fill annular space between pipe and wall-sleeve, wall or casing opening.

2. Watertight seal between pipe and wall-sleeve, wall or casing opening.

3. Size and select seal component materials in accordance with service requirements.

4. Service Requirements:

a. Corrosion resistant.

b. Underground, buried, and wet conditions.

5. Glass-reinforced plastic pressure end plates.

B. Wall Sleeve: PVC material with waterstop collar, and nailer end caps.

C. Sleeve-Forming Disk: Nonconductive plastic-based material, 3 inch thick.

D. Pipeline-Casing Seals:

1. End Seals: 1/8 inch, pull-on type, rubber or synthetic rubber based.

2.6 ESCUTCHEONS

A. Material:

1. Chrome-plated.

2. Metals and Finish: Comply with ASME A112.18.1.

B. Construction:

1. One-piece for mounting on chrome-plated tubing or pipe and one-piece or split-pattern type elsewhere.

2. Internal spring tension devices or setscrews to maintain a fixed position against a surface.

2.7 INCOMING FIRE SERVICE BACKFLOW PREVENTER

A. A backflow preventer assembly shall be installed on fire protection systems when connected to a drinking water supply. Degree of hazard present and type of incoming service backflow peventer shall be coordinated with the Authority Having Jurisdiction.

B. Double Check Detector Assembly

1. ASSE 1048, UL 1469, AWWA C510-92: The main valve body shall be manufactured from 300 Series stainless-steel to provide corrosion resistance, 100% lead free through the waterway. The double check detector assembly consists of two independently operating, spring loaded check valves, two UL, FM, OSY resilient seated gate valves, and bypass assembly. The bypass assembly consists of a meter, a double check including shutoff valves and required test cocks. Each cam-check shall be internally loaded and provide a positive drip tight closure against reverse flow. Cam-check includes a stainless-steel cam arm and spring, rubber faced disc and a replaceable seat. There shall be no brass or bronze parts used within the cam-check valve assembly. The check valve seats shall be of molded thermoplastic construction. The use of seat screws as a retention method is prohibited. All internal parts shall be accessible through a single cover on the valve assembly. The valve cover shall be held in place through the use of a single grooved style two-bolt coupling. The bypass line shall be hydraulically sized to accurately measure low flow. The bypass line shall consist of a meter, a small diameter double check assembly with test cocks and isolation valves. The bypass line double check valve shall have two independently operating modular poppet check valves, and top mounted test cocks.

2. May be installed horizontal or vertical "flow up" position.

3. Basis of Design: Ames Series 3000SS

2.8

A. Manufacturers:

1. Elkhart Brass Manufacturing Company, Inc: www.elkhartbrass.com/#sle.

2. Ptter Roemer: www.potterroemer.com

3. Fire End Croker Corporation: www.croker.com/#sle.

4. Substitutions: See Section01 6000-Product Requirements.

B. Type: Flush, wall mount made of corrosion resistant metal complying with UL 405.

C. Inlets: Quantity inlets as required per NFPA, 2-1/2 inch swivel fittings, internal threaded. Thread size and inlets according to Authority Having Jurisdiction. Brass caps with gaskets, chains, and lugs.

D. Rated Working Pressure: 175 psi.

E. Finish: Chrome.

F. Sleeve: Brass.

G. Signage: Raised or engraved lettering 1 inch minimum indicating system type.

H. At the low point near each fire department connection, install a 90-degree elbow with drain connection to allow for localized system drainage to prevent freezing.

1. Basis of Design: Victaulic #10-DR.

2.9 PIPE HANGERS AND SUPPORTS

A. Supporting Elements: provide UL/FM components per NFPA 13, ANSI B 31.1 and MSS SP-58 except that "C" clamps or any modification thereof are unacceptable.

1. "C" clamps: With set screw, locknut and restraining strap are acceptable for piping up to 2-1/2".

B. Furnish necessary piping and equipment supporting elements including; building structure attachments; supplementary steel; hanger rods, stanchions and fixtures; vertical pipe attachments; horizontal pipe attachments; anchors; guides.

C. Center Loading Beam Clamps: For attachments to building structure as approved except piping supported from top of steel.

D. Hangers for Pipe Sizes 1/2 to 1-1/2 inch: Malleable iron, adjustable swivel, split ring.

E. Hangers for Pipe Sizes 2 inches and Over: Carbon steel, adjustable, clevis.

F. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.

G. Vertical Support: Steel riser clamp.

H. Floor Support: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.

2.10 MECHANICAL COUPLINGS

A. Manufacturers:

1. Tyco Fire Protection Products: www.tyco-fire.com/#sle.

2. Victaulic Company: www.victaulic.com/#sle.

3. Anvil/Gruvlok: www.anvilintl.com

4. Substitutions: See Section 01 6000 - Product Requirements.

B. Rigid Mechanical Couplings for Grooved Joints:

1. Dimensions and Testing: Comply with AWWA C606.

2. Minimum Working Pressure: 300 psig.

3. Housing Material: Fabricate of ductile iron complying with ASTM A536.

4. Gasket Material: EPDM-HP suitable for operating temperature range from minus 30 degrees F to 250 degrees F.

5. Bolts and Nuts: Hot-dipped-galvanized or zinc-electroplated steel.

C. Only use grooved coupling as permitted by NFPA 13 and NFPA 14.

PART 3 EXECUTION

3.1 FIRE SUPPRESSION PIPING APPLICATIONS

A. Standard-pressure, wet-pipe sprinkler system, NPS 2 (DN 50) and smaller, shall be one of the following:

1. Schedule 40, black-steel pipe with threaded ends; uncoated, gray-iron threaded fittings; and threaded joints.

2. Schedule 40, black-steel pipe with roll-grooved ends; uncoated, grooved-end fittings for steel piping; grooved-end-pipe couplings for steel piping; and grooved joints.

3. Schedule 40, black-steel pipe with plain ends; steel welding fittings; and welded joints.

B. Standard-pressure, wet-pipe sprinkler system, NPS 2-1/2 (DN 65) and larger, shall be one of the following:

1. Schedule 40, black-steel pipe with roll-grooved ends; uncoated, grooved-end fittings for steel piping; grooved-end-pipe couplings for steel piping; and grooved joints.

2. Schedule 40, black-steel pipe with plain ends; steel welding fittings; and welded joints.

3. Schedule 10, black-steel pipe with roll-grooved ends; uncoated, grooved-end fittings for steel piping; grooved-end-pipe couplings for steel piping; and grooved joints.

4. Schedule 10, black-steel pipe with plain ends; uncoated, plain-end-pipe fittings; and twist-locked joints.

5. Schedule 10, black-steel pipe with plain ends; welding fittings; and welded joints.

C. High-pressure, wet-pipe sprinkler system, shall be one of the following:

1. Schedule 40, black-steel pipe with plain ends; steel welding fittings; and welded joints.

3.2 PREPARATION

A. Ream pipe and tube ends. Remove burrs. Bevel or groove plain end ferrous pipe.

B. Remove scale and foreign material, from inside and outside, before assembly.

C. Prepare piping connections to equipment with flanges or unions. Unions or flanges for servicing and disconnect are not required in installations using grooved joint couplings.

3.3 INSTALLATION

A. Install sprinkler system and service main piping, hangers, and supports in accordance with NFPA 13.

B. Route piping in orderly manner, plumb and parallel to building structure. Maintain gradient.

C. Install piping to conserve building space, to not interfere with use of space and other work.

D. Group piping whenever practical at common elevations.

E. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

F. Pipe Hangers and Supports:

1. Install hangers to provide minimum 1/2 inch space between finished covering and adjacent work.

2. Place hangers within 12 inches of each horizontal elbow.

3. Use hangers with 1-1/2 inch minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.

4. Support vertical piping at every other floor. Support riser piping independently of connected horizontal piping.

5. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.

G. Slope piping and arrange systems to drain at low points. Use eccentric reducers to maintain top of pipe level.

H. Prepare pipe, fittings, supports, and accessories for finish painting. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc-rich primer to welding.

I. Structural Considerations:

1. Do not penetrate building structural members unless indicated.

J. Provide sleeves when penetrating footings, floors, and walls. Seal pipe including sleeve penetrations to achieve fire resistance equivalent to fire separation required.

1. Underground Piping: Caulk pipe sleeve watertight with lead and oakum or mechanically expandable chloroprene inserts with bitumen sealed metal components.

2. Aboveground Piping:

a. Pack solid using mineral fiber complying with ASTM C592.

b. Fill space with an elastomer caulk to a depth of 0.50 inch where penetrations occur between conditioned and unconditioned spaces.

3. All Rated Openings: Caulk tight with firestopping material complying with ASTM E814 in accordance with Section 07 8400 to prevent the spread of fire, smoke, and gases.

4. Caulk exterior wall sleeves watertight with lead and oakum or mechanically expandable chloroprene inserts with mastic-sealed components.

K. Manufactured Sleeve-Seal Systems:

1. Install manufactured sleeve-seal systems in sleeves located in grade slabs and exterior concrete walls at piping entrances into building.

2. Provide sealing elements of the size, quantity, and type required for the piping and sleeve inner diameter or penetration diameter.

3. Locate piping in center of sleeve or penetration.

4. Install field assembled sleeve-seal system components in annular space between sleeve and piping.

5. Tighten bolting for a watertight seal.

6. Install in accordance with manufacturer's recommendations.

L. Escutcheons:

1. Install and firmly attach escutcheons at piping penetrations into finished spaces.

2. Provide escutcheons on both sides of partitions separating finished areas through which piping passes.

3. Attach plates at the underside only of suspended ceilings.

4. Use chrome plated escutcheons in occupied spaces and to conceal openings in construction.

M. When installing more than one piping system material, ensure system components are compatible and joined to ensure the integrity of the system. Provide necessary joining fittings. Ensure flanges, union, and couplings for servicing are consistently provided.

N. Grooved joints shall be installed in accordance with the manufacturer’s latest published instructions. The gasket style and elastomeric material (grade) shall be verified as suitable for the intended service. Gaskets shall be molded and produced by the grooved coupling manufacturer. Grooved ends shall be clean and free from indentations, projections, and roll marks in the area from pipe end to groove. Grooved coupling manufacturer’s factory trained field representative shall provide on-site training for contractor’s field personnel in the proper use of grooving tools, application of groove, and installation of grooved piping products. Factory trained representative shall periodically visit the jobsite to ensure best practices in grooved product installation are being followed. Contractor shall remove and replace any improperly installed products.

O. Where pipes are in partitions, furred out spaces and chases, obtain information as to their exact location and size and install work so as to be entirely concealed in allotted space. If conflicts arise making this impossible, obtain instructions from Architect before proceeding with work.

P. Where there is evidence that parts of fire protection work will interfere with other work, assist in working out space conditions and/or structure, make necessary adjustments to accommodate work.

Q. Fire protection work installed before coordinating with other work so as to cause interference with other work to be changed to correct such condition without additional cost to Owner.

R. Accessibility:

1. Install fire protection work to permit removal (without damage to other parts) of coils, heat exchangers, pumps, fan shafts and wheels, belt guards, sheaves and drives and other parts requiring periodic replacement or maintenance.

2. Arrange pipes and equipment to permit ready access to valves, cocks, traps, starters, motors, dampers, control components and to clear openings of swinging and overhead doors and of access panels.

S. When necessary to install "U"-shaped dip in a pipe due to a conflict with duct work or other building components, Contractor shall install a ¾" diameter hose nipple and cap pointing down at lowest point in pipe dip. Contractor shall try to arrange piping layout to avoid such dips; no such dip shall be installed without prior approval of Engineer. All such conditions shall be clearly located and noted on record drawings given to Owner.

T. When necessary to install inverted "U" in branch piping to rise above an obstruction, Contractor shall install an upright ¾" diameter air vent nipple and cap at high point of inverted "U". Contractor shall try to arrange piping layout to avoid such high points; no such installation shall be made without approval of Engineer. All such conditions shall be clearly located and noted on record drawings given to Owner.

U. Contractor shall provide Owner with at least 24 hours prior notice before commencing sprinkler installations. Owner shall be responsible for deactivating building alarm system and notifying local fire department or other agencies. Under no circumstances shall Contractor attempt to deactivate building alarm system or circumvent any valve tamper switch. Contractor shall perform all work during normal business hours. By the end of each working day, Contractor shall cap all pipe ends.

V. Pressure test completed work in progress, repair any leaks and otherwise make the sprinkler system water tight so that fire alarm and sprinkler protection system can be reactivated by Owner during non-business hours.

3.4 SOUND CONTROL

A. Penetrations shall be maintained airtight to prevent sound transfer.

B. Piping shall pass through sleeves. Pack sleeves tight with glass fiber or oakum and caulked on both sides with non-hardening acoustical sealant.

3.5 CLEANING

A. Flush entire piping system of foreign matter in accordance with NFPA 13.

B. Upon completion of work, clean all parts of the installation.

C. Clean equipment, pipes, valves, and fittings of grease, metal cuttings, and sludge that may have accumulated from the installation and testing of the system.

3.6 TESTING AND ACCEPTANCE

A. After completing branch system, Contractor shall test fire sprinkler piping hydrostatically for a period of two hours at not less than 200 psi or at 50 psi in excess of the maximum operating static pressure when the maximum static pressure exceeds 150 psi. Contractor shall check system for leakage of joints and measure hydrostatic pressure at low point of each system or zone being tested.

B. The Contractor shall repair or replace piping and fittings as required to eliminate leakage (in accordance with NFPA standards for “little or no leakage”) and retest as specified to demonstrate compliance.

C. Upon satisfactory completion and testing of branch piping system, Contractor shall provide Owner with a letter certifying that branch piping system has been completed in accordance with NFPA 13 and is operational, complete and has no defects.

D. Test shall be witnessed by Architect/Owner and any authorities having jurisdiction who may so require.

SECTION 21 0523
GENERAL-DUTY VALVES FOR WATER-BASED FIRE-SUPPRESSION PIPING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Bronze butterfly valves with indicators.

B. Iron butterfly valves with indicators.

C. Check valves.

D. Bronze OS Y gate valves.

E. Iron OS Y gate valves.

F. Trim and drain valves.

1.2 RELATED REQUIREMENTS

A. Section 21 0500 - Common Work Results for Fire Suppression: Pipe and fittings.

B. Section 21 0553 - Identification for Fire Suppression Piping and Equipment.

C. Section 26 0583 - Wiring Connections: Electrical characteristics and wiring connections.

D. Section 28 4600 - Fire Detection and Alarm.

1.3 ABBREVIATIONS AND ACRONYMS

A. EPDM: Ethylene-propylene diene monomer.

B. NBR: Acrylonitrile-butadiene, Buna-N, or nitrile rubber.

C. NRS: Non-rising stem.

D. OS Y: Outside screw and yoke.

E. PTFE: Polytetrafluoroethylene.

F. SBR: Styrene-butadiene rubber.

1.4 REFERENCE STANDARDS

A. ASME BPVC-IX - Boiler and Pressure Vessel Code, Section IX - Qualification Standard for Welding, Brazing, and Fusing Procedures; Welders; Brazers; and Welding, Brazing, and Fusing Operators; 2023.

B. UL (DIR) - Online Certifications Directory; Current Edition.

1.5 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide data on valves including manufacturers catalog information. Submit performance ratings, rough-in details, weights, support requirements, and piping connections.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications:

1. Obtain valves for each valve type from single manufacturer.

2. Company must specialize in manufacturing products specified in this section, with not less than three years of documented experience.

B. Where listed products are specified, provide products listed, classified, and labeled by UL (DIR) or testing firm acceptable to authorities having jurisdiction as suitable for the purpose indicated.

C. Welding Materials and Procedures: Comply with ASME BPVC-IX.

D. Grooved end valves shall be of the same manufacturer as the adjoining couplings.

PART 2 PRODUCTS

2.1 GENERAL REQUIREMENTS

A. Valve Pressure Ratings: Not less than minimum pressure rating indicated or higher as required.

B. Valve Sizes: Same as upstream piping unless otherwise indicated.

C. Valve Actuator Types:

1. Worm-gear actuator with handwheel for quarter-turn valves, except trim and drain valves.

2. Handwheel: For other than quarter-turn trim and drain valves.

3. Hand-lever: For quarter-turn trim and drain valves 2 NPS and smaller.

2.2 BRONZE BUTTERFLY VALVES WITH INDICATORS

A. Minimum Pressure Rating: 175 psig.

B. Body Material: Bronze.

C. Seat: EPDM.

D. Stem: Bronze or stainless steel.

E. Disc: Bronze with EPDM coating.

F. Actuator: Worm gear or traveling nut.

G. Supervisory Switch: Internal or external.

2.3 IRON BUTTERFLY VALVES WITH INDICATORS

A. Minimum Pressure Rating: 300 psig.

B. Body Material: Cast or ductile iron with nylon, EPDM, epoxy, or polyamide coating.

C. Seat: Pressure-responsive EPDM.

D. Stem: Stainless steel, offset from the disc centerline to provide complete 360-degree circumferential seating.

E. Disc: Ductile iron, electroless-nickel plated.

F. Actuator: Weatherproof actuator housing with worm gear or traveling nut.

G. Supervisory Switch: Internal or external.

H. Body Design: Grooved-end connections.

1. Basis of Design: Victaulic Series 705.

2.4 CHECK VALVES

A. Minimum Pressure Rating: 250 psig.

B. Type: Center guided or spring-assisted swing check valve for vertical or horizontal installation.

C. Body Material: Cast iron, ductile iron.

D. Center guided check with elastomeric seal or elastomer coated disc.

E. Hinge Spring: Stainless steel.

F. End Connections: Flanged, grooved, or threaded.

1. Basis of Design: Victaulic Series 717.

2.5 BRONZE OS Y GATE VALVES

A. Minimum Pressure Rating: 175 psig.

B. Body and Bonnet Material: Bronze or brass.

C. Wedge: One-piece bronze or brass.

D. Wedge Seat: Bronze.

E. Stem: Bronze or brass.

F. Packing: Non-asbestos PTFE.

G. Supervisory Switch: External.

H. End Connections: Threaded.

2.6 IRON OS Y GATE VALVES

A. Body and Bonnet Material: Cast or ductile iron.

B. Wedge: Cast or ductile iron, or bronze with elastomeric coating.

C. Stem: Brass, bronze, or stainless steel.

D. Packing: Non-asbestos PTFE or EPDM.

E. Supervisory Switch: External.

F. Basis of Design: Victaulic Series 771.

2.7 TRIM AND DRAIN VALVES

A. Ball Valves:

1. Description:

a. Pressure Rating: 175 psig.

b. Body Design: Two piece.

c. Body Material: Forged brass or bronze.

d. Port Size: Full or standard.

e. Seat: PTFE.

f. Stem: Bronze or stainless steel.

g. Ball: Chrome-plated brass.

h. Actuator: Hand-lever.

PART 3 EXECUTION

3.1 EXAMINATION

A. Confirm valve interior to be free of foreign matter and corrosion.

B. Remove packing materials.

C. Examine guides and seats by operating valves from the fully open position to the fully closed position.

D. Examine valve threads and mating pipe for form and cleanliness.

E. Examine grooved ends for form and cleanliness. Ends shall be clean and free from indentations and projections, and roll marks in the area from valve end to (and including) the groove.

3.2 INSTALLATION

A. Comply with specific valve installation requirements and application in all applicable Division 21 Sections.

B. Install listed fire protection shutoff valves supervised-open, located to control sources of water supply except from fire department connections.

1. Install permanent identification signs indicating portion of system controlled by each valve.

C. Provide drain valves plugged with hose adapter with cap and chain at main shut off valves, low points of piping and any apparatus. Drain valve to be size ¾" minimum.

D. Provide OS Y gate valves for shut-off or isolating services. Valves to have OS Y tamper monitor switch as required by NFPA or where indicated on drawings.

E. Where approved, butterfly valves may be used instead of gate valves. Valves to have tamper monitor switch as required by NFPA or where indicated on drawings.

F. In addition to tamper monitor switches (only if required by Owner or local authorities), provide each control valve with approved padlock and chain. All padlocks shall be keyed alike

G. Provide hand wheels for gate valves.

H. Valves with threaded connections to have unions at equipment arranged for easy access, service, maintenance, and equipment removal without system shutdown.

I. Valves in horizontal piping installed with stem at or above the pipe center.

J. Position valves to allow full stem movement.

K. Install valve tags. Comply with Section 21 0553 requirements for valve tags, schedules, and signs on surfaces concealing valves; and the appropriate NFPA standard applying to the piping system in which valves are installed.

SECTION 21 0553
IDENTIFICATION FOR FIRE SUPPRESSION PIPING AND EQUIPMENT

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Nameplates.

1.2 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturers catalog literature for each product required.

PART 2 PRODUCTS

2.1 IDENTIFICATION APPLICATIONS

A. Valves: Nameplates.

2.2 NAMEPLATES

A. Manufacturers:

1. Brimar Industries, Inc: www.pipemarker.com/#sle.
2. Kolbi Pipe Marker Company: www.kolbipipemarkers.com/#sle.
3. Seton Identification Products, a Tricor Direct Company: www.seton.com/#sle.
4. Substitutions: See Section 01 6000 - Product Requirements.

B. Description: Laminated three-layer plastic with engraved letters.

PART 3 EXECUTION

3.1 PREPARATION

A. Degrease and clean surfaces to receive adhesive for identification materials.

3.2 INSTALLATION

A. Install nameplates with corrosive-resistant mechanical fasteners, or adhesive. Apply with sufficient adhesive to ensure permanent adhesion and seal with clear lacquer.

B. Locate ceiling tacks to locate valves above T-bar type panel ceilings. Locate in corner of panel closest to equipment.

SECTION 21 1300
FIRE-SUPPRESSION SPRINKLER SYSTEMS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Wet-pipe sprinkler system.

B. System design, installation, and certification.

1.2 RELATED REQUIREMENTS

A. Section 21 0500 - Common Work Results for Fire Suppression: Pipe and fittings.

B. Section 21 0523 - General-Duty Valves for Water-Based Fire-Suppression Piping.

C. Section 21 0553 - Identification for Fire Suppression Piping and Equipment.

1.3 REFERENCE STANDARDS

A. ITS (DIR) - Directory of Listed Products; Current Edition.

B. NFPA 13 - Standard for the Installation of Sprinkler Systems; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

C. UL (DIR) - Online Certifications Directory; Current Edition.

1.4 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide data on sprinklers, valves, and specialties, including manufacturers catalog information. Submit performance ratings, rough-in details, weights, support requirements, and piping connections.

C. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.

1. See Section 01 6000 - Product Requirements for additional provisions.

2. Extra Sprinklers: Type and size matching those installed in quantity required by referenced NFPA design and installation standard.

3. Sprinkler Wrenches: For each sprinkler type.

D. Project Record Documents: Record actual locations of sprinklers and deviations of piping from drawings. Indicate drain and test locations.

1.5 QUALITY ASSURANCE

A. Comply with UL (DIR) requirements.

B. Designer Qualifications: Design system under direct supervision of a Professional Engineer experienced in design of this type of work and licensed in the State in which the Project is located.

C. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.

D. All grooved couplings, fittings, valves, and specialties shall be the products of a single manufacturer. Grooving tools shall be of the same manufacturer as the grooved components.

1. All castings used for couplings housings, fittings, or valve and specialty bodies shall be date stamped for quality assurance and traceability.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Sprinklers, Specialties, and Equipment:

1. Victaulic Company: www.victaulic.com

2. Anvil/Viking Corporation: www.vikinggroupinc.com/#sle.

3. Reliable Sprinkler: www.reliablesprinkler.com

4. Substitutions: See Section 01 6000 - Product Requirements.

2.2 SPRINKLER SYSTEM

A. Sprinkler System: Provide coverage for building areas noted.

B. Occupancy: Refer to Schedule on Drawings.

C. Water Supply: Determine volume and pressure from water flow test data.

D. Interface system with building fire and smoke alarm system.

E. Provide fire department connections as required by NFPA.

F. Storage Cabinet for Spare Sprinklers and Tools: Steel, located adjacent to alarm valve.

2.3 SPRINKLERS

2.4 PIPING SPECIALTIES

A. Wet Pipe Sprinkler Alarm Valve: Check type valve with divided seat ring, rubber-faced clapper to automatically actuate water motor alarm, pressure retard chamber and variable pressure trim with the following additional capabilities and features:

1. Activate electric alarm.

2. Test and drain valve.

3. Replaceable internal components without removing valve from installed position.

4. Manufacturers:

a. Victaulic Company; Series 751 with Series 760 motor alarm: www.victaulic.com/#sle.

b. Substitutions: See Section 01 6000 - Product Requirements.

B. Riser Manifold Assemblies

1. Riser Manifold: integral vane type flow switch and test drain assembly with pressure gauge, grooved connections, 250 psi maximum working pressure; all components to be UL listed.

2. Universal Manifold Check Assembly: Ductile iron construction, incorporating a control valve, check valve, flow switch, adjustable relief valve, and system gauges in one compact body/footprint. The assembly should include the following additional capabilities and features:

a. Activate electric alarm.

b. Test and drain assembly with a universal test orifice and adjustable relief valve with a range of 175 to 310 psi.

c. Replaceable internal components without removing valve from installed position.

d. Rated for use at the maximum service pressure of 300 psi.

e. UL Listed and FM Approved.

f. Manufacturers:

1) Victaulic Company; Model Globe UMC: https://globesprinkler.com/product-detail/umc-floor-control-shotgun-riser-assembly.

2) Substitutions: See Section 01 6000 - Product Requirements.

C. Test Connections:

1. Inspector's Test Connection:

a. Acceptable Manufacturers

1) AFG Manufacturing

2) Elkhart Brass

3) Guardian Fire Equipment Inc.

4) Potter-Roemer

b. UL/FM Cast brass body with spring loaded position indicator with positive shut-off. In-line flow with self-draining, clearable sight glass. Tamper-proof orifice permanently installed. Model 1000 Test and Drain manufactured by AFG Manufacturing Inc.

2. Backflow Preventer Test Connection:

a. Provide downstream of the backflow prevention assembly, listed hose valves with 2.5 inch National Standard male hose threads with cap and chain.

b. Furnish one valve for each 250 gpm of system demand or fraction thereof.

c. Provide permanent sign reading "Test Valve" in accordance with Section 21 0553.

D. Electric Alarm: Electrically operated chrome plated gong with pressure alarm switch.

E. Water Flow Switch: Vane type switch for mounting horizontal or vertical, with two contacts; rated 10 amp at 125 volt AC and 2.5 amp at 24 volt DC.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install in accordance with referenced NFPA design and installation standard.

B. Install equipment in accordance with manufacturer's instructions.

C. Locate outside alarm gong on building wall as required.

D. Place pipe runs to minimize obstruction to other work.

E. Place piping in concealed spaces above finished ceilings.

F. Apply masking tape or paper cover to ensure concealed sprinklers, cover plates, and sprinkler escutcheons do not receive field paint finish. Remove after painting. Replace painted sprinklers.

G. Flush entire piping system of foreign matter.

H. Hydrostatically test entire system.

I. Require test be witnessed by Fire Marshal.

3.2 INTERFACE WITH OTHER PRODUCTS

A. Ensure required devices are installed and connected as required to fire alarm system.

SECTION 22 0005
BASIC PLUMBING REQUIREMENTS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. This section applies to all sections of Division 22.

B. Drawings and general provisions of the contract, including Division 00 and Division 01 specification sections, apply to work of this section.

C. Provide all items, articles, materials, operations or methods listed, mentioned or scheduled on drawings and/or herein, including all labor, materials, equipment and incidentals necessary and required for their completion.

D. The items in this section are supplementary to the requirements set forth in other portions of the specifications as indicated under item "A" above.

1.2 APPLICATION

A. This section applies to all plumbing work. The contractors involved shall check all sections of the specifications in addition to the particular section covering their specific trade. Each distinct section of the specifications aimed for one trade may have detailed information with regards to other trades, therefore, it is imperative that all sections be reviewed to get a complete picture of all other trades' functions and work required.

B. The plumbing contractor is responsible for the installation and operation of the plumbing systems.

1.3 INSPECTION OF SITE

A. Each Contractor shall visit the site prior to bid submission to determine all existing conditions that may affect his work and shall make appropriate allowances for such conditions in his bid. Failure to visit the site shall not be cause for a request for additional compensation later in the project during construction.

B. The submitting of a proposal implies that the contractor has visited the site and understands the conditions under which the work must be conducted.

C. Install Work in locations shown on Drawings, unless prevented by Project conditions.

D. Prepare drawings showing proposed rearrangement of Work to meet Project conditions, including changes to Work specified in other Sections. Obtain permission of Owner before proceeding.

1.4 ALTERNATES AND SUBSTITUTIONS

A. Refer to Division 01 - General Requirements for procedures to submit products by a Manufacturer that is not listed as approved equal in the Specifications.

A. Products identified wiithin the schedules and details are used as the basis of design for laying out and coordinating with other trades such as structural, architectural, and electrical. Should Division 22 Contractor submit products by a manufacturer other than that indicated as Basis of Design in the Drawings, Contractor shall then be responsible for evaluating the impacts of the proposed Manufacturer's equipment, even if the Manufacturer is listed in the specifications as an approved equal. This includes the proposed Manufacturer's electrical, architectural and structural requirements and their subsequent impacts on the current design and coordination of any differing dimensions and clearances with all other trades. This evaluation shall be included as part of the proposed product submittal.

1.6 MATERIALS

A. Plumbing equipment is to be furnished with motors, electrical controls and protective devices, and integral operating devices which are normally included by the manufacturer or required by the Contract Documents.

B. The Plumbing trades shall provide all control wiring, 120 volts and less, for the equipment and devices furnished under Division 22 of these specifications, including all wiring devices, transformers, conduit, etc. Any conduits used for control wiring shall meet the specifications as indicated in Division 26.

C. Power wiring 120 volts and greater shall be by the Electrical Trades.

1.7 CODES, PERMITS AND FEES

A. Unless otherwise indicated, all required permits, licenses, inspections, approvals and fees for plumbing work shall be secured and paid for by the contractor. All work shall conform to all applicable codes, rules and regulations. Applicable publications listed in all sections of Division 22 shall be the latest issue, unless otherwise noted.

B. Rules of local utility companies and municipalities shall be complied with. Check with the utility company and/or municipality supplying service to the installation and determine all devices including, but not limited to: meters, regulators, valves which will be required and include the cost of all such items in the proposal.

C. All work shall be executed in accordance with the rules and regulations set forth in local and state codes. Prepare any detailed drawings or diagrams which may be required by the governing authorities. Where the drawings and/or specifications indicate materials or construction in excess of code requirements, the drawings and/or specifications shall govern.

1.8 MAINTENANCE

A. Provide 8 hours of instruction to the owner's designated personnel in the maintenance and operation of equipment and systems.

B. Provide complete maintenance and operating instructional manuals covering all mechanical equipment herein specified, together with parts lists. Maintenance and operating instructional manuals shall be job specific to this project. Generic manuals are not acceptable. Manuals shall be submitted in electronic format for review. When approved, four (4) bound hard copies and an indexed electronic PDF shall be provided to the owner. Maintenance and operating instructional manuals shall be provided when construction is approximately 75% complete.

1.9 WARRANTY AND GUARANTEE

A. Contractor shall guarantee all work installed by him or his subcontractors to be free from defect in material and workmanship for a period of one year from date of final acceptance of the work, unless a longer period is stipulated under specific headings. Contractor shall repair or replace at no additional cost to the owner, any material or equipment developing defects and shall also make good any damage caused by such defects or the correction of defects. Repairs or replacements shall bear additional guarantee, as originally called for, dated from the final acceptance of the repair or replacement. This requirement shall be binding even though it will exceed product guarantees normally furnished by some manufacturers. Contractor shall submit his own and each equipment manufacturers written certificates, warranting that each item of equipment furnished complies with all requirements of the drawings and specifications. Note that guarantee shall run from date of final acceptance of the work, not from date of installation of a device or piece of equipment.

1.10 SUBMITTALS

A. Shop drawings and samples shall be submitted in compliance with the Conditions of the Contract and Division 1 General Requirements.

B. Contractor shall provide submittals where items are referred to by symbolic designation on the drawings. All submittals shall bear the same designation (plumbing piping, plumbing fixtures, etc.). Refer to other sections of the electrical specifications for additional requirements.

C. Shop Drawings: Each piece of equipment shall be identified by the number shown in the schedules and by specification article number pertaining to the item. Shop drawings shall as a minimum be ¼” equals 1’ 0” scale, and shall be newly prepared by the Contractor and not reproduced from the Architect’s drawings. Layouts shall be made for all floor plans including all ductwork, piping, electrical distribution and other mechanical equipment. Layouts shall show clearances of piping, ducts, etc., above floor.

D. Contractor shall obtain Engineer’s approval on all the work before any equipment is purchased, or any work installed. Contractor shall also secure approval of the Governmental Authorities having jurisdiction on all equipment and on the layout of the complete system.

E. The Engineer’s review and approval of shop drawings is a gratuitous assistance and in no way does it relieve the Contractor from responsibility for errors or omissions which may exist on the shop drawings. Where such errors or omissions are discovered later, they must be made good by the Contractor, without any additional cost to the Owner, irrespective of any approval by the Engineer.

1. The Contractor shall incorporate with his shop drawings, a letter indicating all deviations from the plans and/or specifications. If in the opinion of the Architect, the deviations are not equal, the Contractor will be required to furnish the item as specified and as indicated on the drawings.

2. Record documents shall be submitted in compliance with the requirements of the Specifications.

F. Engineer WILL NOT REVIEW:

1. Submittals not specified.

2. Submittals not reviewed by Contractor; including Contractor stamp with signature comments.

3. Submittals made after work is delivered to site and/or installed.

4. Submittal resubmissions unless resubmission is required by Architect/Engineer.

G. Installation of any item that requires submittal approval by the engineer shall be installed at the contractors risk. The contractor, at his cost, shall remove all work installed prior to approval of the submittal.

H. The engineer will not be responsible for errors in quantities, or dimensions required to fit the job condition, details of fabrication to insure proper assembly at the job, or for errors resulting from errors in submittals.

I. For underground piping, record dimensions and invert elevations of all piping, including all offsets, fittings, cathodic protection and accessories. Locate dimensions from benchmarks that will be preserved after construction is complete.

1.11 RECORD DRAWINGS

A. Refer to Division 01 - General Requirements for procedures. All literature shall be furnished in accordance with requirements listed in Division 01.

B. Contractor shall provide the following record drawings as part of the Project closeout document process:

1. Contract Documents, specifications and submittals, indicating "As-Built" conditions and actual products selected for use.

2. Product and Maintenance manuals for all equipment listed within this specification manual and in Contract Documents. Provide with parts lists as applicable.

1.12 QUALITY ASSURANCE

A. Other referenced standards:

1. Comply with referenced standards, guidelines, data sheets from various associations, including NFPA, ANSI, ASTM, ASME, ASHRAE.

PART 2 PRODUCTS

2.1 SLEEVES AND ESCUTCHEONS

A. Provide sleeves wherever pipes pass through exterior wall and floors. Sleeves shall be schedule 40 steel pipe cut to length. Sleeves shall terminate flush with walls, partitions and ceilings in finished areas. All sleeves through floor shall extend 2" above floor. Provide cast brass nickel-plated escutcheons with positive catches on each visible sleeve penetration. Sleves are to be sealed at each installation with a 3M approved sealant. The space between the inside of the sleeve and the outside of the pipe or conduit with in the sleeve shall be sealed at each installation with a 3M approved sealant.

2.2 DIELECTRIC UNIONS

A. Dielectric unions shall be used to connect dissimilar metals (such as steel and copper) to prevent electrolytic action.

B. Dielectric waterway fittings shall be a copper-silicon casting conforming to UNS C87850, and UL classified in accordance with ANSI / NSF-61 for potable water service.

2.3 BUILDING ATTACHMENTS FOR PLUMBING WORK SUPPORTS

A. General Requirements:

1. Provide building attachments required for supporting plumbing work, suitably selected and installed for the loads applied with a minimum additional safety factor of 3.

2. Where specified attachments are not suitable for conditions, submit to Engineer for approval, proposal for alternate building attachments.

3. If specially designed building attachments are required, retain the services of a licenced structural engineer to design such building attachments.

4. Approved Manufacturers: Grinnell, or equivalent products by Michigan Hanger and B-Line.

5. Provide supplemental trapeze supports where necessary. Design trapeze to support all trades. Coordinate loads, and supports with all trades. Size trapeze for maximum deflection of 1/64 of the span.

B. Attachments to Structural Steel:

1. Support plumbing work from building structural steel where possible and approved. No welding or bolting to structural steel is permitted unless authorized by Architect. C-clamps are not permitted.

a. Center beam clamp - for loads over 120 lb.: Malleable center hung Grinnell Fig. 228.

b. Side beam clamp with retaining clips - for loads up to 120 lb.

C. Cast in Place Concrete Inserts:

1. Provide inserts selected for applied load of present load plus 100% for future, and coordinated with concrete work. Except as detailed on drawings, inserts shall be Unistrut or Grinnell. Plan, lay out and coordinate setting of inserts prior to concrete pour. Use Grinnell Fig. 285 lightweight concrete insert for loads up to 400# or Grinnell Fig. 281 Wedge Type concrete insert for loads up to 1200#

D. Drilled Insert Anchors:

1. Where plumbing work cannot be supported from structural steel, or cast in place concrete inserts, provide drilled concrete insert anchors. Submit for approval, project specific installation drawings for all loads over 100 lbs. Install inserts in web of beam if possible and approved. Insert depth shall not exceed two thirds the thickness of the concrete. Where existing concrete appears to be deteriorating, or where applied load at insert exceeds 1000 lbs., conduct test of concrete to determine derated capacity of insert. Anchors may be adhesive or expansion type up to 1000 lbs., and shall be adhesive type for loads over 1000 lbs.

PART 3 EXECUTION

3.1 GENERAL

A. Existing piping: when encountered during the course of work, protect, brace and support existing piping where required for proper execution of the work.

B. Interruption of existing active piping: when the course of work makes shut-down of services unavoidable, the plumbing contractor shall schedule the shut-down at such time as approved by the owners representative, which will cause least interference with established operating routine.

C. Arrange work accordingly, providing such fittings as duct transitions traps, valves and accessories necessary to complete all construction in an orderiy fashion.

D. Install all equipment in strict accordance all directions and recommendations furnished by the manufacturer.

E. Roof mounted equipment requiring service shall be located a minimum of 10 feet from roof edges. Where equipment can't be located away from roof edge and guard rails are not provided, provide permanent fall arrest anchorage connection device that complies with ANSI/ASSE Z 359.1.

3.2 INTERPRETATION OF CONTRACT DOCUMENTS

A. Should there be discrepancy or a question of intent, refer matter to Architect/Engineer for decision before ordering any equipment or materials or before starting any related work.

B. Drawings and Specifications are to be taken together. Work specified and not shown or work shown and not specified shall be performed or furnished as though mentioned in both Specifications and Drawings. If there is discrepancy between Drawings and Specifications as to quantity or quality to be provided, the greater quantity or better quality shall be provided.

C. Minor items and accessories or devices reasonably inferable as necessary to complete and proper installation and operation of any system shall be provided by Contractor for such system whether or not specifically called for by Specifications or Drawings.

D. Architect/Engineer may change location of any equipment 5’ and any piping, ductwork, conduit, etc. 10’ in any direction without extra charge, provided such changes are made before installation.

E. Locations of items not definitely fixed by dimensions are approximate only and exact locations necessary to secure the best conditions and results shall be determined at the site and shall be subject to review and approval by Architect/Engineer.

F. Follow drawings in laying out work, check drawings of other trades to verify spaces in which work will be installed, and maintain maximum headroom and space conditions at all points.

1. Where headroom or space conditions appear inadequate, notify Architect or Owner’s field representative before proceeding with installation.

2. Pipe/duct rerouting and size changes shall be made at no additional cost to the Owner.

G. Furnish advance information on locations and sizes of frames, boxes, sleeves and openings needed for the work, and also furnish information and shop drawings necessary to permit installation of other work without delay.

H. Where there is evidence that parts of the Work specified in Divisions 21, 22, and 23 will interfere with other work, assist in working out space conditions to make satisfactory adjustments, revise and submit coordinated shop drawings.

I. After review and without additional cost to the Owner, make minor modifications in the work as required by structural interferences, by interferences with work of other sections or for proper execution of the work.

J. Work installed before coordinating with other work so as to cause interference with other work shall be changed and corrected without additional cost to the Owner.

K. Drawings are diagrammatic in nature and are a graphic representation of requirements and shall be followed as closely as actual building construction will permit. All changes from the plans necessary to make the work conform to the building as constructed and to fit the work of other trades or to conform to rules of the Governmental Authorities having jurisdiction, NFPA, OSHA and the Owner’s Insurance Underwriters, shall be made by the Contractor without extra cost to the Owner.

L. The layout of the piping, ductwork, equipment, etc., as shown on the drawings shall be checked and exact locations shall be determined by the dimensions of the equipment approved and the Contractor shall obtain approval for the revised layout before the apparatus is installed. The Contractor shall field measure or consult existing record Architectural and Structural Drawings if available for all dimensions, locations of partitions, locations and sizes of structural supports, foundations, etc.

M. Omission in the Drawings and/or Specifications of any items necessary for the proper completion or operation of the work outlined in this specification shall not relieve the Contractor from furnishing same without additional cost to the Owner.

N. The Equipment Shop Drawings should be furnished to the installing Contractor by the purchasing Contractor before roughing in. Contractor shall not install any piping or ductwork for said equipment until he has received approved shop drawings for same.

3.3 ACCESSIBILITY

A. Do not locate traps, valves, controls, unions, cleanouts, etc. in any system at a location that will be inaccessible after construction is completed. Maintain accessibility for all components in plumbing systems.

3.4 ACCESS PANELS:

A. Refer to Division 08 - Openings; Provide access doors in locations as required by applicable codes and as indicated below. Coordinate locations with architectural trades.

B. Submit shop drawings for review before ordering panels. Where fire rating is required, furnish label doors compatible with fire rating of assembly.

C. Contractor shall confer with other trades with respect to access panel locations, and shall wherever practical group valves, traps, dampers, etc. in such way as to be accessible from single panel and eliminate as many access panels as possible.

D. Furnish access panels to access valves, traps, control valves or devices, dampers, damper motors, etc. Access panels shall be sized as necessary for ample access, or as indicated on drawings, but no smaller than 12" x 12" where devices are within easy reach of operator, and at least 24"x24" when operator must pass through opening in order to reach the devices. Architectural Trades shall install access panels coordinated with Mechanical Trades.

E. Access panels in fire rated walls or ceiling must be U.L. labeled for intended use. Unless otherwise indicated on plans, access doors shall be hinged flush type steel framed panel, 14 gauge minimum for frame, and with anchor straps. Only narrow border shall be exposed. Hinges shall be concealed type. Locking device shall be flush type and screw driver operated. Metal surfaces shall be prime coated with rust-inhibitive paint. Panels shall be compatible with architectural adjacent materials.

3.5 PROTECTION OF ELECTRICAL EQUIPMENT

A. Contractor shall furnish and install sheet metal drain pans beneath piping that is routed above electrical equipment and/or above the 3' access space in front of such equipment. Electrical equipment, for the purpose of addressing drain pan requirements, shall be defined as free-standing or wall-mounted switchgear, transformers, distribution boards or motor control centers.

1. Drain pans shall be 20 gauge galvanized sheet metal with a minimum 4" high turned up edge. Bottom of drain pan shall slope to a single drainage point at ⅛" per foot. A 1" diameter clear plastic tube shall allow collected fluid to drain to the nearest open site floor drain. Secure plastic tubing to building structure only.

2. Drain pan shall be hung from building structure with angle iron trapeze hangers (no hanger shall penetrate the drain pan). Consider drain pan to be full of water for hanger load calculations.

3. Drain pans shall include liquid detectors with alarms only if noted on the drawings. Liquid detectors shall be specified in Section 22 10 06 Plumbing Piping Specialties.

B. Contractor shall include provisions to adjust the local lighting layout, at no extra cost to Owner, in order to accommodate any detrimental effect the drain pan has on the illumination of the electrical equipment and access space.

3.6 CUTTING, PATCHING AND DAMAGE TO OTHER WORK

A. Refer to Division 01 - General Requirements.

B. All cutting required shall be done by the contractor whose work is involved, without extra cost the owner. All patching and restoration including the furnishing and installation of access panels in ceiling, walls; etc. Within the building lines shall be done by the respective, responsible contractor. No cutting of structural steel, concrete, or wood shall be done without prior approval and explicit directions of the architect patched by the respective, responsible contractor.

C. The contractor, under whose jurisdiction the work may fall, shall provide labor, material, and tools required to cut, repair, protect, cap, or relocate existing pipes, conduits, or utilities interfering with or uncovered during work, per regulations of the authorities having jurisdiction.

3.7 EXCAVATION AND BACKFILLING

A. Provide all excavation, trenching, tunneling, removal of materials, de-watering and backfilling required for the proper laying of pipes and plumbing work. Coordinate the work with other excavating and backfilling in same area.

3.8 ROUGH-IN FOR CONNECTION TO EQUIPMENT

A. It shall be the responsibility of each contractor to study the architectural, structural, electrical, and mechanical drawings, conferring with the various trades involved and checking with the supplier of equipment in order to properly rough-in for all equipment.

3.9 MATERIAL AND EQUIPMENT

A. All material and equipment shall be new and of the best quality used for the purpose in good commercial practice, and shall be the standard product of reputable manufacturers. The material and equipment must meet approval of state and local codes in the area it is being used. Roof decks shall not be used to support piping, conduit, equipment, devices, etc.

3.10 SEAL PENETRATIONS

A. Seal the space around pipes in sleeves and around duct openings through walls, floors and ceilings. Provide adequate clearance to allow for proper sealing.

3.11 SOUND CONTROL

A. Penetrations shall be maintained airtight to pevent sound transfer.

B. Piping shall pass through sleeves. Pack sleeves tight with glass fiber or oakum and caulked on both sides with non-hardening acoustical sealant.

3.12 FIRESTOPPING

A. Refer to Division 07 - Thermal and Moisture Protection for more information.

B. Provide UL classified firestopping system for plumbing penetrations through rated walls and floors to maintain the fire rating.

3.13 CONTROL WIRING

A. All control wiring for plumbing and electrical equipment, including motor starters, shall be 120 volt maximum and wired with one side of the coil grounded and the operating contacts in the north side of the circuit. All control wiring shall be installed in conduit.

3.14 CLEANING, FLUSHING, AND INSPECTING

A. Refer to Division 01 - General Requirements; all plumbing equipment and components shall be cleaned as frequently as necessary through the construction process and again prior to project completion.

B. Clean exterior surfaces of installed piping systems of superfluous materials and prepare for application of specified coatings (if any). Flush out piping systems with clean water before proceeding with required tests. Inspect each run of each system for completion of joints, supports and accessory items.

C. Sufficient flushing water shall be introduced into the mains to produce a velocity of not less than 4’ per second and this flow rate shall be continued until the discharge is clean and clear and does not show evidences of silt or foreign matter when a sample is visually inspected.

D. Inspect pressure piping in accordance with procedures of ASME B31.

3.15 DELIVERY, STORAGE AND PROTECTION OF EQUIPMENT AND MATERIALS

A. Refer to Division 01 - General Requirements; all equipment and materials shall be delivered, stored and secured per manufacturer's recommendations.

B. On-site storage shall be coordinated with Construction Manager/General Contractor and be performed in a manner as to avoid damage, deterioration and loss.

C. Contractor shall provide temporary protection for installed equipment prior to project completion.

D. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.

E. All equipment shall be inspected prior to installation to assure that equipment is free from defect and damage.

F. Protect plumbing fixtures and piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

3.16 PIPING TESTS

A. Test pressure piping in accordance with ASME B31.

B. General: Provide temporary equipment for testing, including pump and gauges. Test piping systems before insulation is installed wherever feasible and remove control devices before testing. Test each natural section of each piping system independently, but do not use piping system valves to isolate sections where test pressure exceeds valve pressure rating. Fill each section with water and pressurize for indicated pressure and time.

1. Test each piping system at 150% of operating pressure, or other pressure as required by Authority Having Jurisdiction, whichever is greater.

a. Domestic water systems and equipment vents shall be tested hydrostatically for minimum of four hours at 1½ times design pressure for that system, or 100 psig minimum, whichever is greater, unless otherwise specified.

b. Storm, soil, waste and vent piping shall be tested with water for minimum of 24 hours at 10 feet head.

2. Observe each test section for leakage at end of test period. Test fails if leakage is observed or if pressure drop exceeds 5% of test pressure.

C. Repair piping systems sections which fail required piping test, by disassembly and re-installation, using new materials to extent required to overcome leakage. Do not use chemicals, stop-leak compounds, mastics or other temporary repair methods.

D. Drain test water from piping systems after testing and repair work has been completed.

SECTION 22 0517
SLEEVES AND SLEEVE SEALS FOR PLUMBING PIPING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Pipe sleeves.

B. Pipe sleeve-seals.

1.2 RELATED REQUIREMENTS

A. Section 07 8400 - Firestopping.

1.3 REFERENCE STANDARDS

A. ASTM C592 - Standard Specification for Mineral Fiber Blanket Insulation and Blanket-Type Pipe Insulation (Metal-Mesh Covered) (Industrial Type); 2022a.

B. ASTM E814 - Standard Test Method for Fire Tests of Penetration Firestop Systems; 2023a.

1.4 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Shop Drawings: Indicate pipe materials used, jointing methods, supports, floor and wall penetration seals. Indicate installation, layout, weights, mounting and support details, and piping connections.

PART 2 PRODUCTS

2.1 PIPE SLEEVES

A. Vertical Piping:

1. Sleeve Length: 1 inch above finished floor.

2. Provide sealant for watertight joint.

3. Blocked Out Floor Openings: Provide 1-1/2 inch angle set in silicon adhesive around opening.

4. Drilled Penetrations: Provide 1-1/2 inch angle ring or square set in silicone adhesive around penetration.

B. Sheet Metal: Pipe passing through interior walls, partitions, and floors, unless steel or brass sleeves are specified below.

C. Pipe Passing Through Below Grade Exterior Walls:

1. Zinc coated or cast iron pipe.

2. Provide watertight space with link rubber or modular seal between sleeve and pipe on both pipe ends.

D. Pipe Passing Through Mechanical, Laundry, and Animal Room Floors above Basement:

1. Galvanized steel pipe or black iron pipe with asphalt coating.

2. Connect sleeve with floor plate except in mechanical rooms.

E. Penetrations in concrete beam flanges are permitted but are prohibited through ribs or beams without prior approval from the Architect.

F. Clearances:

1. Provide allowance for insulated piping.

2. Wall, Floor, Partitions, and Beam Flanges: 1 inch greater than external pipe diameter.

3. All Rated Openings: Caulked tight with fire stopping material complying with ASTM E814 in accordance with Section 07 8400 to prevent the spread of fire, smoke, and gases.

2.2 PIPE-SLEEVE SEALS

A. Modular Mechanical Sleeve-Seal:

1. Elastomer-based interlocking links continuously fill annular space between pipe and wall-sleeve, wall or casing opening.

2. Watertight seal between pipe and wall-sleeve, wall or casing opening.

3. Size and select seal component materials in accordance with service requirements.

4. Glass-reinforced plastic pressure end plates.

B. Sealing Compounds:

1. Provide packing and sealing compound to fill pipe to sleeve thickness.

2. Combined packing and sealing compounding to match partition fire-resistance hourly rating.

C. Pipe Sleeve Material:

1. Bearing Walls: Steel, cast iron, or terra-cotta pipe.

2. Masonry Structures: Sheet metal.

PART 3 EXECUTION

3.1 INSTALLATION

A. Route piping in orderly manner, plumb and parallel to building structure. Maintain gradient.

B. Install piping to conserve building space, to not interfere with use of space and other work.

C. Install piping and pipe sleeves to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

D. Structural Considerations: Do not penetrate building structural members unless indicated.

E. Provide sleeves when penetrating footings, floors, walls, and partitions. Seal pipe including sleeve penetrations to achieve fire resistance equivalent to fire separation required.

1. Underground Piping: Caulk pipe sleeve watertight with lead and oakum or mechanically expandable chloroprene inserts with bitumen sealed metal components.

2. Aboveground Piping:

a. Pack solid using mineral fiber complying with ASTM C592.

b. Fill space with an elastomer caulk to a depth of 0.50 inch where penetrations occur between conditioned and unconditioned spaces.

3. All Rated Openings: Caulk tight with fire stopping material complying with ASTM E814 in accordance with Section 07 8400 to prevent the spread of fire, smoke, and gases.

4. Caulk exterior wall sleeves watertight with lead and oakum or mechanically expandable chloroprene inserts with mastic-sealed components.

F. Manufactured Sleeve-Seal Systems:

1. Install manufactured sleeve-seal systems in sleeves located in grade slabs and exterior concrete walls at piping entrances into building.

2. Provide sealing elements of the size, quantity, and type required for the piping and sleeve inner diameter or penetration diameter.

3. Locate piping in center of sleeve or penetration.

4. Install field assembled sleeve-seal system components in annular space between sleeve and piping.

5. Tighten bolting for a water-tight seal.

6. Install in accordance with manufacturer's recommendations.

G. When installing more than one piping system material, ensure system components are compatible and joined to ensure the integrity of the system. Provide necessary joining fittings. Ensure flanges, union, and couplings for servicing are consistently provided.

SECTION 22 0519
METERS AND GAUGES FOR PLUMBING PIPING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Pressure gauges.

1.2 REFERENCE STANDARDS

A. ASME B40.100 - Pressure Gauges and Gauge Attachments; 2022.

B. UL 393 - Indicating Pressure Gauges for Fire-Protection Service; Current Edition, Including All Revisions.

1.3 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide red-marked product data sheets for each furnished item with associated components and accessories.

C. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.

1. See Section 01 6000 - Product Requirements. for additional provisions.

2. Extra Pressure Gauges: One of each type and size.

PART 2 PRODUCTS

2.1 PRESSURE GAUGES

A. Manufacturers:

1. Ashcroft, Inc: www.ashcroft.com/#sle.

2. Dwyer Instruments, Inc: www.dwyer-inst.com/#sle.

3. Moeller Instrument Company, Inc: www.moellerinstrument.com/#sle.

4. Omega Engineering a subsidiary of Spectris, Plc: www.omega.com/#sle.

5. Weksler Glass Thermometer Corp: www.wekslerglass.com/#sle.

6. Substitutions: See Section 01 6000 - Product Requirements.

B. Bourdon Tube for Liquids and Gases:

1. Dial Size and Cover: 4-1/2 inch diameter scale with polycarbonate window.

2. Dial Text and Markings: Black color on white background with scaled kPa and psi units.

3. Accuracy: ASME B40.100, adjustable commercial grade (D) with 5 percent of span.

4. Process Connection: Lower-back, 1/4 inch NPT male except where noted.

C. Accessories:

1. Gauge Cock: Carbon steel with tee or lever handle for maximum 150 psi.

PART 3 EXECUTION

3.1 EXAMINATION

A. Do not install instrumentation when areas are under construction, except for required rough-in, taps, supports, and test plugs.

3.2 INSTALLATION

A. Install metering products in accordance with manufacturer's instructions for intended fluid type and service.

B. Install pressure gauges as follows:

1. Include gauge cock to isolate each gauge and extend nipples for insulation clearance.

2. Adjust gauges to selected viewing angle, clean thoroughly, and calibrate to zero.

3.3 SCHEDULES

A. Pressure Gauges, Location and Scale Range:

1. Pressure reducing valves, 0 to 120 psi.

SECTION 22 0523
GENERAL-DUTY VALVES FOR PLUMBING PIPING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Ball valves.

1.2 RELATED REQUIREMENTS

A. Section 08 3100 - Access Doors and Panels.

B. Section 22 0553 - Identification for Plumbing Piping and Equipment.

C. Section 22 0719 - Plumbing Piping Insulation.

D. Section 22 1005 - Plumbing Piping.

1.3 ABBREVIATIONS AND ACRONYMS

A. CWP: Cold working pressure.

B. EPDM: Ethylene propylene copolymer rubber.

C. NBR: Acrylonitrile-butadiene, Buna-N, or nitrile rubber.

D. PTFE: Polytetrafluoroethylene.

E. TFE: Tetrafluoroethylene.

F. WOG: Water, oil, and gas.

1.4 REFERENCE STANDARDS

A. ASTM F-2389-07 Standard Specification for Pressure-rated Polypropylene (PP) Piping.

B. CSA B137.11 Polypropylene (PP-R) Pipe and Fittings for Pressure Applications.

C. DIN-DVS 2207-112017 Welding Thermoplastic materials – Heated element welding of pipes, piping parts, and panels made of polypropylene.

D. ASME B1.20.1 - Pipe Threads, General Purpose, Inch; 2013 (Reaffirmed 2018).

E. ASME B16.1 - Gray Iron Pipe Flanges and Flanged Fittings: Classes 25, 125, and 250; 2020.

F. ASME B16.5 - Pipe Flanges and Flanged Fittings: NPS 1/2 through NPS 24 Metric/Inch Standard; 2020.

G. ASME B16.10 - Face-to-Face and End-to-End Dimensions of Valves; 2022.

H. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings; 2021.

I. ASME B16.34 - Valves — Flanged, Threaded, and Welding End; 2020.

J. ASME B31.9 - Building Services Piping; 2020.

K. ASME BPVC-IX - Boiler and Pressure Vessel Code, Section IX - Qualification Standard for Welding, Brazing, and Fusing Procedures; Welders; Brazers; and Welding, Brazing, and Fusing Operators; 2023.

L. AWWA C606 - Grooved and Shouldered Joints; 2022.

M. MSS SP-110 - Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends; 2010, with Errata .

N. NSF 61 - Drinking Water System Components - Health Effects; 2022, with Errata.

O. NSF 372 - Drinking Water System Components - Lead Content; 2022.

1.5 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide data on valves including manufacturers catalog information. Submit performance ratings, rough-in details, weights, support requirements, and piping connections.

C. Grooved joint valves shall be referred to on drawings and product submittals, and be identified by the manufacturer’s listed model or series designation.

1.6 QUALITY ASSURANCE

A. Manufacturer:

1. Obtain valves for each valve type from single manufacturer.

B. Welding Materials and Procedures: Comply with ASME BPVC-IX.

C. Grooved end valves shall be of the same manufacturer as the adjoining couplings.

D. All castings used for valve bodies shall be date stamped for quality assurance and traceability.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Use the following precautions during storage:

1. Maintain valve end protection and protect flanges and specialties from dirt.

a. Provide temporary inlet and outlet caps.

b. Maintain caps in place until installation.

PART 2 PRODUCTS

2.1 APPLICATIONS

A. Listed pipe sizes shown using nominal pipe sizes (NPS) and nominal diameter (DN).

B. Provide the following valves for the applications if not indicated on drawings:

1. Shutoff: Ball or butterfly.

a. Gate valves shall only be used on shut off for pumped sanitary/storm piping only.

b. High performance ball valves shall be used in "Critical Service" applications. Contractor shall ask Engineer and Owner prior to submittal stage, what areas of the project are "Critical Service".

2. Dead-End: Single-flange butterfly (lug) type.

3. Swing Check:

a. 2 NPS and Smaller: Bronze swing check valves with bronze or nonmetallic disc.

b. 2-1/2 NPS and Larger for Domestic Water: Iron swing check valves with closure control, metal or resilient seat check valves.

c. 2-1/2 inch and Larger for Sanitary Waste and Storm Drainage: Iron swing check valves with lever and weight or spring.

C. Substitutions of valves with higher CWP classes or WSP ratings for same valve types are permitted when specified CWP ratings or WSP classes are not available.

D. Domestic, Cold Water Valves:

1. 2 inch and Smaller:

a. Ball: Two piece, full port, bronze with bronze or stainless steel trim.

1) Hot Forged brass valves by Bonomi are allowed as specified below. Only ASTM C28500 alloy allowed.

b. Bronze Swing Check: Class 125, bronze disc.

c. Bronze or Hot Forged Brass Spring Loaded Check: Class 125, nonmetallic disc

2. 2-1/2 inch and Larger:

a. Iron Ball: Class 150.

b. Iron Single-Flange Butterfly: 200 CWP, EPDM seat, aluminum-bronze disc.

c. Grooved End, Cast Brass Butterfly: 300 CWP, Fluoroelastomer pressure-responsive seat, aluminum-bronze disc, or ductile iron EPDM encapsulated pressure-responsive disc.

2.2 GENERAL REQUIREMENTS

A. Valve Pressure and Temperature Ratings: No less than rating indicated; as required for system pressures and temperatures.

B. Valve Sizes: Match upstream piping unless otherwise indicated.

C. Valve Actuator Types:

1. Hand Lever: Quarter-turn valves 6 NPS and smaller.

D. Insulated Piping Valves: With 2 inch stem extensions and the following features:

1. Ball Valves: Extended operating handle of non-thermal-conductive material, and protective sleeve that allows operation of valve without breaking the vapor seal or disturbing insulation.

2. Memory Stops: Fully adjustable after insulation is installed.

E. Valve-End Connections:

1. Threaded End Valves: ASME B1.20.1.

2. Flanges on Iron Valves: ASME B16.1 for flanges on iron valves.

3. Pipe Flanges and Flanged Fittings 1/2 inch through 24 inch: ASME B16.5.

4. Solder Joint Connections: ASME B16.18.

5. Grooved End Connections: Copper-tube dimensions, similar to AWWA C606.

F. General ASME Compliance:

1. Ferrous Valve Dimensions and Design Criteria: ASME B16.10 and ASME B16.34.

2. Solder-joint Connections: ASME B16.18.

3. Building Services Piping Valves: ASME B31.9.

G. Potable Water Use:

1. Certified: Approved for use in compliance with NSF 61 and NSF 372.

2. Lead-Free Certified: Wetted surface material includes less than 0.25 percent lead content.

H. Source Limitations: Obtain each valve type from a single manufacturer.

2.3 BRONZE, BALL VALVES

A. General:

1. Fabricate from dezincification resistant material.

2. Copper alloys containing more than 15 percent zinc are not permitted.

B. Two Piece, Full Port with Bronze or Stainless Steel Trim:

1. Comply with MSS SP-110.

2. WSP Rating: 150 psi.

3. CWP Rating: 600-1000 psig.

4. Body: Lead Free Bronze.

5. Ends Connections: Pipe thread or solder.

6. Seats: PTFE or TFE.

7. Operator: Provide stem extension.

8. Manufacturers:

a. Apollo Valves: www.apollovalves.com/#sle. BRONZE VALVES ONLY

b. Nibco: www.nibco.com BRONZE VALVES ONLY

c. ASC Engineered Solutions www.asc-es.com

d. Bonomi www.bonominorthamerica.com Lead Free Hot Forged Brass Ball Valves are allowed; only ASTM C28500 alloy is permitted.

e. Substitutions: See Section 01 6000 - Product Requirements.

C. High Performance Ball Valves (up to 2"), Two Piece, Full Port with Stainless Steel Trim:

1. Comply with MSS SP-110/145

2. WSP Rating: 150 psi.

3. CWP Rating: 1,000 psi.

4. Body: Bronze.

5. End connections: Pipe thread, solder or press.

6. Seats: Reinforced PTFE

7. Operator: Reversable handle.

8. Manufacturers:

a. Nibco: www.nibco.com

PART 3 EXECUTION

3.1 INSTALLATION

A. Provide unions or flanges with valves to facilitate equipment removal and maintenance while maintaining system operation and full accessibility for servicing.

B. Provide separate valve support as required and locate valve with stem at or above center of piping, maintaining unimpeded stem movement.

C. Provide non-conducting dielectric connections wherever jointing dissimilar metals.

D. Provide access where valves and fittings are not exposed.

E. Install valves with stems upright or horizontal, not inverted.

SECTION 22 0553
IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Nameplates.

B. Tags.

C. Pipe markers.

D. Underground warning tape.

1.2 RELATED REQUIREMENTS

A. Section 09 9123 - Interior Painting: Identification painting.

1.3 REFERENCE STANDARDS

A. ASME A13.1 - Scheme for the Identification of Piping Systems; 2020.

B. ASTM D709 - Standard Specification for Laminated Thermosetting Materials; 2017.

1.4 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide manufacturers catalog literature for each product required.

PART 2 PRODUCTS

2.1 PLUMBING COMPONENT IDENTIFICATION GUIDELINE

A. Tags:

1. Piping: 3/4 inch diameter and smaller.

2. Manual operated valves and automated control valves.

B. Pipe Markers: 3/4 inch diameter and higher.

2.2 NAMEPLATES

A. Manufacturers:

1. Brimar Industries, Inc: www.pipemarker.com/#sle.

2. Kolbi Pipe Marker Co: www.kolbipipemarkers.com/#sle.

3. Seton Identification Products: www.seton.com/#sle.

4. Substitutions: See Section 01 6000 - Product Requirements.

B. Description: Engraved piece with up to three lines of text.

1. Letter Color: White.

2. Letter Height: 1/4 inch.

3. Background Color: Black.

4. Nameplate Material:

a. Flexible: Polycarbonate with adhesive backing per ASTM D709.

b. Metal: Brass with adhesive backing.

2.3 TAGS

A. Manufacturers:

1. Brady Corporation: www.bradycorp.com/#sle.

2. Brimar Industries, Inc: www.pipemarker.com/#sle.

3. Kolbi Pipe Marker Co: www.kolbipipemarkers.com/#sle.

4. Seton Identification Products: www.seton.com/#sle.

5. Substitutions: See Section 01 6000 - Product Requirements.

B. Metal: Brass, 19 gauge 1-1/2 inch in diameter with smooth edges, blank, smooth edges, and corrosion-resistant ball chain. Up to three lines of text.

C. Piping: 3/4 inch diameter and smaller. Include corrosion resistant chain. Identify service, flow direction, and pressure.

2.4 PIPE MARKERS

A. Manufacturers:

1. Brady Corporation: www.bradycorp.com/#sle.

2. Brimar Industries, Inc: www.pipemarker.com/#sle.

3. Kolbi Pipe Marker Co: www.kolbipipemarkers.com/#sle.

4. Seton Identification Products: www.seton.com/#sle.

5. Substitutions: See Section 01 6000 - Product Requirements.

B. Comply with ASME A13.1.

C. Flexible Marker: Factory fabricated, semi-rigid, preformed to fit around pipe or pipe covering; minimum information indicating flow direction arrow and identification of fluid conveyed.

D. Underground Flexible Marker: Bright-colored continuously printed ribbon tape, minimum 6 inches wide by 4 mil, 0.004 inch thick, manufactured for direct burial service.

E. Identification Scheme, ASME A13.1:

1. Primary: External Pipe Diameter, Uninsulated or Insulated.

2. Secondary: Color scheme per fluid service.

a. Water; Potable, Cooling, Boiler Feed, and Other: White text on green background.

3. Tertiary: Other Details.

a. Directional flow arrow.

2.5 UNDERGROUND WARNING TAPE

A. Manufacturers:

1. Brady Corporation: www.bradyid.com/#sle.

2. Brimar Industries, Inc: www.brimar.com/#sle.

3. Kolbi Pipe Marker Co: www.kolbipipemarkers.com/#sle.

4. Seton Identification Products: www.seton.com/#sle.

5. Substitutions: See Section 01 6000 - Product Requirements.

B. Materials: Use foil-backed detectable type polyethylene tape suitable for direct burial, unless otherwise indicated.

C. Foil-backed Detectable Type Tape: 3 inches wide, with minimum thickness of 5 mil, 0.005 inch, unless otherwise required for proper detection.

D. Legend: Type of service, continuously repeated over full length of tape.

PART 3 EXECUTION

3.1 PREPARATION

A. Degrease and clean surfaces to receive identification products.

3.2 INSTALLATION

A. Install flexible nameplates with corrosive-resistant mechanical fasteners, or adhesive. Apply with sufficient adhesive to ensure permanent adhesion and seal with clear lacquer.

B. Install tags in clear view and align with axis of piping

C. Install plastic pipe markers in accordance with manufacturer's instructions.

1. Install in clear view and align with axis of piping.

D. Install underground plastic pipe markers 6 to 8 inches below finished grade, directly above buried pipe.

E. Apply ASME A13.1 Pipe Marking Rules:

1. Place pipe marker adjacent to changes in direction.

2. Place pipe marker adjacent each valve port and flange end.

3. Place pipe marker at both sides of floor and wall penetrations.

4. Place pipe marker every 25 to 50 feet interval of straight run.

SECTION 22 0719
PLUMBING PIPING INSULATION

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Cellular glass insulation.

B. Flexible elastomeric cellular insulation.

C. Glass fiber insulation.

D. Jacketing and accessories.

1.2 RELATED REQUIREMENTS

A. Section 07 8400 - Firestopping.

B. Section 22 1005 - Plumbing Piping: Placement of hangers and hanger inserts.

1.3 REFERENCE STANDARDS

A. ASTM C177 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus; 2019, with Editorial Revision (2023).

B. ASTM C195 - Standard Specification for Mineral Fiber Thermal Insulating Cement; 2007 (Reapproved 2019).

C. ASTM C534/C534M - Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form; 2023.

D. ASTM C547 - Standard Specification for Mineral Fiber Pipe Insulation; 2022a.

E. ASTM C552 - Standard Specification for Cellular Glass Thermal Insulation; 2022.

F. ASTM C795 - Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel; 2008 (Reapproved 2023).

G. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023c.

H. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials; 2022a, with Editorial Revision (2023).

I. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

1.4 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.

PART 2 PRODUCTS

2.1 REGULATORY REQUIREMENTS

A. Surface Burning Characteristics: Flame spread index/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84 or UL 723.

2.2 GLASS FIBER INSULATION

A. Manufacturers:

1. CertainTeed Corporation: www.certainteed.com/#sle.

2. Johns Manville Corporation: www.jm.com/#sle.

3. Knauf Insulation: www.knaufinsulation.com/#sle.

4. Owens Corning Corporation: www.ocbuildingspec.com/#sle.

5. Substitutions: See Section 01 6000 - Product Requirements.

B. Insulation: ASTM C547 and ASTM C795; rigid molded, noncombustible.

1. K Value: ASTM C177, 0.24 at 75 degrees F.

2. Maximum Service Temperature: 850 degrees F.

3. Maximum Moisture Absorption: 0.2 percent by volume.

C. Vapor Barrier Jacket: White Kraft paper with glass fiber yarn, bonded to aluminized film; moisture vapor transmission when tested in accordance with ASTM E96/E96M of 0.02 perm.

D. Tie Wire: 0.048 inch stainless steel with twisted ends on maximum 12 inch centers.

E. Vapor Barrier Lap Adhesive: Compatible with insulation.

1. Vapor Barrier Lap Adhesive shall be compatible with the insulation and as recommended by the insulation manufacturer.

F. Insulating Cement/Mastic: ASTM C195; hydraulic setting on mineral wool.

G. Indoor Vapor Barrier Finish:

1. Vinyl emulsion type acrylic, compatible with insulation, white color.

2.3 CELLULAR GLASS INSULATION

A. Manufacturers:

1. Owens Corning Corporation; FOAMGLAS: www.ocbuildingspec.com/#sle.

B. Insulation: ASTM C552, Type II, Grade 6.

1. K Value: 0.35 at 100 degrees F.

2. Service Temperature Range: From 250 degrees F to 800 degrees F.

3. Water Vapor Permeability: 0.005 perm inch maximum per inch.

4. Water Absorption: 0.5 percent by volume, maximum.

2.4 FLEXIBLE ELASTOMERIC CELLULAR INSULATION

A. Manufacturers:

1. Aeroflex USA, Inc: www.aeroflexusa.com/#sle.

2. Armacell LLC: www.armacell.us/#sle.

3. K-Flex USA LLC: www.kflexusa.com/#sle.

4. Substitutions: See Section 01 6000 - Product Requirements.

B. Insulation: Preformed flexible elastomeric cellular rubber insulation complying with ASTM C534/C534M Grade 1; use molded tubular material wherever possible.

1. Minimum Service Temperature: Minus 40 degrees F.

2. Maximum Service Temperature: 220 degrees F.

3. Connection: Waterproof vapor barrier adhesive.

C. Elastomeric Foam Adhesive: Air dried, contact adhesive, compatible with insulation.

2.5 JACKETING AND ACCESSORIES

A. PVC Plastic Jacket:

1. Manufacturers:

a. Johns Manville Corporation: www.jm.com/#sle.

b. Proto Corporation: www.protocorporation.com.

c. Substitutions: See Section 01 6000 - Product Requirements.

2. Jacket: One piece molded type fitting covers and sheet material, off-white color.

a. Minimum Service Temperature: 0 degrees F.

b. Maximum Service Temperature: 150 degrees F.

c. Moisture Vapor Permeability: 0.02 per inch (0.029 ng/Pa s m), maximum, when tested in accordance with ASTM E96/E96M.

d. Thickness: 10 mil, 0.010 inch.

e. Connections: Brush on welding adhesive.

3. Covering Adhesive Mastic: Compatible with insulation.

B. Aluminum-Foil Laminate Jacket:

1. Manufacturers:

a. H.B. Fuller Construction Products, Inc; Foster - Vapor-Fas: www.fosterproducts.com/#sle.

b. Ideal Tape Co., Inc: www.idealtape.com/#sle.

c. Substitutions: See Section 01 6000 - Product Requirements.

2. Factory-applied, pressure sensitive adhesive jacketing on paper release liner.

3. Finish: Aluminum smooth.

4. Comply with ASTM C1775.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that piping has been tested before applying insulation materials.

B. Verify that surfaces are clean and dry, with foreign material removed.

3.2 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install in accordance with North American Insulation Manufacturers Association (NAIMA) National Insulation Standards.

C. Exposed Piping: Locate insulation and cover seams in least visible locations.

D. Insulated pipes conveying fluids below ambient temperature: Insulate entire system including fittings, valves, unions, flanges, strainers, flexible connections, pump bodies, and expansion joints.

E. Glass fiber insulated pipes conveying fluids below ambient temperature:

1. Provide vapor barrier jackets, factory-applied or field-applied. Secure with self-sealing longitudinal laps and butt strips with pressure-sensitive adhesive. Secure with outward clinch expanding staples and vapor barrier mastic.

2. Insulate fittings, joints, and valves with molded insulation of like material and thickness as adjacent pipe. Finish with glass cloth and vapor barrier adhesive or PVC fitting covers.

F. Glass fiber insulated pipes conveying fluids above ambient temperature:

1. Provide standard jackets, with or without vapor barrier, factory-applied or field-applied. Secure with self-sealing longitudinal laps and butt strips with pressure-sensitive adhesive. Secure with outward clinch expanding staples.

2. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe. Finish with glass cloth and adhesive or PVC fitting covers.

G. Inserts and Shields:

1. Application: Piping 1-1/2 inches diameter or larger.

2. Shields: Galvanized steel between pipe hangers or pipe hanger rolls and inserts.

3. Insert Location: Between support shield and piping and under the finish jacket.

4. Insert Configuration: Minimum 6 inches long, of same thickness and contour as adjoining insulation; may be factory fabricated.

5. Insert Material: Hydrous calcium silicate insulation or other heavy density insulating material suitable for the planned temperature range.

H. Continue insulation through walls, sleeves, pipe hangers, and other pipe penetrations. Finish at supports, protrusions, and interruptions.

I. Pipe Exposed in Mechanical Equipment Rooms or Finished Spaces (less than 10 feet above finished floor): Finish with PVC jacket and fitting covers.

J. Heat Traced Piping: Insulate fittings, joints, and valves with insulation of like material, thickness, and finish as adjoining pipe. Size large enough to enclose pipe and heat tracer. Cover with aluminum jacket with seams located on bottom side of horizontal piping.

K. Piping Located in Crawl Space:

1. Provide Cellular Glass insulation. Provide factory fabricated assembly with inner all-purpose service jacket with self-sealing lap, and asphalt impregnated open mesh glass fabric, with one mil, 0.001 inch thick aluminum foil sandwiched between three layers of bituminous compound; outer surface faced with a polyester film.

2. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe. Finish with aluminum jacket with seams located on bottom side of horizontal piping.

3.3 SCHEDULES

A. Plumbing Systems:

1. Domestic Cold Water: 1 inch thick.

2. Sanitary Drainage in Crawl Space: 1/2 inch thick with PVC Jacket.

3. Roof Conductor in Crawl Space: 1/2 inch thick with PVC Jacket.

B. Other Systems:

SECTION 22 1005
PLUMBING PIPING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Sanitary waste piping, buried within 5 feet of building.

B. Sanitary waste piping, above grade.

C. Domestic water piping, buried within 5 feet of building.

D. Domestic water piping, above grade.

E. Storm drainage piping, buried within 5 feet of building.

F. Storm drainage piping, above grade.

G. Pipe flanges, unions, and couplings.

H. Pipe hangers and supports.

1.2 RELATED REQUIREMENTS

A. Section 22 0516 - Expansion Fittings and Loops for Plumbing Piping.

B. Section 22 0553 - Identification for Plumbing Piping and Equipment.

C. Section 22 0719 - Plumbing Piping Insulation.

1.3 REFERENCE STANDARDS

A. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings; 2021.

B. ASME B16.22 - Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings; 2021.

C. ASME B16.23 - Cast Copper Alloy Solder Joint Drainage Fittings: DWV; 2021.

D. ASME B16.29 - Wrought Copper and Wrought Copper Alloy Solder-Joint Drainage Fittings—DWV; 2022.

E. ASME B31.9 - Building Services Piping; 2020.

F. ASTM A74 - Standard Specification for Cast Iron Soil Pipe and Fittings; 2021.

G. ASTM B32 - Standard Specification for Solder Metal; 2020.

H. ASTM B42 - Standard Specification for Seamless Copper Pipe, Standard Sizes; 2020.

I. ASTM B88 - Standard Specification for Seamless Copper Water Tube; 2022.

J. ASTM B88M - Standard Specification for Seamless Copper Water Tube (Metric); 2020.

K. ASTM B306 - Standard Specification for Copper Drainage Tube (DWV); 2020.

L. ASTM B813 - Standard Specification for Liquid and Paste Fluxes for Soldering of Copper and Copper Alloy Tube; 2016.

M. ASTM B828 - Standard Practice for Making Capillary Joints by Soldering of Copper and Copper Alloy Tube and Fittings; 2016.

N. ASTM C564 - Standard Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings; 2020a.

O. ASTM C1277 - Standard Specification for Shielded Couplings Joining Hubless Cast Iron Soil Pipe and Fittings; 2020.

P. AWWA C111/A21.11 - Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings; 2023.

Q. AWWA C151/A21.51 - Ductile-Iron Pipe, Centrifugally Cast; 2017, with Errata (2018).

R. AWWA C651 - Disinfecting Water Mains; 2014, with Addendum (2020).

S. CISPI 301 - Standard Specification for Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications; 2021.

T. CISPI 310 - Specification for Coupling for Use in Connection with Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications; 2020.

U. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation; 2018, with Amendment (2019).

V. NSF 61 - Drinking Water System Components - Health Effects; 2022, with Errata.

W. NSF 372 - Drinking Water System Components - Lead Content; 2022.

1.4 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide data on pipe materials, pipe fittings, and accessories. Provide manufacturers catalog information.

1. Grooved joint couplings and fittings shall be referred to on drawings and product submittals, and be identified by the manufacturer’s listed model or series designation.

1.5 QUALITY ASSURANCE

A. Perform work in accordance with applicable codes.

B. Identify pipe with marking including size, ASTM material classification, ASTM specification, potable water certification, water pressure rating.

C. All grooved couplings, fittings, valves, and specialties shall be the products of a single manufacturer. Grooving tools shall be of the same manufacturer as the grooved components.

1. All castings used for couplings housings, fittings, or valve and specialty bodies shall be date stamped for quality assurance and traceability.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.

B. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

1.7 FIELD CONDITIONS

A. Do not install underground piping when bedding is wet or frozen.

1.8 PERFORMANCE REQUIREMENTS

A. Provide components and installation capable of producing plumbing piping systems with the following minimum working-pressure ratings:

1. Cold-Water Piping: 80 psig at 75 deg. F

PART 2 PRODUCTS

2.1 GENERAL REQUIREMENTS

A. Potable Water Supply Systems: Provide piping, pipe fittings, and solder and flux (if used), that comply with NSF 61 and NSF 372 for maximum lead content; label pipe and fittings.

2.2 SANITARY WASTE PIPING, BURIED WITHIN 5 FEET OF BUILDING

A. Cast Iron Pipe: ASTM A74 extra heavy weight.

1. Fittings: Cast iron.

2. Joints: Hub-and-spigot, CISPI HSN compression type with ASTM C564 neoprene gaskets or lead and oakum.

B. Cast Iron Pipe & Fittings: CISPI 301, ASTM A 888 hubless.

1. Tensile Strength: 21,000 psig minimum.

2. Pipe and fittings shall be marked with the collective trademark of the Cast Iron Soil Pipe Institute and listed by NSF International.

3. Each length of pipe and each fitting shall be plainly marked with size, country of origin, and name of manufacturer, or manufacturer’s registered trademark by which the manufacturer can be readily identified after installation.

4. Heavy-Duty, Hubless-Piping Couplings:

   a. Manufacturers: Subject to compliance with requirements. Provide products by one of the following:

      1) Ideal Tridon

      2) ANACO-Husky

      3) Tyler Couplings

      4) Mission Rubber Company

   b. Standards: ASTM C 1540.

   c. Description: Shield Assemblies shall consist of stainless-steel bi-directional corrugated shield with stainless-steel bands and tightening devices; and ASTM C 564, rubber sleeve with integral, center pipe stop.

C. PVC Pipe:

1. Comply with NSF 14, "Plastics Piping Systems Components and Related Materials," for plastic piping components. Include marking with "NSF-dwv" for plastic drain, waste, and vent piping and "NSF-sewer" for plastic sewer piping.

2. Solid-Wall PVC Pipe: ASTM D 2665, drain, waste, and vent.

3. Cellular-Core PVC Pipe: ASTM F 891, Schedule 40 **will not be accepted**.

4. PVC Socket Fittings: ASTM D 2665, made to ASTM D 3311, drain, waste, and vent patterns.

5. PVC Pressure Fittings: ASTM D 2466, Socket Type

6. Primer: ASTM F 656.

   a. Primer shall have a VOC content of 550g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24)

   b. Adhesive primer 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”

7. Solvent Cement: ASTM D 2564.

   a. PVC solvent cement shall have a VOC content of 510 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24)

b. Solvent cement 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"

2.3 SANITARY WASTE PIPING, ABOVE GRADE

A. Cast Iron Pipe & Fittings: CISPI 301, ASTM A 888 hubless.

1. Fittings: Cast iron.

2. Joints: CISPI 310, neoprene gasket and stainless steel clamp and shield assemblies.

3. Tensile Strength: 21,000 psig minimum.

4. Pipe and fittings shall be marked with the collective trademark of the Cast Iron Soil Pipe Institute and listed by NSF International.

5. Each length of pipe and each fitting shall be plainly marked with size, country of origin, and name of manufacturer, or manufacturer's registered trademark by which the manufacturer can be readily identified after installation.

6. CISPI, Hubless-Piping Couplings:

a. Manufacturers: Subject to compliance with requirements. Provide products by one of the following:

1) Ideal Tridon

2) ANACO-Husky

3) Tyler Couplings

4) Mission Rubber Company

b. Standards: ASTM C 1277 and CISPI 310.

c. Description: Shield Assemblies shall consist of stainless-steel bi-directional corrugated shield with stainless-steel bands and tightening devices; and ASTM C 564, rubber sleeve with integral, center pipe stop. Couplings shall bear the trademark NSF International.

B. Copper Tube: ASTM B306, DWV.

1. Fittings: ASME B16.29, wrought copper, or ASME B16.23, sovent.

2. Joints: ASTM B32, alloy Sn50 solder.

2.4 DOMESTIC WATER PIPING, BURIED WITHIN 5 FEET OF BUILDING

A. Copper Pipe: ASTM B42, hard drawn.

1. Fittings: ASME B16.18, cast copper alloy or ASME B16.22 wrought copper and bronze.

2. Joints: ASTM B32, alloy Sn95 solder.

B. Ductile Iron Pipe: AWWA C151/A21.51.

1. Fittings: Ductile iron, standard thickness.

2. Joints: AWWA C111/A21.11, styrene butadiene rubber (SBR) or vulcanized SBR gasket with 3/4 inch diameter rods.

2.5 DOMESTIC WATER PIPING, ABOVE GRADE

A. Copper Pipe: ASTM B88 (ASTM B88M), Type L (B) or K (A), Drawn (H). Type M (C) will not be accepted.

1. Fittings:

a. ASME B16.18, cast copper alloy or ASME B16.22, wrought copper and bronze.

b. Grooved end fittings manufactured to copper-tube dimensions. (Flaring of tube or fitting ends to accommodate alternate sized couplings is not permitted.)

2. Joints:

a. ASTM B32, solder.

b. Grooved joint coupling consisting of two ductile iron housings. EPDM gasket rated from -40 degrees to 250 degrees, or Fluoroelastomer. ASTM A449 compliant bolts and nuts. Installation ready rigid coupling for direct installation without field disassembly.

1) UL classified in accordance with NSF-61 for potable water service. The system shall meet the low-lead requirements of NSF-372.

3. Mechanical Press Sealed Fittings: Double-pressed type, NSF 61 and NSF 372 approved or certified, utilizing EPDM, nontoxic, synthetic rubber sealing elements.

a. Manufacturers:

1) Apollo Valves: www.apollovalves.com/#sle.

2) SCI Copper Press by ASC Engineered Solutions www.asc-es.com

3) Nibco: www.nibco.com.

4) Substitutions: See Section 01 6000 - Product Requirements.

2.6 STORM DRAINAGE PIPING, BURIED WITHIN 5 FEET OF BUILDING

A. Cast Iron Pipe: ASTM A74 extra heavy weight.

1. Fittings: Cast iron.

2. Joint Seals: ASTM C564 neoprene gaskets, or lead and oakum.

B. Cast Iron Pipe & Fittings: CISPI 301, ASTM A 888 hubless.

1. Fittings: Cast iron.

2. Joints: CISPI 310, neoprene gasket and stainless steel clamp and shield assemblies.

3. Tensile Strength: 21,000 psig minimum.

4. Pipe and fittings shall be marked with the collective trademark of the Cast Iron Soil Pipe Institute and listed by NSF International.

5. Each length of pipe and each fitting shall be plainly marked with size, country of origin, and name of manufacturer, or manufacturer's registered trademark by which the manufacturer can be readily identified after installation.

6. Heavy-Duty, Hubless-Piping Couplings:

a. Manufacturers: Subject to compliance with requirements. Provide products by one of the following:

1) Ideal Tridon

2) ANACO-Husky

3) Tyler Couplings

4) Mission Rubber Company

b. Standards: ASTM C 1540.

c. Description: Shield Assemblies shall consist of stainless-steel bi-directional corrugated shield with stainless-steel bands and tightening devices; and ASTM C 564, rubber sleeve with integral, center pipe stop.

C. PVC Pipe:

1. Comply with NSF 14, "Plastics Piping Systems Components and Related Materials," for plastic piping components. Include marking with "NSF-dwv" for plastic drain, waste, and vent piping and "NSF-sewer" for plastic sewer piping.

2. Solid-Wall PVC Pipe: ASTM D 2665, drain, waste, and vent.

3. Cellular-Core PVC Pipe: ASTM F 891, Schedule 40 **will not be accepted**.

4. PVC Socket Fittings: ASTM D 2665, made to ASTM D 3311, drain, waste, and vent patterns.

5. PVC Pressure Fittings: ASTM D 2466, Socket Type

6. Primer: ASTM F 656.

   a. Primer shall have a VOC content of 550g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24)

   b. Adhesive primer 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"

7. Solvent Cement: ASTM D 2564.

   a. PVC solvent cement shall have a VOC content of 510 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24)

   b. Solvent cement 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"

2.7 STORM DRAINAGE PIPING, ABOVE GRADE

A. Cast Iron Pipe & Fittings: CISPI 301, ASTM A 888 hubless.

1. Fittings: Cast iron.

2. Joints: CISPI 310, neoprene gasket and stainless steel clamp and shield assemblies.

3. Tensile Strength: 21,000 psig minimum.

4. Pipe and fittings shall be marked with the collective trademark of the Cast Iron Soil Pipe Institute ® and listed by NSF International.

5. Each length of pipe and each fitting shall be plainly marked with size, country of origin, and name of manufacturer, or manufacturer's registered trademark by which the manufacturer can be readily identified after installation.

6. CISPI, Hubless-Piping Couplings:

   a. Manufacturers: Subject to compliance with requirements. Provide products by one of the following:

      1) Ideal Tridon

      2) ANACO-Husky

      3) Tyler Couplings

      4) Mission Rubber Company

b. Standards: ASTM C 1277 and CISPI 310.

c. Description: Shield Assemblies shall consist of stainless-steel bi-directional corrugated shield with stainless-steel bands and tightening devices; and ASTM C 564, rubber sleeve with integral, center pipe stop. Couplings shall bear the trademark NSF International.

2.8 PIPE FLANGES, UNIONS, AND COUPLINGS

A. Unions for Pipe Sizes 3 inch and Under:

1. Ferrous Pipe: Class 150 malleable iron threaded unions.

2. Copper Tube and Pipe: Class 150 bronze unions with soldered joints.

B. Flanges for Pipe Sizes Over 1 inch:

1. Ferrous Pipe: Class 150 malleable iron threaded or forged steel slip-on flanges; preformed neoprene gaskets.

2. Copper Tube and Pipe: Class 150 slip-on bronze flanges; preformed neoprene gaskets.

C. Unions or flanges for servicing and disconnect are not required in installations using grooved joint couplings.

D. No-Hub Couplings:

1. Testing: In accordance with ASTM C1277 and CISPI 310.

2. General: Comply with ASTM C1277 and CISPI 310.

3. Gasket Material: Neoprene complying with ASTM C564.

4. Band Material: Stainless steel complying with ASTM A240.

5. Eyelet Material: Stainless steel.

6. Manufacturers:

a. Ideal Clamp Products, Inc: www.idealtridon.com//#sle.

b. Anaco-Husky: www.anaco-husky.com.

c. Tyler Couplings

d. Mission Rubber Company

e. Substitutions: See Section 01 6000 - Product Requirements.

2.9 PIPE HANGERS AND SUPPORTS

A. Provide hangers and supports that comply with MSS SP-58.

1. If type of hanger or support for a particular situation is not indicated, select appropriate type using MSS SP-58 recommendations.

2. Overhead Supports: Individual steel rod hangers attached to structure or to trapeze hangers.

3. Trapeze Hangers: Welded steel channel frames attached to structure.

4. Vertical Pipe Support: Steel riser clamp. Riser clamps shall be isolated from the building structure by placing felt or rubber pads between the clamp and the structure.

B. All materials shall be new and manufactured for the specific purpose of supporting systems, equipment, pipes and accessories.

C. Hangers for uncovered (uninsulated) copper piping shall be factory-applied plastic coated steel or copper plated.

D. No-hub Pipe & Fitting Restraints

1. Installation of no-hub piping shall follow CISPI 301-21. Horizontal pipe and fittings 5 inches and larger must be suitale braced to prevent horizontal movement. This shall be done at every branch opening or change of direction by the use of braces, blocks, rodding or other suitable methods, to prevent movement or joint seprataion.

PART 3 EXECUTION

3.1 PREPARATION

A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.

B. Remove scale and dirt, on inside and outside, before assembly.

C. Prepare piping connections to equipment with flanges, grooved joint couplings, or unions.

3.2 INSTALLATION

A. Install in accordance with manufacturer's instructions. Cast iron soil pipe installed in accordance to CISPI's Handbook.

B. Provide non-conducting dielectric connections wherever jointing dissimilar metals.

C. Route piping in orderly manner and maintain gradient. Route parallel and perpendicular to walls.

D. Install piping to maintain headroom, conserve space, and not interfere with use of space.

E. Group piping whenever practical at common elevations.

F. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

G. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings.

H. Provide access where valves and fittings are not exposed. Coordinate size and location of access door with Division 01.

I. Establish elevations of buried piping outside the building to ensure not less than 4 ft of cover.

J. Provide support for utility meters in accordance with requirements of utility companies.

K. Install valves with stems upright or horizontal, not inverted. See Section 22 0523.

L. Install water piping to ASME B31.9.

M. Slope water piping and arrange to drain at low points.

N. Copper Pipe and Tube: Make soldered joints in accordance with ASTM B828, using specified solder, and flux meeting ASTM B813; in potable water systems use flux also complying with NSF 61 and NSF 372.

O. Grooved joints shall be installed in accordance with the manufacturer's latest published instructions. The gasket style and elastomeric material (grade) shall be verified as suitable for the intended service. Gaskets shall be molded and produced by the grooved coupling manufacturer. Grooved ends shall be clean and free from indentations, projections, and roll marks in the area from pipe end to groove. Grooved coupling manufacturer's factory trained field representative shall provide on-site training for contractor's field personnel in the proper use of grooving tools, application of groove, and installation of grooved piping products. Factory trained representative shall periodically visit the jobsite to ensure best practices in grooved product installation are being followed. Contractor shall remove and replace any improperly installed products.

P. Sleeve pipes passing through partitions, walls, and floors.

Q. Install hangers and supports complete with necessary attachments, inserts, bolts, rods, nuts, washers, and other accessories.

R. Pipe Hangers and Supports:

1. Install in accordance with ASME B31.9.

2. Support vertical piping at every other floor. Support riser piping independently of connected horizontal piping.

3. Install hangers and supports to allow controlled thermal and seismic movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.

4. Install lateral bracing with pipe hangers and supports to prevent swaying.

S. Pipe Sleeve-Seal Systems:

1. Install manufactured sleeve-seal systems in sleeves located in grade slabs and exterior concrete walls at piping entrances into building.

2. Provide sealing elements of the size, quantity, and type required for the piping and sleeve inner diameter or penetration diameter.

3. Locate piping in center of sleeve or penetration.

4. Install field assembled sleeve-seal system components in annular space between sleeve and piping.

5. Tighten bolting for a watertight seal.

6. Install in accordance with manufacturer's recommendations.

T. When installing more than one piping system material, ensure system components are compatible and joined to ensure the integrity of the system. Provide necessary joining fittings. Ensure flanges, union, and couplings for servicing are consistently provided.

U. In general, all piping, and similar items shall be installed concealed from view above ceiling, in partitions, shafts, chases, unless otherwise indicated.

V. Where pipes are in partitions, furred out spaces and chases, obtain information as to their exact location and size and install work so as to be entirely concealed in allotted space. If conflicts arise making this impossible, obtain instructions from Architect/Engineer before proceeding with work.

W. Where there is evidence that plumbing work will interfere with other work, assist in working out space conditions and/or structure, make necessary adjustments to accommodate work.

X. Plumbing work installed before coordinating with other work so as to cause interference with other work to be changed to correct such condition without additional cost to Owner.

Y. Appliances and equipment to be installed and connected with best engineering practices and in accordance with manufacturer’s instructions and recommendations. Piping, valves, connections and other like items recommended by manufacturer or as required for proper operation to be provided without additional cost to Owner.

Z. In no case will any pipe, conduit or duct be installed where it is supported on or suspended from another pipe, conduit or duct.

3.3 APPLICATION

A. Install unions downstream of valves and at equipment or apparatus connections.

B. Install brass male adapters each side of valves in copper piped system. Solder adapters to pipe.

3.4 TOLERANCES

A. Drainage Piping: Establish invert elevations within 1/2 inch vertically of location indicated and slope to drain at minimum of 1/8 inch per foot slope; 1/4 inch per foor slope for piping serving low flow fixtures.

B. Water Piping: Slope at minimum of 1/32 inch per foot and arrange to drain at low points.

3.5 DISINFECTION OF DOMESTIC WATER PIPING SYSTEM

A. Prior to starting work, verify system is complete, flushed, and clean.

B. Ensure acidity (pH) of water to be treated is between 7.4 and 7.6 by adding alkali (caustic soda or soda ash) or acid (hydrochloric).

C. Inject disinfectant, free chlorine in liquid, powder, tablet, or gas form throughout system to obtain 50 to 80 mg/L residual.

D. Bleed water from outlets to ensure distribution and test for disinfectant residual at minimum 15 percent of outlets.

E. Maintain disinfectant in system for 24 hours.

F. If final disinfectant residual tests less than 25 mg/L, repeat treatment.

G. Flush disinfectant from system until residual equal to that of incoming water or 1.0 mg/L.

H. Take samples no sooner than 24 hours after flushing, from 10 percent of outlets and from water entry, and analyze in accordance with AWWA C651.

I. Polypropylene Pipe:

1. Do not enclose, cover, or put piping into operation until it has been inspected and approved by authorities having jurisdiction.

2. The pipes shall be flushed with cold water after finishing the installation. Flush the system until the water runs clear of debris and dirt.

3. Clean, flush and disinfect potable water piping system following the guidelines of the manufacturer.

4. Inspect and test piping systems following procedures of authorities having jurisdiction and as specified by the piping system manufacturer.

5. Do not add additional chlorine, chloramine, chlorine dioxide, on-site copper ion generation or other disinfectants to the PP-R system without first consulting with piping manufacturer.

3.6 SERVICE CONNECTIONS

A. Provide new sanitary and storm sewer services. Before commencing work, check invert elevations required for sewer connections, confirm inverts and ensure that these can be properly connected with slope for drainage and cover to avoid freezing.

B. Provide new water service complete with approved wye strainer, reduce pressure backflow preventer, and water meter with by-pass valves.

1. Provide 18 gauge, 0.0478-inch galvanized sheet metal sleeve around service main to 6 inch above floor and 6 feet minimum below grade. Size for minimum of 2 inches of loose batt insulation stuffing.

SECTION 22 1006
PLUMBING PIPING SPECIALTIES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Drains.

B. Cleanouts.

C. Backflow preventers.

D. Strainers.

E. Floor drain trap seals.

1.2 RELATED REQUIREMENTS

A. Section 22 1005 - Plumbing Piping.

B. Section 22 3000 - Plumbing Equipment.

C. Section 22 4000 - Plumbing Fixtures.

1.3 REFERENCE STANDARDS

A. ASME A112.6.3 - Floor Drains; 2022.

B. ASSE 1013 - Performance Requirements for Reduced Pressure Principle Backflow Prevention Assemblies; 2021.

C. NSF 61 - Drinking Water System Components - Health Effects; 2022, with Errata.

D. NSF 372 - Drinking Water System Components - Lead Content; 2022.

1.4 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide component sizes, rough-in requirements, service sizes, and finishes.

C. Project Record Documents: Record actual locations of equipment, cleanouts, backflow preventers, water hammer arrestors, and other specialties applicable to project.

D. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.

1. See Section 01 6000 - Product Requirements for additional provisions.

2. Extra Loose Keys for Outside Hose Bibbs: One.

PART 2 PRODUCTS

2.1 GENERAL REQUIREMENTS

A. Specialties in Potable Water Supply Systems: Provide products that comply with NSF 61 and NSF 372 for maximum lead content.

2.2 DRAINS

A. Manufacturers:

1. Jay R. Smith Manufacturing Company: www.jayrsmith.com/#sle.
2. Josam Company: www.josam.com/#sle.
3. MIFAB, Inc: www.mifab.com/#sle.
4. Zurn Industries, LLC: www.zurn.com/#sle.
5. Sioux Chief: www.siouxchief.com.
6. Watts: www.watts.com
7. Substitutions: See Section 01 6000 - Product Requirements.

B. Downspout Nozzles:

1. Bronze round with hinged perforated cover.

C. Floor Drains:

1. ASME A112.6.3; lacquered cast iron or stainless steel, two piece body with double drainage flange, weep holes, and reversible clamping collar.
2. Strainer: Refer to Plumbing Fixture Schedule for size, type and accessories.

2.3 CLEANOUTS

A. Manufacturers:

1. Jay R. Smith Manufacturing Company: www.jayrsmith.com/#sle.
2. Josam Company: www.josam.com/#sle.
3. MIFAB, Inc: www.mifab.com/#sle.
4. Zurn Industries, LLC: www.zurn.com/#sle.
5. Substitutions: See Section 01 6000 - Product Requirements.

B. Cleanouts at Exterior Surfaced Areas

1. Round cast nickel bronze access frame and non-skid cover.

C. Cleanouts at Exterior Unsurfaced Areas:

1. Line type with lacquered cast iron body and round epoxy coated gasketed cover.

D. Cleanouts at Interior Unfinished Accessible Areas: Calked or threaded type. Provide bolted stack cleanouts on vertical rainwater leaders.

2.4 AIR ADMITTANCE VALVES

A. Manufacturers:

1. IPS Corporation: Studor; www.ipscorp.com

2. Sioux Chief: Turbo Vent; www.siouxchief.com

3. Oatey: Sure Vent; www.oatey.com

4. Substitutions: See Section 01 6000 - Product Requirements.

B. Description: ASSE 1050 and 1051; Valve shall provide positive seal at 0 psi and under positive line pressure to prevent sewer gasses from entering the occupied space. ABS/PVC body with Schedule 40 adapter and actuating device.

C. When device is located in a wall, provide with recessed access box with vented cover plate. Access box shall be fire rated when installing in fire rated walls. Refer to Architectural drawings.

2.5 BACKFLOW PREVENTERS

A. Manufacturers:

1. Apollo Valves: www.apollovalves.com.

2. MIFAB, Inc or BEECO: www.mifab.com.

3. Watts Regulator Company, a part of Watts Water Technologies: www.wattsregulator.com.

4. Zurn Industries, LLC: www.zurn.com.

5. Substitutions: See Section 01 6000 - Product Requirements.

B. Reduced Pressure Backflow Preventer Assembly (1.5" and Above):

1. ASSE 1013 and NSF 61 compliant stainless steel or epoxy coated ductile iron body assembly with corrosion resistant internal parts, stainless steel springs, diaphragm type differential pressure relief valve located between check valves, third check valve that opens under back pressure in case of diaphragm failure, and non-threaded vent outlet.

2. Configured to protect against backsiphonage and backpressure into potable water supply.

3. Size: 1 1/2" - 10" inch assembly with flanged NRS gate valves.

4. Maximum Working Parameters: 175 psi at 140 degrees F.

5. Flood Control System: Designed to prevent flooding of a building caused by discharge from a catastrophically fouled Reduced Pressure Principle backflow preventer. System shall shut down water when 50 gallons/day discharge limit has been reached.

   a. The pre-wired flood control package includes a Reduced Pressure Principle Backflow Preventer that detects and measures relief valve discharge in real-time, and is attached to (2) Solenoid Control Valves (on both inlet and outlet to prevent water discharge due to a fouled second check) to shut-off the water supply when excessive discharge happens using a built-in relief valve position monitor.

   b. The Solenoid Control Valves shall be 24 VAC Operation, normally open (water is on during power failure) with a manual operator on solenoid in case of power failure.

   c. Controller shall communicate via Ethernet or LTE or cellular network. Gateway option shall be Ethernet unless otherwise noted.

   d. The controller shall include AUX terminals to connect to an external alarm or building monitoring system. These terminals provide contact closure only.

   e. Electrical Contractor shall provide 120 VAC grounded outlet for controller power. Controller shall be 2 Amps, max.

6. Accessories: Provide air gap fitting and test cock.

   a. Pipe air gap fitting to adjacent floor drain.

7. The entire valve station assembly shall be provided by the same manufacturer and be covered by a single warranty policy.

2.6 STRAINERS

A. Manufacturers:

1. Armstrong International, Inc: www.armstronginternational.com

2. Green Country Filter Manufacturing: www.greencountryfilter.com

3. WEAMCO: www.weamco.com

4. Legend: www.legendvalve.com

5. Substitutions: See Section01 6000-Product Requirements.

B. Size 2 inches and Under:

1. Class 150, threaded bronze body 300 psi CWP, Y pattern with 1/32 inch stainless steel perforated screen. Lead free.

C. Size 1-1/2 inch to 4 inches:

1. Class 125, flanged iron body, Y pattern with 1/16 inch stainless steel perforated screen. Lead free.

2.7 AIR VENTS

A. Manufacturers:

1. Cash Acme, a brand of Reliance Worldwide Corporation: www.cashacme.com/#sle.

2. ITT Bell & Gossett: www.bellgossett.com/#sle.

3. Taco, Inc: www.taco-hvac.com/#sle.

4. Substitutions: See Section 01 6000 - Product Requirements.

B. Manual Type: Short vertical sections of 2 inch diameter pipe to form air chamber, with 1/8 inch brass needle valve at top of chamber.

2.8 FLOOR DRAIN TRAP SEALS

A. Manufacturers:

1. MIFAB, Inc: www.mifab.com/#sle.

2. JR Smith: www.jrsmith.com.

3. Zurn: www.zurn.com

4. Rectorseal / Sure Seal: www.rectorseal.com

5. Substitutions: See Section 01 6000 - Product Requirements.

B. Description: Push-fit EPDM or silicone fitting with a one-way membrane. For use in floor drain outlets or the adjustable strainer throats to minimize evaporation of the trap seal.

C. Standard: Required flow rates per ASSE 1072.

D. Size: To match floor drain in which protection device is to be installed

E. Do not use in applications where the room/space has atmospheric pressure less than ambient pressure of the exterior of the room/space or building

PART 3 EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Coordinate clean-out locations with Architect prior to installation.

C. Provide air vents at high points in the system and as indicated on plans or details. Provide at least one air vent in mechanical rooms on all domestic water piping services.

D. Extend cleanouts to finished floor or wall surface. Lubricate threaded cleanout plugs with mixture of graphite and linseed oil. Ensure clearance at cleanout for rodding of drainage system.

E. Encase exterior cleanouts in concrete flush with grade.

F. Install floor cleanouts at elevation to accommodate finished floor.

G. Install approved potable water protection devices on plumbing lines where contamination of domestic water may occur; on boiler feed water lines, janitor rooms, fire sprinkler systems, premise isolation, irrigation systems, flush valves, interior and exterior hose bibbs.

H. Pipe relief from backflow preventer to nearest drain.

SECTION 23 0005
BASIC HVAC REQUIREMENTS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. This section applies to all sections of Division 23.

B. Drawings and general provisions of the contract, including Division 00 and Division 01 specification sections, apply to work of this section.

C. Provide all items, articles, materials, operations or methods listed, mentioned or scheduled on drawings and/or herein, including all labor, materials, equipment and incidentals necessary and required for their completion.

D. The items in this section are supplementary to the requirements set forth in other portions of the specifications as indicated under item "A" above.

1.2 APPLICATION

A. This section applies to all mechanical work. The contractors involved shall check all sections of the specifications in addition to the particular section covering their specific trade. Each distinct section of the specifications aimed for one trade may have detailed information with regards to other trades, therefore, it is imperative that all sections be reviewed to get a complete picture of all other trades' functions and work required.

B. The mechanical contractor is responsible for the installation and operation of the hvac systems and temperature control systems.

C. The mechanical contractor is responsible for receiving, unloading and placement of all of the owner provided equipment.

1.3 INSPECTION OF SITE

A. Visit the site, examine and verify the conditions under which the work must be conducted before submitting proposal.

B. The submitting of a proposal implies that the contractor has visited the site and understands the conditions under which the work must be conducted.

1.4 ALTERNATES AND SUBSTITUTIONS

A. Refer to Division 01 - General Requirements for procedures.

1.5 DEVIATION FROM BASIS OF DESIGN MANUFACTURER

A. Products identified within the schedules and details are used as the basis of design for laying out and coordinating with other trades such as structural, architectural, and electrical. Should the Division 23 Contractors submit equipment by a Manufacturer other than that indicated as the Basis of Design in the Drawings, Contractor shall then be responsible for evaluating the impacts of the proposed Manufacturer's equipment, even if the Manufacturer is listed in the specifications as an approved equal. This includes the proposed Manufacturer's electrical, architectural and structural requirements and their subsequent impacts on the current design (roof openings, curbs, structural support, etc.) and coordination of any differing dimensions and clearances with all other trades.

1.6 DRAWINGS

A. The drawings are diagrammatic and show the general location and arrangement of all equipment, piping and related items. They shall be followed as closely as elements of the construction will permit.

B. Examine the drawings of other trades and verify the conditions governing the work on the job site. The mechanical and electrical contractor shall check all documents including architectural, structural, plumbing, HVAC and electrical to avert possible installation conflicts. Arrange work accordingly, providing such fittings, traps, valves and accessories as may be required to meet such conditions.

C. Deviations from the drawings, with the exception of minor changes in routing and other such incidental changes that do not affect the functioning or serviceability of the systems, shall not be made without the written approval of the Architect/Engineer.

D. The architectural and structural drawings take precedence in all matters pertaining to the building structure, mechanical drawings in all matters pertaining to mechanical trades and electrical drawings in all matters pertaining to electrical trades. Where there are conflicts or differences between the drawings for the various trades, report such conflicts or differences to the Architect/Engineer for resolution.

E. Do not scale drawings for measurements.

F. Field verifications of actual existing conditions are required by the contractor since actual locations, distances, and levels will be governed by actual field conditions. All measurements shall be verified at the site.

G. If during field verification, the contractor identifies that there may require substantial changes from the original plans, the contractor shall notify the architect for agreement on necessary adjustment before the installation is started

H. Discrepancies shown between plans, or between plans and actual field conditions, or between plans and specifications shall promptly be brought to the attention of the Architect/Engineer for a decision.

I. Drawings and specifications are intended to cover the completed installation of systems to function as described. The omission of the expressed reference to any item of labor and material necessary to comply with practice codes, ordinances, etc., shall not relieve the contractor from providing such additional labor and material at no cost to Owner.

1.7 CODES, PERMITS AND FEES

A. Unless otherwise indicated, all required permits, licenses, inspections, approvals and fees for mechanical work shall be secured and paid for by the contractor. All work shall conform to all applicable codes, rules and regulations. Applicable publications listed in all sections of Division 23 shall be the latest issue, unless otherwise noted.

B. Rules of local utility companies and municipalities shall be complied with. Check with the utility company and/or municipality supplying service to the installation and determine all devices including, but not limited to: meters, regulators, valves which will be required and include the cost of all such items in the proposal.

C. All work shall be executed in accordance with the rules and regulations set forth in local and state codes. Prepare any detailed drawings or diagrams which may be required by the governing authorities. Where the drawings and/or specifications indicate materials or construction in excess of code requirements, the drawings and/or specifications shall govern.

1.8 MAINTENANCE

A. Provide 40 hours of instruction to the owner's designated personnel in the maintenance and operation of equipment and systems.

B. Provide complete maintenance and operating instructional manuals covering all mechanical equipment herein specified, together with parts lists. Maintenance and operating instructional manuals shall be job specific to this project. Generic manuals are not acceptable. Four (4) copies of all literature shall be furnished for owner and shall be bound in book or ring binder form. Maintenance and operating instructional manuals shall be provided when construction is approximately 75% complete.

1.9 WARRANTY AND GUARANTEE

A. Contractor shall guarantee all work installed by themselves or their subcontractors to be free from defect in material and workmanship for a period of one year from date of final acceptance of the work, unless a longer period is stipulated under specific headings. Contractor shall repair or replace at no additional cost to the owner, any material or equipment developing defects and shall also make good any damage caused by such defects or the correction of defects. Repairs or replacements shall bear additional guarantee, as originally called for, dated from the final acceptance of the repair or replacement. This requirement shall be binding even though it will exceed product guarantees normally furnished by some manufacturers. Contractor shall submit his own and each equipment manufacturers written certificates, warranting that each item of equipment furnished complies with all requirements of the drawings and specifications. Note that guarantee shall run from date of final acceptance of the work, not from date of installation of a device or piece of equipment.

1.10 SUBMITTALS

A. Refer to Division 01 - General Requirements for procedures.

B. Contractor shall provide submittals where items are referred to by symbolic designation on the drawings. All submittals shall bear the same designation (hvac equipment, piping equipment, etc.). Refer to other sections of the mechanical specifications for additional requirements.

C. Engineer WILL NOT REVIEW:

1. Submittals not specified.

2. Submittals not reviewed by Contractor, including Contractor stamp with signature comments.

3. Submittals made after work is delivered to site and/or installed.

4. Submittal resubmissions unless resubmission is required by Architect/Engineer.

D. Types of submittals include the following:

1. Shop Drawings

2. Product Data Sheets

3. Samples

4. Manufacturers Instructions

5. Maintenance Data

6. Warranty

E. Installation of any item that requires submittal approval by the engineer shall be installed at the contractors risk. The contractor, at his cost, shall remove all work installed prior to approval of the submittal.

F. The engineer will not be responsible for errors in quantities, or dimensions required to fit the job condition, details of fabrication to insure proper assembly at the job, or for errors resulting from mistakes in submittals.

1.11 RECORD DRAWINGS

A. Refer to Division 01 - General Requirements for procedures.

B. Contractor shall provide the following record drawings as part of the Project closeout document process:

1. Contract Documents, specifications and submittals, indicating "As-Built" conditions and actual products selected for use.

2. Product and Maintenance manuals for all equipment listed within this specification manual and in Contract Documents. Provide with parts lists as applicable.

C. Record drawings shall be maintained by the contractor up to date as the project progresses.

D. Recording all deviations from the contract documents, indicate exact locations of all buried services both inside and outside of the building; include concealed piping and equipment in the entire contract. Final record drawings shall reflect the as-built conditions.

1.12 QUALITY ASSURANCE

A. Other referenced standards:

1. Comply with referenced standards, guidelines, data sheets from various associations, including NFPA, ANSI, ASTM, ASME, ASHRAE

PART 2 PRODUCTS

2.1 SLEEVES AND ESCUTCHEONS

A. Provide sleeves wherever pipes pass through exterior wall, and floors. Sleeves shall be schedule 40 steel pipe cut to length. Sleeves shall terminate flush with walls, partitions and ceilings in finished areas. All sleeves through floor shall extend 2" above floor. Provide cast brass nickel-plated escutcheons with positive catches on each visible sleeve penetration. Sleves are to be sealed at each installation with a 3M approved sealant. The space between the inside of the sleeve and the outside of the pipe or conduit with in the sleeve shall be sealed at each installation with a 3M approved sealant.

2.2 DIELECTRIC UNIONS

A. Dielectric unions shall be used to connect dissimilar metals (such as steel and copper) to prevent electrolytic action.

2.3 BUILDING ATTACHMENTS FOR MECHANICAL WORK SUPPORTS

A. General Requirements:

1. Provide building attachments required for supporting mechanical work, suitably selected and installed for the loads applied with a minimum additional safety factor of 3.

2. Where specified attachments are not suitable for conditions, submit to Engineer for approval, proposal for alternate building attachments.

3. If specially designed building attachments are required, retain the services of a licenced structural engineer to design such building attachments.

4. Approved Manufacturers: Grinnell, or equivalent products by Michigan Hanger and B-Line.

5. Provide supplemental trapeze supports where necessary. Design trapeze to support all trades. Coordinate loads, and supports with all trades. Size trapeze for maximum deflection of 1/64 of the span.

B. Attachments to Structural Steel:

1. Support mechanical work from building structural steel where possible and approved. No welding or bolting to structural steel is permitted unless authorized by Architect. C-clamps are not permitted.

a. Center beam clamp - for loads over 120 lb.: Malleable center hung Grinnell Fig. 228.

b. Side beam clamp with retaining clips - for loads up to 120 lb.

C. Cast in Place Concrete Inserts:

1. Provide inserts selected for applied load of present load plus 100% for future, and coordinated with concrete work. Except as detailed on drawings, inserts shall be Unistrut or Grinnell. Plan, lay out and coordinate setting of inserts prior to concrete pour. Use Grinnell Fig. 285 lightweight concrete insert for loads up to 400# or Grinnell Fig. 281 Wedge Type concrete insert for loads up to 1200#

D. Drilled Insert Anchors:

1. Where mechanical work cannot be supported from structural steel, or cast in place concrete inserts, provide drilled concrete insert anchors. Submit for approval, project specific installation drawings for all loads over 100 lbs. Install inserts in web of beam if possible and approved. Insert depth shall not exceed two thirds the thickness of the concrete. Where existing concrete appears to be deteriorating, or where applied load at insert exceeds 1000 lbs., conduct test of concrete to determine derated capacity of insert. Anchors may be adhesive or expansion type up to 1000 lbs., and shall be adhesive type for loads over 1000 lbs.

2. Manufacturers: Hilti

PART 3 EXECUTION

3.1 GENERAL

A. Existing piping and ductwork: when encountered during the course of work, protect, brace and support existing piping and ductwork where required for proper execution of the work.

B. Interruption of existing active piping and ductwork: when the course of work makes shut-down of services unavoidable, the mechanical contractor shall schedule the shut-down at such time as approved by the owners representative, which will cause least interference with established operating routine.

C. Arrange work accordingly, providing such fittings as duct transitions traps, valves and accessories necessary to complete all construction in an orderly fashion.

D. Install all equipment in strict accordance all directions and recommendations furnished by the manufacturer.

E. Roof mounted equipment requiring service shall be located a minimum of 10 feet from roof edges. Where equipment can't be located away from roof edge and guard rails are not provided, provide permanent fall arrest anchorage connection device that complies with ANSI/ASSE Z 359.1.

3.2 ACCESSIBILITY

A. Do not locate valves, traps, controls, unions, dampers, etc. in any system at a location that will be inaccessible after construction is completed. Maintain accessibility for all components in mechanical, electrical, and plumbing systems.

3.3 ACCESS DOORS AND PANELS

A. Refer to Division 08 - Openings; Provide access doors in locations as required by applicable codes and as indicated below. Coordinate locations with architectural trades.

B. Furnish access panels to access valves, traps, control valves or devices, dampers, damper motors, etc. Access panels shall be sized as necessary for ample access, or as indicated on drawings, but no smaller than 12" x 12" where devices are within easy reach of operator, and at least 24"x24" when operator must pass through opening in order to reach the devices. Architectural Trades shall install access panels coordinated with Mechanical Trades.

C. Access panels in fire rated walls or ceiling must be U.L. labeled for intended use. Unless otherwise indicated on plans, access doors shall be hinged flush type steel framed panel, 14 gauge minimum for frame, and with anchor straps. Only narrow border shall be exposed. Hinges shall be concealed type. Locking device shall be flush type and screw driver operated. Metal surfaces shall be prime coated with rust-inhibitive paint. Panels shall be compatible with architectural adjacent materials Manufacturer: Milcor, Bilco.

3.4 CUTTING AND PATCHING

A. Refer to Division 01 - General Requirements and Division 02 - Existing Conditions.

B. All cutting required shall be done by the contractor whose work is involved, without extra cost the owner. All patching and restoration including the furnishing and installation of access panels in ceiling, walls; etc. Within the building lines shall be done by the respective, responsible contractor. No cutting of structural steel, concrete, or wood shall be done without prior approval and explicit directions of the architect patched by the respective, responsible contractor.

C. The contractor, under whose jurisdiction the work may fall, shall provide labor, material, and tools required to cut, repair, protect, cap, or relocate existing pipes, conduits, or utilities interfering with or uncovered during work, per regulations of the authorities having jurisdiction.

3.5 ROUGH-IN FOR CONNECTION TO EQUIPMENT

A. It shall be the responsibility of each contractor to study the architectural, structural, electrical, and mechanical drawings, conferring with the various trades involved and checking with the supplier of equipment in order to properly rough-in for all equipment.

3.6 MATERIAL AND EQUIPMENT

A. All material and equipment shall be new and of the best quality used for the purpose in good commercial practice, and shall be the standard product of reputable manufacturers. The material and equipment must meet approval of state and local codes in the area it is being used. Roof decks shall not be used to support piping, conduit, equipment, devices, etc.

3.7 SEAL PENETRATIONS

A. Seal the space around pipes in sleeves and around duct openings through walls, floors and ceilings. Provide adequate clearance to allow for proper sealing.

3.8 SOUND CONTROL

A. Penetrations shall be maintained airtight to prevent sound transfer.

B. Piping, ductwork, etc. shall pass through sleeves. Pack sleeves tight with glass fiber or oakum and caulked on both sides with non-hardening acoustical sealant.

3.9 FIRESTOPPING

A. Refer to Division 07 - Thermal and Moisture Protection for more information.

B. Provide UL classified firestopping system for mechanical penetrations through rated walls and floors to maintain the fire rating.

3.10 DELIVERY, STORAGE AND HANDLING OF EQUIPMENT AND MATERIALS

A. Refer to Division 01 - General Requirements; All equipment and materials shall be delivered, stored and secured per manufacturer's recommendations.

B. On-site storage shall be coordinated with Construction Manager and be performed in a manner as to avoid damage, deterioration and loss.

C. Contractor shall provide temporary protection for installed equipment prior to project completion.

D. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.

E. All equipment shall be inspected prior to installation to assure that equipment is free from defect and damage.

F. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

G. Protect dampers, grilles, louvers from damage to operating linkages and blades.

3.11 CLEANING

A. Refer to Division 01 - General Requirements; all mechanical equipment and components shall be cleaned as frequently as necessary through the construction process and again prior to project completion.

3.12 CONTROL WIRING

A. All control wiring for mechanical and electrical equipment, including motor starters, shall be 120 volt maximum and wired with one side of the coil grounded and the operating contacts in the north side of the circuit. All control wiring shall be installed in conduit.

INSTALLATION MANUAL

R-410A
J**ZJ SERIES W/SMART EQUIPMENT™

6-1/2 - 12-1/2 Ton

60 Hertz

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General

Johnson Controls J**ZJ units are single package air conditioners with optional gas heating designed for outdoor installation on a rooftop or slab and for non-residential use. These units can be equipped with factory or field installed electric heaters for heating applications.

These units are completely assembled on rigid, permanently attached base rails. All piping, refrigerant charge, and electrical wiring is factory installed and tested. The units require electric power, gas supply (where applicable), and duct connections. The electric heaters have nickel-chrome elements and utilize single-point power connection.

Safety Considerations

⚠ This is a safety alert symbol. When you see this symbol on labels or in manuals, be alert to the potential for personal injury.

Understand and pay particular attention the signal words **DANGER**, **WARNING** or **CAUTION**.

DANGER indicates an **imminently** hazardous situation, which, if not avoided, **will result in death or serious injury.**

WARNING indicates a **potentially** hazardous situation, which, if not avoided, **could result in death or serious injury.**

CAUTION indicates a potentially hazardous situation, which, if not avoided **may result in minor or moderate injury.** It is also used to alert against unsafe practices and hazards involving only property damage.

⚠WARNING

Improper installation may create a condition where the operation of the product could cause personal injury or property damage. Improper installation, adjustment, alteration, service or maintenance can cause injury or property damage. Refer to this manual for assistance or for additional information, consult a qualified contractor, installer or service agency.

⚠ CAUTION

This product must be installed in strict compliance with the installation instructions and any applicable local, state and national codes including, but not limited to building, electrical, and mechanical codes.

⚠WARNING

Before performing service or maintenance operations on unit, turn off main power switch to unit. Electrical shock could cause personal injury. Improper installation, adjustment, alteration, service or maintenance can cause injury or property damage. Refer to this manual. For assistance or additional information consult a qualified installer, service agency or the gas supplier.

⚠ CAUTION

This system uses R-410A Refrigerant which operates at higher pressures than R-22. No other refrigerant may be used in this system. Gage sets, hoses, refrigerant containers and recovery systems must be designed to handle R-410A. If you are unsure, consult the equipment manufacturer. Failure to use R-410A compatible servicing equipment may result in property damage or injury.

⚠WARNING

If the information in this manual is not followed exactly, a fire or explosion may result causing property damage, personal injury or loss of life.

Do not store or use gasoline or other flammable vapors and liquids in the vicinity of this or any other appliance.

WHAT TO DO IF YOU SMELL GAS:

a. Do not try to light any appliance.

b. Do not touch any electrical switch; do not use any phone in your building.

c. Immediately call your gas supplier from a neighbor's phone. Follow the gas supplier's instructions.

d. If you cannot reach your gas supplier, call the fire department.

Installation and service must be performed by a qualified installer, service agency or the gas supplier.

Due to system pressure, moving parts, and electrical components, installation and servicing of air conditioning equipment can be hazardous. Only qualified, trained service personnel should install, repair, or service this equipment. Untrained personnel can perform basic maintenance functions of cleaning coils and filters and replacing filters.

Observe all precautions in the literature, labels, and tags accompanying the equipment whenever working on air conditioning equipment. Be sure to follow all other applicable safety precautions and codes including ANSI Z223.1 or CSA-B149.1- latest edition.

Wear safety glasses and work gloves. Use quenching cloth and have a fire extinguisher available during brazing operations.

Inspection

As soon as a unit is received, it should be inspected for possible damage during transit. If damage is evident, the extent of the damage should be noted on the carrier's freight bill. A separate request for inspection by the carrier's agent should be made in writing.

⚠ CAUTION

This product must be installed in strict compliance with the enclosed installation instructions and any applicable local, state and national codes including, but not limited to, building, electrical, and mechanical codes.

The furnace and its individual shut-off valve must be disconnected from the gas supply piping system during any pressure testing at pressures in excess of 1/2 PSIG.

Pressures greater than 1/2 PSIG will cause gas valve damage resulting in a hazardous condition. If it is subjected to a pressure greater than 1/2 PSIG, the gas valve must be replaced.

The furnace must be isolated from the gas supply piping system by closing its individual manual shut-off valve during any pressure testing of the gas supply piping system at test pressures equal to or less than 1/2 PSIG

Reference

Additional information is available in the following reference forms:

- Technical Guide - J06 thru 12ZJ, 5167797
- General Installation - J06 thru 12ZJ, 5167530
- Smart Equipment™ Control Quick Start Guide - 1136326
- Economizer Accessory -
  Downflow Factory Installed
  Downflow Field Installed
  Horizontal Field Installed
- Motorized Outdoor Air Damper
- Manual Outdoor Air Damper (0-100%)
- Manual Outdoor Air Damper (0-35%)
- Gas Heat Propane Conversion Kit
- Gas Heat High Altitude Kit (Natural Gas)
- Gas Heat High Altitude Kit (Propane)
- –60°F Gas Heat Kit
- Electric Heater Accessory 50" cabinet

Renewal Parts

For authorized replacement parts, call Johnson Controls, Inc. National Source1 Parts Outlet at 1-866-525-9670.

Approvals

Design certified by CSA as follows:

1. For use as a cooling only unit, cooling unit with supplemental electric heat or a forced air furnace.
2. For outdoor installation only.
3. For installation on combustible material and may be installed directly on combustible flooring or, in the U.S., on wood flooring or Class A, Class B or Class C roof covering materials.
4. For use with natural gas (convertible to LP with kit).

⚠ CAUTION

This product must be installed in strict compliance with the enclosed installation instructions and any applicable local, state, and national codes including, but not limited to, building, electrical, and mechanical codes.

⚠WARNING

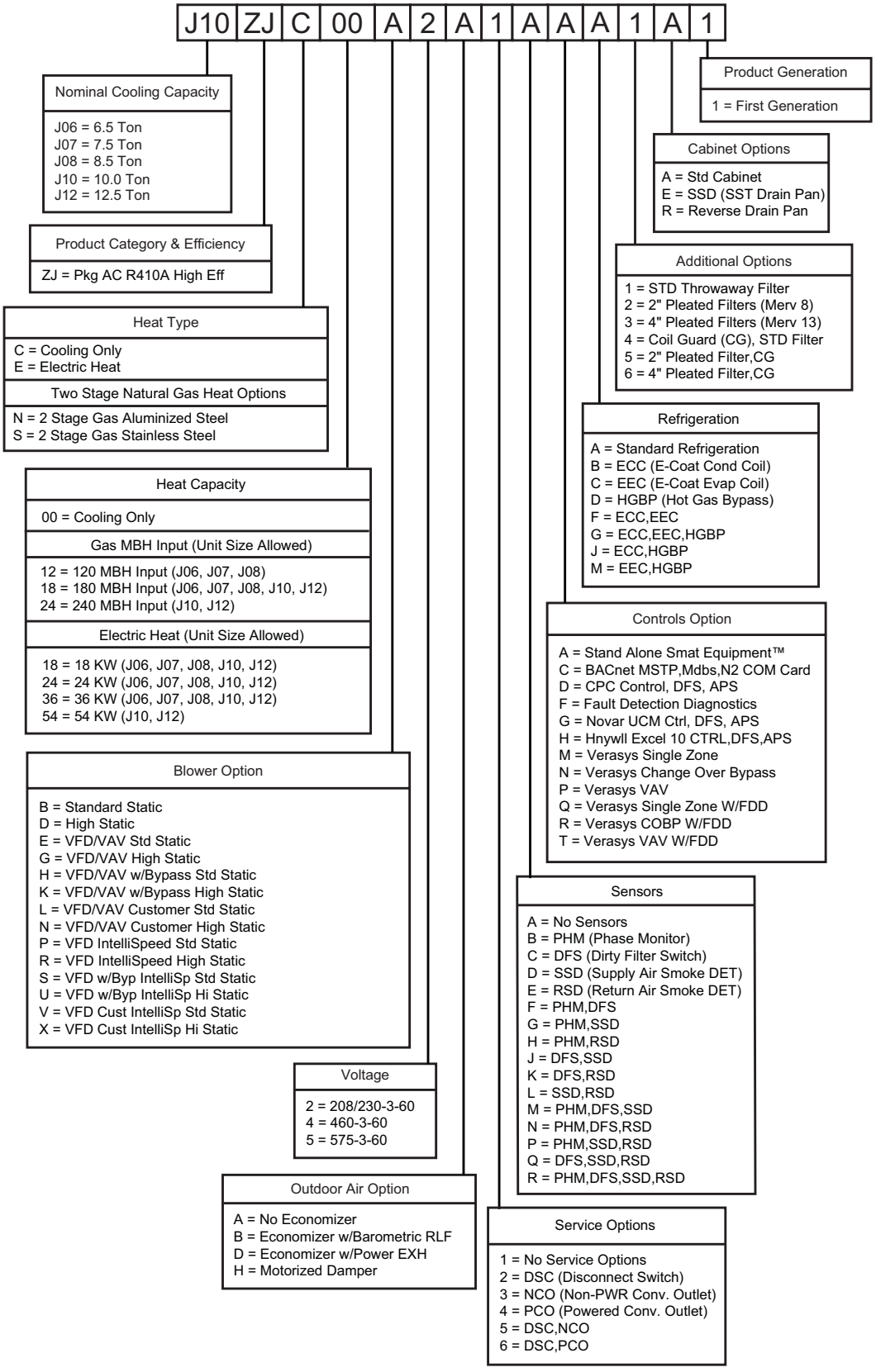
Improper installation may create a condition where the operation of the product could cause personal injury or property damage.

⚠ CAUTION

This system uses R-410A Refrigerant which operates at higher pressures than R-22. No other refrigerant may be used in this system.

Nomenclature

6.5-12.5 Ton J**ZJ Johnson Controls® Model Number Nomenclature



Installation

Installation Safety Information

Read these instructions before continuing this appliance installation. This is an outdoor combination heating and cooling unit. The installer must assure that these instructions are made available to the consumer and with instructions to retain them for future reference.

1. Refer to the unit rating plate for the approved type of gas for this product.
2. Install this unit only in a location and position as specified on Page 7 of these instructions.
3. Never test for gas leaks with an open flame. Use commercially available soap solution made specifically for the detection of leaks when checking all connections, as specified on Pages 5, 33, 33 and 58 of these instructions.
4. Always install furnace to operate within the furnace's intended temperature-rise range with the duct system and within the allowable external static pressure range, as specified on the unit name/rating plate, specified on Page 60 of these instructions.
5. This equipment is not to be used for temporary heating of buildings or structures under construction.

⚠WARNING

FIRE OR EXPLOSION HAZARD

Failure to follow the safety warning exactly could result in serious injury, death or property damage.

Never test for gas leaks with an open flame. use a commercially available soap solution made specifically for the detection of leaks to check all connections. A fire or explosion may result causing property damage, personal injury or loss of life.

Preceding Installation

1. Remove the two screws holding the brackets in the front, rear and compressor side fork-lift slots.

Figure 1: Unit Shipping Bracket

2. Turn each bracket toward the ground and the protective plywood covering will drop to the ground.
3. Remove the condenser coil external protective covering prior to operation.
4. Remove the toolless doorknobs and instruction packet prior to installation.

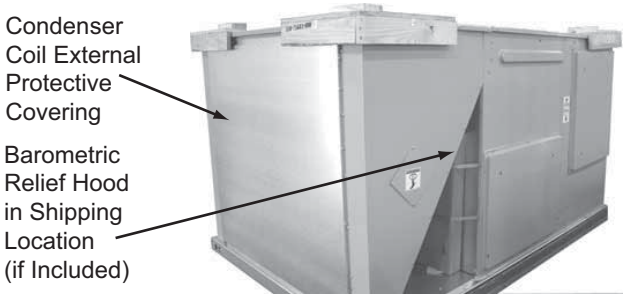


Figure 2: Condenser Covering

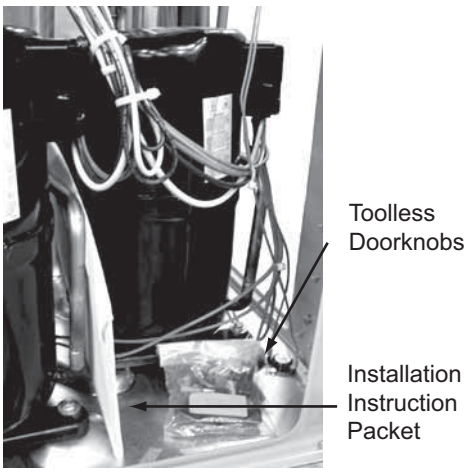


Figure 3: Compressor Section

5. If a factory option convenience outlet is installed, the weatherproof outlet cover must be field installed. The cover shall be located behind the filter access panel. To install the cover, remove the shipping label covering the convenience outlet, follow the instructions on the back of the weatherproof cover box, and attach the cover to the unit using the (4) screws provided.

⚠ CAUTION

208/230-3-60 and 380/415-3-50 units with factory installed Powered Convenience Outlet Option are wired for 230v and 415v power supply respectively. Change tap on transformer for 208-3-60 or 380-3-50 operation. See unit wiring diagram.

Limitations

These units must be installed in accordance with the following:

<u>In U.S.A.:</u>

1. National Electrical Code, ANSI/NFPA No. 70 - Latest Edition
2. National Fuel Gas Code, ANSI Z223.1 - Latest Edition

3. Gas-Fired Central Furnace Standard, ANSI Z21.47 Latest Edition
4. Local building codes, and
5. Local gas utility requirements

In Canada:

1. Canadian Electrical Code, CSA C22.1
2. Installation Codes, CSA - B149.1.
3. Local plumbing and waste water codes, and
4. Other applicable local codes.

Refer to unit application data found in this document.

After installation, gas fired units must be adjusted to obtain a temperature rise within the range specified on the unit rating plate.

If components are to be added to a unit to meet local codes, they are to be installed at the dealer's and/or customer's expense.

Size of unit for proposed installation should be based on heat loss/heat gain calculation made according to the methods of Air Conditioning Contractors of America (ACCA).

This furnace is not to be used for temporary heating of buildings or structures under construction.

⚠ CAUTION

The Smart Equipment™ control board used in this product will effectively operate the cooling system down to 0°F when this product is applied in a comfort cooling application for people. An economizer is typically included in this type of application. When applying this product for process cooling applications (computer rooms, switchgear, etc.), please call the applications department for Unitary Products @ 1-877-UPG-SERV for guidance. Additional accessories may be needed for stable operation at temperatures below 30° F.

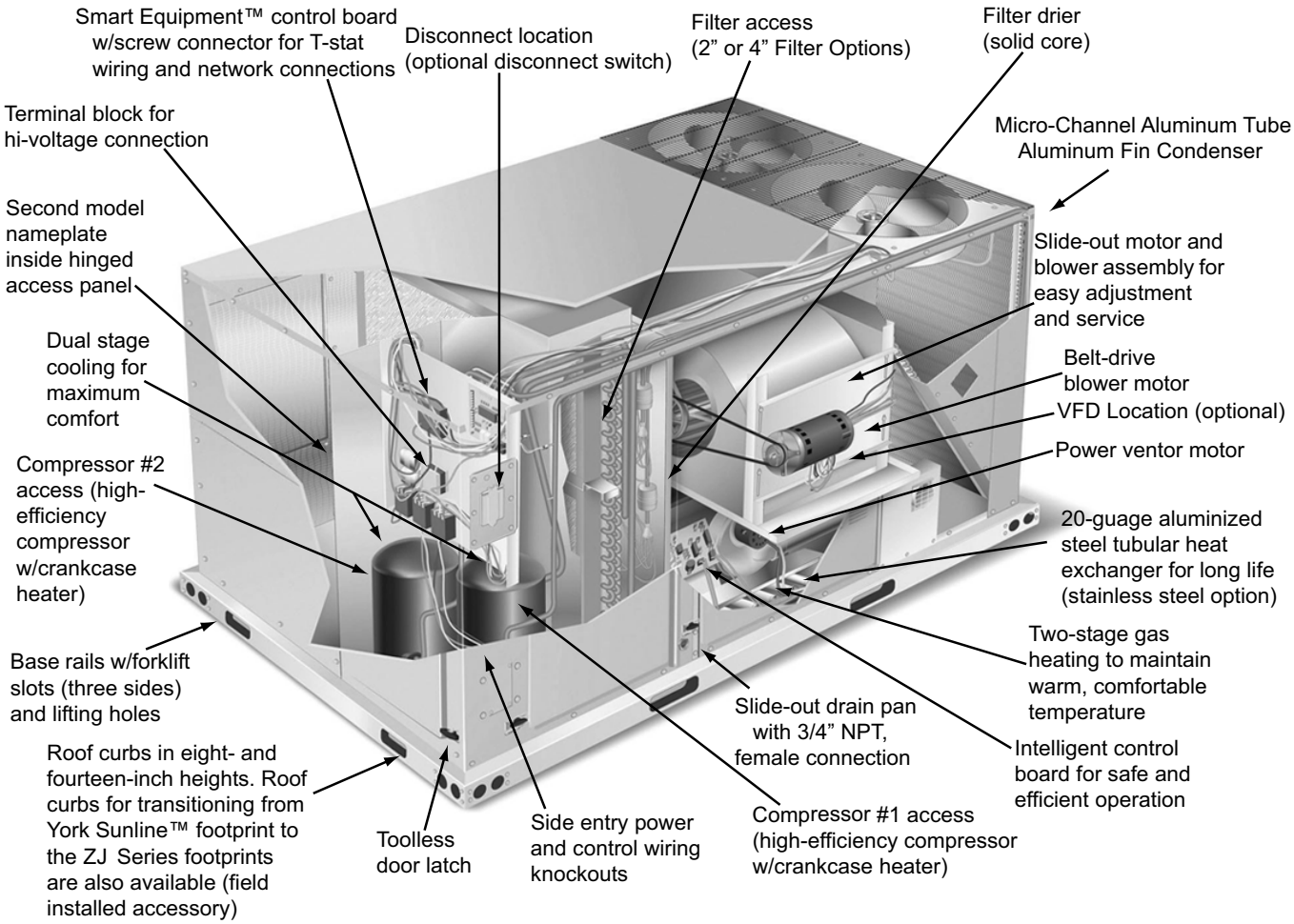


Figure 4: Component Location (J10ZJ Shown)

Table 1: J06 thru 12ZJ Unit Limitations

Size (Tons)	Model	Unit Voltage	Unit Limitations		
			Applied Voltage		Outdoor DB Temp
			Min	Max	Max (°F)
J06 (6.5)	ZJ	208/230-3-60	187	252	125
		460-3-60	432	504	125
		575-3-60	540	630	125
J07 (7.5)	ZJ	208/230-3-60	187	252	125
		460-3-60	432	504	125
		575-3-60	540	630	125
J08 (8.5)	ZJ	208/230-3-60	187	252	125
		460-3-60	432	504	125
		575-3-60	540	630	125
J10 (10)	ZJ	208/230-3-60	187	252	125
		460-3-60	432	504	125
		575-3-60	540	630	125
J12 (12.5)	ZJ	208/230-3-60	187	252	125
		460-3-60	432	504	125
		575-3-60	540	630	125

Location

Use the following guidelines to select a suitable location for these units:

1. Unit is designed for outdoor installation only.
2. Condenser coils must have an unlimited supply of air. Where a choice of location is possible, position the unit on either north or east side of building.
3. Suitable for mounting on roof curb.
4. For ground level installation, use a level concrete slab with a minimum thickness of 4 inches. The length and width should be at least 6 inches greater than the unit base rails. Do not tie slab to the building foundation.
5. Roof structures must be able to support the weight of the unit and its options/accessories. Unit must be installed on a solid, level roof curb or appropriate angle iron frame.
6. Maintain level tolerance to 1/2” across the entire width and length of unit.

⚠WARNING

Excessive exposure of this furnace to contaminated combustion air may result in equipment damage or personal injury. Typical contaminates include: permanent wave solution, chlorinated waxes and cleaners, chlorine based swimming pool chemicals, water softening chemicals, carbon tetrachloride, Halogen type refrigerants, cleaning solvents (e.g. perchloroethylene), printing inks, paint removers, varnishes, hydrochloric acid, cements and glues, antistatic fabric softeners for clothes dryers, masonry acid washing materials.

Clearances

All units require particular clearances for proper operation and service. Installer must make provisions for adequate combustion and ventilation air in accordance with section 5.3 of Air for Combustion and Ventilation of the National Fuel Gas Code, ANSI Z223.1 – Latest Edition (in U.S.A.), or Sections 7.2, 7.3, or 7.4 of Gas Installation Codes, CSA-B149.1 (in Canada) - Latest Edition, and/or applicable provisions of the local building codes. Refer to Table 5 for clearances required for combustible construction, servicing, and proper unit operation.

⚠WARNING

Do not permit overhanging structures or shrubs to obstruct condenser air discharge outlet, combustion air inlet or vent outlets.

Rigging And Handling

Exercise care when moving the unit. Do not remove any packaging until the unit is near the place of installation. Rig the unit by attaching chain or cable slings to the lifting holes provided in the base rails. Spreader bars, whose length exceeds the largest dimension across the unit, **MUST** be used across the top of the unit.

⚠ CAUTION

If a unit is to be installed on a roof curb other than a JCI roof curb, gasketing must be applied to all surfaces that come in contact with the unit underside.

⚠ CAUTION

Before lifting, make sure the unit weight is distributed equally on the rigging cables so it will lift evenly.

Units may be moved or lifted with a forklift. Slotted openings in the base rails are provided for this purpose.

LENGTH OF FORKS MUST BE A MINIMUM OF 60 INCHES.

⚠ CAUTION

All panels must be secured in place when the unit is lifted.

The condenser coils should be protected from rigging cable damage with plywood or other suitable material.

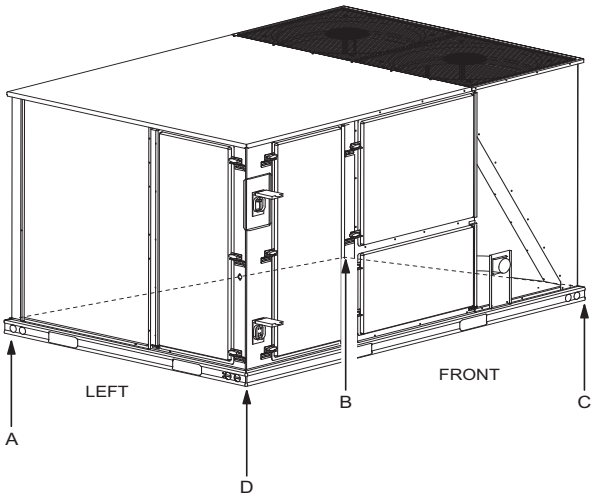


Figure 5: Unit 4 Point Load Weight

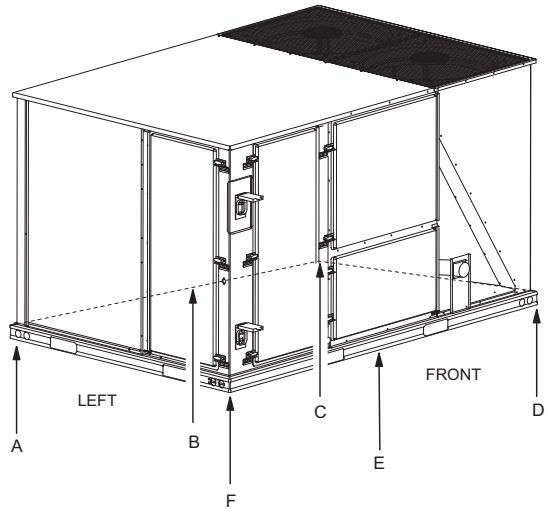


Figure 6: Unit 6 Point Load Weight

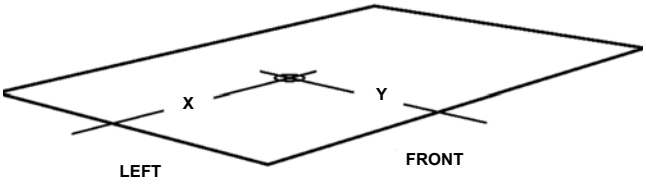


Figure 7: Center of Gravity

Table 2: Weights and Dimensions

Size (Tons)	Model	Weight (lbs.)		Center of Gravity		4 Point Load Location (lbs.)				6 Point Load Location (lbs.)					
		Shipping	Operating	X	Y	A	B	C	D	A	B	C	D	E	F
J06 (6.5)	ZJ	1035	1030	39	25	245	191	260	333	170	144	122	167	195	232
J07 (7.5)	ZJ	1055	1050	39	25	250	195	265	340	174	146	125	170	199	236
J08 (8.5)	ZJ	1065	1060	38	24	247	184	268	360	173	141	117	171	206	253
J10 (10)	ZJ	1075	1070	39	24	245	191	278	357	170	143	122	178	209	248
J12 (12.5)	ZJ	1285	1280	48	24	240	281	410	350	156	173	192	280	252	227

Table 3: J06 thru 12ZJ Unit Accessory Weights

Unit Accessory	Weight (lbs.)	
	Shipping	Operating
Economizer	90	85
Power Exhaust	40	35
Electric Heat[1]	49	49
Gas Heat[2]	110	110
Variable Frequency Drive[3]	30	30

1. Weight given is for the maximum heater size available (54KW).
2. Weight given is for the maximum number of tube heat exchangers available (8 tube).
3. Weight includes mounting hardware, controls and manual bypass option.

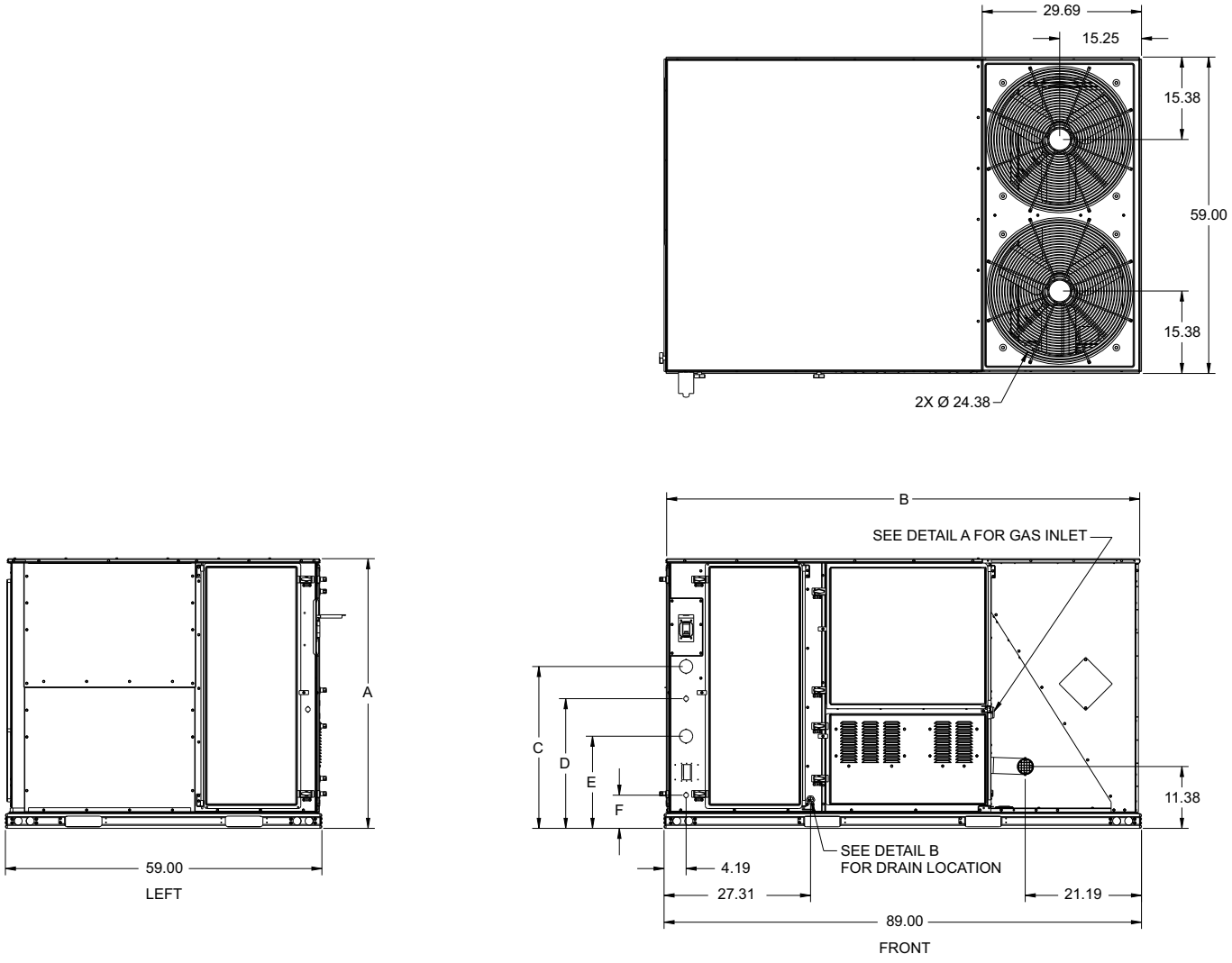


Figure 8: J06 thru 10ZJ Physical Dimensions

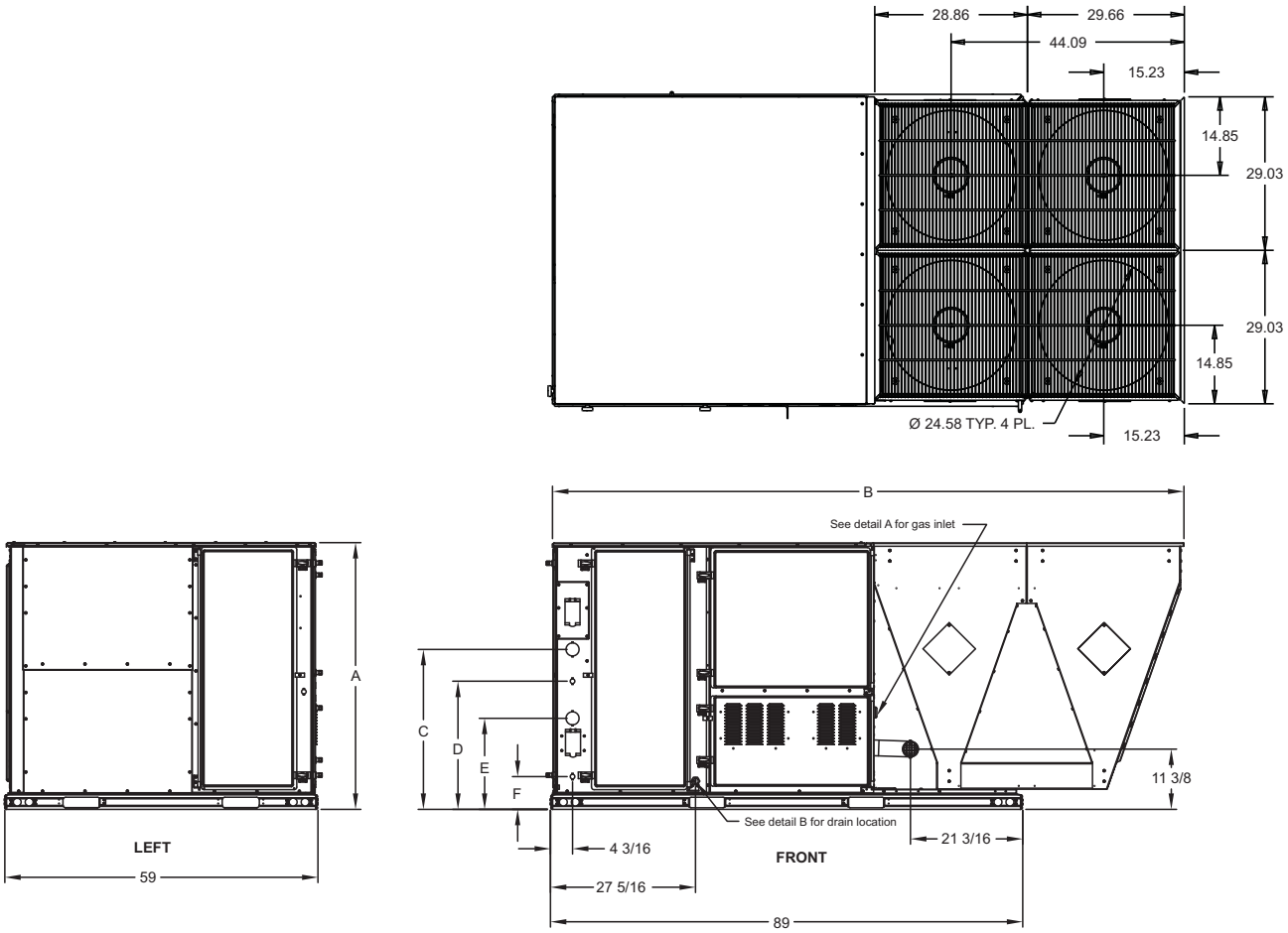
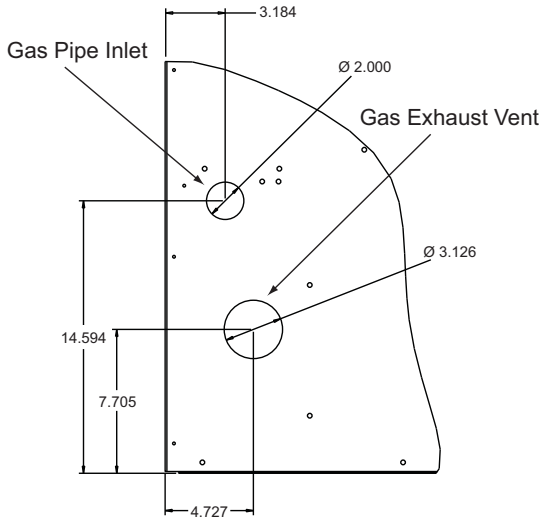


Figure 9: J12ZJ Physical Dimensions

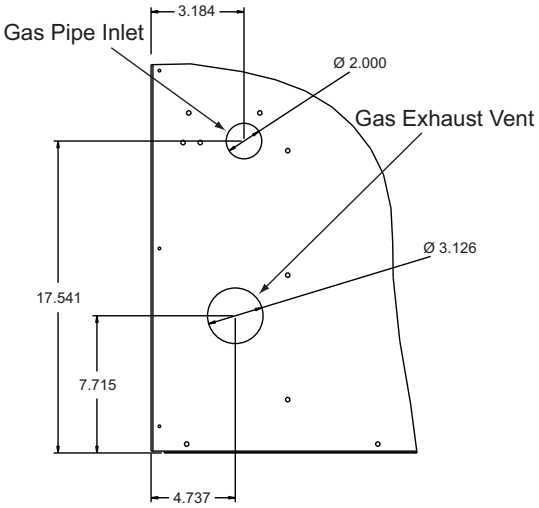
Table 4: J06 thru 12ZJ Unit Physical Dimensions

Unit Model Number	Dimension (in.)					
	A	B	C	D	E	F
J06ZJ	50 3/4	89	30 3/16	24 3/16	17 3/16	6 3/16
J07ZJ	50 3/4	89	30 3/16	24 3/16	17 3/16	6 3/16
J08ZJ	50 3/4	89	30 3/16	24 3/16	17 3/16	6 3/16
J10ZJ	50 3/4	89	30 3/16	24 3/16	17 3/16	6 3/16
J12ZJ	50 3/4	119 1/2	30 3/16	24 3/16	17 3/16	6 3/16

Detail A



42" CABINET



50 3/4" CABINET

Detail B

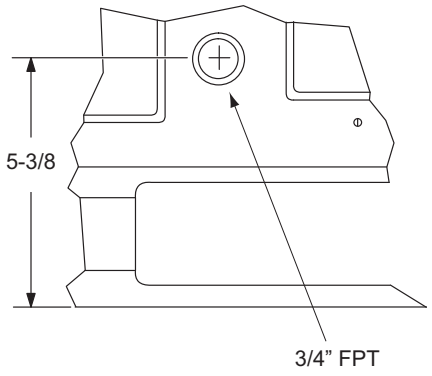
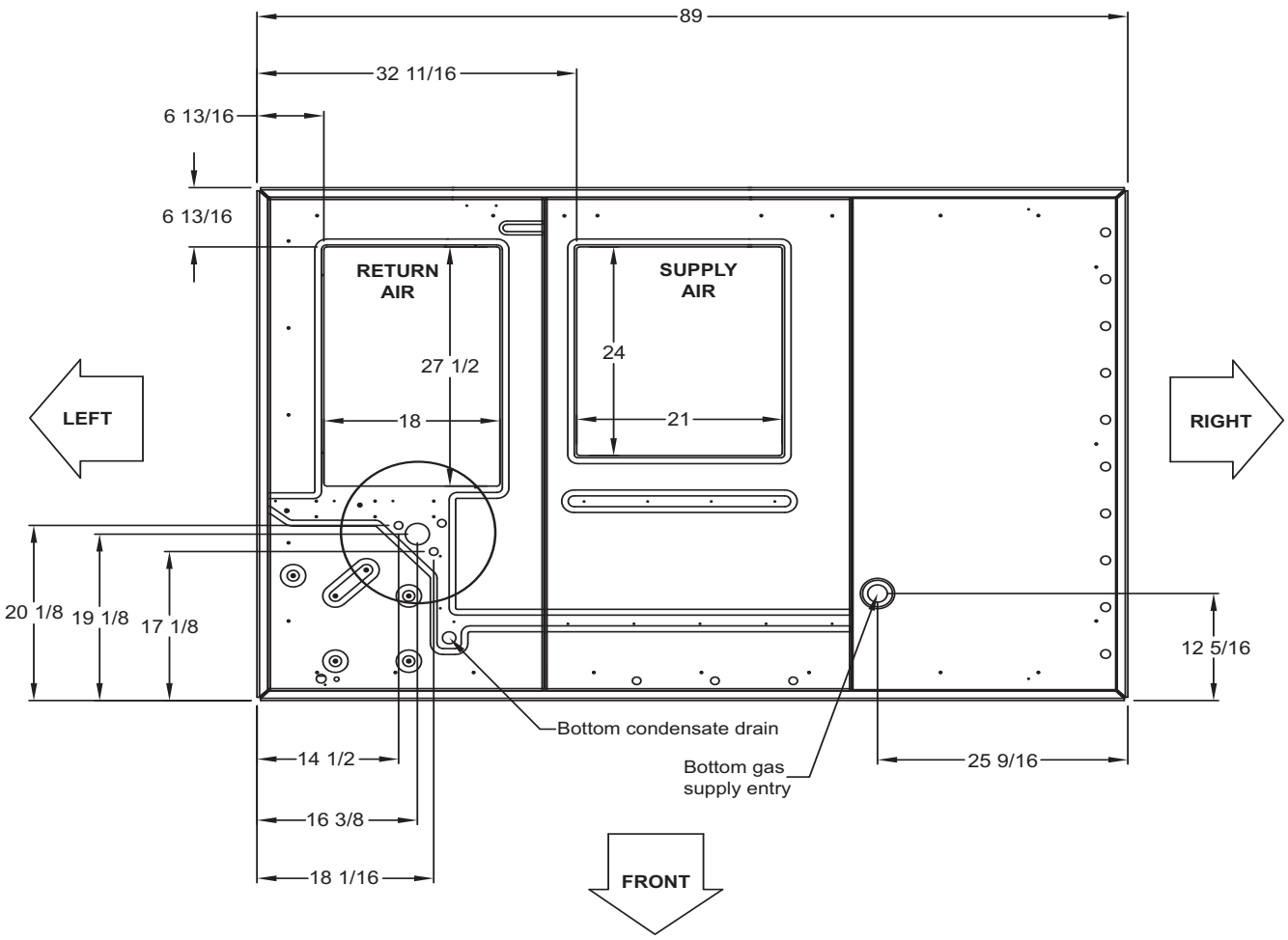


Table 5: J06 thru 12ZJ Unit Clearances

Direction	Distance (in.)	Direction	Distance (in.)
Top[1]	72	Right	12
Front	36	Left	36
Rear	36	Bottom[2]	0

1. Units must be installed outdoors. Over hanging structure or shrubs should not obscure condenser air discharge outlet.
2. Units may be installed on combustable floors made from wood or class A, B or C roof covering materials.



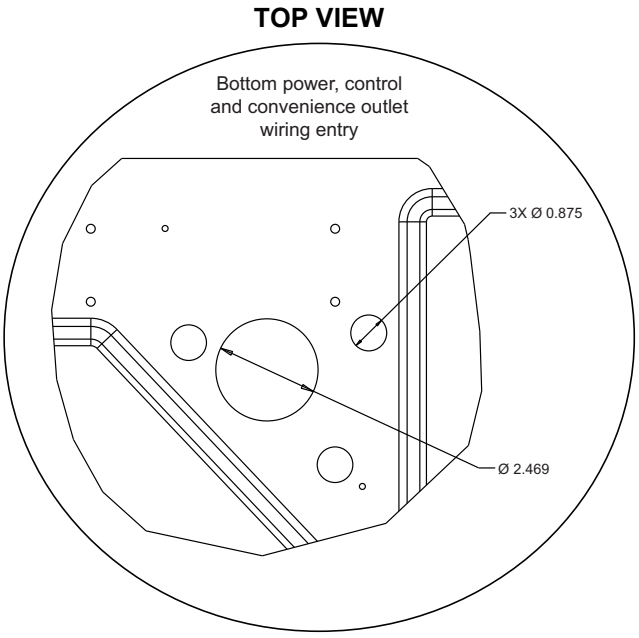


Figure 10: J06 thru 12ZJ Unit Bottom Duct Openings

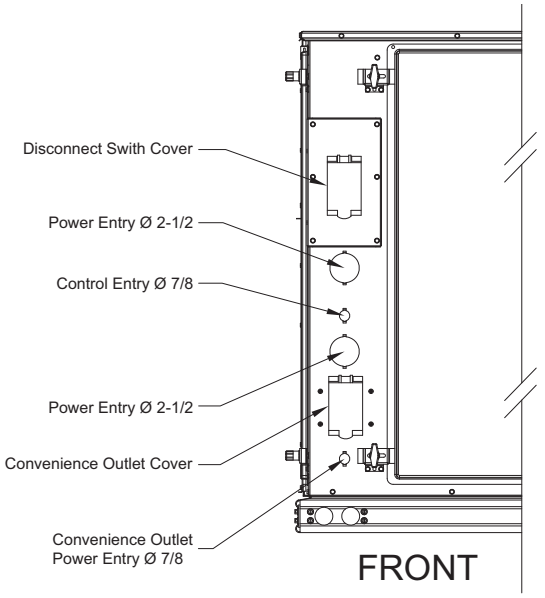


Figure 11: J06 thru 12ZJ Unit Electrical Entry

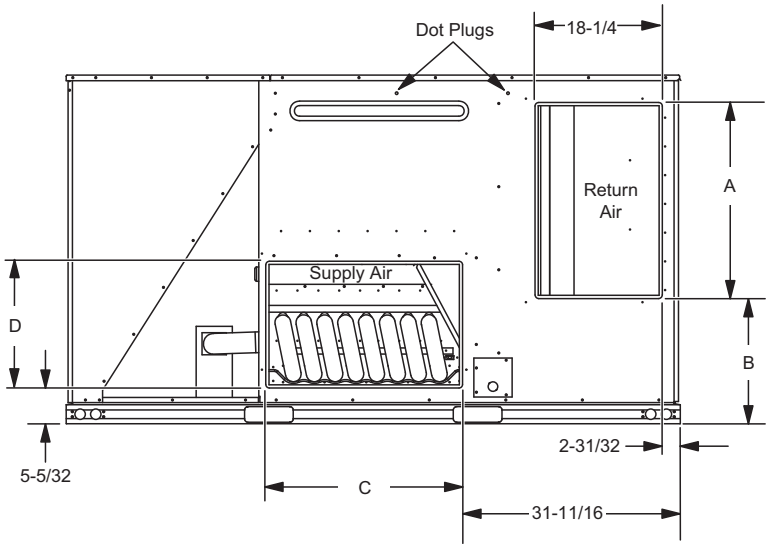


Figure 12: J06 thru 10ZJ Unit Side Duct Openings

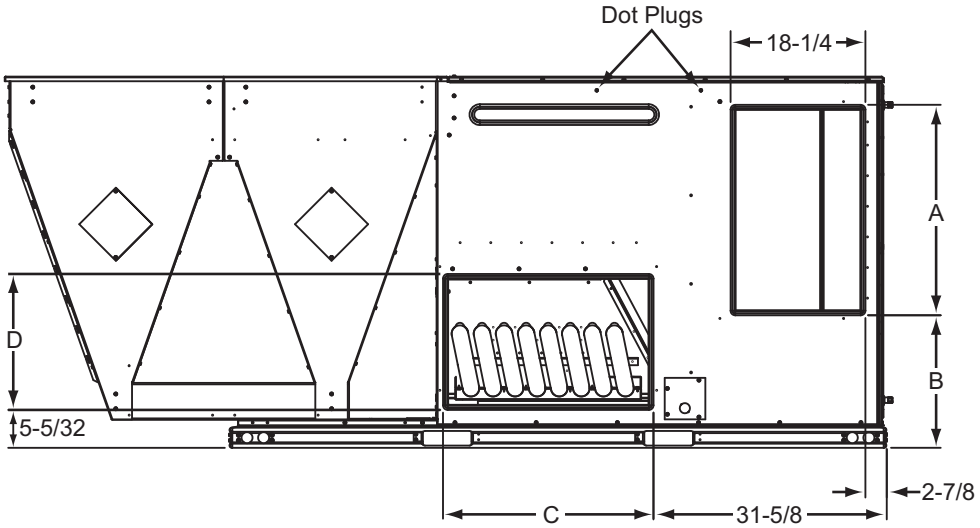


Figure 13: J12ZJ Unit Side Duct Openings

Table 6: Side Duct Dimensions

Unit Model Number	Dimension (in.)			
	A	B	C	D
J06ZJ	28 1/4	18 1/16	28 1/4	18 1/4
J07ZJ	28 1/4	18 1/16	28 1/4	18 1/4
J08ZJ	28 1/4	18 1/16	28 1/4	18 1/4
J10ZJ	28 1/4	18 1/16	28 1/4	18 1/4
J12ZJ	28 1/4	18 1/16	28 1/4	18 1/4

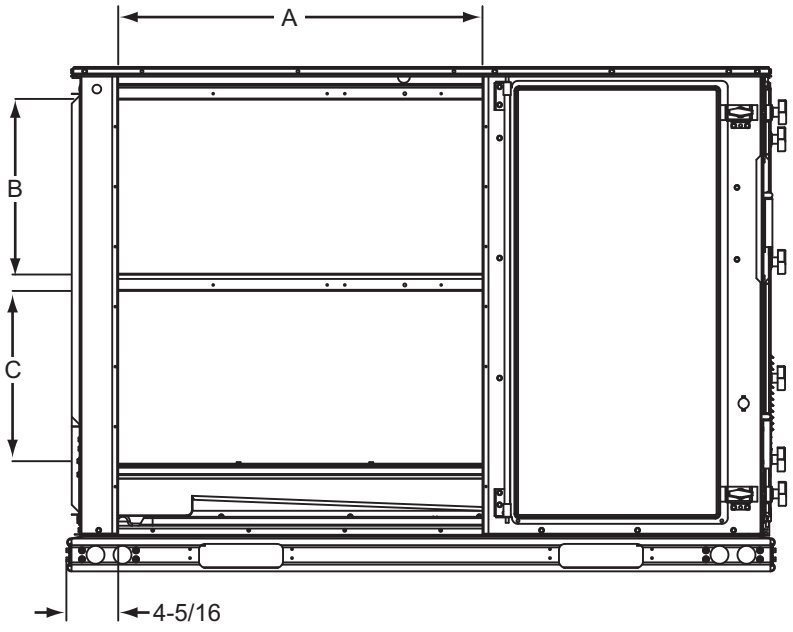


Figure 14: J06 thru 12ZJ Unit Left/End Duct Opening

Table 7: Left/End Duct Dimensions

Unit Model Number	Dimension (in.)		
	A	B	C
J06ZJ	30.358	22.580	22.330
J07ZJ	30.358	22.580	22.330
J08ZJ	30.358	22.580	22.330
J10ZJ	30.358	22.580	22.330
J12ZJ	30.358	22.580	22.330

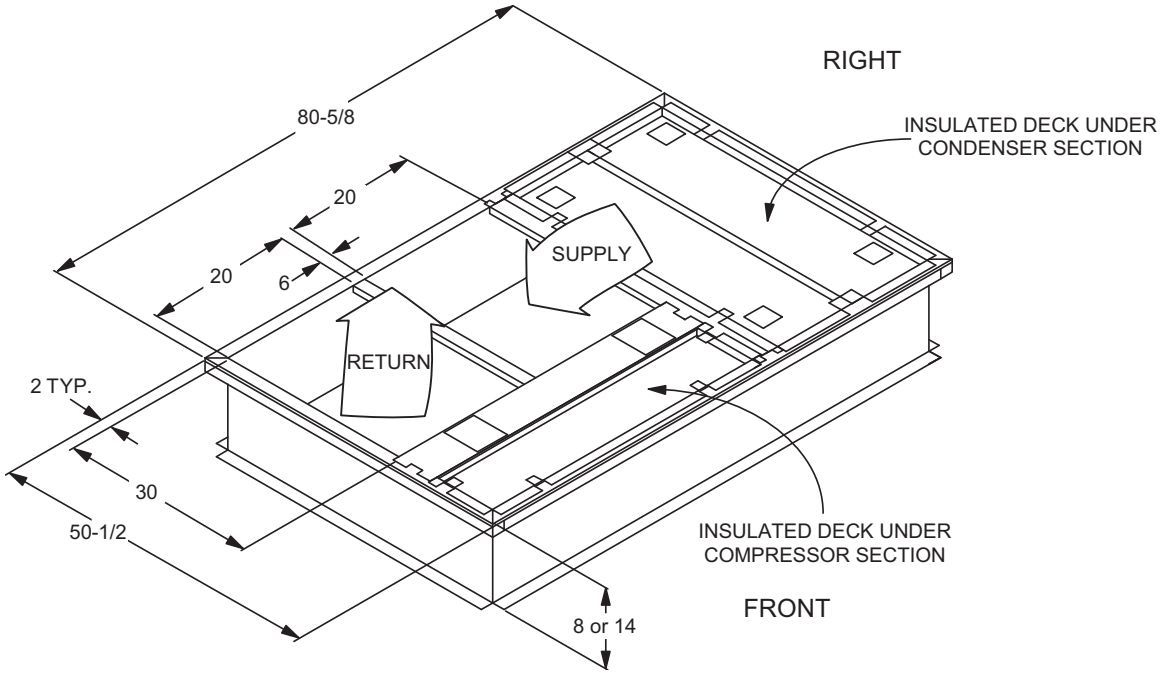


Figure 15: J06 thru 12ZJ Roof Curb

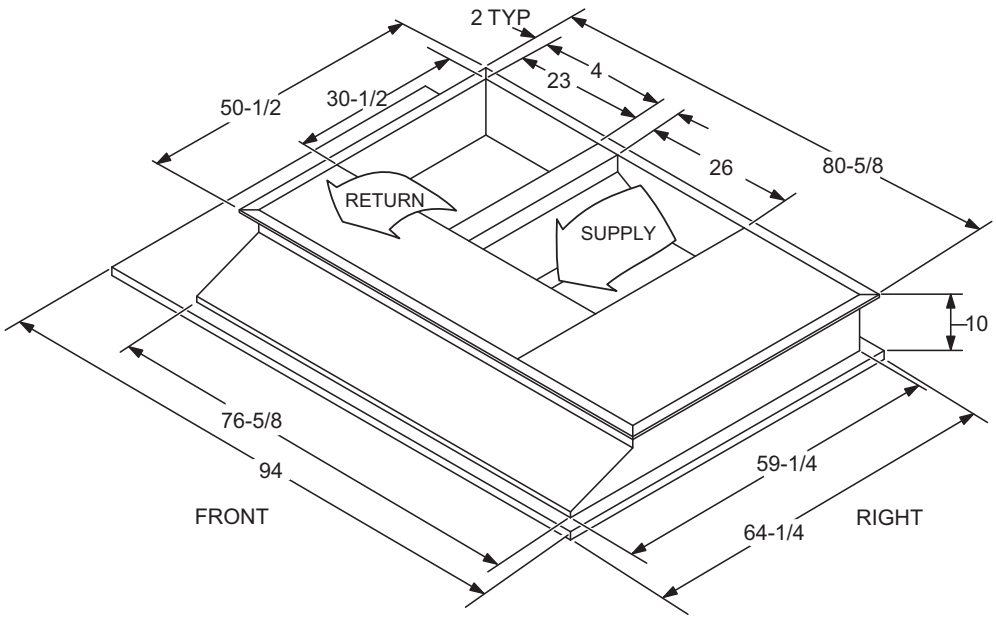


Figure 16: J06 thru 12ZJ Transition Roof Curb

Ductwork

Ductwork should be designed and sized according to the methods in Manual D of the Air Conditioning Contractors of America (ACCA) or as recommended by any other recognized authority such as ASHRAE or SMACNA.

A closed return duct system should be used. This will not preclude use of economizers or outdoor fresh air intake. The supply and return air duct connections at the unit should be made with flexible joints to minimize noise.

The supply and return air duct systems should be designed for the CFM and static pressure requirements of the job. They should NOT be sized to match the dimensions of the duct connections on the unit.

Refer to Figure 10 for bottom air duct openings. Refer to Figures 12, 13 and Table 6 for side air duct openings.

Duct Covers

Units are shipped with the side duct openings covered and a covering over the bottom of the unit. For bottom duct application, no duct cover changes are necessary. For side duct application, remove the side duct covers and install over the bottom duct openings. The panels removed from the side duct connections are designed to be reused by securing each panel to its respective down flow opening. But keep in mind that the supply panel is installed with the painted surface UP, facing the heat exchanger, while the return panel is installed with the painted surface DOWN, facing the down flow duct opening. The supply panel is secured with the bracket (already in place from the factory) and two screws. It's a snug fit for the panel when sliding it between the heat exchanger and unit bottom, but there is room. The return panel is secured with four screws.

⚠ CAUTION

When fastening ductwork to side duct flanges on unit, insert screws through duct flanges only. DO NOT insert screws through casing. Outdoor ductwork must be insulated and water-proofed.

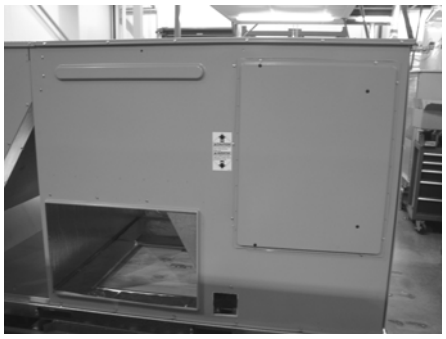


Figure 17: Side Panels With Hole Plugs

NOTE: Orientation. Panel is "insulation" side up.

Figure 18: Return Downflow Plenum With Panel

Figure 19: Discharge Panel In Place

Side Panels

Units are shipped with side panels to cover the area where an economizer or motorized damper may be installed. These panels must be saved and used as tops for the Economizer rain hoods (See Figure 20)

Figure 20: Save Side Panels For Economizer Hood Tops

Condensate Drain

The side condensate drain is reversible and maybe re-oriented to the rear of the cabinet to facilitate condensate piping. A condensate drain connection is available through the base pan

for piping inside the roof curb. Trap the connection per Figure 21. The trap and drain lines should be protected from freezing.

Plumbing must conform to local codes. Use a sealing compound on male pipe threads. Install condensate drain line from the 3/4 inch NPT female connection on the unit to an open drain.

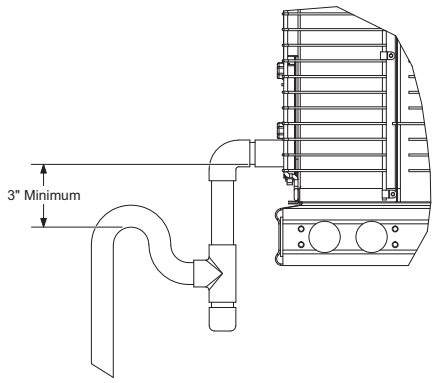


Figure 21: Condensate Drain

Compressors

The scroll compressor used in this product is specifically designed to operate with R-410A Refrigerant and cannot be interchanged.

⚠ CAUTION

This system uses R-410A Refrigerant which operates at higher pressures than R-22. No other refrigerant may be used in this system.

The compressor also uses a polyolester (POE oil), Mobil 3MA POE. This oil is extremely hygroscopic, meaning it absorbs water readily. POE oil can absorb 15 times as much water as other oils designed for HCFC and CFC refrigerants. Take all necessary precautions to avoid exposure of the oil to the atmosphere.

⚠ CAUTION

Do not leave the system open to the atmosphere. Unit damage could occur due to moisture being absorbed by the **POE oil** in the system. This type of oil is highly susceptible to moisture absorption

POE (polyolester) compressor lubricants are known to cause long term damage to some synthetic roofing materials.

⚠ CAUTION

Exposure, even if immediately cleaned up, may cause embrittlement (leading to cracking) to occur in one year or more. When performing any service that may risk exposure of compressor oil to the roof, take precautions to protect roofing.

Procedures which risk oil leakage include, but are not limited to, compressor replacement, repairing refrigerant leaks, replacing refrigerant components such as filter drier, pressure switch, metering device or coil.

Units are shipped with compressor mountings which are factory-adjusted and ready for operation.

⚠ CAUTION

Do not loosen compressor mounting bolts.

Filters

Two-inch filters are supplied with each unit. One-inch filters may be used with no modification to the filter racks. Filters must always be installed ahead of evaporator coil and must be kept clean or replaced with same size and type. Dirty filters reduce the capacity of the unit and result in frosted coils or safety shutdown. Refer to physical data tables, for the number and size of filters needed for the unit. The unit should not be operated without filters properly installed.

⚠ CAUTION

Make sure that panel latches are properly positioned on the unit to maintain an airtight seal.

Power And Control Wiring

Field wiring to the unit, fuses, and disconnects must conform to provisions of National Electrical Code (NEC), ANSI/NFPA No. 70 – Latest Edition (in U.S.A.), current Canadian Electrical Code C221, and/or local ordinances. The unit must be electrically grounded in accordance with NEC and CEC as specified above and/or local codes.

Voltage tolerances which must be maintained at the compressor terminals during starting and running conditions are indicated on the unit Rating Plate and Table 1.

⚠ CAUTION

208/230-3-60 and 380/415-3-50 units control transformers are factory wired for 230v and 415v power supply respectively. Change tap on transformer for 208-3-60 or 380-3-50 operation. See unit wiring diagram.

The internal wiring harnesses furnished with this unit are an integral part of the design certified unit. Field alteration to comply with electrical codes should not be required. If any of the wire supplied with the unit must be replaced, replacement wire must be of the type shown on the wiring diagram and the same minimum gauge as the replaced wire.

A disconnect must be utilized for these units. Factory installed disconnects are available. If installing a disconnect (field supplied or Johnson Controls supplied accessory), refer to Figure 4 for the recommended mounting location.

⚠ CAUTION

Avoid damage to internal components if drilling holes for disconnect mounting.

NOTE: Since not all local codes allow the mounting of a disconnect on the unit, please confirm compliance with local code before mounting a disconnect on the unit.

Electrical line must be sized properly to carry the load. USE COPPER CONDUCTORS ONLY. Each unit must be wired with a separate branch circuit fed directly from the meter panel and properly fused.

Refer to Figures 22, 23 and 24 for typical field wiring and to the appropriate unit wiring diagram mounted inside control doors for control circuit and power wiring information.

⚠ CAUTION

When connecting electrical power and control wiring to the unit, water-proof connectors must be used so that water or moisture cannot be drawn into the unit during normal operation. The above water-proofing conditions will also apply when installing a field supplied disconnect switch.

Power Wiring Detail

Units are factory wired for the voltage shown on the unit nameplate. Refer to Electrical Data Table 9 to size power wiring, fuses, and disconnect switch.

Power wiring is brought into the unit through the side of the unit or the basepan inside the curb.

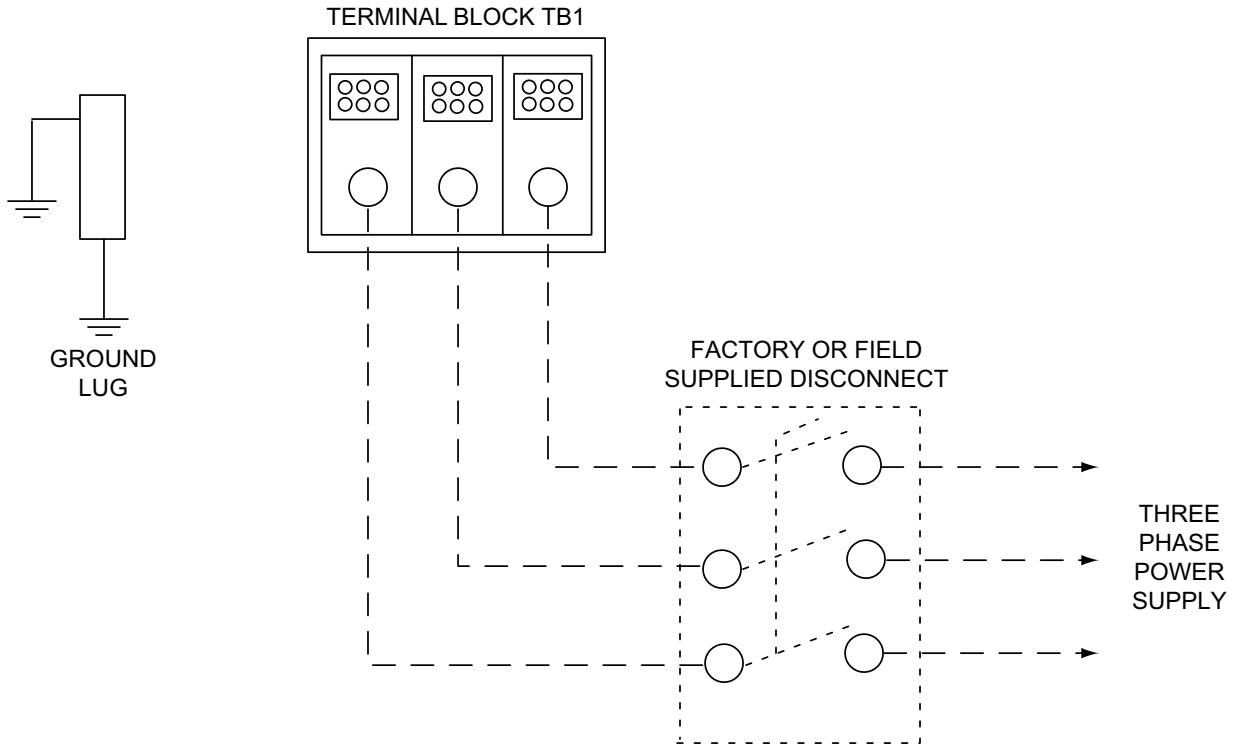


Figure 22: Field Wiring Disconnect - Cooling Unit With/Without Electric Heat and All Units With VFD Option

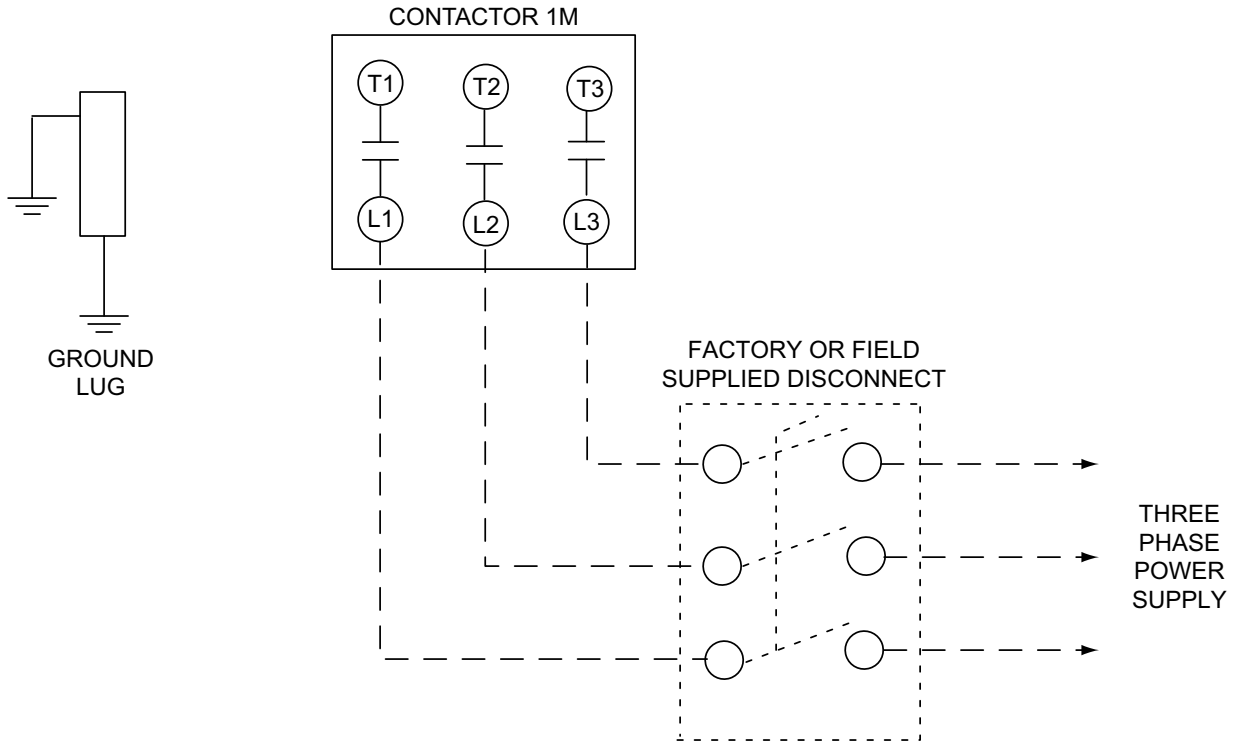


Figure 23: Field Wiring Disconnect - Cooling Unit With Gas Heat Without VFD Option

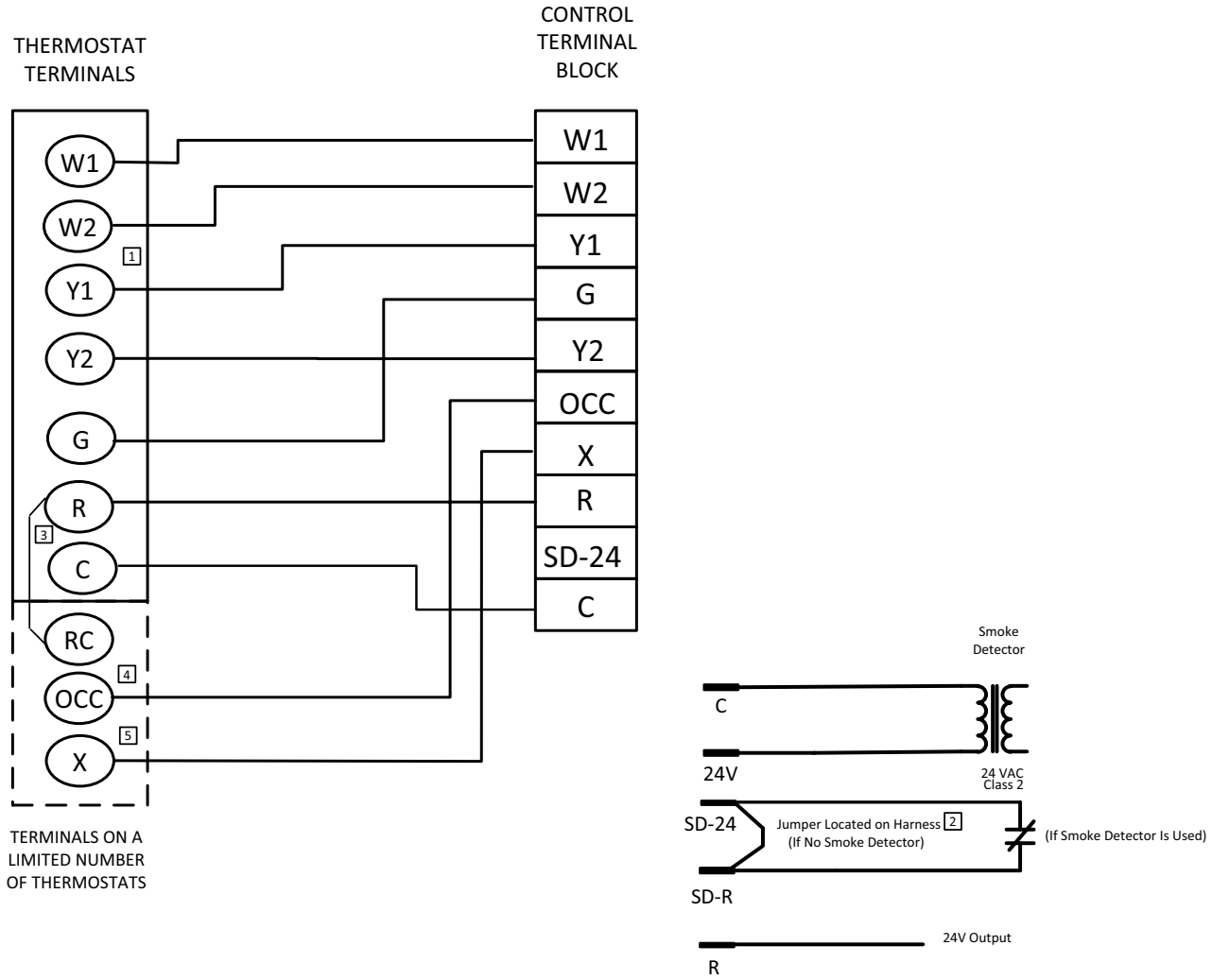
Thermostat Wiring (Not applicable to units with VFD)

The thermostat should be located on an inside wall approximately 56 inch above the floor where it will not be subject to drafts, sun exposure or heat from electrical fixtures or appliances. Follow the manufacturer's instructions enclosed with thermostat for general installation procedure. Color-coded, insulated wires should be used to connect the thermostat to the unit. Refer to Table 8 for control wire sizing and maximum length.

Table 8: Control Wire Sizes

Wire Size	Maximum Length[1]
18 AWG	150 Feet

1. From the unit to the thermostat and back to the unit.



1 Second stage heating not required on single stage heating units.

2 Jumper is required if there is no Smoke Detector circuit.

3 Jumper is required for any combination of R, RC, or RH.

4 OCC is an output from the thermostat to indicate the Occupied condition.

5 X is an input to the thermostat to display Error Status conditions.

Figure 24: Typical Electronic Thermostat Field Wiring

⚠ CAUTION

208/230-3-60 and 380/415-3-50 units control transformers are factory wired for 230v and 415v power supply respectively. Change tap on transformer for 208-3-60 or 380-3-50 operation. See unit wiring diagram.

Table 9: Electrical Data

J06 thru 12ZJ Standard Motor - Without Powered Convenience Outlet

Size (Tons)	Volt	Compressors (each)			OD Fan Motors (each)	Supply Blower Motor	Pwr Exh Motor	Pwr Conv Outlet	Electric Heat Option				MCA[1] (Amps)	MCA[1] w/Pwr Exh (Amps)	Max Fuse[2]/ Breaker[3] Size (Amps)	Max Fuse[2]/ Breaker[3] Size w/ Pwr Exh (Amps)
		RLA	LRA	MCC	FLA	FLA	FLA	FLA	Model	kW	Stages	Amps				
J06 (6.5)	208	9.3	68.0	14.5	2.1	5.2	5.5	0.0	None	-	-	-	30.3	35.8	35	45
									E09	6.8	1	18.9	30.3	37.0	35	45
									E18	13.5	2	37.5	53.3	60.2	60	70
									E24	18.0	2	50.0	69.0	75.8	70	80
									E36	25.5	2	70.8	95.0	101.9	100	110
	230	9.3	68.0	14.5	2.1	5.2	5.5	0.0	None	-	-	-	30.3	35.8	35	45
									E09	9.0	1	21.7	33.6	40.4	35	45
									E18	18.0	2	43.3	60.6	67.5	70	70
									E24	24.0	2	57.7	78.7	85.5	80	90
									E36	34.0	2	81.8	108.7	115.6	110	125
	460	4.9	34.0	7.6	1.3	2.6	2.2	0.0	None	-	-	-	16.1	18.3	20	20
									E09	9.0	1	10.8	16.8	19.5	20	20
									E18	18.0	2	21.7	30.3	33.1	35	35
									E24	24.0	2	28.9	39.3	42.1	40	45
									E36	34.0	2	40.9	54.4	57.1	60	60
	575	3.8	28.0	6.0	0.7	2.0	1.8	0.0	None	-	-	-	11.9	13.7	15	15
									E09	9.0	1	8.7	13.3	15.6	15	20
									E18	18.0	2	17.3	24.2	26.4	25	30
									E24	24.0	2	23.1	31.4	33.6	35	35
									E36	34.0	2	32.7	43.4	45.6	45	50
J07 (7.5)	208	11.9	88.0	18.5	3.0	5.2	5.5	0.0	None	-	-	-	38.0	43.5	45	50
									E09	6.8	1	18.9	38.0	43.5	45	50
									E18	13.5	2	37.5	53.3	60.2	60	70
									E24	18.0	2	50.0	69.0	75.8	70	80
									E36	25.5	2	70.8	95.0	101.9	100	110
	230	11.9	88.0	18.5	3.0	5.2	5.5	0.0	None	-	-	-	38.0	43.5	45	50
									E09	9.0	1	21.7	38.0	43.5	45	50
									E18	18.0	2	43.3	60.6	67.5	70	70
									E24	24.0	2	57.7	78.7	85.5	80	90
									E36	34.0	2	81.8	108.7	115.6	110	125
	460	5.2	44.0	8.1	1.6	2.6	2.2	0.0	None	-	-	-	17.5	19.7	20	20
									E09	9.0	1	10.8	17.5	19.7	20	20
									E18	18.0	2	21.7	30.3	33.1	35	35
									E24	24.0	2	28.9	39.3	42.1	40	45
									E36	34.0	2	40.9	54.4	57.1	60	60
	575	4.8	36.0	7.5	1.4	2.0	1.8	0.0	None	-	-	-	15.5	17.3	20	20
									E09	9.0	1	8.7	15.5	17.3	20	20
									E18	18.0	2	17.3	24.2	26.4	25	30
									E24	24.0	2	23.1	31.4	33.6	35	35
									E36	34.0	2	32.7	43.4	45.6	45	50
J08 (8.5)	208	12.2	88.0	19.0	3.0	6.8	5.5	0.0	None	-	-	-	40.3	45.8	50	50
									E09	6.8	1	18.9	40.3	45.8	50	50
									E18	13.5	2	37.5	55.3	62.2	60	70
									E24	18.0	2	50.0	71.0	77.8	80	80
									E36	25.5	2	70.8	97.0	103.9	100	110
	230	12.2	88.0	19.0	3.0	6.8	5.5	0.0	None	-	-	-	40.3	45.8	50	50
									E09	9.0	1	21.7	40.3	45.8	50	50
									E18	18.0	2	43.3	62.6	69.5	70	70
									E24	24.0	2	57.7	80.7	87.5	90	90
									E36	34.0	2	81.8	110.7	117.6	125	125
	460	5.8	44.0	9.0	1.6	3.4	2.2	0.0	None	-	-	-	19.7	21.9	25	25
									E09	9.0	1	10.8	19.7	21.9	25	25
									E18	18.0	2	21.7	31.3	34.1	35	35
									E24	24.0	2	28.9	40.3	43.1	45	45
									E36	34.0	2	40.9	55.4	58.1	60	60
	575	4.4	36.0	5.5	1.4	2.4	1.8	0.0	None	-	-	-	15.0	16.8	15	20
									E09	9.0	1	8.7	15.0	16.8	15	20
									E18	18.0	2	17.3	24.7	26.9	25	30
									E24	24.0	2	23.1	31.9	34.1	35	35
									E36	34.0	2	32.7	43.9	46.1	45	50

J06 thru 12ZJ Standard Motor - Without Powered Convenience Outlet (Continued)

Size (Tons)	Volt	Compressors (each)			OD Fan Motors (each)	Supply Blower Motor	Pwr Exh Motor	Pwr Conv Outlet	Electric Heat Option				MCA[1] (Amps)	MCA[1] w/Pwr Exh (Amps)	Max Fuse[2]/ Breaker[3] Size (Amps)	Max Fuse[2]/ Breaker[3] Size w/ Pwr Exh (Amps)
		RLA	LRA	MCC	FLA	FLA	FLA	FLA	Model	kW	Stages	Amps				
J10 (10)	208	16.0	110.0	24.9	3.0	6.8	5.5	0.0	None	-	-	-	48.9	54.4	60	70
									E18	13.5	2	37.5	55.3	62.2	60	70
									E24	18.0	2	50.0	71.0	77.8	80	80
									E36	25.5	2	70.8	97.0	103.9	100	110
									E54	40.6	2	112.7	149.4	156.2	150	175
	230	16.0	110.0	24.9	3.0	6.8	5.5	0.0	None	-	-	-	48.9	54.4	60	70
									E18	18.0	2	43.3	62.6	69.5	70	70
									E24	24.0	2	57.7	80.7	87.5	90	90
									E36	34.0	2	81.8	110.7	117.6	125	125
									E54	54.0	2	129.9	138.4	145.3	150	175
	460	7.8	52.0	12.1	1.6	3.4	2.2	0.0	None	-	-	-	24.2	26.4	30	30
									E18	18.0	2	21.7	31.3	34.1	35	35
									E24	24.0	2	28.9	40.3	43.1	45	45
									E36	34.0	2	40.9	55.4	58.1	60	60
									E54	54.0	2	65.0	69.2	72.0	80	80
	575	5.7	38.9	8.9	1.4	2.4	1.8	0.0	None	-	-	-	17.9	19.7	20	25
									E18	18.0	2	17.3	24.7	26.9	25	30
									E24	24.0	2	23.1	31.9	34.1	35	35
									E36	34.0	2	32.7	43.9	46.1	45	50
									E54	54.0	2	52.0	55.0	57.2	60	60
J12 (12.5)	208	23.1	160.0	36.0	2.1	9.6	5.5	0.0	None	-	-	-	70.0	75.5	90	90
									E18	13.5	2	37.5	70.0	75.5	90	90
									E24	18.0	2	50.0	74.5	81.3	90	90
									E36	25.5	2	70.8	100.5	107.4	110	110
									E54	40.6	2	112.7	152.9	159.7	175	175
	230	23.1	160.0	36.0	2.1	9.6	5.5	0.0	None	-	-	-	70.0	75.5	90	90
									E18	18.0	2	43.3	70.0	75.5	90	90
									E24	24.0	2	57.7	84.2	91.0	90	100
									E36	34.0	2	81.8	114.2	121.1	125	125
									E54	54.0	2	129.9	141.9	148.8	175	175
	460	12.2	87.0	19.0	1.3	4.7	2.2	0.0	None	-	-	-	37.2	39.4	45	50
									E18	18.0	2	21.7	37.2	39.4	45	50
									E24	24.0	2	28.9	42.0	44.7	45	50
									E36	34.0	2	40.9	57.0	59.7	60	60
									E54	54.0	2	65.0	70.8	73.6	80	80
	575	8.7	62.0	13.5	0.7	3.6	1.8	0.0	None	-	-	-	25.8	27.6	30	35
									E18	18.0	2	17.3	26.2	28.4	30	35
									E24	24.0	2	23.1	33.4	35.6	35	40
									E36	34.0	2	32.7	45.4	47.6	50	50
									E54	54.0	2	52.0	56.5	58.7	70	70

1. Minimum Circuit Ampacity.
2. Dual Element, Time Delay Type.
3. HACR type per NEC.

J06 thru 12ZJ Hi Static Motor - Without Powered Convenience Outlet

Size (Tons)	Volt	Compressors (each)			OD Fan Motors (each)	Supply Blower Motor	Pwr Exh Motor	Pwr Conv Outlet	Electric Heat Option				MCA[1] (Amps)	MCA[1] w/Pwr Exh (Amps)	Max Fuse[2]/ Breaker[3] Size (Amps)	Max Fuse[2]/ Breaker[3] Size w/ Pwr Exh (Amps)
		RLA	LRA	MCC	FLA	FLA	FLA	FLA	Model	kW	Stages	Amps				
J06 (6.5)	208	9.3	68.0	14.5	2.1	6.8	5.5	0.0	None	-	-	-	31.9	37.4	40	45
									E09	6.8	1	18.9	32.1	39.0	40	45
									E18	13.5	2	37.5	55.3	62.2	60	70
									E24	18.0	2	50.0	71.0	77.8	80	80
									E36	25.5	2	70.8	97.0	103.9	100	110
	230	9.3	68.0	14.5	2.1	6.8	5.5	0.0	None	-	-	-	31.9	37.4	40	45
									E09	9.0	1	21.7	35.6	42.4	40	45
									E18	18.0	2	43.3	62.6	69.5	70	70
									E24	24.0	2	57.7	80.7	87.5	90	90
									E36	34.0	2	81.8	110.7	117.6	125	125
	460	4.9	34.0	7.6	1.3	3.4	2.2	0.0	None	-	-	-	16.9	19.1	20	20
									E09	9.0	1	10.8	17.8	20.5	20	25
									E18	18.0	2	21.7	31.3	34.1	35	35
									E24	24.0	2	28.9	40.3	43.1	45	45
									E36	34.0	2	40.9	55.4	58.1	60	60
	575	3.8	28.0	6.0	0.7	2.4	1.8	0.0	None	-	-	-	12.3	14.1	15	15
									E09	9.0	1	8.7	13.8	16.1	15	20
									E18	18.0	2	17.3	24.7	26.9	25	30
									E24	24.0	2	23.1	31.9	34.1	35	35
									E36	34.0	2	32.7	43.9	46.1	45	50
J07 (7.5)	208	11.9	88.0	18.5	3.0	9.6	5.5	0.0	None	-	-	-	42.4	47.9	50	50
									E09	6.8	1	18.9	42.4	47.9	50	50
									E18	13.5	2	37.5	58.8	65.7	60	70
									E24	18.0	2	50.0	74.5	81.3	80	90
									E36	25.5	2	70.8	100.5	107.4	110	110
	230	11.9	88.0	18.5	3.0	9.6	5.5	0.0	None	-	-	-	42.4	47.9	50	50
									E09	9.0	1	21.7	42.4	47.9	50	50
									E18	18.0	2	43.3	66.1	73.0	70	80
									E24	24.0	2	57.7	84.2	91.0	90	100
									E36	34.0	2	81.8	114.2	121.1	125	125
	460	5.2	44.0	8.1	1.6	4.7	2.2	0.0	None	-	-	-	19.6	21.8	20	25
									E09	9.0	1	10.8	19.6	22.2	20	25
									E18	18.0	2	21.7	32.9	35.7	35	40
									E24	24.0	2	28.9	42.0	44.7	45	45
									E36	34.0	2	40.9	57.0	59.7	60	60
	575	4.8	36.0	7.5	1.4	3.6	1.8	0.0	None	-	-	-	17.1	18.9	20	20
									E09	9.0	1	8.7	17.1	18.9	20	20
									E18	18.0	2	17.3	26.2	28.4	30	30
									E24	24.0	2	23.1	33.4	35.6	35	40
									E36	34.0	2	32.7	45.4	47.6	50	50
J08 (8.5)	208	12.2	88.0	19.0	3.0	9.6	5.5	0.0	None	-	-	-	43.1	48.6	50	60
									E09	6.8	1	18.9	43.1	48.6	50	60
									E18	13.5	2	37.5	58.8	65.7	60	70
									E24	18.0	2	50.0	74.5	81.3	80	90
									E36	25.5	2	70.8	100.5	107.4	110	110
	230	12.2	88.0	19.0	3.0	9.6	5.5	0.0	None	-	-	-	43.1	48.6	50	60
									E09	9.0	1	21.7	43.1	48.6	50	60
									E18	18.0	2	43.3	66.1	73.0	70	80
									E24	24.0	2	57.7	84.2	91.0	90	100
									E36	34.0	2	81.8	114.2	121.1	125	125
	460	5.8	44.0	9.0	1.6	4.7	2.2	0.0	None	-	-	-	21.0	23.2	25	25
									E09	9.0	1	10.8	21.0	23.2	25	25
									E18	18.0	2	21.7	32.9	35.7	35	40
									E24	24.0	2	28.9	42.0	44.7	45	45
									E36	34.0	2	40.9	57.0	59.7	60	60
	575	4.4	36.0	5.5	1.4	3.6	1.8	0.0	None	-	-	-	16.2	18.0	20	20
									E09	9.0	1	8.7	16.2	18.0	20	20
									E18	18.0	2	17.3	26.2	28.4	30	30
									E24	24.0	2	23.1	33.4	35.6	35	40
									E36	34.0	2	32.7	45.4	47.6	50	50

J06 thru 12ZJ Hi Static Motor - Without Powered Convenience Outlet (Continued)

Size (Tons)	Volt	Compressors (each)			OD Fan Motors (each)	Supply Blower Motor	Pwr Exh Motor	Pwr Conv Outlet	Electric Heat Option				MCA[1] (Amps)	MCA[1] w/Pwr Exh (Amps)	Max Fuse[2]/ Breaker[3] Size (Amps)	Max Fuse[2]/ Breaker[3] Size w/ Pwr Exh (Amps)
		RLA	LRA	MCC	FLA	FLA	FLA	FLA	Model	kW	Stages	Amps				
J10 (10)	208	16.0	110.0	24.9	3.0	9.6	5.5	0.0	None	-	-	-	51.7	57.2	60	70
									E18	13.5	2	37.5	58.8	65.7	60	70
									E24	18.0	2	50.0	74.5	81.3	80	90
									E36	25.5	2	70.8	100.5	107.4	110	110
									E54	40.6	2	112.7	152.9	159.7	175	175
	230	16.0	110.0	24.9	3.0	9.6	5.5	0.0	None	-	-	-	51.7	57.2	60	70
									E18	18.0	2	43.3	66.1	73.0	70	80
									E24	24.0	2	57.7	84.2	91.0	90	100
									E36	34.0	2	81.8	114.2	121.1	125	125
									E54	54.0	2	129.9	141.9	148.8	175	175
	460	7.8	52.0	12.1	1.6	4.7	2.2	0.0	None	-	-	-	25.5	27.7	30	35
									E18	18.0	2	21.7	32.9	35.7	35	40
									E24	24.0	2	28.9	42.0	44.7	45	45
									E36	34.0	2	40.9	57.0	59.7	60	60
									E54	54.0	2	65.0	70.8	73.6	80	80
	575	5.7	38.9	8.9	1.4	3.6	1.8	0.0	None	-	-	-	19.1	20.9	20	25
									E18	18.0	2	17.3	26.2	28.4	30	30
									E24	24.0	2	23.1	33.4	35.6	35	40
									E36	34.0	2	32.7	45.4	47.6	50	50
									E54	54.0	2	52.0	56.5	58.7	70	70
J12 (12.5)	208	23.1	160.0	36.0	2.1	14.0	5.5	0.0	None	-	-	-	74.4	79.9	90	100
									E18	13.5	2	37.5	74.4	79.9	90	100
									E24	18.0	2	50.0	80.0	86.8	90	100
									E36	25.5	2	70.8	106.0	112.9	110	125
									E54	40.6	2	112.7	158.4	165.2	175	175
	230	23.1	160.0	36.0	2.1	14.0	5.5	0.0	None	-	-	-	74.4	79.9	90	100
									E18	18.0	2	43.3	74.4	79.9	90	100
									E24	24.0	2	57.7	89.7	96.5	90	100
									E36	34.0	2	81.8	119.7	126.6	125	150
									E54	54.0	2	129.9	147.4	154.3	175	175
	460	12.2	87.0	19.0	1.3	6.6	2.2	0.0	None	-	-	-	39.1	41.3	50	50
									E18	18.0	2	21.7	39.1	41.3	50	50
									E24	24.0	2	28.9	44.3	47.1	50	50
									E36	34.0	2	40.9	59.4	62.1	60	70
									E54	54.0	2	65.0	73.2	76.0	80	90
	575	8.7	62.0	13.5	0.7	5.2	1.8	0.0	None	-	-	-	27.4	29.2	35	35
									E18	18.0	2	17.3	28.2	30.4	35	35
									E24	24.0	2	23.1	35.4	37.6	40	40
									E36	34.0	2	32.7	47.4	49.6	50	50
									E54	54.0	2	52.0	58.5	60.7	70	70

1. Minimum Circuit Ampacity.
2. Dual Element, Time Delay Type.
3. HACR type per NEC.

J06 thru 12ZJ Standard Motor - With Powered Convenience Outlet

Size (Tons)	Volt	Compressors (each)			OD Fan Motors (each)	Supply Blower Motor	Pwr Exh Motor	Pwr Conv Outlet	Electric Heat Option				MCA[1] (Amps)	MCA[1] w/Pwr Exh (Amps)	Max Fuse[2]/ Breaker[3] Size (Amps)	Max Fuse[2]/ Breaker[3] Size w/ Pwr Exh (Amps)
		RLA	LRA	MCC	FLA	FLA	FLA	FLA	Model	kW	Stages	Amps				
J06 (6.5)	208	9.3	68.0	14.5	2.1	5.2	5.5	10.0	None	-	-	-	40.5	46.0	50	50
									E09	6.8	1	18.9	42.6	49.5	50	50
									E18	13.5	2	37.5	65.8	72.7	70	80
									E24	18.0	2	50.0	81.5	88.3	90	90
									E36	25.5	2	70.8	107.5	114.4	110	125
	230	9.3	68.0	14.5	2.1	5.2	5.5	10.0	None	-	-	-	40.5	46.0	50	50
									E09	9.0	1	21.7	46.1	52.9	50	60
									E18	18.0	2	43.3	73.1	80.0	80	80
									E24	24.0	2	57.7	91.2	98.0	100	100
									E36	34.0	2	81.8	121.2	128.1	125	150
	460	4.9	34.0	7.6	1.3	2.6	2.2	5.0	None	-	-	-	21.2	23.4	25	25
									E09	9.0	1	10.8	23.0	25.8	25	30
									E18	18.0	2	21.7	36.6	39.3	40	40
									E24	24.0	2	28.9	45.6	48.3	50	50
									E36	34.0	2	40.9	60.6	63.4	70	70
	575	3.8	28.0	6.0	0.7	2.0	1.8	4.0	None	-	-	-	15.9	17.7	20	20
									E09	9.0	1	8.7	18.3	20.6	20	25
									E18	18.0	2	17.3	29.2	31.4	30	35
									E24	24.0	2	23.1	36.4	38.6	40	40
									E36	34.0	2	32.7	48.4	50.6	50	60
J07 (7.5)	208	11.9	88.0	18.5	3.0	5.2	5.5	10.0	None	-	-	-	48.0	53.5	50	60
									E09	6.8	1	18.9	48.0	53.5	50	60
									E18	13.5	2	37.5	65.8	72.7	70	80
									E24	18.0	2	50.0	81.5	88.3	90	90
									E36	25.5	2	70.8	107.5	114.4	110	125
	230	11.9	88.0	18.5	3.0	5.2	5.5	10.0	None	-	-	-	48.0	53.5	50	60
									E09	9.0	1	21.7	48.0	53.5	50	60
									E18	18.0	2	43.3	73.1	80.0	80	80
									E24	24.0	2	57.7	91.2	98.0	100	100
									E36	34.0	2	81.8	121.2	128.1	125	150
	460	5.2	44.0	8.1	1.6	2.6	2.2	5.0	None	-	-	-	22.5	24.7	25	25
									E09	9.0	1	10.8	23.0	25.8	25	30
									E18	18.0	2	21.7	36.6	39.3	40	40
									E24	24.0	2	28.9	45.6	48.3	50	50
									E36	34.0	2	40.9	60.6	63.4	70	70
	575	4.8	36.0	7.5	1.4	2.0	1.8	4.0	None	-	-	-	19.5	21.3	20	25
									E09	9.0	1	8.7	19.5	21.3	20	25
									E18	18.0	2	17.3	29.2	31.4	30	35
									E24	24.0	2	23.1	36.4	38.6	40	40
									E36	34.0	2	32.7	48.4	50.6	50	60
J08 (8.5)	208	12.2	88.0	19.0	3.0	6.8	5.5	10.0	None	-	-	-	50.3	55.8	60	60
									E09	6.8	1	18.9	50.3	55.8	60	60
									E18	13.5	2	37.5	67.8	74.7	70	80
									E24	18.0	2	50.0	83.5	90.3	90	100
									E36	25.5	2	70.8	109.5	116.4	110	125
	230	12.2	88.0	19.0	3.0	6.8	5.5	10.0	None	-	-	-	50.3	55.8	60	60
									E09	9.0	1	21.7	50.3	55.8	60	60
									E18	18.0	2	43.3	75.1	82.0	80	90
									E24	24.0	2	57.7	93.2	100.0	100	100
									E36	34.0	2	81.8	123.2	130.1	125	150
	460	5.8	44.0	9.0	1.6	3.4	2.2	5.0	None	-	-	-	24.7	26.9	30	30
									E09	9.0	1	10.8	24.7	26.9	30	30
									E18	18.0	2	21.7	37.6	40.3	40	45
									E24	24.0	2	28.9	46.6	49.3	50	50
									E36	34.0	2	40.9	61.6	64.4	70	70
	575	4.4	36.0	5.5	1.4	2.4	1.8	4.0	None	-	-	-	19.0	20.8	20	25
									E09	9.0	1	8.7	19.0	21.1	20	25
									E18	18.0	2	17.3	29.7	31.9	30	35
									E24	24.0	2	23.1	36.9	39.1	40	40
									E36	34.0	2	32.7	48.9	51.1	50	60

J06 thru 12ZJ Standard Motor - With Powered Convenience Outlet (Continued)

Size (Tons)	Volt	Compressors (each)			OD Fan Motors (each)	Supply Blower Motor	Pwr Exh Motor	Pwr Conv Outlet	Electric Heat Option				MCA[1] (Amps)	MCA[1] w/Pwr Exh (Amps)	Max Fuse[2]/ Breaker[3] Size (Amps)	Max Fuse[2]/ Breaker[3] Size w/ Pwr Exh (Amps)
		RLA	LRA	MCC	FLA	FLA	FLA	FLA	Model	kW	Stages	Amps				
J10 (10)	208	16.0	110.0	24.9	3.0	6.8	5.5	10.0	None	-	-	-	58.9	64.4	70	80
									E18	13.5	2	37.5	67.8	74.7	70	80
									E24	18.0	2	50.0	83.5	90.3	90	100
									E36	25.5	2	70.8	109.5	116.4	110	125
									E54	40.6	2	112.7	161.9	168.7	175	175
	230	16.0	110.0	24.9	3.0	6.8	5.5	10.0	None	-	-	-	58.9	64.4	70	80
									E18	18.0	2	43.3	75.1	82.0	80	90
									E24	24.0	2	57.7	93.2	100.0	100	100
									E36	34.0	2	81.8	123.2	130.1	125	150
									E54	54.0	2	129.9	150.9	157.8	175	175
	460	7.8	52.0	12.1	1.6	3.4	2.2	5.0	None	-	-	-	29.2	31.4	35	35
									E18	18.0	2	21.7	37.6	40.3	40	45
									E24	24.0	2	28.9	46.6	49.3	50	50
									E36	34.0	2	40.9	61.6	64.4	70	70
									E54	54.0	2	65.0	75.5	78.2	80	90
	575	5.7	38.9	8.9	1.4	2.4	1.8	4.0	None	-	-	-	21.9	23.7	25	25
									E18	18.0	2	17.3	29.7	31.9	30	35
									E24	24.0	2	23.1	36.9	39.1	40	40
									E36	34.0	2	32.7	48.9	51.1	50	60
									E54	54.0	2	52.0	60.0	62.2	70	70
J12 (12.5)	208	23.1	160.0	36.0	2.1	9.6	5.5	10.0	None	-	-	-	80.0	85.5	100	100
									E18	13.5	2	37.5	80.0	85.5	100	100
									E24	18.0	2	50.0	87.0	93.8	100	100
									E36	25.5	2	70.8	113.0	119.9	125	125
									E54	40.6	2	112.7	165.4	172.2	175	175
	230	23.1	160.0	36.0	2.1	9.6	5.5	10.0	None	-	-	-	80.0	85.5	100	100
									E18	18.0	2	43.3	80.0	85.5	100	100
									E24	24.0	2	57.7	96.7	103.5	100	110
									E36	34.0	2	81.8	126.7	133.6	150	150
									E54	54.0	2	129.9	154.4	161.3	175	175
	460	12.2	87.0	19.0	1.3	4.7	2.2	5.0	None	-	-	-	42.2	44.4	50	50
									E18	18.0	2	21.7	42.2	44.4	50	50
									E24	24.0	2	28.9	48.2	51.0	50	60
									E36	34.0	2	40.9	63.2	66.0	70	70
									E54	54.0	2	65.0	77.1	79.8	90	90
	575	8.7	62.0	13.5	0.7	3.6	1.8	4.0	None	-	-	-	29.8	31.6	35	40
									E18	18.0	2	17.3	31.2	33.4	35	40
									E24	24.0	2	23.1	38.4	40.6	40	45
									E36	34.0	2	32.7	50.4	52.6	60	60
									E54	54.0	2	52.0	61.5	63.7	70	70

1. Minimum Circuit Ampacity.
2. Dual Element, Time Delay Type.
3. HACR type per NEC.

J06 thru 12ZJ Hi Static Motor - With Powered Convenience Outlet

Size (Tons)	Volt	Compressors (each)			OD Fan Motors (each)	Supply Blower Motor	Pwr Exh Motor	Pwr Conv Outlet	Electric Heat Option				MCA[1] (Amps)	MCA[1] w/Pwr Exh (Amps)	Max Fuse[2]/ Breaker[3] Size (Amps)	Max Fuse[2]/ Breaker[3] Size w/ Pwr Exh (Amps)
		RLA	LRA	MCC	FLA	FLA	FLA	FLA	Model	kW	Stages	Amps				
J06 (6.5)	208	9.3	68.0	14.5	2.1	6.8	5.5	10.0	None	-	-	-	42.1	47.6	50	50
									E09	6.8	1	18.9	44.6	51.5	50	60
									E18	13.5	2	37.5	67.8	74.7	70	80
									E24	18.0	2	50.0	83.5	90.3	90	100
									E36	25.5	2	70.8	109.5	116.4	110	125
	230	9.3	68.0	14.5	2.1	6.8	5.5	10.0	None	-	-	-	42.1	47.6	50	50
									E09	9.0	1	21.7	48.1	54.9	50	60
									E18	18.0	2	43.3	75.1	82.0	80	90
									E24	24.0	2	57.7	93.2	100.0	100	100
									E36	34.0	2	81.8	123.2	130.1	125	150
	460	4.9	34.0	7.6	1.3	3.4	2.2	5.0	None	-	-	-	22.0	24.2	25	25
									E09	9.0	1	10.8	24.0	26.8	25	30
									E18	18.0	2	21.7	37.6	40.3	40	45
									E24	24.0	2	28.9	46.6	49.3	50	50
									E36	34.0	2	40.9	61.6	64.4	70	70
	575	3.8	28.0	6.0	0.7	2.4	1.8	4.0	None	-	-	-	16.3	18.1	20	20
									E09	9.0	1	8.7	18.8	21.1	20	25
									E18	18.0	2	17.3	29.7	31.9	30	35
									E24	24.0	2	23.1	36.9	39.1	40	40
									E36	34.0	2	32.7	48.9	51.1	50	60
J07 (7.5)	208	11.9	88.0	18.5	3.0	9.6	5.5	10.0	None	-	-	-	52.4	57.9	60	60
									E09	6.8	1	18.9	52.4	57.9	60	60
									E18	13.5	2	37.5	71.3	78.2	80	80
									E24	18.0	2	50.0	87.0	93.8	90	100
									E36	25.5	2	70.8	113.0	119.9	125	125
	230	11.9	88.0	18.5	3.0	9.6	5.5	10.0	None	-	-	-	52.4	57.9	60	60
									E09	9.0	1	21.7	52.4	58.4	60	60
									E18	18.0	2	43.3	78.6	85.5	80	90
									E24	24.0	2	57.7	96.7	103.5	100	110
									E36	34.0	2	81.8	126.7	133.6	150	150
	460	5.2	44.0	8.1	1.6	4.7	2.2	5.0	None	-	-	-	24.6	26.8	25	30
									E09	9.0	1	10.8	25.7	28.4	30	30
									E18	18.0	2	21.7	39.2	41.9	40	45
									E24	24.0	2	28.9	48.2	51.0	50	60
									E36	34.0	2	40.9	63.2	66.0	70	70
	575	4.8	36.0	7.5	1.4	3.6	1.8	4.0	None	-	-	-	21.1	22.9	25	25
									E09	9.0	1	8.7	21.1	22.9	25	25
									E18	18.0	2	17.3	31.2	33.4	35	35
									E24	24.0	2	23.1	38.4	40.6	40	45
									E36	34.0	2	32.7	50.4	52.6	60	60
J08 (8.5)	208	12.2	88.0	19.0	3.0	9.6	5.5	10.0	None	-	-	-	53.1	58.6	60	70
									E09	6.8	1	18.9	53.1	58.6	60	70
									E18	13.5	2	37.5	71.3	78.2	80	80
									E24	18.0	2	50.0	87.0	93.8	90	100
									E36	25.5	2	70.8	113.0	119.9	125	125
	230	12.2	88.0	19.0	3.0	9.6	5.5	10.0	None	-	-	-	53.1	58.6	60	70
									E09	9.0	1	21.7	53.1	58.6	60	70
									E18	18.0	2	43.3	78.6	85.5	80	90
									E24	24.0	2	57.7	96.7	103.5	100	110
									E36	34.0	2	81.8	126.7	133.6	150	150
	460	5.8	44.0	9.0	1.6	4.7	2.2	5.0	None	-	-	-	26.0	28.2	30	30
									E09	9.0	1	10.8	26.0	28.4	30	30
									E18	18.0	2	21.7	39.2	41.9	40	45
									E24	24.0	2	28.9	48.2	51.0	50	60
									E36	34.0	2	40.9	63.2	66.0	70	70
	575	4.4	36.0	5.5	1.4	3.6	1.8	4.0	None	-	-	-	20.2	22.0	25	25
									E09	9.0	1	8.7	20.3	22.6	25	25
									E18	18.0	2	17.3	31.2	33.4	35	35
									E24	24.0	2	23.1	38.4	40.6	40	45
									E36	34.0	2	32.7	50.4	52.6	60	60

J06 thru 12ZJ Hi Static Motor - With Powered Convenience Outlet (Continued)

Size (Tons)	Volt	Compressors (each)			OD Fan Motors (each)	Supply Blower Motor	Pwr Exh Motor	Pwr Conv Outlet	Electric Heat Option				MCA[1] (Amps)	MCA[1] w/Pwr Exh (Amps)	Max Fuse[2]/ Breaker[3] Size (Amps)	Max Fuse[2]/ Breaker[3] Size w/ Pwr Exh (Amps)
		RLA	LRA	MCC	FLA	FLA	FLA	FLA	Model	kW	Stages	Amps				
J10 (10)	208	16.0	110.0	24.9	3.0	9.6	5.5	10.0	None	-	-	-	61.7	67.2	70	80
									E18	13.5	2	37.5	71.3	78.2	80	80
									E24	18.0	2	50.0	87.0	93.8	90	100
									E36	25.5	2	70.8	113.0	119.9	125	125
									E54	40.6	2	112.7	165.4	172.2	175	175
	230	16.0	110.0	24.9	3.0	9.6	5.5	10.0	None	-	-	-	61.7	67.2	70	80
									E18	18.0	2	43.3	78.6	85.5	80	90
									E24	24.0	2	57.7	96.7	103.5	100	110
									E36	34.0	2	81.8	126.7	133.6	150	150
									E54	54.0	2	129.9	154.4	161.3	175	175
	460	7.8	52.0	12.1	1.6	4.7	2.2	5.0	None	-	-	-	30.5	32.7	35	40
									E18	18.0	2	21.7	39.2	41.9	40	45
									E24	24.0	2	28.9	48.2	51.0	50	60
									E36	34.0	2	40.9	63.2	66.0	70	70
									E54	54.0	2	65.0	77.1	79.8	90	90
	575	5.7	38.9	8.9	1.4	3.6	1.8	4.0	None	-	-	-	23.1	24.9	25	30
									E18	18.0	2	17.3	31.2	33.4	35	35
									E24	24.0	2	23.1	38.4	40.6	40	45
									E36	34.0	2	32.7	50.4	52.6	60	60
									E54	54.0	2	52.0	61.5	63.7	70	70
J12 (12.5)	208	23.1	160.0	36.0	2.1	14.0	5.5	10.0	None	-	-	-	84.4	89.9	100	110
									E18	13.5	2	37.5	84.4	89.9	100	110
									E24	18.0	2	50.0	92.5	99.3	100	110
									E36	25.5	2	70.8	118.5	125.4	125	150
									E54	40.6	2	112.7	170.9	177.7	175	200
	230	23.1	160.0	36.0	2.1	14.0	5.5	10.0	None	-	-	-	84.4	89.9	100	110
									E18	18.0	2	43.3	84.4	91.0	100	110
									E24	24.0	2	57.7	102.2	109.0	110	110
									E36	34.0	2	81.8	132.2	139.1	150	150
									E54	54.0	2	129.9	159.9	166.8	175	175
	460	12.2	87.0	19.0	1.3	6.6	2.2	5.0	None	-	-	-	44.1	46.3	50	50
									E18	18.0	2	21.7	44.1	46.3	50	50
									E24	24.0	2	28.9	50.6	53.3	60	60
									E36	34.0	2	40.9	65.6	68.4	70	70
									E54	54.0	2	65.0	79.5	82.2	90	90
	575	8.7	62.0	13.5	0.7	5.2	1.8	4.0	None	-	-	-	31.4	33.2	40	40
									E18	18.0	2	17.3	33.2	35.4	40	40
									E24	24.0	2	23.1	40.4	42.6	45	45
									E36	34.0	2	32.7	52.4	54.6	60	60
									E54	54.0	2	52.0	63.5	65.7	70	70

1. Minimum Circuit Ampacity.
2. Dual Element, Time Delay Type.
3. HACR type per NEC.

Table 10: Physical Data

J06 thru 12ZJ Physical Data

Component	Models									
	J06ZJ		J07ZJ		J08ZJ		J10ZJ		J12ZJ	
Nominal Tonnage	**6.5**		**7.5**		**8.5**		**10**		**12.5**	
AHRI COOLING PERFORMANCE										
Gross Capacity @ AHRI A point (Btu)	80000		93000		106000		124000		154000	
AHRI net capacity (Btu)	75000		90000		102000		120000		150000	
EER	12.2[1]/11.8[2]		12.2[1]/12.0[2]		12.2[1]/12.0[2]		12.0		12.1[1]/12[2]	
IEER with Constant Volume	14.0		13.2[1]/13.0[2]		13.0		12.9[1]/12.8[2]		13.7[1]/13.5[2]	
IEER with Intellispeed	14.8[1]/14.6[2]		14.8[1]/14.6[2]		14.0[1]/13.8[2]		14.8[1]/14.6[2]		15.2[1]/15.0[2]	
IEER with VAV	14.1[1]/13.9[2]		13.2[1]/13.0[2]		13.45[1]/13.25[2]		13.85[1]/13.65[2]		13.8[1]/13.6[2]	
CFM	2600		2400		2800		3400		3500	
System power (KW)	6.40		7.38		8.30		9.80		12.50	
Refrigerant type	R-410A		R-410A		R-410A		R-410A		R-410A	
Refrigerant charge (lb-oz)										
System 1	5-10		7-12		8-8		7-14		10-8	
System 2	5-12		7-10		8-12		7-14		9-12	
AHRI HEATING PERFORMANCE										
Heating model	N12	N18	N12	N18	N12	N18	N18	N24	N18	N24
Heat input (K Btu)	120	180	120	180	120	180	180	240	180	240
Heat output (K Btu)	96	144	96	144	96	144	144	192	144	192
AFUE %	-	-	-	-	-	-	-	-	-	-
Steady state efficiency (%)	80	80	80	80	80	80	80	80	80	80
No. burners	4	6	4	6	4	6	6	8	6	8
No. stages	2[3]	2[3]	2[3]	2[3]	2[3]	2[3]	2[3]	2[3]	2[3]	2[3]
Temperature Rise Range (ºF)	20-50	35-65	15-45	30-60	10-40	25-55	20-50	35-65	10-40	25-55
Gas Limit Setting (ºF)	165	165	165	165	215	195	195	160	195	160
Gas piping connection (in.)	3/4	3/4	3/4	3/4	3/4	3/4	3/4	3/4	3/4	3/4
DIMENSIONS (inches)										
Length	89		89		89		89		119-1/2	
Width	59		59		59		59		59	
Height	50-3/4		50-3/4		50-3/4		50-3/4		50-3/4	
OPERATING WT. (lbs.)	1030		1050		1060		1070		1280	
COMPRESSORS[4]										
Type	Recip		Recip		Recip		Scroll		Scroll	
Quantity	2		2		2		2		2	
Unit Capacity Steps (%)	50 / 100		50 / 100		50 / 100		50 / 100		50 / 100	
CONDENSER COIL DATA										
Face area (Sq. Ft.)	29.0		23.8		29.0		29.0		47.5	
Rows	1		1		1		1		1	
Fins per inch	23		23		23		23		23	
Tube diameter (in./MM)	.71/18		1/25		1/25		1/25		.71/18	
Circuitry Type	2-pass Microchannel		2-pass Microchannel		2-pass Microchannel		2-pass Microchannel		2-pass Microchannel	
EVAPORATOR COIL DATA										
Face area (Sq. Ft.)	13.2		13.2		13.2		13.2		13.2	
Rows	3		4		4		4		4	
Fins per inch	15		15		15		15		15	
Tube diameter	0.375		0.375		0.375		0.375		0.375	
Circuitry Type	Intertwined		Intertwined		Intertwined		Intertwined		Intertwined	
Refrigerant control	TXV		TXV		TXV		TXV		TXV	

J06 thru 12ZJ Physical Data (Continued)

Component	Models									
	J06ZJ		J07ZJ		J08ZJ		J10ZJ		J12ZJ	
Nominal Tonnage	**6.5**		**7.5**		**8.5**		**10**		**12.5**	
CONDENSER FAN DATA										
Quantity of fans	2		2		2		2		4	
Fan diameter (Inch)	24		24		24		24		24	
Type	Prop		Prop		Prop		Prop		Prop	
Drive type	Direct		Direct		Direct		Direct		Direct	
Quantity of motors	2		2		2		2		4	
Motor HP each	1/3		3/4		3/4		3/4		1/3	
No. speeds	1		1		1		1		1	
RPM	850		1110		1110		1110		850	
Total CFM	7400		8000		9000		9400		14000	
BELT DRIVE EVAP FAN DATA										
Quantity	1		1		1		1		1	
Fan Size (Inch)	15 x 15		15 x 15		15 x 15		15 x 15		15 x 15	
Type	Centrifugal		Centrifugal		Centrifugal		Centrifugal		Centrifugal	
Motor Sheave	1VL40	1VM50	1VL40	1VM50	1VM50	1VM50	1VM50	1VM50	1VM50	1VP56
Blower Sheave	AK74	AK74	AK69	AK69	AK89	AK74	AK84	AK74	AK74	BK77
Belt	A53	A54	A52	A54	A56	A54	A56	A54	A54	BX56
Motor HP each	1-1/2	2	1-1/2	3	2	3	2	3	3	5
RPM	1725	1725	1725	1725	1725	1725	1725	1725	1725	1725
Frame size	56	56	56	56	56	56	56	56	56	184T
FILTERS										
Quantity - Size	4 - (24 x 20 x 2)[5,6]		4 - (24 x 20 x 2)[5,6]		4 - (24 x 20 x 2)[5,6]		4 - (24 x 20 x 2)[5,6]		4 - (24 x 20 x 2)[5,6]	
	4 - (24 x 20 x 4)[7]		4 - (24 x 20 x 4)[7]		4 - (24 x 20 x 4)[7]		4 - (24 x 20 x 4)[7]		4 - (24 x 20 x 4)[7]	

1. Cooling Only Unit or Cooling Unit with Electric Heat
2. Cooling Unit with Gas Heat
3. 1st Stage 60% of Full Capacity.
4. J10ZJ, J12ZJ have crankcase heaters standard.
5. 2 In. Throwaway, Standard, MERV (Minimum Efficiency Reporting Value) 3.
6. 2 In. Pleated, Optional, MERV 8.
7. 4 In. Pleated, Optional, MERV 13.

Optional Electric Heat

The factory-installed heaters are wired for single point power supply. Power supply need only be brought into the single point terminal block.

These CSA approved heaters are located within the central compartment of the unit with the heater elements extending in to the supply air chamber.

Fuses are supplied, where required, by the factory. Some kW sizes require fuses and others do not. refer to Table 11 for minimum CFM limitations and to Table 9 for electrical data.

Table 11: Electric Heat Minimum Supply Air

Size (Tons)	Model	Voltage	Minimum Supply Air (CFM)				
			Heater kW				
			9	18	24	36	54
J06 (6.5)	ZJ	208/230-3-60	1950	1950	1950	1950	-
		460-3-60	1950	1950	1950	1950	-
		600-3-60	1950	1950	1950	1950	-
J07 (7.5)	ZJ	208/230-3-60	2250	2250	2250	2250	-
		460-3-60	2250	2250	2250	2250	-
		600-3-60	2250	2250	2250	2250	-
J08 (8.5)	ZJ	208/230-3-60	2550	2550	2550	2550	-
		460-3-60	2550	2550	2550	2550	-
		600-3-60	2550	2550	2550	2550	-
J10 (10)	ZJ	208/230-3-60	-	3000	3000	3000	3500
		460-3-60	-	3000	3000	3000	3000
		600-3-60	-	3000	3000	3000	3500
J12 (12.5)	ZJ	208/230-3-60	-	3750	3750	3750	4000
		460-3-60	-	3750	3750	3750	3750
		600-3-60	-	3750	3750	3750	3750

Optional Gas Heat

These gas-fired heaters have aluminized-steel or optional stainless steel, tubular heat exchangers with spark ignition.

NOTE: On VAV units, individual VAV boxes must be fully open in heating mode to insure airflow falls within specified Temperature Rise range.

Gas Piping

Proper sizing of gas piping depends on the cubic feet per hour of gas flow required, specific gravity of the gas and the length of run. "National Fuel Gas Code" Z223.1 (in U.S.A.) or the current Gas Installation Codes CSA-B149.1 (in Canada) should be followed in all cases unless superseded by local codes or gas utility requirements. Refer to the Pipe Sizing Table 12. The heating value of the gas may differ with locality. The value should be checked with the local gas utility.

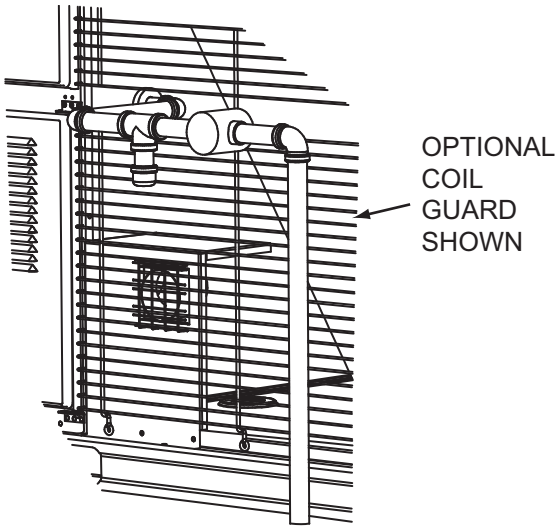


Figure 25: Side Entry Gas Piping

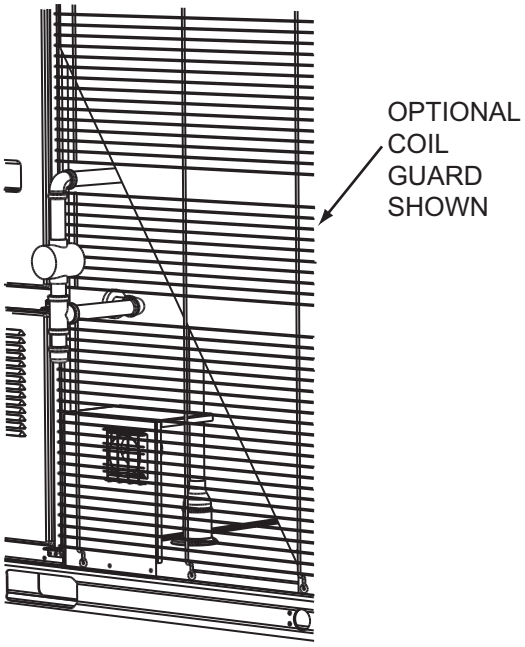


Figure 26: Bottom Entry Gas Piping

Table 12: Gas Pipe Sizing - Capacity of Pipe

Length of Pipe (ft.)	Nominal Iron Pipe Size		
	3/4 in.	1 in.	1-1/4 in.
10	278	520	1050
20	190	350	730
30	152	285	590
40	130	245	500
50	115	215	440
60	105	195	400
70	96	180	370
80	90	170	350
90	84	160	320
100	79	150	305

NOTE: Maximum capacity of pipe in cubic feet of gas per hour based upon a pressure drop of 0.3 inch W.C. and 0.6 specific gravity gas.

NOTE: There may be a local gas utility requirement specifying a minimum diameter for gas piping. All units require a 3/4 inch pipe connection at the entrance fitting. Line should not be sized smaller than the entrance fitting size.

Table 13: Gas Heat Minimum Supply Air

Size (Tons)	Model	Heat Size	Supply Air (CFM)			
			Cooling		Heating	
			Min	Max	Min	Max
J06 (6.5)	ZJ	N12	1950	3250	1950	3250
		N18	1950	3250	1950	3250
J07 (7.5)	ZJ	N12	2250	3750	2250	3750
		N18	2250	3750	2250	3750
J08 (8.5)	ZJ	N12	2550	4250	2550	4250
		N18	2550	4250	2550	4250
J10 (10)	ZJ	N18	3000	5000	3000	5000
		N24	3000	5000	3000	5000
J12 (12.5)	ZJ	N18	3750	6250	3750	6250
		N24	3750	6250	3750	6250

Gas Connection

The gas supply line can be routed within the space and roof curb, exiting through the unit's basepan. Refer to Figures 8 and 9 for the gas piping inlet location. Typical supply piping arrangements are shown in Figures 25 and 26. All pipe nipples, fittings, and the gas cock are field supplied or may be purchased in UP accessory kit #1GP0405.

Gas piping recommendations:

1. A drip leg and a ground joint union must be installed in the gas piping.
2. Where required by local codes, a manual shut-off valve must be installed outside of the unit.
3. Use wrought iron or steel pipe for all gas lines. Pipe dope should be applied sparingly to male threads only.

⚠WARNING

Natural gas may contain some propane. Propane is an excellent solvent and will quickly dissolve white lead and most standard commercial compounds. A special pipe dope must be used when assembling wrought iron or steel pipe. Shellac based compounds such as Gaskolac or Stalastic, and compounds such as Rectorseal #5, Clydes's or John Crane may be used.

4. All piping should be cleaned of dirt and scale by hammering on the outside of the pipe and blowing out loose particles. Before initial start-up, be sure that all gas lines external to the unit have been purged of air.
5. The gas supply should be a separate line and installed in accordance with all safety codes as prescribed under "Limitations".

6. A 1/8-inch NPT plugged tapping, accessible for test gage connection, must be installed immediately upstream of the gas supply connection to the unit.
7. After the gas connections have been completed, open the main shut-off valve admitting normal gas pressure to the mains. Check all joints for leaks with soap solution or other material suitable for the purpose. **NEVER USE A FLAME.**

⚠WARNING

FIRE OR EXPLOSION HAZARD

Failure to follow the safety warning exactly could result in serious injury, death or property damage.

Never test for gas leaks with an open flame. use a commercially available soap solution made specifically for the detection of leaks to check all connections. A fire or explosion may result causing property damage, personal injury or loss of life.

⚠ CAUTION

The furnace and its individual shut-off valve must be disconnected from the gas supply piping system during any pressure testing at pressures in excess of 1/2 PSIG.

Pressures greater than 1/2 PSIG will cause gas valve damage resulting in a hazardous condition. If it is subjected to a pressure greater than 1/2 PSIG, the gas valve must be replaced.

The furnace must be isolated from the gas supply piping system by closing its individual manual shut-off valve during any pressure testing of the gas supply piping system at test pressures equal to or less than 1/2 PSIG.

⚠WARNING

Threaded joints should be coated with a sealing compound that is resistant to the action of liquefied petroleum gases. **Do not use Teflon tape.**

Lp Units, Tanks And Piping

All gas heat units are shipped from the factory equipped for natural gas use only. The unit may be converted in the field for use with LP gas with accessory kit model number 1NP0442.

All LP gas equipment must conform to the safety standards of the National Fire Protection Association.

For satisfactory operation, LP gas pressure must be 10.5 inch W.C. at the unit under full load. Maintaining proper gas pressure depends on three main factors:

1. The vaporization rate which depends on the temperature of the liquid and the “wetted surface” area of the container(s).
2. The proper pressure regulation. (Two-stage regulation is recommended).
3. The pressure drop in the lines between regulators and between the second stage regulator and the appliance. Pipe size required will depend on the length of the pipe run and the total load of all appliances.

Complete information regarding tank sizing for vaporization, recommended regulator settings, and pipe sizing is available from most regulator manufacturers and LP gas suppliers.

⚠WARNING

LP gas is an excellent solvent and will quickly dissolve white lead and most standard commercial compounds. A special pipe dope must be used when assembling wrought iron or steel pipe for LP. Shellac base compounds such as Gaskolac or Stalastic, and compounds such as Rectorseal #5, Clyde’s, or John Crane may be used.

Check all connections for leaks when piping is completed using a soap solution. **NEVER USE A FLAME.**

⚠WARNING

FIRE OR EXPLOSION HAZARD

Failure to follow the safety warning exactly could result in serious injury, death or property damage.

Never test for gas leaks with an open flame. use a commercially available soap solution made specifically for the detection of leaks to check all connections. A fire or explosion may result causing property damage, personal injury or loss of life.

Vent And Combustion Air

Venting slots in the heating compartment access panel remove the need for a combustion air hood. The gas heat flue exhaust is routed through factory installed exhaust piping with screen. If necessary, a flue exhaust extension may be installed at the point of installation.

Options/Accessories

Electric Heat

Electric heaters are available as factory-installed options or field-installed accessories. Refer to electric heat instructions for installation. These heaters mount in the heat compartment with the heating elements extending into the supply air chamber. All electric heaters are fused and intended for use with single point power supply.

Smoke Detectors

⚠WARNING

The use of duct smoke detectors have specific limitations as established by the National Fire Protection Association. Duct smoke detectors are; NOT a substitute for an open area smoke detector, NOT a substitute for early warning detection, and NOT a replacement for a building's regular fire detection system. Refer to NFPA Code 72 and Standard 90A for additional information.

The factory-installed smoke detector will shut down operation of the unit by interrupting power to the UCB when smoke is detected within its mounting compartment. The smoke detector option is available for both supply and/or return air configurations. Be aware that the supply air configuration has the sensor component mounted in the blower section, with its control module mounted in the return air compartment.

⚠WARNING

Factory-installed smoke detectors may be subjected to extreme temperatures during "off" times due to outside air infiltration. These smoke detectors have an operational limit of -4°F to 158°F. Smoke detectors installed in areas that could be outside this range will have to be relocated to prevent false alarms.

⚠WARNING

To assure adequate airflow reaches the smoke detector's sensor, make sure that the holes of the sampling tube face into the air stream, and that the far-end of the sampling tube is sealed with the plastic end cap.

In addition, the unit's supply airflow must be adjusted to provide a pressure differential across the smoke detector's sampling and exhaust ports of at least 0.01 inches of water and no more than 1.11 inches of water, as measured by a manometer.

The detector must be tested and maintained on a regular basis according to NFPA 72 requirements and cleaned at least once a year. For specific troubleshooting and maintenance procedures, please refer to the smoke detector's installation instructions which accompanies the unit.

Motorized Outdoor Damper

The Motorized Outdoor Damper can be a factory installed option or a field installed accessory. If factory installed, refer to the instructions included with the outdoor air hood to complete the assembly. Field installed Motorized Outdoor Damper accessories include complete instructions for installation.

Economizer

The Economizer can be a factory installed option or a field installed accessory. If factory installed, refer to the instructions included with the outdoor air hood to complete the assembly. Field installed Economizer accessories include complete instructions for installation.

There are two Economizer options:

1. Down Flow, End Return Horizontal applications which include Fresh Air Hood, Exhaust Hood with Barometric Relief.
2. Horizontal Flow application (Field Installed Kit Only) that requires the purchase of a barometric relief hood.
3. With the Down Flow, End Return Horizontal application it is required to save the two Side Panels for the economizer hood tops (See Figure 20).

Power Exhaust

The Power Exhaust can be a factory installed option or a field installed accessory. If factory installed, refer to the instructions included with the outdoor air hood to complete the assembly. Field installed Power Exhaust accessories include complete instructions for installation.

The Power Exhaust factory installed option is for Down Flow application only.

There are two field installed Power Exhaust accessories:

1. Down Flow application.
2. Horizontal Flow application that requires the purchase of a barometric relief hood.

Rain Hood

All of the hood components, including the filters, the gasketing and the hardware for assembling, are packaged and located between the condenser coil section and the main unit cabinet, if the unit has factory installed options. If field installed accessories are being installed all parts necessary for the installation comes in the accessory.

Optional Variable Air Volume (VAV)

A variable air volume (VAV) option using a variable frequency drive (VFD) is available for applications requiring a constant supply-duct static pressure. A differential pressure transducer is used to monitor supply duct static pressure and return a speed reference signal to the VFD to control the output of the indoor blower motor.

Duct Static Pressure Transducer

A 0-5" WC pressure transducer, located in the control box compartment, is used to sense static (gauge) pressure in the supply air duct and convert this pressure measurement to a proportional 0-5 VDC electrical output. Pressure-transmitting plastic tubing (1/4" diameter) must be field supplied and installed from the transducer to both the ductwork and to the atmosphere. Connect the tubing from the 'HIGH' pressure tap of

the transducer to a static pressure tap (field supplied) in the supply duct located at a point where constant pressure is expected. To prevent an unstable signal due to air turbulence, there should be no obstructions, turns or VAV terminal boxes up- or down-stream of the sensing tube location for at least a distance of 6-10 times the duct diameter. Tubing must also be run between the 'LOW' pressure tap of the transducer and atmospheric pressure (outside of the unit).

⚠ CAUTION

Do not run plastic tubing in the supply or return air ducts as air movement could cause erroneous pressure measurements. If the tubing penetrates through the bottom of the unit be sure openings are sealed to prevent air and water leakage.

Factory-installed VFD

The factory-installed VFD is mounted in the blower access compartment. The drive comes wired from the factory to include both 3-phase power and control connections (run permit signal, speed reference signal & fault signal). All required drive parameters are pre-programmed at the factory, except in the case of 208-volt applications, in which the parameter that defines motor nameplate voltage must be changed to a value of 208.00 and the parameter that defines motor-rated current must be changed to the appropriate value appearing on the motor's nameplate. Refer to the enclosed drive material or access the UPGnet Commercial Product Catalog website for instructions on changing parameter settings.

For units with VFD and VAV control, the unit must first be put into the Occupied Mode to start operation. The default setting for all VAV units is 'Unoccupied', therefore the installer must add a jumper wire between terminals R - OCC on the UCB to put the unit into 'Occupied' Mode. Additionally, the unit can be switched between Unoccupied/Occupied mode through network communications.

Occupied mode can be set by any one of three methods.

A BAS writing to the UCB.

If not already equipped with a jumper between R-OCC, then installer shall add. Ensure the OccMode is set to External.

Using the schedule within the UCB.

Ensure OccMode is set to Schedule and use this feature to indicate occupied and unoccupied times each day.

Manual Bypass

An optional, factory-installed manual bypass switch available with factory-installed VFD can be found in the Blower Motor Access compartment and has the following three positions:

- **DRIVE** - routes power through the VFD for modulating control of the indoor blower motor.
- **LINE (or BYPASS)** - routes power directly to the motor which provides full-speed motor operation and complete electrical isolation of the drive.
- **TEST** - routes power to the VFD but not to the motor to allow for drive programming and/or diagnostics.

If a drive failure occurs, the unit does not automatically switch to bypass mode. The LINE/DRIVE/TEST switch must be manually switched to the LINE (BYPASS) position. If there is a call for the fan, the indoor blower motor will run at full-speed while in the bypass mode.

⚠ CAUTION

If the unit is operated with the manual bypass switch in the LINE (BYPASS) position and there are VAV boxes present in the duct system, then boxes must be driven to the full-open position using a customer-supplied power source to prevent over-pressurizing and possible damage to the ductwork.

⚠WARNING

Before beginning any service, disconnect all power to the drive. Be aware that high voltages are present in the drive even after power has been disconnected. Capacitors within the drive must be allowed to discharge before beginning service.

'VFD-ready' For Customer-installation

Units configured as 'VFD-ready' provide provisions for a customer-installed drive. The physical dimensions of VFDs can vary greatly among manufacturers, horsepower ratings and voltage requirements. Keep in mind that drive manufacturers also require various minimum clearances to allow for adequate internal cooling of the drive during operation.

The unit comes with a mounting bracket installed in the Blower Access compartment which may accommodate other vendor's drives depending on their size. In order to utilize the unit's mounting bracket, the maximum recommended drive dimensions are limited to approximately 9" H x 5" W x 7.5" D.

If the drive will not fit in the allotted space, then it will need to be mounted elsewhere; either within the building on a perpendicular wall which is not subjected to excessive temperature, vibration, humidity, dust, corrosive gas, explosive gas, etc., or within an appropriate enclosure rated for outside installation to safeguard against moisture, dust and excessive heat.

The power leads to the drive (L1, L2, L3) and from the motor (T1, T2, T3) have been temporarily spliced together with wire nuts. After removing the wire nuts, connect the wires to the field-installed VFD per the VFD wiring diagram (See Figure 27).

The VFD should also be grounded per the manufacturer's specifications.

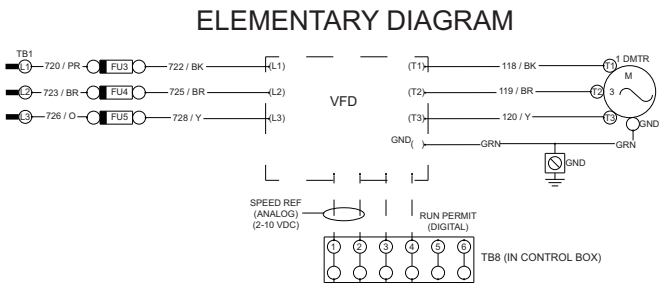


Figure 27: Simplified VFD Wiring

⚠ CAUTION

Do not connect AC power to the T1, T2, T3 drive terminals to prevent damage to the VFD.

⚠ CAUTION

The fuses (FU3, FU4, FU5) supplied with the unit are sized according to the electrical load of the blower motor, but may not provide adequate protection to the customer-installed drive, depending upon its specifications. Once a drive has been selected and installed, refer to the drive manufacturer's recommendations for proper fuse sizing.

A terminal block located in the control box is provided for field connection of the VFD speed reference signal (2-10 VDC) and to the normally-open, run-permit auxiliary contact. The use of shielded cable is recommended for the above control wiring connections.

Optional Hot Gas Bypass (HGBP)

To allow for low cooling load operation, a direct-acting, pressure-modulating bypass control valve installed on the system #1 discharge line is used to divert high temperature, high pressure refrigerant around the TXV in order to maintain a desired minimum evaporator pressure.

The opening pressure of the bypass valve is adjustable between 95 and 115 psig with a factory-setting of 105 psig. HGBP is standard on all units with VAV and optional with CV units.

Economizer Sequences

Several functions can drive the economizer, including: minimum position, free cooling, economizer loading, and minimum outdoor air supply.

Economizer Minimum Position

The economizer minimum position is set during occupied mode when outside air is not suitable for free cooling. The position of the damper is set proportionally between the "Economizer Minimum Position and the Economizer Minimum Position Low Speed Fan" set points, in relationship to the VFD output percentage. On a constant volume single speed supply fan system both set-points should be set to the same value.

Free Cooling

Four types of free cooling options are available: dry bulb changeover, single enthalpy, dual enthalpy changeover, and Auto.

Dry Bulb Changeover

For dry bulb economizer operation, the outside air is suitable for free cooling if the outside air temperature is 1°F below the Economizer OAT Enable Setpoint **and** 1°F below the Return Air Temperature.

Free cooling is no longer available if the outside air temperature rises above **either** the Economizer OAT Enable setpoint **or** the return air temperature.

Single Enthalpy Changeover

For single enthalpy economizer operation, the outside air is suitable for free cooling if the outside air enthalpy is at least 1 BTU/lb below the Economizer Outside Air Enthalpy Setpoint **and** the outside air temperature is no greater than the RAT plus 9°F.

If the outside air temperature rises above the RAT plus 10°F, free cooling is no longer available. The outside air temperature must drop to no greater than RAT plus 9°F to enter free cooling again.

Free cooling is no longer available if the outside air enthalpy rises above the Economizer Outside Air Enthalpy Setpoint.

Dual Enthalpy Changeover

For dual enthalpy economizer operation, the outside air enthalpy must be lower than the return air enthalpy by 1 btu/lb AND the outside air temperature is no greater than the RAT plus 9°F.

Auto

The control determines the type of free cooling changeover based on which sensors are present and reliable. Conditions include:

- Return and outside air dry bulb = dry bulb changeover
- Return and outside air dry bulb and outside air humidity = single enthalpy
- Return and outside air dry bulb and return and outside air humidity = dual enthalpy
- If either the return or outside air dry bulb sensors are unreliable, free cooling is not available

Free Cooling Operation

When the control determines that the outside air is suitable, the first stage of cooling will always be free cooling.

Thermostat

In free cooling, with a thermostat input to Y1, the dampers modulate to control the supply air temperature to the Economizer Setpoint +/- 1°F (default 55°F).

If the thermostat provides an input to Y2 **and** the parameter Compressors Off in Free Cooling is turned OFF a compressor output energizes. The economizer dampers continue to modulate to control the supply air temperature to the Economizer Setpoint.

If the supply air temperature cannot be maintained within 5°F of the economizer setpoint, the first stage compressor (C1) will be turned on. Second stage compressor (C2) will be added as needed to keep the supply air temperature within the 5°F of the economizer setpoint.

Sensor

In free cooling, with a demand from the zone/return sensor for the first stage of cooling, the dampers modulate to control the supply air temperature to the Economizer Setpoint +/- 1°F.

If the economizer output is at 100% **and** the SAT is greater than the Economizer setpoint + 1°F, the control starts a 12-minute timer to energize a compressor output.

If at any time the economizer output drops below 100% the timer stops and resets when the economizer output returns to 100%.

Once a compressor output is turned ON, the economizer dampers continue to modulate to control the supply air temperature to the Economizer Setpoint.

At no time will a compressor output be turned ON if the economizer output is less than 100%, even if the differential between zone (or return) temperature and the current cooling setpoint is great enough to demand more than one stage of cooling.

If the economizer output goes to minimum position **and** the SAT is less than Economizer Setpoint -1°F, the control starts a 12-minute timer to de-energize a compressor output.

If at any time the economizer output goes above the minimum position the timer stops and resets when the economizer output returns to minimum position.

If the demand for cooling from the space/return is satisfied, the economizer output will modulate to minimum position and the compressor outputs will be de-energized as long as their minimum run timers have expired.

Power Exhaust

Setpoints

a. Economizer Enable ON
b. Power Exhaust Enable ON
c. Modulating Power Exhaust OFF
d. Exhaust VFD Installed OFF
e. Building Pressure Sensor Enabled OFF
f. Econo Damper Position For Exh Fan ON Percent
g. Econo Damper Position For Exh Fan OFF Percent

Inputs

No inputs are present for non-modulating power exhaust.

Outputs

a. 2-10 VDC from ECON on Economizer Expansion module
b. 24 VAC from EX-FAN to energize exhaust fan on Economizer Expansion module

Operation

Operation details include:

a. Compares economizer output to the Economizer Damper Position For Exhaust Fan On and OFF.
b. Energizes exhaust fan when economizer output is above Economizer Damper Position For Exhaust Fan On.
c. De-energizes exhaust fan when economizer output is below the Economizer Damper Position for Exhaust Fan OFF

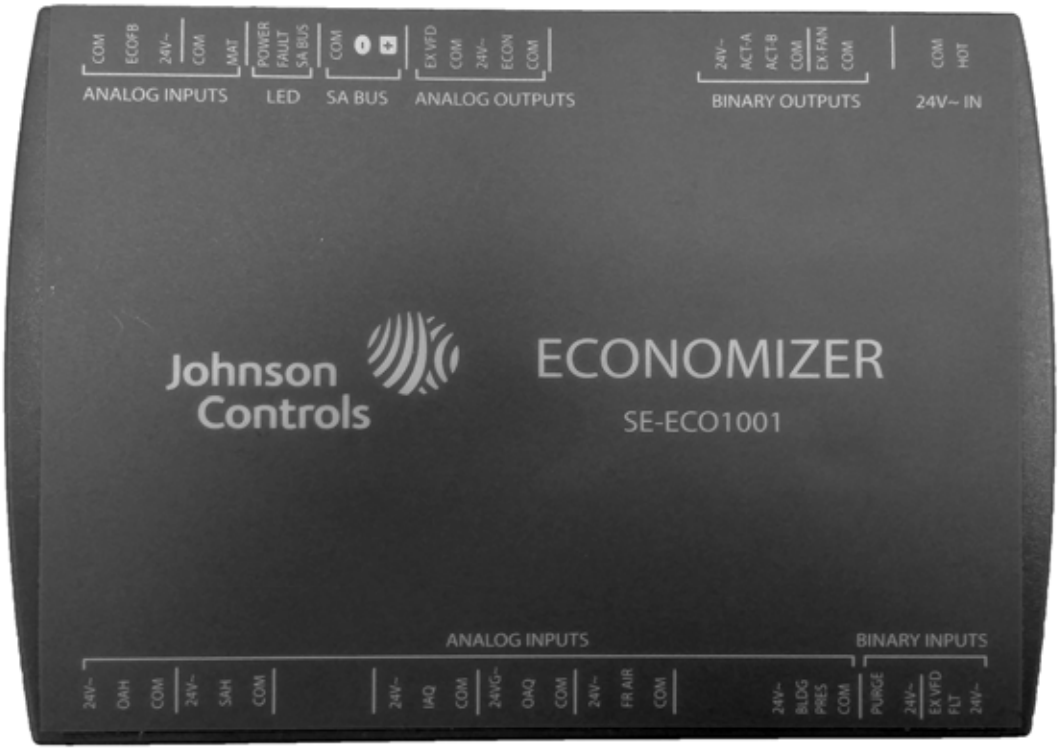


Figure 28: SE-ECO1001-0 Economizer Controller

Table 14: Smart Equipment™ Economizer Board Details

Board Label	Cover Label	Description	Function & Comments
		Directional orientation: viewed with the center text of the cover label upright	
		ANALOG INPUTS Terminal at left on upper edge of economizer board	
C	COM	24 VAC common/0-10 VDC negative for economizer actuator position feedback	Connects through circuit trace to 24V~ IN pin COM
IN2	ECOFB	0-10 VDC positive input from Economizer actuator position Feedback	EconDampPos parameter reports input status (0-100%). Used to meet Cali. Title 24 requirements for economizer actuator position feedback
R	24V~	24 VAC hot supplied for economizer actuator position feedback	Connects through circuit trace to 24V~ IN pin HOT
C	COM	Mixed Air Temperature sensor input from 10KΩ @ 77°F, Type III negative temperature coefficient thermistor	MAT parameter reports input status (°F/°C), 3.65 VDC reading MAT (+) to COM (−) with open circuit. Read-only use in current control revision.
IN1	MAT		
		LEDs at left on upper edge of economizer board	
POWER	POWER	Green UCB power indicator	Lit indicates 24 VAC is present at 24V~ IN COM and HOT pins
FAULT	FAULT	Red networking error and firmware error indicator	1/10th second on/off flashing indicates a networking error (polarity, addressing, etc.) or a firmware error (likely correctable with re-loading from USB flash drive)
SA BUS	SA BUS	Green UCB SA bus communication transmission indicator	Lit/flickering indicates UCB-to-economizer board SA bus communication is currently active, off indicates the economizer board is awaiting SA bus communication
		SA BUS[1] Pin connections at left on upper edge of economizer board	
C	COM	Common for SA BUS power and communication circuits	EconCtrlr parameter reports UCB-to-economizer board SA bus communication status. Negative of the SA BUS communication circuit to the UCB. Through the unit wiring harness, may continue on to the 4-stage board and/or fault detection & diagnostics board

Table 14: Smart Equipment™ Economizer Board Details (Continued)

Board Label	Cover Label	Description	Function & Comments
–	–	Communication for SA BUS devices	EconCtrlr parameter reports UCB-to-economizer board SA BUS communication status. Positive of the VDC (typically, a fluctuating 1.5 to 3.5 volts reading to C; at least 0.25 volts lower than +) SA BUS communication circuit to the UCB. Through the unit wiring harness, may continue on to the 4-stage board and/or fault detection & diagnostics board
+	+	Communication for SA BUS devices	EconCtrlr parameter reports UCB-to-economizer board SA BUS communication status. Positive of the VDC (typically, a fluctuating 1.5 to 3.5 volts reading to C; at least 0.25 volts higher than –) SA BUS communication circuit to the UCB. Through the unit wiring harness, may continue on to the 4-stage board and/or fault detection & diagnostics board
		ANALOG OUTPUTS Pin at center on upper edge of economizer board	
J4	EX VFD	2-10 VDC positive output for the modulating power Exhaust fan Variable Frequency Drive/ discharge damper modulating power exhaust actuator	ExFanVFD parameter reports output status (0-100%) when ExFType selection is Variable Frequency Fan; EAD-O parameter reports output status (0-100%) when ExFType selection is Modulating Damper. Used to ramp the power exhaust fan VFD/ position the discharge damper actuator.
	COM	24 VAC common/0-10 VDC negative for the power exhaust variable frequency drive/ discharge damper modulating power exhaust actuator	Connects through circuit trace to 24V~ IN pin COM
	24V~	24 VAC hot supplied for the discharge damper modulating power exhaust actuator and economizer actuator	Connects through circuit trace to 24V~ IN pin HOT
	ECON	2-10 VDC output for the Economizer actuator	Econ parameter reports output status (0-100%). Used to position the economizer actuator for minimum position, free cooling, demand ventilation, cooling economizer loading and purge functions
	COM	24 VAC common/0-10 VDC negative for economizer actuator	Connects through circuit trace to 24V~ IN pin COM
		BINARY OUTPUTS Pin at right on upper edge of economizer board	
J3	24V~	24 VAC hot supplied for an incremental (floating control) economizer actuator	Connects through circuit trace to 24V~ IN pin HOT
	ACT-A	24 VAC hot outputs to position an incremental (floating control) economizer actuator	Unused in current control revision
	ACT-B	24 VAC return	Unused in current control revision
	COM	24 VAC common for an incremental (floating control) economizer actuator	Connects through circuit trace to 24V~ IN pin COM
	EX-FAN	24 VAC hot output to energize power exhaust fan contactor coil/VFD enable relay coil	ExFan parameter reports output status (Off-On) when ExFType selection is Non-Modulating, Modulating Damper or Variable Frequency Fan. Used to turn on/enable the power exhaust fan motor.
	COM	24 VAC common/0-10 VDC negative for economizer actuator	Connects through circuit trace to 24V~ IN pin COM
		24V~ IN Pin connections at right on upper edge of economizer board	
C	COM	24 VAC transformer Common referenced to cabinet ground	24 VAC common connection to power the economizer board. Connects through circuit traces to C/COM terminals and pins distributed on the economizer board.

Table 14: Smart Equipment™ Economizer Board Details (Continued)

Board Label	Cover Label	Description	Function & Comments
R	HOT	24 VAC transformer HOT	24 VAC hot connection to power the economizer board. Connects through circuit traces to R/24V~ terminals and pins distributed on the economizer board.
		ANALOG INPUTS Terminal on lower edge of economizer board	
R	24V~	24 VAC hot supplied for the outdoor air humidity sensor	Connects through circuit trace to 24V~ IN pin HOT
IN3	OAH	0-10 VDC positive input from the Outdoor Air Humidity sensor	OAH parameter reports input status (0-100%H). Used in outdoor air enthalpy calculation for dual enthalpy economizer free cooling changeover.
C	COM	24 VAC common/0-10 VDC negative for the outdoor air humidity sensor	Connects through circuit trace to 24V~ IN pin COM
R	24V~	24 VAC hot supplied for the supply air humidity sensor	Connects through circuit trace to 24V~ IN pin HOT
IN4	SAH	0-10 VDC positive input from the Supply Air Humidity sensor	SAH parameter reports input status (0-100%H). Unused in current control revision.
C	COM	24 VAC common/0-10 VDC negative for the supply air humidity sensor	Connects through circuit trace to 24V~ IN pin COM
R	24V~	24 VAC hot supplied for the indoor air quality sensor	Connects through circuit trace to 24V~ IN pin HOT
IN5	IAQ	0-10 VDC positive input from the Indoor Air Quality sensor	IAQRange parameter sets the CO2 parts per million measured by the indoor air quality sensor when it outputs 10 VDC; IAQ parameter reports input status (0-5000ppm). Used for demand ventilation functions if the NetIAQ parameter indicates ?Unrel.
C	COM	24 VAC common/0-10 VDC negative for the indoor air quality sensor	Connects through circuit trace to 24V~ IN pin COM
R	24V~	24 VAC hot supplied for the outdoor air quality sensor	Connects through circuit trace to 24V~ IN pin HOT
IN6	OAQ	0-10 VDC positive input from the Outdoor Air Quality sensor	OAQRange parameter sets the CO2 parts per million measured by the outdoor air quality sensor when it outputs 10 VDC; OAQ parameter reports input status (0-5000ppm). Used for demand ventilation function when DVent-Mode selection is Diff between IAQ and OAQ and the NetOAQ parameter indicates ?Unrel.
C	COM	24 VAC common/0-10 VDC negative for the outdoor air quality sensor	Connects through circuit trace to 24V~ IN pin COM
R	24V~	24 VAC hot supplied for the air monitoring station sensor	Connects through circuit trace to 24V~ IN pin HOT
IN7	FR AIR	0-10 VDC positive input from the air monitoring station sensor	MOA-Range parameter sets the cubic feet per minute/liters per second measured by the air monitoring station sensor when it outputs 10 VDC; Fr Air parameter reports input status (0-50000CFM/23595lps). Used for economizer minimum position reset in speed-controlled indoor blower applications.
C	COM	24 VAC common/0-10 VDC negative for the air monitoring station sensor	Connects through circuit trace to 24V~ IN pin COM
R	24V~	24 VAC hot supplied for the building pressure sensor	Connects through circuit trace to 24V~ IN pin HOT
IN8	BLDG PRES	0-5 VDC positive input from the Building Pressure sensor	BldgPres parameter reports input status (-.250-.250”/w/-.062-.062kPa). Used for modulating power exhaust functions when ExFType selection is Modulating Damper or Variable Frequency Fan.

Table 14: Smart Equipment™ Economizer Board Details (Continued)

Board Label	Cover Label	Description	Function & Comments
C	COM	24 VAC common/0-5 VDC negative for the building pressure sensor	Connects through circuit trace to 24V~ IN pin COM
		BINARY INPUTS at right on lower edge of economizer board	
IN9	PURGE	24 VAC hot input from the PURGE dry contact	Purge parameter reports input status (False with 0 VAC input-True with 24 VAC input). When Purge status is True, heating and cooling operation is prevented, the indoor blower and power exhaust fan operate, the economizer actuator is positioned to 100%.
	24V~	24 VAC hot supplied for the purge dry contact	Connects through circuit trace to 24V~ IN pin HOT
IN10	EX VFD FLT	24 VAC hot input from the power Exhaust Variable Frequency Drive Fault contact	ExFanVFDFlt parameter reports input status (Normal with 0 VAC input-Alarm with 24 VAC input) when ExFType selection is Variable Frequency Fan. When ExFanVFDFlt status is Alarm, EX-FAN fan output is prevented.
	24V~	24 VAC hot supplied for the power exhaust variable frequency drive fault contact	Connects through circuit trace to 24V~ IN pin HOT

1. When wiring unit and other devices using the SA Bus and FC Bus, see Table 31.

Indoor Air Quality - IAQ

Indoor Air Quality (indoor sensor input): The Indoor Air Quality sensor is connected to the economizer board through the IAQ analog input terminal and the associated COM and 24V~ inputs on the economizer board. Terminal IAQ accepts a 0 to +10 Vdc signal with respect to the (IAQ) terminal. When the signal is below its set point, the actuator is allowed to modulate normally in accordance with the enthalpy and mixed air sensor inputs. When the IAQ signal exceeds its set point setting, and there is no call for free cooling, the actuator is proportionately modulated from the 0 to 10 Vdc signal, with 0 Vdc corresponding to full closed and 10 Vdc corresponding to full open. When there is no call for free cooling, the damper position is limited by the IAQ Max damper position setting. When the signal exceeds its set point (Demand Control Ventilation Set Point) setting and there is a call for free cooling, the actuator modulates from the minimum position to the full open position based on the highest call from either the mixed air sensor input or the IAQ voltage input.

- Optional CO2 Space Sensor Kit Part #2AQ04700524
- Optional CO2 Sensor Kit Part #2AQ04700624

Phasing

J**ZJ units are properly phased at the factory. Check for proper compressor rotation. If the blower or compressors rotate in the wrong direction at start-up, the electrical connection to the unit is misphased. Change the phasing of the **Field Line Connection at the factory or field supplied disconnect** to obtain proper rotation. (Scroll compressors operate in only one direction. If the scroll is drawing low amperage, has similar suction and discharge pressures, or producing a high noise level, the scroll is misphased.)

⚠ CAUTION

Scroll compressors require proper rotation to operate correctly. Units are properly phased at the factory. Do not change the internal wiring to make the blower condenser fans, or compressor rotate correctly.

Blower Rotation

Check for proper supply air blower rotation. If the blower is rotating backwards, the line voltage at the unit point of power connection is misphased (See ‘PHASING’).

Table 15: Supply Air Limitations

Unit Size (Ton)	Minimum	Maximum
J06 (6.5)	1950	3250
J07 (7.5)	2250	3750
J08 (8.5)	2550	4250
J10 (10)	3000	5000
J12 (12.5)	3750	6250

Belt Tension

The tension on the belt should be adjusted as shown in Figure 29.

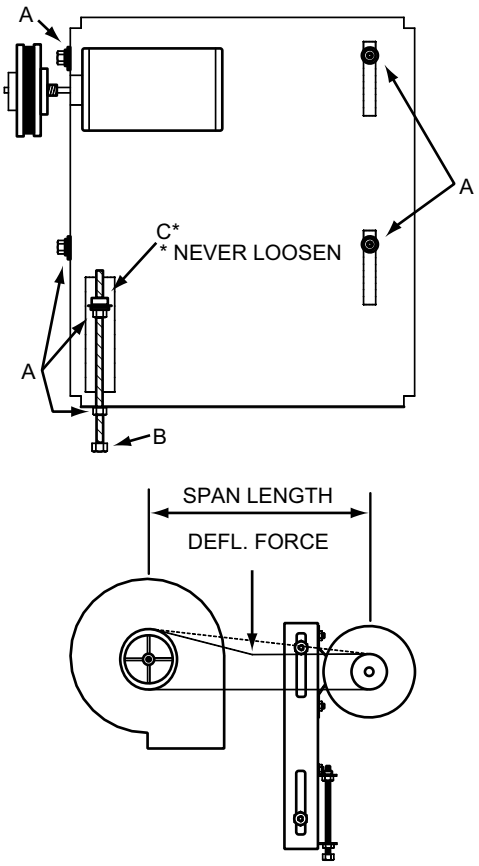


Figure 29: Belt Adjustment

⚠ CAUTION

Procedure for adjusting belt tension:

1. Loosen six nuts (top and bottom) A.
2. Adjust by turning (B).
3. Never loosen nuts (C).
4. Use belt tension checker to apply a perpendicular force to one belt at the midpoint of the span as shown. Deflection distance of 4mm (5/32”) is obtained.

To determine the deflection distance from normal position, use a straight edge from sheave to sheave as reference line. The recommended deflection force is as follows:

Tension new belts at the max. deflection force recommended for the belt section. Check the belt tension at least two times during the first 24 hours of operation. Any retensioning should fall between the min. and max. deflection force values.

5. After adjusting re-tighten nuts (A).

CFM Static Pressure and Power-Altitude and Temperature Corrections

The information below should be used to assist in application of product when being applied at altitudes at or exceeding 1000 feet above sea level.

The air flow rates listed in the standard blower performance tables are based on standard air at sea level. As the altitude or temperature increases, the density of air decreases. In order to use the indoor blower tables for high altitude applications, certain corrections are necessary.

A centrifugal fan is a "constant volume" device. This means that, if the rpm remains constant, the CFM delivered is the same regardless of the density of the air. However, since the air at high altitude is less dense, less static pressure will be generated and less power will be required than a similar application at sea level. Air density correction factors are shown in Table 16 and Figure 30.

Table 16: Altitude/Temperature Correction Factors

Air Temp.	Altitude (Ft.)										
	0	1000	2000	3000	4000	5000	6000	7000	8000	9000	10000
40	1.060	1.022	0.986	0.950	0.916	0.882	0.849	0.818	0.788	0.758	0.729
50	1.039	1.002	0.966	0.931	0.898	0.864	0.832	0.802	0.772	0.743	0.715
60	1.019	0.982	0.948	0.913	0.880	0.848	0.816	0.787	0.757	0.729	0.701
70	1.000	0.964	0.930	0.896	0.864	0.832	0.801	0.772	0.743	0.715	0.688
80	0.982	0.947	0.913	0.880	0.848	0.817	0.787	0.758	0.730	0.702	0.676
90	0.964	0.929	0.897	0.864	0.833	0.802	0.772	0.744	0.716	0.689	0.663
100	0.946	0.912	0.880	0.848	0.817	0.787	0.758	0.730	0.703	0.676	0.651

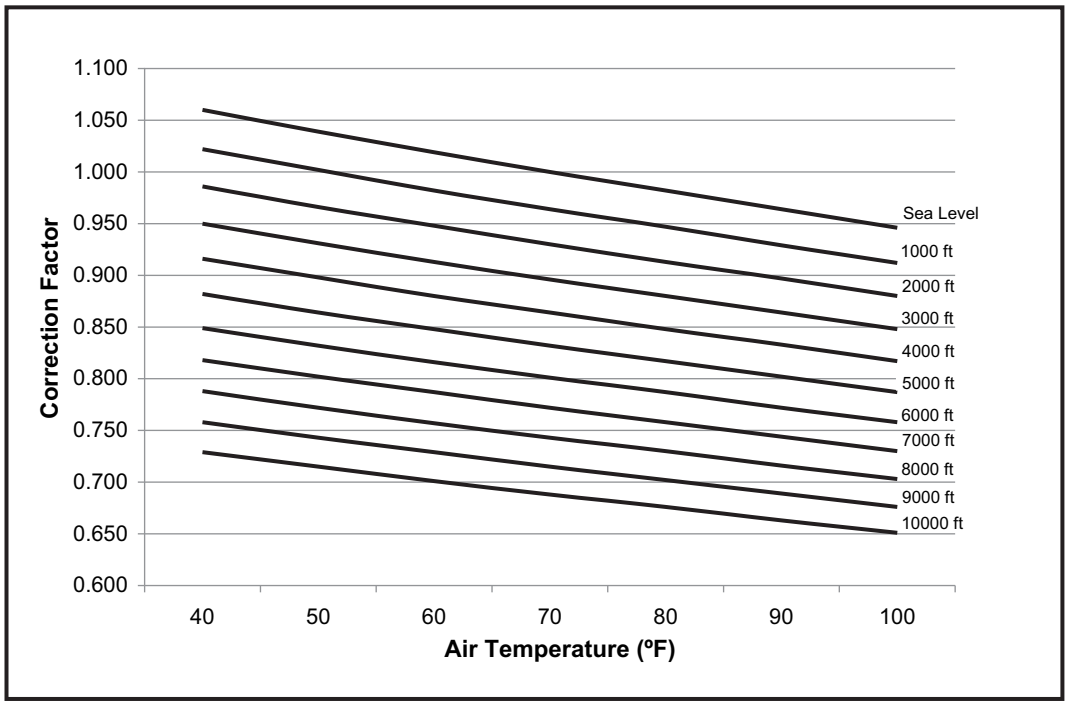


Figure 30: Altitude/Temperature Correction Factors

The examples below will assist in determining the airflow performance of the product at altitude.

Example 1: What are the corrected CFM, static pressure, and BHP at an elevation of 5,000 ft. if the blower performance data is 6,000 CFM, 1.5 IWC and 4.0 BHP?

Solution: At an elevation of 5,000 ft. the indoor blower will still deliver 6,000 CFM if the rpm is unchanged. However, Table 15 must be used to determine the static pressure and BHP. Since no temperature data is given, we will assume an air temperature of 70°F. Table 17 shows the correction factor to be 0.832.

Corrected static pressure = 1.5 x 0.832 = 1.248 IWC

Corrected BHP = 4.0 x 0.832 = 3.328

Example 2: A system, located at 5,000 feet of elevation, is to deliver 6,000 CFM at a static pressure of 1.5". Use the unit blower tables to select the blower speed and the BHP requirement.

Solution: As in the example above, no temperature information is given so 70°F is assumed.

The 1.5" static pressure given is at an elevation of 5,000 ft. The first step is to convert this static pressure to equivalent sea level conditions.

Sea level static pressure = 1.5 / .832 = 1.80"

Enter the blower table at 6000 sCFM and static pressure of 1.8". The rpm listed will be the same rpm needed at 5,000 ft.

Suppose that the corresponding BHP listed in the table is 3.2. This value must be corrected for elevation.

BHP at 5,000 ft. = 3.2 x .832 = 2.66

Drive Selection

1. Determine side or bottom supply duct Application.
2. Determine desired airflow.
3. Calculate or measure the amount of external static pressure.
4. Using the operating point determined from steps 1, 2 & 3, locate this point on the appropriate supply air blower performance table. (Linear interpolation may be necessary.)
5. Noting the RPM and BHP from step 4, locate the appropriate motor and, or drive on the RPM selection table.
6. Review the BHP compared to the motor options available. Select the appropriate motor and, or drive.
7. Review the RPM range for the motor options available. Select the appropriate drive if multiple drives are available for the chosen motor.
8. Determine turns open to obtain the desired operation point.

Example

1. 2600 CFM
2. 1.6 iwg
3. Using the supply air blower performance table below, the following data point was located: 1268 RPM & 1.95 BHP.
4. Using the RPM selection table below, Size X and Model Y is found.
5. 1.95 BHP exceeds the maximum continuous BHP rating of the 1.5 HP motor. The 2 HP motor is required.
6. 1268 RPM is within the range of the 2 HP drives.
7. Using the 2 HP motor and drive, .5 turns open will achieve 1268 RPM.

Example Supply Air Blower Performance

Air Flow (CFM)	Available External Static Pressure - IWG																			
	0.2		0.4		0.6		0.8		1.0		1.2		1.4		1.6		1.8		2.0	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
	1.5 HP & Field Supplied Drive								Standard 1.5 HP & Drive						Alternate 2 HP & Drive					
2200	804	0.50	866	0.71	925	0.90	982	1.06	1038	1.21	1092	1.35	1147	1.48	1203	1.61	1259	1.73	1317	1.87
2400	835	0.66	897	0.87	956	1.06	1013	1.22	1069	1.37	1124	1.51	1178	1.64	1234	1.77	1290	1.90	1348	2.03
2600	869	0.84	931	1.05	990	1.24	1047	1.40	1103	1.55	1158	1.69	1212	1.82	1268	1.95	1324	2.07	1382	2.21
2800	906	1.03	968	1.25	1027	1.43	1084	1.60	1139	1.75	1194	1.89	1249	2.02	1304	2.14	1361	2.27	-	-

Table X: RPM Selection

Size (Tons)	Model	HP	Max BHP	Motor Sheave	Blower Sheave	6 Turns Open	5 Turns Open	4 Turns Open	3 Turns Open	2 Turns Open	1 Turn Open	Fully Closed
X	Y	1.5	1.73	1VM50	AK74	N/A	897	945	991	1035	1079	1126
		2	2.30	1VM50	AK64	N/A	1039	1094	1150	1207	1256	1308

Airflow Performance

Table 17: Airflow Performance - Side Duct Application

J06ZJ (6.5 Ton) Side Duct

Air Flow (CFM)	Available External Static Pressure - IWG[1]																			
	0.2		0.4		0.6		0.8		1.0		1.2		1.4		1.6		1.8		2.0	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
	FS[4]				Standard 1.5 HP & Drive										Hi Static 2 HP & Drive					
1800	514	0.15	586	0.33	657	0.52	727	0.71	794	0.89	857	1.07	917	1.23	972	1.38	1021	1.50	1064	1.59
2000	529	0.23	601	0.41	672	0.60	741	0.79	808	0.97	872	1.15	931	1.31	986	1.46	1036	1.58	1079	1.67
2200	544	0.33	616	0.51	687	0.69	756	0.88	823	1.07	886	1.24	946	1.41	1001	1.55	1051	1.67	1094	1.77
2400	559	0.43	631	0.61	702	0.80	771	0.98	838	1.17	902	1.35	961	1.51	1016	1.65	1066	1.78	1109	1.87
2600	574	0.54	646	0.72	717	0.91	787	1.10	853	1.28	917	1.46	977	1.62	1032	1.77	1081	1.89	1124	1.98
2800	590	0.67	662	0.85	733	1.03	802	1.22	869	1.41	933	1.59	993	1.75	1047	1.89	1097	2.02	1140	2.11
3000	607	0.80	679	0.98	750	1.17	819	1.36	886	1.54	949	1.72	1009	1.88	1064	2.03	1113	2.15	1157	2.24
3200	624	0.95	695	1.13	766	1.31	836	1.50	903	1.69	966	1.86	1026	2.03	1081	2.17	1130	2.29	-	-
3400	641	1.10	713	1.28	784	1.47	853	1.66	920	1.84	984	2.02	1043	2.18	1098	2.33	-	-	-	-
																	FS[4]			

1. Blower performance includes gas heat exchangers and 2” filters. See STATIC RESISTANCE table for additional applications.
2. See RPM SELECTION table to determine desired motor sheave setting and to determine the maximum continuous BHP.
3. kW = BHP x 0.932.
4. Field Supplied Drive.

J07ZJ (7.5 Ton) Side Duct

Air Flow (CFM)	Available External Static Pressure - IWG[1]																			
	0.2		0.4		0.6		0.8		1.0		1.2		1.4		1.6		1.8		2.0	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
	FS[4]				Standard 1.5 HP & Drive										Hi Static 3 HP & Drive					
2000	-	-	656	0.24	711	0.48	768	0.73	826	0.96	886	1.19	945	1.41	1003	1.61	1058	1.79	1110	1.95
2200	619	0.07	670	0.32	724	0.57	781	0.81	840	1.04	899	1.27	959	1.49	1016	1.69	1072	1.87	1124	2.04
2400	631	0.16	682	0.41	736	0.66	793	0.90	852	1.14	911	1.36	970	1.58	1028	1.78	1084	1.97	1136	2.13
2600	642	0.27	692	0.52	747	0.76	804	1.01	862	1.24	922	1.47	981	1.69	1039	1.89	1094	2.07	1146	2.24
2800	652	0.39	703	0.64	757	0.88	814	1.13	873	1.36	932	1.59	992	1.81	1049	2.01	1105	2.19	1157	2.36
3000	663	0.53	714	0.77	768	1.02	825	1.26	884	1.50	943	1.73	1003	1.94	1060	2.14	1116	2.33	1168	2.49
3200	675	0.68	726	0.92	780	1.17	837	1.41	896	1.65	955	1.88	1014	2.09	1072	2.29	1128	2.48	1180	2.64
3400	688	0.84	739	1.09	793	1.34	850	1.58	909	1.82	968	2.04	1027	2.26	1085	2.46	1141	2.65	1193	2.81
3600	703	1.03	753	1.28	807	1.52	864	1.76	923	2.00	983	2.23	1042	2.44	1100	2.64	1155	2.83	-	-
3800	718	1.23	769	1.47	823	1.72	880	1.96	939	2.20	998	2.43	1058	2.64	1115	2.84	1171	3.03	-	-

1. Blower performance includes gas heat exchangers and 2” filters. See STATIC RESISTANCE table for additional applications.
2. See RPM SELECTION table to determine desired motor sheave setting and to determine the maximum continuous BHP.
3. kW = BHP x 0.932.
4. Field Supplied Drive.

J08ZJ (8.5 Ton) Side Duct

Air Flow (CFM)	Available External Static Pressure - IWG[1]																			
	0.2		0.4		0.6		0.8		1.0		1.2		1.4		1.6		1.8		2.0	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
	Field Supplied Drive				Standard 2 HP & Drive								Hi Static 3 HP & Drive							
2200	654	0.32	706	0.53	755	0.73	803	0.92	849	1.10	893	1.27	937	1.44	979	1.62	1020	1.79	1061	1.96
2400	664	0.43	716	0.64	765	0.83	813	1.02	859	1.20	904	1.38	947	1.55	989	1.72	1030	1.89	1071	2.07
2600	675	0.53	726	0.74	776	0.94	824	1.12	870	1.30	914	1.48	957	1.65	1000	1.82	1041	1.99	1082	2.17
2800	686	0.63	738	0.84	787	1.04	835	1.23	881	1.41	925	1.58	969	1.76	1011	1.93	1052	2.10	1093	2.27
3000	699	0.75	750	0.96	800	1.16	847	1.34	893	1.52	938	1.70	981	1.87	1024	2.04	1065	2.21	1106	2.39
3200	713	0.88	764	1.09	814	1.28	861	1.47	907	1.65	952	1.83	995	2.00	1037	2.17	1079	2.34	1119	2.52
3400	728	1.02	779	1.23	829	1.43	877	1.61	923	1.79	967	1.97	1010	2.14	1053	2.31	1094	2.48	1135	2.66
3600	745	1.18	796	1.39	846	1.59	893	1.77	939	1.95	984	2.13	1027	2.30	1069	2.47	1111	2.64	1152	2.82
3800	763	1.36	815	1.57	864	1.76	912	1.95	958	2.13	1002	2.31	1046	2.48	1088	2.65	1129	2.82	1170	3.00
4000	783	1.55	835	1.76	884	1.96	932	2.15	978	2.33	1022	2.50	1066	2.67	1108	2.84	1149	3.02	1190	3.19
4200	805	1.77	856	1.98	906	2.17	953	2.36	999	2.54	1044	2.72	1087	2.89	1129	3.06	1171	3.23	1211	3.41
																	3 HP & Field Supplied Drive			

1. Blower performance includes gas heat exchangers and 2” filters. See STATIC RESISTANCE table for additional applications.
2. See RPM SELECTION table to determine desired motor sheave setting and to determine the maximum continuous BHP.
3. kW = BHP x 0.932.

J10ZJ (10 Ton) Side Duct

Air Flow (CFM)	Available External Static Pressure - IWG[1]																			
	0.2		0.4		0.6		0.8		1.0		1.2		1.4		1.6		1.8		2.0	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
	Field Supplied Drive				Standard 2 HP & Drive										Hi Static 3 HP & Drive					
2600	675	0.53	726	0.74	776	0.94	824	1.12	870	1.30	914	1.48	957	1.65	1000	1.82	1041	1.99	1082	2.17
2800	686	0.63	738	0.84	787	1.04	835	1.23	881	1.41	925	1.58	969	1.76	1011	1.93	1052	2.10	1093	2.27
3000	699	0.75	750	0.96	800	1.16	847	1.34	893	1.52	938	1.70	981	1.87	1024	2.04	1065	2.21	1106	2.39
3200	713	0.88	764	1.09	814	1.28	861	1.47	907	1.65	952	1.83	995	2.00	1037	2.17	1079	2.34	1119	2.52
3400	728	1.02	779	1.23	829	1.43	877	1.61	923	1.79	967	1.97	1010	2.14	1053	2.31	1094	2.48	1135	2.66
3600	745	1.18	796	1.39	846	1.59	893	1.77	939	1.95	984	2.13	1027	2.30	1069	2.47	1111	2.64	1152	2.82
3800	763	1.36	815	1.57	864	1.76	912	1.95	958	2.13	1002	2.31	1046	2.48	1088	2.65	1129	2.82	1170	3.00
4000	783	1.55	835	1.76	884	1.96	932	2.15	978	2.33	1022	2.50	1066	2.67	1108	2.84	1149	3.02	1190	3.19
4200	805	1.77	856	1.98	906	2.17	953	2.36	999	2.54	1044	2.72	1087	2.89	1129	3.06	1171	3.23	1211	3.41
4400	828	2.00	879	2.21	929	2.41	976	2.59	1022	2.77	1067	2.95	1110	3.12	1152	3.29	-	-	-	-
4600	852	2.25	904	2.46	953	2.66	1001	2.85	1047	3.03	1092	3.20	1135	3.37	-	-	-	-	-	-
4800	879	2.52	930	2.73	980	2.93	1027	3.12	1073	3.30	-	-	-	-	-	-	-	-	-	-
5000	906	2.81	958	3.02	1007	3.22	1055	3.41	-	-	-	-	-	-	-	-	-	-	-	-
											3 HP & Field Supplied Drive									

1. Blower performance includes gas heat exchangers and 2” filters. See STATIC RESISTANCE table for additional applications.
2. See RPM SELECTION table to determine desired motor sheave setting and to determine the maximum continuous BHP.
3. kW = BHP x 0.932.

J12ZJ (12.5 Ton) Side Duct

Air Flow (CFM)	Available External Static Pressure - IWG[1]																			
	0.2		0.4		0.6		0.8		1.0		1.2		1.4		1.6		1.8		2.0	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
	Field Supplied Drive								Standard 3 HP & Drive											
3200	713	0.88	764	1.09	814	1.28	861	1.47	907	1.65	952	1.83	995	2.00	1037	2.17	1079	2.34	1119	2.52
3400	728	1.02	779	1.23	829	1.43	877	1.61	923	1.79	967	1.97	1010	2.14	1053	2.31	1094	2.48	1135	2.66
3600	745	1.18	796	1.39	846	1.59	893	1.77	939	1.95	984	2.13	1027	2.30	1069	2.47	1111	2.64	1152	2.82
3800	763	1.36	815	1.57	864	1.76	912	1.95	958	2.13	1002	2.31	1046	2.48	1088	2.65	1129	2.82	1170	3.00
4000	783	1.55	835	1.76	884	1.96	932	2.15	978	2.33	1022	2.50	1066	2.67	1108	2.84	1149	3.02	1190	3.19
4200	805	1.77	856	1.98	906	2.17	953	2.36	999	2.54	1044	2.72	1087	2.89	1129	3.06	1171	3.23	1211	3.41
4400	828	2.00	879	2.21	929	2.41	976	2.59	1022	2.77	1067	2.95	1110	3.12	1152	3.29	1194	3.46	1235	3.64
4600	852	2.25	904	2.46	953	2.66	1001	2.85	1047	3.03	1092	3.20	1135	3.37	1177	3.54	1219	3.72	1259	3.89
4800	879	2.52	930	2.73	980	2.93	1027	3.12	1073	3.30	1118	3.47	1161	3.65	1203	3.82	1245	3.99	1285	4.16
5000	906	2.81	958	3.02	1007	3.22	1055	3.41	1101	3.59	1146	3.76	1189	3.94	1231	4.11	1273	4.28	1313	4.45
5200	936	3.12	987	3.33	1037	3.53	1084	3.72	1130	3.90	1175	4.07	1218	4.24	1260	4.42	1302	4.59	1343	4.76
5400	966	3.45	1018	3.66	1067	3.86	1115	4.05	1161	4.23	1206	4.40	1249	4.57	1291	4.74	1333	4.91	1373	5.09
5600	999	3.80	1050	4.01	1100	4.20	1147	4.39	1193	4.57	1238	4.75	1281	4.92	1323	5.09	1365	5.26	1405	5.44
5800	1032	4.16	1084	4.37	1133	4.57	1181	4.75	1227	4.93	1271	5.11	1315	5.28	1357	5.45	1398	5.62	-	-
6000	1067	4.54	1119	4.75	1168	4.95	1216	5.13	1262	5.31	1306	5.49	1350	5.66	-	-	-	-	-	-
6200	1103	4.94	1155	5.15	1204	5.34	1252	5.53	1298	5.71	-	-	-	-	-	-	-	-	-	-
	Hi Static 5 HP & Drive								5 HP & Field Supplied Drive											

1. Blower performance includes gas heat exchangers and 2” filters. See STATIC RESISTANCE table for additional applications.
2. See RPM SELECTION table to determine desired motor sheave setting and to determine the maximum continuous BHP.
3. kW = BHP x 0.932.

Table 18: Airflow Performance - Bottom Duct Application

J06ZJ (6.5 Ton) Bottom Duct

Air Flow (CFM)	Available External Static Pressure - IWG[1]																			
	0.2		0.4		0.6		0.8		1.0		1.2		1.4		1.6		1.8		2.0	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
	FS[4]		Standard 1.5 HP & Drive								Hi Static 2 HP & Drive									
1800	603	0.13	656	0.36	718	0.58	784	0.79	851	0.98	914	1.16	968	1.31	1010	1.43	1035	1.53	1039	1.59
2000	627	0.26	680	0.49	742	0.71	808	0.92	875	1.12	937	1.29	992	1.44	1034	1.57	1059	1.66	1063	1.72
2200	650	0.40	703	0.63	765	0.85	831	1.06	898	1.25	961	1.43	1015	1.58	1057	1.71	1082	1.80	1086	1.86
2400	673	0.55	726	0.78	788	1.00	854	1.21	921	1.40	984	1.58	1038	1.73	1080	1.85	1105	1.95	1109	2.01
2600	696	0.71	749	0.94	811	1.16	878	1.37	944	1.56	1007	1.73	1061	1.89	1103	2.01	1128	2.10	1133	2.16
2800	720	0.87	773	1.10	835	1.32	902	1.53	968	1.73	1031	1.90	1085	2.05	1127	2.18	1152	2.27	1157	2.33
3000	745	1.05	798	1.28	860	1.50	926	1.71	993	1.91	1056	2.08	1110	2.23	1152	2.36	1177	2.45	1181	2.51
3200	771	1.24	824	1.47	886	1.69	952	1.90	1019	2.09	1081	2.27	1136	2.42	1178	2.54	1203	2.64	1207	2.70
3400	797	1.44	850	1.67	912	1.89	979	2.10	1045	2.29	1108	2.47	1162	2.62	1204	2.74	1229	2.84	1234	2.90
															3 HP & Field Supplied Drive					

1. Blower performance includes gas heat exchangers and 2” filters. See STATIC RESISTANCE table for additional applications.
2. See RPM SELECTION table to determine desired motor sheave setting and to determine the maximum continuous BHP.
3. kW = BHP x 0.932.
4. Field Supplied Drive.

J07ZJ (7.5 Ton) Bottom Duct

Air Flow (CFM)	Available External Static Pressure - IWG[1]																			
	0.2		0.4		0.6		0.8		1.0		1.2		1.4		1.6		1.8		2.0	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
	FS[4]		Standard 1.5 HP & Drive										Hi Static 3 HP & Drive							
2000	644	0.11	698	0.38	755	0.62	814	0.85	874	1.06	933	1.26	990	1.46	1043	1.66	1090	1.87	1131	2.09
2200	666	0.26	720	0.53	777	0.77	836	1.00	896	1.21	956	1.41	1012	1.61	1065	1.81	1113	2.02	1153	2.24
2400	689	0.42	743	0.69	800	0.93	859	1.16	919	1.37	978	1.57	1035	1.77	1088	1.97	1135	2.18	1176	2.40
2600	712	0.60	766	0.87	823	1.11	882	1.34	942	1.55	1002	1.75	1058	1.95	1111	2.15	1159	2.36	1199	2.58
2800	736	0.80	790	1.06	847	1.31	906	1.53	967	1.74	1026	1.94	1082	2.14	1135	2.34	1183	2.55	1223	2.78
3000	761	1.00	815	1.27	872	1.52	931	1.74	991	1.95	1051	2.15	1107	2.35	1160	2.55	1208	2.76	1248	2.98
3200	787	1.22	840	1.49	898	1.74	957	1.96	1017	2.17	1076	2.37	1133	2.57	1186	2.77	1233	2.98	1274	3.20
3400	813	1.46	867	1.73	924	1.97	984	2.19	1044	2.40	1103	2.61	1160	2.80	1212	3.01	1260	3.21	-	-
3600	841	1.70	894	1.97	952	2.21	1011	2.44	1071	2.65	1130	2.85	1187	3.05	-	-	-	-	-	-
3800	869	1.96	923	2.22	980	2.47	1039	2.69	1099	2.90	1158	3.10	1215	3.30	-	-	-	-	-	-
															3 HP & Field Supplied Drive					

1. Blower performance includes gas heat exchangers and 2” filters. See STATIC RESISTANCE table for additional applications.
2. See RPM SELECTION table to determine desired motor sheave setting and to determine the maximum continuous BHP.
3. kW = BHP x 0.932.
4. Field Supplied Drive.

J08ZJ (8.5 Ton) Bottom Duct

Air Flow (CFM)	Available External Static Pressure - IWG[1]																			
	0.2		0.4		0.6		0.8		1.0		1.2		1.4		1.6		1.8		2.0	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
	FS[4]		Standard 2 HP & Drive								Hi Static 3 HP & Drive									
2200	685	0.59	739	0.74	791	0.88	841	1.01	889	1.14	936	1.27	981	1.39	1025	1.51	1069	1.63	1111	1.75
2400	702	0.70	756	0.85	808	0.99	858	1.12	906	1.25	953	1.37	999	1.49	1043	1.62	1086	1.74	1129	1.86
2600	722	0.83	776	0.97	828	1.11	878	1.25	926	1.37	973	1.50	1018	1.62	1063	1.74	1106	1.86	1149	1.99
2800	744	0.97	798	1.12	850	1.26	900	1.39	949	1.52	995	1.64	1041	1.76	1085	1.88	1128	2.00	1171	2.13
3000	769	1.13	823	1.28	875	1.42	925	1.55	974	1.68	1020	1.80	1066	1.92	1110	2.05	1153	2.17	1196	2.29
3200	797	1.32	851	1.46	903	1.60	953	1.74	1001	1.86	1048	1.99	1093	2.11	1138	2.23	1181	2.35	1224	2.48
3400	828	1.52	882	1.67	934	1.81	983	1.94	1032	2.07	1078	2.19	1124	2.32	1168	2.44	1212	2.56	1254	2.68
3600	861	1.75	915	1.90	967	2.04	1017	2.17	1065	2.30	1112	2.42	1157	2.54	1201	2.67	1245	2.79	1287	2.91
3800	897	2.00	951	2.15	1002	2.29	1052	2.42	1101	2.55	1147	2.67	1193	2.80	1237	2.92	1280	3.04	1323	3.16
4000	935	2.27	989	2.42	1041	2.56	1091	2.69	1139	2.82	1186	2.95	1231	3.07	1275	3.19	1319	3.31	1362	3.43
4200	976	2.57	1030	2.72	1082	2.86	1132	2.99	1180	3.12	1227	3.24	1272	3.36	-	-	-	-	-	-
															3 HP & Field Supplied Drive					

1. Blower performance includes gas heat exchangers and 2” filters. See STATIC RESISTANCE table for additional applications.
2. See RPM SELECTION table to determine desired motor sheave setting and to determine the maximum continuous BHP.
3. kW = BHP x 0.932.
4. Field Supplied Drive.

J10ZJ (10 Ton) Bottom Duct

Air Flow (CFM)	Available External Static Pressure - IWG[1]																			
	0.2		0.4		0.6		0.8		1.0		1.2		1.4		1.6		1.8		2.0	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
	Field Supplied Drive		Standard 2 HP & Drive										Hi Static 3 HP & Drive							
2600	722	0.83	776	0.97	828	1.11	878	1.25	926	1.37	973	1.50	1018	1.62	1063	1.74	1106	1.86	1149	1.99
2800	744	0.97	798	1.12	850	1.26	900	1.39	949	1.52	995	1.64	1041	1.76	1085	1.88	1128	2.00	1171	2.13
3000	769	1.13	823	1.28	875	1.42	925	1.55	974	1.68	1020	1.80	1066	1.92	1110	2.05	1153	2.17	1196	2.29
3200	797	1.32	851	1.46	903	1.60	953	1.74	1001	1.86	1048	1.99	1093	2.11	1138	2.23	1181	2.35	1224	2.48
3400	828	1.52	882	1.67	934	1.81	983	1.94	1032	2.07	1078	2.19	1124	2.32	1168	2.44	1212	2.56	1254	2.68
3600	861	1.75	915	1.90	967	2.04	1017	2.17	1065	2.30	1112	2.42	1157	2.54	1201	2.67	1245	2.79	1287	2.91
3800	897	2.00	951	2.15	1002	2.29	1052	2.42	1101	2.55	1147	2.67	1193	2.80	1237	2.92	1280	3.04	1323	3.16
4000	935	2.27	989	2.42	1041	2.56	1091	2.69	1139	2.82	1186	2.95	1231	3.07	1275	3.19	1319	3.31	1362	3.43
4200	976	2.57	1030	2.72	1082	2.86	1132	2.99	1180	3.12	1227	3.24	1272	3.36	-	-	-	-	-	-
4400	1019	2.88	1073	3.03	1125	3.17	1175	3.30	1223	3.43	-	-	-	-	-	-	-	-	-	-
4600	1065	3.22	1119	3.36	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
			3 HP & Field Supplied Drive																	

1. Blower performance includes gas heat exchangers and 2” filters. See STATIC RESISTANCE table for additional applications.
2. See RPM SELECTION table to determine desired motor sheave setting and to determine the maximum continuous BHP.
3. kW = BHP x 0.932.

J12ZJ (12.5 Ton) Bottom Duct

Air Flow (CFM)	Available External Static Pressure - IWG[1]																			
	0.2		0.4		0.6		0.8		1.0		1.2		1.4		1.6		1.8		2.0	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
	Field Supplied Drive				Standard 3 HP & Drive										Hi Static 5 HP & Drive					
3200	797	1.32	851	1.46	903	1.60	953	1.74	1001	1.86	1048	1.99	1093	2.11	1138	2.23	1181	2.35	1224	2.48
3400	828	1.52	882	1.67	934	1.81	983	1.94	1032	2.07	1078	2.19	1124	2.32	1168	2.44	1212	2.56	1254	2.68
3600	861	1.75	915	1.90	967	2.04	1017	2.17	1065	2.30	1112	2.42	1157	2.54	1201	2.67	1245	2.79	1287	2.91
3800	897	2.00	951	2.15	1002	2.29	1052	2.42	1101	2.55	1147	2.67	1193	2.80	1237	2.92	1280	3.04	1323	3.16
4000	935	2.27	989	2.42	1041	2.56	1091	2.69	1139	2.82	1186	2.95	1231	3.07	1275	3.19	1319	3.31	1362	3.43
4200	976	2.57	1030	2.72	1082	2.86	1132	2.99	1180	3.12	1227	3.24	1272	3.36	1316	3.48	1360	3.60	1402	3.73
4400	1019	2.88	1073	3.03	1125	3.17	1175	3.30	1223	3.43	1270	3.55	1315	3.67	1360	3.80	1403	3.92	1446	4.04
4600	1065	3.22	1119	3.36	1171	3.50	1221	3.64	1269	3.76	1316	3.89	1361	4.01	1405	4.13	1449	4.25	1491	4.38
4800	1113	3.57	1167	3.72	1219	3.86	1269	3.99	1317	4.12	1364	4.24	1409	4.36	1453	4.48	1497	4.61	1540	4.73
5000	1163	3.94	1217	4.09	1269	4.23	1319	4.36	1367	4.49	1414	4.62	1459	4.74	1504	4.86	1547	4.98	1590	5.10
5200	1216	4.34	1270	4.48	1321	4.62	1371	4.76	1420	4.88	1466	5.01	1512	5.13	1556	5.25	1600	5.37	1642	5.50
5400	1270	4.75	1324	4.89	1376	5.03	1426	5.17	1474	5.29	1521	5.42	1566	5.54	1611	5.66	-	-	-	-
5600	1327	5.17	1381	5.32	1433	5.46	1483	5.59	1531	5.72	-	-	-	-	-	-	-	-	-	-
5800	1385	5.62	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
			5 HP & Field Supplied Drive																	

1. Blower performance includes gas heat exchangers and 2” filters. See STATIC RESISTANCE table for additional applications.
2. See RPM SELECTION table to determine desired motor sheave setting and to determine the maximum continuous BHP.
3. kW = BHP x 0.932.

Table 19: RPM Selection

Size (Tons)	Model	HP	Max BHP	Motor Sheave	Blower Sheave	6 Turns Open	5 Turns Open	4 Turns Open	3 Turns Open	2 Turns Open	1 Turn Open	Fully Closed
J06 (6.5)	ZJ	1.5	1.73	1VL40	AK74	N/A	641	690	739	789	838	887
		2	2.30	1VM50	AK74	N/A	887	936	986	1035	1084	1134
J07 (7.5)	ZJ	1.5	1.73	1VL40	AK69	N/A	690	743	796	849	902	955
		3	3.45	1VM50	AK69	N/A	955	1008	1062	1115	1168	1221
102 (8.5)	ZJ	2	2.30	1VM50	AK89	N/A	731	771	812	852	893	934
		3	3.45	1VM50	AK74	N/A	887	936	986	1035	1084	1134
J10 (10)	ZJ	2	2.30	1VM50	AK84	N/A	776	819	863	906	949	992
		3	3.45	1VM50	AK74	N/A	887	936	986	1035	1084	1134
J12 (12.5)	ZJ	3	3.45	1VM50	AK74	N/A	887	936	986	1035	1084	1134
		5	5.75	1VP56	BK77	1052	1095	1136	1175	1216	1272	N/A

Table 20: Indoor Blower Specifications

Size (Tons)	Model	Motor					Motor Sheave			Blower Sheave			Belt
		HP	RPM	Eff.	SF	Frame	Datum Dia. (in.)	Bore (in.)	Model	Datum Dia. (in.)	Bore (in.)	Model	
J06 (6.5)	ZJ	1-1/2	1725	0.8	1.15	56	2.6 - 3.6	7/8	1VL40	7.0	1	AK74	A53
		2	1725	0.8	1.15	56	3.6 - 4.6	7/8	1VM50	7.0	1	AK74	A54
J07 (7.5)	ZJ	1-1/2	1725	0.8	1.15	56	2.6 - 3.6	7/8	1VL40	6.5	1	AK69	A53
		3	1725	0.8	1.15	56	3.6 - 4.6	7/8	1VM50	6.5	1	AK69	A54
J08 (8.5)	ZJ	2	1725	0.8	1.15	56	3.4 - 4.4	7/8	1VM50	8.5	1	AK89	A56
		3	1725	0.8	1.15	56	3.4 - 4.4	7/8	1VM50	7.0	1	AK74	A54
J10 (10)	ZJ	2	1725	0.8	1.15	56	3.4 - 4.4	7/8	1VM50	8.0	1	AK84	A56
		3	1725	0.8	1.15	56	3.4 - 4.4	7/8	1VM50	7.0	1	AK74	A54
J12 (12.5)	ZJ	3	1725	0.8	1.15	56	3.4 - 4.4	7/8	1VM50	7.0	1	AK74	A54
		5	1725	0.87	1.15	184T	4.3 - 5.3	1-1/8	1VP56	6.7	1	BK77	BX55

Table 21: Power Exhaust Specifications

Model	Voltage	Motor			Motor			Fuse Size	CFM @ 0.1 ESP
		HP	RPM[1]	QTY	LRA	FLA	MCA		
2PE04703225	208/230-1-60	3/4	1075	1	7.8	5	6.3	10	3800
2PE04703246	460-1-60	3/4	1075	1	3.4	2.2	2.8	5	3800
2PE04703258	575-1-60	3/4	1050	1	2.9	1.5	1.9	4	3800

1. Motors are multi-tapped and factory wired for high speed.

Air Balance

⚠ CAUTION

On VAV units be certain that the VFD is set to maximum output, exhaust dampers are closed and individual space damper boxes are full open.

VFD units with manual bypass option must not be in the bypass mode ('LINE" position), unless all individual space dampers are full open.

Start the supply air blower motor. Adjust the resistances in both the supply and the return air duct systems to balance the air distribution throughout the conditioned space. The job specifications may require that this balancing be done by someone other than the equipment installer.

⚠ CAUTION

Belt drive blower systems MUST be adjusted to the specific static and CFM requirements for the application. The Belt drive blowers are NOT set at the factory for any specific static or CFM. Adjustments of the blower speed and belt tension are REQUIRED. Verify proper sheave alignment; tighten blower pulley and motor sheave set screws after these adjustments. Re-checking set screws after 10-12 hrs. run time is recommended.

Checking Air Quantity

Method One

1. Remove the dot plugs from the duct panel (for location of the dot plugs see Figures 12 and 13).
2. Insert eight-inches of 1/4 inch metal tubing into the airflow on both sides of the indoor coil.

NOTE: The tubes must be inserted and held in a position perpendicular to the air flow so that velocity pressure will not affect the static pressure readings.

3. Use an Inclined Manometer or Magnehelic to determine the pressure drop across a dry evaporator coil. Since the moisture on an evaporator coil can vary greatly, measuring the pressure drop across a wet coil under field conditions could be inaccurate. To assure a dry coil, the compressors should be de-activated while the test is being run.

NOTE: De-energize the compressors before taking any test measurements to assure a dry evaporator coil.

4. The CFM through the unit can be determined from the pressure drop indicated by the manometer by referring to Figure 31. In order to obtain an accurate measurement, be certain that the air filters are clean.
5. To adjust Measured CFM to Required CFM, see SUPPLY AIR DRIVE ADJUSTMENT.
6. After readings have been obtained, remove the tubes and replace the dot plugs.
7. Tighten blower pulley and motor sheave set screws after any adjustments. Re-check set screws after 10-12 hrs. run time is recommended.

⚠WARNING

Failure to properly adjust the total system air quantity can result in extensive blower damage.

Method Two

1. Drill two 5/16 inch holes, one in the return air duct as close to the inlet of the unit as possible, and another in the supply air duct as close to the outlet of the unit as possible.
2. Using the whole drilled in step 1, insert eight inches of 1/4 inch metal tubing into the airflow of the return and supply air ducts of the unit.

NOTE: The tubes must be inserted and held in position perpendicular to the airflow so that velocity pressure will not affect the static pressure readings.

3. Use an Inclined Manometer or Magnehelic to determine the pressure drop across the unit. This is the External Static Pressure (ESP). In order to obtain an accurate measurement, be certain that the air filters are clean.
4. Determine the number of turns the variable motor sheave is open.
5. Select the correct blower performance table for the unit from Tables 17 and 18. Tables are presented for side and down flow configuration.
6. Determine the unit Measured CFM from the Blower Performance Table, External Static Pressure and the number of turns the variable motor sheave is open.
7. To adjust Measured CFM to Required CFM, see SUPPLY AIR DRIVE ADJUSTMENT.
8. After reading has been obtained, remove the tubes and seal holes.
9. Tighten blower pulley and motor sheave set screws after any adjustments. Re-check set screws after 10-12 hrs. run time is recommended.

NOTE: With the addition of field installed accessories repeat this procedure.

⚠WARNING

Failure to properly adjust the total system air quantity can result in extensive blower damage.

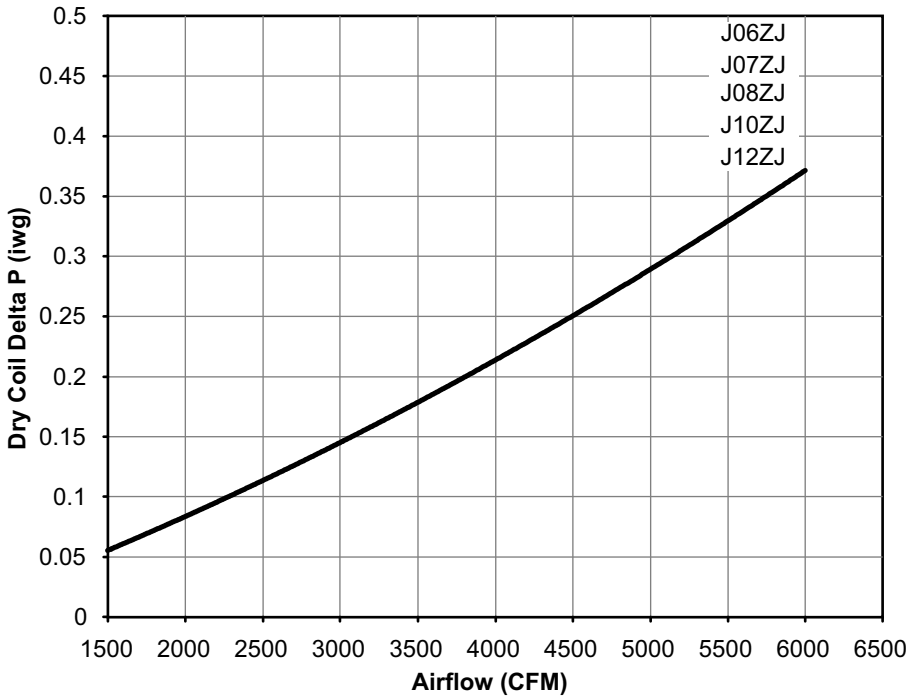


Figure 31: Dry Coil Delta P

Supply Air Drive Adjustment

⚠ CAUTION

Before making any blower speed changes review the installation for any installation errors, leaks or undesirable systems effects that can result in loss of airflow.

Even small changes in blower speed can result in substantial changes in static pressure and BHP. BHP and AMP draw of the blower motor will increase by the cube of the blower speed. Static pressure will increase by the square of the blower speed. Only qualified personnel should make blower speed changes, strictly adhering to the fan laws.

At unit start-up, the measured CFM may be higher or lower than the required CFM. To achieve the required CFM, the speed of the drive may have adjusted by changing the datum diameter (DD) of the variable pitch motor sheave as described below:

$$\left(\frac{\text{4,000 CFM}}{\text{3,800 CFM}}\right) \bullet \text{4.0 in.} = \text{4.21 in.}$$

Use the following tables and the DD calculated per the above equation to adjust the motor variable pitch sheave.

EXAMPLE

A 12.5 ton unit was selected to deliver 4,000 CFM with a 3 HP motor, but the unit is delivering 3,800 CFM. The variable pitch motor sheave is set at 2 turns open.

Use the equation to determine the required DD for the new motor sheave,

$$\left(\frac{\text{Required CFM}}{\text{Measured CFM}}\right) \bullet \text{Existing DD} = \text{New DD}$$

Use Table 22 to locate the DD nearest to 4.21 in. Close the sheave to 1 turn open.

New BHP

= (Speed increase)^3 • BHP at 3,800 CFM

= (Speed increase)^3 • Original BHP

= New BHP

New motor Amps

= (Speed increase)^3 • Amps at 3,800 CFM

= (Speed increase)^3 • Original Amps

= New Amps

Table 22: Motor Sheave Datum Diameters

1VM50x7/8 (1-1/2, 2 & 3 HP Motor)		1VP56x1-1/8 (5 HP Motor)	
Turns Open	**Datum Diameter**	**Turns Open**	**Datum Diameter**
0	4.4	1	5.3
1/2	4.3	1-1/2	5.2
1	4.2	2	5.1
1-1/2	4.1	2-1/2	5.0
2	4.0	3	4.9
2-1/2	3.9	3-1/2	4.8
3	3.8	4	4.7
3-1/2	3.7	4-1/2	4.6
4	3.6	5	4.5
4-1/2	3.5	5-1/2	4.4
5	3.4	6	4.3

⚠ CAUTION

Belt drive blower systems MUST be adjusted to the specific static and CFM requirements for the application. The Belt drive blowers are NOT set at the factory for any specific static or CFM. Adjustments of the blower speed and belt tension are REQUIRED. Verify proper sheave alignment; tighten blower pulley and motor sheave set screws after these adjustments. Re-checking set screws after 10-12 hrs. run time is recommended.

Table 23: Additional Static Resistance

Size (Tons)	Model	CFM	Cooling Only[1]	Economizer[2,3]	4" Filter[2]	Electric Heat kW[2]				
						9	18	24	36	54
J06 (6.5) J07 (7.5) 102 (8.5) J10 (10) J12 (12.5)	ZJ	1900	0.06	0.02	0.12	0.05	0.06	0.07	0.08	0.10
		2100	0.07	0.02	0.13	0.06	0.07	0.08	0.09	0.11
		2300	0.08	0.04	0.14	0.07	0.08	0.09	0.10	0.13
		2500	0.09	0.11	0.16	0.08	0.09	0.10	0.11	0.14
		2700	0.11	0.18	0.17	0.09	0.10	0.12	0.13	0.16
		2900	0.12	0.25	0.19	0.10	0.11	0.13	0.14	0.18
		3100	0.14	0.31	0.20	0.12	0.13	0.15	0.16	0.20
		3300	0.16	0.37	0.22	0.13	0.14	0.17	0.18	0.22
		3500	0.18	0.43	0.26	0.15	0.16	0.19	0.20	0.24
		3700	0.20	0.49	0.27	0.17	0.18	0.21	0.22	0.26
		3900	0.23	0.54	0.29	0.19	0.20	0.23	0.24	0.28
		4100	0.25	0.58	0.32	0.21	0.22	0.25	0.26	0.31
		4300	0.28	0.65	0.35	0.23	0.24	0.28	0.29	0.34
		4500	0.30	0.69	0.38	0.25	0.26	0.30	0.31	0.37
		4700	0.33	0.74	0.41	0.28	0.29	0.33	0.34	0.40
		4900	0.36	0.78	0.44	0.30	0.31	0.35	0.37	0.43
		5100	0.39	0.82	0.47	0.33	0.34	0.38	0.40	0.46
		5300	0.42	0.86	0.51	0.35	0.37	0.41	0.43	0.49
		5500	0.45	0.89	0.55	0.38	0.40	0.44	0.46	0.53
		5700	0.48	0.93	0.58	0.41	0.43	0.47	0.49	0.56
		5900	0.52	0.96	0.62	0.44	0.46	0.50	0.53	0.59
		6100	0.56	0.98	0.67	0.47	0.49	0.53	0.56	0.62
		6300	0.60	1.01	0.71	0.50	0.53	0.56	0.59	0.65

1. Add these values to the available static resistance in the respective Blower Performance Tables.
2. Deduct these values from the available external static pressure shown in the respective Blower Performance Tables.
3. The pressure drop through the economizer is greater for 100% outdoor air than for 100% return air. If the resistance of the return air duct is less than 0.25 IWG, the unit will deliver less CFM during full economizer operation.

Operation

Cooling Sequence Of Operation

NOTE: For more in-depth sequence of operation of the Smart Equipment™ control please refer to LIT-12011950 on www.upgnet.com under Product Center \ Equipment Catalog \ Commercial Products \ Zoning Systems and Controls.

For J**ZJ units, a "Y1" call for the first stage of cooling is passed to the Unit Control Board (UCB) which then determines whether the requested operation is available and if so, which components to energize. With a "Y1" call for first stage cooling the UCB will determine if a first stage cooling output is valid as long as all safeties and time-delays allow a C1 output for cooling. The C1 relay on the UCB will close and send 24 volts to the M1 contactor starting the first stage compressor and the associated condenser fan

If a Y2 call is present it is passed to the Unit Control Board (UCB) which then determines whether the requested operation is available and if so, which components to energize. With a "Y2" call for first stage cooling the UCB will determine if a second stage cooling output is valid as long as all safeties and time-delays allow a C2 output for cooling. The C2 relay on the UCB will close and send 24 volts to the M2 contactor starting the first stage compressor and the associated condenser fan.

Continuous Blower

By setting the room thermostat fan switch to "ON," the supply air blower will operate continuously.

Intermittent Blower

With the room thermostat fan switch set to "AUTO" and the system switch set to either the "AUTO" or "HEAT" settings, the blower is energized whenever a cooling or heating operation is requested. The blower is energized after any specified delay associated with the operation.

When energized, the indoor blower has a minimum run time of 30 seconds. Additionally, the indoor blower has a delay of 10 seconds minimum off.

Optional VAV Start-up and Control

⚠ CAUTION

If the unit is operated with the optional manual bypass switch in the LINE (BYPASS) position and there are VAV boxes present in the duct system, then boxes must be driven to the full-open position using a customer-supplied power source to prevent over-pressurizing and possible damage to the ductwork.

Once placed into the Occupied Mode, the speed of the indoor blower motor is controlled by duct static pressure. The Duct Static set point (default = 1.5") is the pressure that the VFD drive will maintain when operating the unit in VAV mode. If the duct static pressure reaches or exceeds the high-limit set-point (default = 4.5"), then the supply fan motor will be shutdown.

The Supply Air Temperature (SAT) is controlled by staging compressors on and off to satisfy the "Operating Cooling Supply Air Temp Set point". There are 3 set points that determine the resulting "Operating Cooling Supply Air Temp Set point".

1. VAV Cooling Supply Air Temp Upper Set point (default 60° F)
2. VAV Cooling Supply Air Temp Lower Set point (default 55° F)
3. VAV Supply Air Temp Reset Set point (default 72° F)

When the Return Air Temp (RAT) is above the "VAV Supply Air Temp Reset Set point" the SAT will be maintained at +/- 5 degrees of the "VAV Cooling Supply Air Temp Lower Set point".

When the Return Air Temp (RAT) is below the "VAV Supply Air Temp Reset Set point" the SAT will be maintained at +/- 5 degrees of the "VAV Cooling Supply Air Temp Upper Set point".

When the Outdoor air condition is sufficient for free cooling, the economizer will modulate to control the SAT to +/- 1 degrees of the operational set point.

No Outdoor Air Options

When the thermostat calls for the first stage of cooling, the low-voltage control circuit from “R” to “Y1” and “G” is completed. The UCB energizes the economizer (if installed and free cooling is available) or the first available compressor* and the condenser fans. For first stage cooling, compressor #1 is energized. If compressor #1 is unavailable, compressor #2 is energized. After completing the specified fan on delay for cooling, the UCB will energize the blower motor.

When the thermostat calls for the second stage of cooling, the low-voltage control circuit from “R” to “Y2” is completed. The control board energizes the first available compressor. If free cooling is being used for the first stage of cooling, compressor #1 is energized. If compressor #1 is active for first stage cooling or the first compressor is locked-out, compressor #2 is energized. In free-cooling mode, if the call for the second stage of cooling continues for 20 minutes, compressor #2 is energized, provided it has not been locked-out.

If there is an initial call for both stages of cooling, the UCB will delay energizing compressor #2 by 30 seconds in order to avoid a power rush.

Once the thermostat has been satisfied, it will de-energize Y1 and Y2. If the compressors have satisfied their minimum run times, the compressors and condenser fans are de-energized. Otherwise, the unit operates each cooling system until the minimum run times for the compressors have been completed. Upon the final compressor de-energizing, the blower is stopped following the elapse of the fan off delay for cooling.

* To be available, a compressor must not be locked-out due to a high or low-pressure switch or the **Evaporator Low Limit Sensor (EC1, 2)** detects a temperature below 26 Deg. F and the **Anti-Short Cycle Delay (ASCD)** must have elapsed.

Economizer With Single Enthalpy Sensor

When the room thermostat calls for "first-stage" cooling, the low voltage control circuit from "R" to "G" and "Y1" is completed. The UCB energizes the blower motor (if the fan switch on the room thermostat is set in the "AUTO" position) and drives the economizer dampers from fully closed to their minimum position. If the enthalpy of the outdoor air is below the set point of the enthalpy controller (previously determined), "Y1" energizes the economizer. The dampers will modulate to maintain a constant supply air temperature as monitored by the discharge air sensor. If the outdoor air enthalpy is above the set point, "Y1" energizes compressor #1.

When the thermostat calls for "second-stage" cooling, the low voltage control circuit from "R" to "Y2" is completed. The UCB energizes the first available compressor. If the enthalpy of the outdoor air is below the set point of the enthalpy controller (i.e. first stage has energized the economizer), "Y2" will energize compressor #1. If the outdoor air is above the set point, "Y2" will energize compressor #2.

Once the thermostat has been satisfied, it will de-energize “Y1” and “Y2”. If the compressors have satisfied their minimum run times, the compressors and condenser fans are de-energized. Otherwise, the unit operates each cooling system until the minimum run times for the compressors have been completed. Upon the final compressor de-energizing, the blower is stopped following the elapse of the fan off delay for cooling, and the economizer damper goes to the closed position. If the unit is in continuous fan operation, the economizer damper goes to the minimum position.

Economizer With Dual Enthalpy Sensors

The operation with the dual enthalpy sensors is identical to the single sensor except that a second enthalpy sensor is mounted in the return air. This return air sensor allows the economizer to choose between outdoor air and return air, whichever has the lowest enthalpy value, to provide maximum operating efficiency.

Economizer With Power Exhaust

A unit equipped with an economizer (single or dual enthalpy) and a power exhaust operates as specified above with one addition. The power exhaust motor is energized 45 seconds after the actuator position exceeds the exhaust fan set point on the economizer control. As always, the "R" to "G" connection provides minimum position but does not provide power exhaust operation.

Motorized Outdoor Air Dampers

This system operation is the same as the units with no outdoor air options with one exception. When the "R" to "G" circuit is complete, the motorized damper drives open to a position set

by the thumbwheel on the damper motor. When the "R" to "G" circuit is opened, the damper spring returns fully closed.

Cooling Operation Errors

Each cooling system is monitored for operation outside of the intended parameters. Errors are handled as described below. All system errors override minimum run times for compressors.

NOTE: The following components are needed to access the control points in the Smart Equipment™ control. Installation and operation guides are located on www.upgnet.com under Product Center \ Equipment Catalog \ Commercial Products \ Zoning Systems and Controls.

1. Local LCD on Unit Control Board.

OR

2. Mobile Access Portal (MAP) Gateway (Portable).
   - Source 1 P/N S1-JC-MAP1810-OP
   - MAP Gateway Quick Start Guide P/N 24-10737-16
   - MAP Gateway Instruction P/N 24-10737-8

High-Pressure Limit Switch

During cooling operation, if a high-pressure limit switch opens, the UCB will de-energize the associated compressor, initiate the ASCD (Anti-short cycle delay), and, if the other compressor is idle, stop the condenser fans. If the call for cooling is still present at the conclusion of the ASCD, the UCB will re-energize the halted compressor.

Should a high-pressure switch open three times within two hours of operation, the UCB will lock-out the associated compressor. If the other compressor is inactive, the condenser fans will be de-energized.

Low-Pressure Limit Switch

The low-pressure limit switch is not monitored during the initial 30 seconds of a cooling system's operation. For the following 30 seconds, the UCB will monitor the low-pressure switch to ensure it closes. If the low-pressure switch fails to close after the 30-second monitoring phase, the UCB will de-energize the associated compressor, initiate the ASCD, and, if the other compressor is idle, stop the condenser fans.

Once the low-pressure switch has been proven (closed during the 30-second monitor period described above), the UCB will monitor the low-pressure limit switch for any openings. If the low-pressure switch opens for greater than 5 seconds, the UCB will de-energize the associated compressor, initiate the ASCD, and, if the other compressor is idle, stop the condenser fans.

If the call for cooling is still present at the conclusion of the ASCD, the UCB will re-energize the halted compressor.

Should a low-pressure switch open three times within one hour of operation, the UCB will lock-out the associated compressor. If the other compressor is inactive, the condenser fans will be de-energized.

Evaporator Low Limit

During cooling operation, if the **Evaporator Low Limit Sensor (EC1, 2)** (Located on the Suction Line at the Evaporator Coil.) detects a temperature below 26 Deg. F (default), the UCB will de-energize the associated compressor, initiate the ASCD, and, if the other compressor is idle, stop the condenser fans. If the call for cooling is still present at the conclusion of the ASCD, the UCB will re-energize the halted compressor. Should the UCB detect the evaporator low limit sensor **(EC1, 2)** falling below 26 Deg. F (default) three times within two hours of operation, the UCB will lock-out the associated compressor. If the other compressor is inactive, the condenser fans will be de-energized.

Low Ambient Cooling

To determine when to operate in low ambient mode, the UCB has an **Outdoor Air Temperature Sensor (OAT)** with a low ambient setpoint at 45ºF (default). When the **OAT Sensor** senses a temperature below the low ambient setpoint and the thermostat is calling for cooling, the UCB will operate in the low ambient mode.

Low ambient mode operates the compressors in this manner: 10 minutes on, 5 minutes off. The indoor blower is operated throughout the cycle. The 5-minute off period is necessary to defrost the indoor coil.

Low ambient mode always begins with compressor operation. Compressor minimum run time may extend the minutes of compressor operation. The off cycle will begin immediately following the elapse of the minimum run time.

When operating in low ambient mode, an evaporator low limit sensor **(EC1, 2)** temperature below 26ºF will de-energize the associated compressor. If the call for cooling is still present at the end of the ASCD and the and the evaporator temperature sensor **(EC1, 2)** temperature is above 26°F, the unit will resume operation.

Safety Controls

The unit control board monitors the following inputs for each cooling system:

1. An evaporator low limit sensor **(EC1, 2)** (Located on the Suction Line at the Evaporator Coil.) to protect against low evaporator temperatures due to a low airflow or a low return air temperature, set at 26°F.
2. A high-pressure switch to protect against excessive discharge pressures due to a blocked condenser coil or a condenser motor failure, (opens at 625 ± 25 psig).
3. A low-pressure switch to protect against loss of refrigerant charge, (opens at 50 ± 5 psig).

The above pressure switches are hard-soldered to the unit. The refrigeration systems are independently monitored and controlled. On any fault, only the associated system will be affected by any safety/preventive action. The other refrigerant system will continue in operation unless it is affected by the fault as well.

The unit control board monitors the temperature limit switch of electric heat units and the temperature limit switch and the gas valve of gas furnace units.

Compressor Protection

In addition to the external pressure switches, the compressors also have inherent (internal) protection. If there is an abnormal temperature rise in a compressor, the protector will open to shut down the compressor. The UCB incorporates features to minimize compressor wear and damage. An **Anti-Short Cycle Delay (ASCD)** is utilized to prevent operation of a compressor too soon after its previous run. Additionally, a minimum run time is imposed any time a compressor is energized.

The ASCD is initiated on unit start-up and on any compressor reset or lock-out.

Electric Heating Sequence Of Operations

The following sequence describes the operation of the electric heat section.

⚠ CAUTION

For units with VFD and electric heat, the speed of the indoor blower motor continues to be controlled by duct static pressure via the Smart Equipment™ control board.

If there are VAV boxes present in the duct system, the boxes must be driven to the full-open position using a customer-supplied power source to assure adequate airflow across the heating elements.

Two-stage heating:

a. Upon a call for first stage heat by the thermostat, the heater relay (RA) will be energized. After completing the specified fan on delay for heating, the UCB will energize the blower motor. If the second stage of heat is required, heater relay (RB) will be energized. After completing the specified fan on delay for heating, the UCB will energize the blower motor.

b The thermostat will cycle the electric heat to satisfy the heating requirements of the conditioned space.

Electric Heat Operation Errors

Temperature Limit

If the UCB senses zero volts from the high temperature limit, the indoor blower motor is immediately energized.

This limit is monitored regardless of unit operation status, i.e. the limit is monitored at all times.

If the temperature limit opens three times within one hour, it will lock-on the indoor blower motor.

Safety Controls

The UCB monitors the temperature limit switch of electric heat units.

The control circuit includes the following safety controls:

Limit Switch (LS)

This control is located inside the heater compartment and is set to open at the temperature indicated in the Electric Heat Limit Setting Tables 24. It resets automatically. The limit switch operates when a high temperature condition, caused by inadequate supply air flow occurs, thus shutting down the heater and energizing the blower.

Table 24: Electric Heat Limit Setting

UNIT (TONS)	VOLTAGE	HEATER kW	LIMIT SWITCH OPENS °F
J06, 07ZJ (6.5, 7.5)	208/230	9	150
		18	150
		24	150
		34	150
J08, 10, 12ZJ (8.5,10, 12.5)		18	150
		24	150
		34	150
		54	130
J06, 07ZJ (6.5, 7.5)	480	9	150
		18	150
		24	150
		34	150
J08, 10, 12ZJ (8.5, 10, 12.5)		18	150
		24	150
		34	150
		54	130
J06, 07ZJ (6.5, 7.5)	600	9	150
		18	150
		24	150
		34	150
J08, 10, 12ZJ (8.5, 10, 12.5)		18	150
		24	150
		34	150
		54	130

Reset

Remove the call for heating by lowering the thermostat setting lower than the conditioned space temperature.

Electric Heat Anticipator Setpoints

It is important that the anticipator setpoint be correct. Too high of a setting will result in longer heat cycles and a greater temperature swing in the conditioned space. Reducing the value below the correct setpoint will give shorter “ON” cycles and may result in the lowering of the temperature within the conditioned space. Refer to Table 25 for the required electric heat anticipator setting.

Table 25: Electric Heat Anticipator Setpoints

SETTING, AMPS	
W1	W2
0.13	0.1

Gas Heating Sequence Of Operations

⚠ CAUTION

For units with VFD and gas heat, the speed of the indoor blower motor continues to be controlled by duct static pressure via the Smart Equipment™ control board.

If there are VAV boxes present in the duct system, the boxes must be driven to the full-open position using a customer-supplied power source to assure adequate airflow across the heat exchanger tubes.

When the thermostat calls for the first stage of heating, the low-voltage control circuit from “R” to “W1” is completed. A call for heat passes through the UCB to the **Ignition Control Board (ICB).** The UCB monitors the “W1” call and acts upon any call for heat by monitoring the **Gas Valve (GV).** Once voltage has been sensed at the GV, the UCB will initiate the fan on delay for heating, energizing the indoor blower the specified delay has elapsed.

When the thermostat has been satisfied, heating calls are ceased. The GV is immediately closed. The blower is de-energized after the fan off delay for heating has elapsed. The draft motor performs a 30-second post purge.

Ignition Control Board

First Stage Of Heating

When the ICB receives a call for first stage of heating, “W1,” the draft motor is energized. Once the draft motor has been proven, a 30-second purge is initiated. At the end of the purge, the GV is opened, and the spark igniter is energized for 10 seconds. The ICB then checks for the presence of flame. If flame is detected, the ICB enters a flame stabilization period. If flame was not detected, the GV closes, and a retry operation begins.

During the flame stabilization period, a loss of the flame for 2 seconds will cause the GV to close and the retry operation to begin. After the flame stabilization period, a loss of flame for 3/4 second will cause the GV to close and the retry operation to begin.

At the conclusion of the flame stabilization period, the ICB will operate the gas heat in high fire for an additional 60 seconds (for a total for 120 seconds of high fire operation). After this 60 seconds, the ICB will then use the call for the second stage of heat to control second stage operation of the GV.

When “W1” is satisfied, both valves are closed.

Second Stage Of Heating

When the ICB receives a call for the second stage of heating, “W2,” the ICB conducts a complete first stage ignition sequence. If this sequence is satisfied, the second main valve of the GV is opened.

When “W2” is satisfied, the second main valve is closed.

Retry Operation

When a flame is lost or is not detected during an attempt to achieve ignition, a retry operation occurs. A 30-second purge is performed between ignition attempts.

If the unit fails after three ignition attempts, the furnace is locked-out for one hour. The furnace is monitored during this one-hour period for unsafe conditions.

Recycle Operation

When a flame is lost after the flame stabilization period, a recycle operation occurs. If the unit fails after five recycle attempts, the furnace is locked-out for one hour.

Gas Heating Operation Errors

Lock-Out

A one-hour lockout occurs following three retries or five recycles. During the one-hour lockout, flame detection, limit conditions, and main valves are tested. Any improper results will cause the appropriate action to occur. Recycling the low voltage power cancels the lock-out.

Temperature Limit

If the UCB senses zero volts from the high temperature limit, the indoor blower motor is immediately energized. When the UCB again senses 24 volts from the temperature limit, the draft motor will perform a 15-second post-purge and the indoor blower will be de-energized following the elapse of the fan off delay for heating.

This limit is monitored regardless of unit operation status, i.e. this limit is monitored at all times.

If the temperature limit opens three times within one hour, it will lock-on the indoor blower motor and flash code is initiated (See Table 32).

Flame Sense

Flame sensing occurs at all times. If “W1” is not present and a flame is sensed for 2 seconds, the draft motor is energized and the GV is kept off. The ICB halts any operation until a flame is not detected. Once the flame detection is lost, the ICB performs a post-purge. Normal operation is allowed concurrently with the purge (i.e. this purge can be considered the purge associated with a call for “W1”).

If “W1” is present, a flame is sensed, but the GV is not energized, the draft motor is energized until the flame detection is lost. Normal operation is now allowed.

The flame detection circuitry continually tests itself. If the ICB finds the flame detection circuitry to be faulty, the ICB will not permit an ignition sequence and the draft motor is energized. If this failure should occur during an ignition cycle the failure is counted as a recycle.

Gas Valve

The UCB and ICB continuously monitor the GV.

If the ICB senses voltage at the GV when not requested, the ICB will energize the draft motor. The ICB will not operate the furnace until voltage is no longer sensed at the GV. The draft motor is stopped when voltage is not sensed at the GV.

Any time the UCB senses voltage at the GV without a call for heat for a continuous five-minute period, the UCB will lock-on the indoor blower. When voltage is no longer sensed at the GV, the UCB will de-energize the indoor blower following the elapse of the fan off delay for heating.

If voltage has been sensed at the GV for at least 15 seconds during the fan on delay for heating and GV voltage or “W1” is lost, the indoor blower is forced on for the length of the fan off delay for heating.

During a call for heat, if the UCB does not sense voltage at the GV for a continuous five-minute period the UCB will initiate a error message. The indoor blower motor will not be locked-on while there is no GV voltage.

Safety Controls

The UCB monitors the temperature limit switch of gas heat units.

The control circuit includes the following safety controls:

Limit Switch (LS)

This control is located inside the gas heat compartment and is set to open at the temperature indicated in the Gas Heat Limit Control Settings Table 26. It resets automatically. The limit switch operates when a high temperature condition, caused by inadequate supply air flow occurs, thus shutting down the heater and energizing the blower.

Auxiliary Limit Switch (ALS)

The auxiliary limit switch is wired in series with the limit switch. As such, the UCB cannot distinguish the auxiliary limit and the gas heat limit switch operation except the auxiliary is manual reset. Consequently, the control will respond in the same manner as outlined above under “Limit Switch”.

Table 26: Gas Heat Limit Control Settings[1]

Unit		Main Limit Setting °F
Size	Opt.	
J06ZJ	N12	165
	N18	165
J07ZJ	N12	165
	N18	165
J08ZJ	N12	215
	N18	195
J10ZJ	N18	195
	N24	160
J12ZJ	N18	195
	N24	160

1. Roll-out = 300°F, Auxiliary Limit = 200°F.

The ICB monitors the Pressure and Roll-out switches of gas heat units.

The control circuit includes the following safety controls:

Pressure Switch (PS)

Once the draft motor has reached full speed and closes the pressure switch during a normal ignition sequence, if the pressure switch opens for 2 seconds, the GV will be de-energized, the ignition cycle is aborted, and the ICB flashes the appropriate code. See Table 32 Ignition Control Flash Codes. The draft motor is energized until the pressure switch closes or “W1” is lost.

Roll-out Switch (ROS)

The roll-out switch is wired in series with the pressure switch. As such, the ICB cannot distinguish the roll-out switch operation from that of the pressure switch.

Consequently, the control will only respond in the same manner as outlined above under “Pressure Switch”. An open rollout will inhibit the gas valve from actuating.

Internal Microprocessor Failure

If the ICB detects an internal failure, it will cease all outputs, ignore inputs, and display the proper flash code for control replacement. The ICB remains in this condition until replaced.

Flash Codes

The ICB will initiate a flash code associated with errors within the system. Refer to IGNITION CONTROL FLASH CODES Table 32.

Resets

Remove the call for heating by lowering the thermostat setting lower than the conditioned space temperature. This resets any flash codes.

Gas Heat Anticipator Setpoints

It is important that the anticipator setpoint be correct. Too high of a setting will result in longer heat cycles and a greater temperature swing in the conditioned space. Reducing the

value below the correct setpoint will give shorter “ON cycles and may result in the lowering of the temperature within the conditioned space. Refer to Table 27 for the required gas heat anticipator setting.

Table 27: Gas Heat Anticipator Setpoints

SETTING, AMPS	
W1	**W2**
0.65	0.1

Start-Up (Cooling)

Prestart Check List

After installation has been completed:

1. Check the electrical supply voltage being supplied. Be sure that it is the same as listed on the unit nameplate.
2. Set the room thermostat to the off position.
3. Turn unit electrical power on.
4. Set the room thermostat fan switch to on.
5. Check indoor blower rotation.
   - If blower rotation is in the wrong direction. Refer to Phasing Section in general information section.

   Check blower drive belt tension.
6. Check the unit supply air (CFM).
7. Measure evaporator fan motor's amp draw.
8. Set the room thermostat fan switch to off.
9. Turn unit electrical power off.

Operating Instructions

1. Turn unit electrical power on.

NOTE: Prior to each cooling season, the crankcase heaters must be energized at least 10 hours before the system is put into operation.

2. Set the room thermostat setting to lower than the room temperature.
3. First stage compressors will energize after the built-in time delay (five minutes).
4. The second stage of the thermostat will energize second stage compressor if needed.

Post Start Check List

1. Verify proper system pressures for both circuits.
2. Measure the temperature drop across the evaporator coil.

Start-Up (Gas Heat)

Pre-Start Check List

Complete the following checks before starting the unit.

1. Check the type of gas being supplied. Be sure that it is the same as listed on the unit nameplate.
2. Make sure that the vent outlet and combustion air inlet are free of any debris or obstruction.

Operating Instructions

⚠ CAUTION

This furnace is equipped with an automatic re-ignition system. DO NOT attempt to manually light the pilot.

Lighting The Main Burners

1. Turn “OFF” electric power to unit.
2. Turn room thermostat to lowest setting.
3. Turn gas valve counter-clockwise to “ON” position (See Figure 33).
4. Turn “ON” electric power to unit.
5. If thermostat set temperature is above room temperature, the main burners will ignite. If a second stage of heat is called for, the main burners for second stage heat will ignite for the second stage heat.

Post Start Checklist

After the entire control circuit has been energized and the heating section is operating, make the following checks:

1. Check for gas leaks in the unit piping as well as the supply piping.

⚠WARNING

FIRE OR EXPLOSION HAZARD

Failure to follow the safety warning exactly could result in serious injury, death or property damage.

Never test for gas leaks with an open flame. use a commercially available soap solution made specifically for the detection of leaks to check all connections. A fire or explosion may result causing property damage, personal injury or loss of life.

2. Check for correct manifold gas pressures. (See CHECKING GAS INPUT.)
3. Check the supply gas pressure. It must be within the limits shown on the rating nameplate. Supply pressure should be checked with all gas appliances in the building at full fire. At no time should the standby gas pressure exceed 10.5 in. or the operating pressure drop below 4.5 in for natural gas units. If gas pressure is outside these limits, contact the local gas utility or propane supplier for corrective action.

Shut Down

1. Set the thermostat to the lowest temperature setting.
2. Turn “OFF” all electric power to unit.
3. Open gas heat access panel.
4. Turn gas valve clockwise to “OFF” position (See Figure 33).

Checking Gas Heat Input

This unit has two stages of gas heat. The first stage is 60% of the full fire input and is considered the minimum input for the furnace. The intended input for each furnace is shown in Table 29. The table applies to units operating on 60 Hz power only.

To determine the rate of gas flow (Second Stage).

1. Turn off all other gas appliances connected to the gas meter.
2. Turn on the furnace and make sure the thermostat is calling for Second stage (100% input) heat.
3. Measure the time needed for one revolution of the hand on the smallest dial on the meter. A typical gas meter has a 1/2 or a 1 cubic foot test dial.
4. Using the number of seconds it takes for one revolution of the dial, calculate the cubic feet of gas consumed per hour. (See example below).
5. If necessary, adjust the high pressure regulator as discussed in the section “Manifold Gas Pressure Adjustment”. **Be sure not to over-fire** the furnace on Second stage. If in doubt, it is better to leave the Second stage of the furnace slightly under-fired. Repeat Steps 1-5.

To determine the rate of gas flow (First Stage)

1. Turn off all other gas appliances connected to the gas meter.
2. Turn on the furnace and make sure the thermostat is calling for first stage (60% input) heat.
3. Even when the thermostat is calling for first stage heat, the unit will light on second stage and will run on Second stage for 1 minute. Allow this one-minute time period to expire and be certain the unit is running on first stage.
4. Measure the time needed for one revolution of the hand on the smallest dial on the meter. A typical gas meter has a 1/2 or a 1 cubic foot test dial.
5. Using the number of seconds it takes for one revolution of the dial, calculate the cubic feet of gas consumed per hour (See example below).
6. If necessary, adjust the low pressure regulator as discussed in the section “Manifold Gas Pressure Adjustment”. **Be sure not to under-fire** the furnace on first stage. If in doubt, it is better to leave the first stage of the furnace slightly over-fired (greater than 60% input). Repeat Steps 1-6.

Table 28: Gas Rate Cubic Feet Per Hour

Seconds for One Rev.	Size of Test Dial	
	1/2 cu. ft.	1 cu. ft.
10	180	360
12	150	300
14	129	257
16	113	225
18	100	200
20	90	180
22	82	164
24	75	150
26	69	138
28	64	129
30	60	120
32	56	113
34	53	106
36	50	100
38	47	95
40	45	90
42	43	86
44	41	82
46	39	78
48	37	75
50	36	72
52	35	69
54	34	67
56	32	64
58	31	62
60	30	60

NOTE: To find the Btu input, multiply the number of cubic feet of gas consumed per hour by the Btu content of the gas in your particular locality (contact your gas company for this information as it varies widely from area to area).

EXAMPLE

By actual measurement, it takes 19 seconds for the hand on a 1 cubic foot dial to make a revolution with a 192,000 Btuh furnace running. To determine rotations per minute, divide 60 by 19 = 3.16. To calculate rotations per hour, multiply 3.16 • 60 = 189.6. Multiply 189.6 • 1 (0.5 if using a 1/2 cubic foot dial) = 189.6. Multiply 189.6 • (the Btu rating of the gas). For this example, assume the gas has a Btu rating of 1050 Btu/ft.^{3}. The result of 199,000 Btuh is within 5% of the 192,000 Btuh rating of the furnace.

Manifold Gas Pressure Adjustment

This gas furnace has two heat stages. Therefore, the gas valve has two adjustment screws located under a plastic protective cover. The second stage (100% input) adjustment screw is adjacent to the “HI” marking on the valve and the first stage (60% input) adjustment screw is located adjacent to the “LO” marking on the valve (See Figure 33).

Manifold pressure adjustment procedure.

Adjust second stage (100% input) pressure first, then adjust first stage (60% input) pressure.

1. Turn off all power to the unit.

2. Using the outlet pressure port on the gas valve, connect a manometer to monitor the manifold pressure.
3. Remove plastic cap covering HI and LO pressure adjustment screws.
4. Turn on power to the unit.
5. Set thermostat to call for second stage heat and start furnace.
6. If necessary, using a screwdriver, turn the second stage adjustment screw (adjacent to the “HI” marking on the valve) clockwise to increase manifold pressure or counterclockwise to decrease manifold pressure. **Be sure not to over-fire the unit on second stage**.
7. After the high manifold pressure has been checked, adjust the thermostat to call for first stage heat.
8. If necessary, using a screwdriver, turn the first stage adjustment screw (adjacent to the “LO” marking on the valve) clockwise to increase manifold pressure or counterclockwise to decrease manifold pressure. **Be sure not to under-fire the unit on first stage**.
9. Once pressure has been checked, replace the plastic cap covering the HI and LO pressure adjustment screws.

NOTE: When using natural gas, the manifold pressure for second stage (100% input) should be 3.5 IWG ± 0.3. The manifold pressure for first stage (60% input) when using natural gas should be 1.5 IWG ± 0.3.

Table 29: Gas Heat Stages

# of Burner Tubes	2nd Stage Input (100% Btuh)	1st Stage Input (60% Btuh)
4	120,000	72,000
6	180,000	108,000
8	240,000	144,000

Adjustment Of Temperature Rise

The temperature rise (the difference of temperature between the return air and the heated air from the furnace) must lie within the range shown on the CSA rating plate and the data in Table 10.

After the temperature rise has been determined, the CFM can be calculated as follows:

$$CFM = \text{Btu Input} \cdot \frac{0.8}{(1.08 \cdot \Delta°F)}$$

After about 20 minutes of operation, determine the furnace temperature rise. Take readings of both the return air and the heated air in the ducts (about 6 feet from the furnace) where they will not be affected by radiant heat. Increase the blower CFM to decrease the temperature rise; decrease the blower CFM to increase the rise (See SUPPLY AIR DRIVE ADJUSTMENT).

NOTE: Each gas heat exchanger size has a minimum allowable CFM. Below this CFM, the limit will open.

Burners/Orifices Inspection/Servicing

Before checking or changing burners, pilot or orifices, CLOSE MAIN MANUAL SHUT-OFF VALVE AND SHUT OFF ALL POWER TO THE UNIT.

1. Open the union fitting just upstream of the unit gas valve and downstream from the main manual shut-off valve in the gas supply line.
2. Remove the screws holding each end of the manifold to the manifold supports.
3. Disconnect wiring to the gas valves and spark igniter's. Remove the manifold & gas valve assembly. Orifices can now be inspected and/or replaced.

To service burners, complete step 4.

4. Remove the heat shield on top of the manifold supports. Burners are now accessible for inspection and/or replacement.

NOTE: Reverse the above procedure to replace the assemblies.

Make sure that burners are level and seat at the rear of the gas orifice.

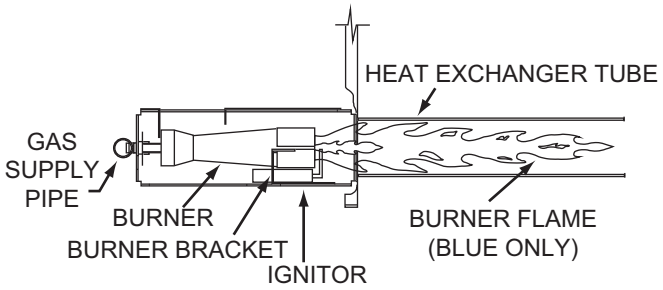


Figure 32: Typical Flame

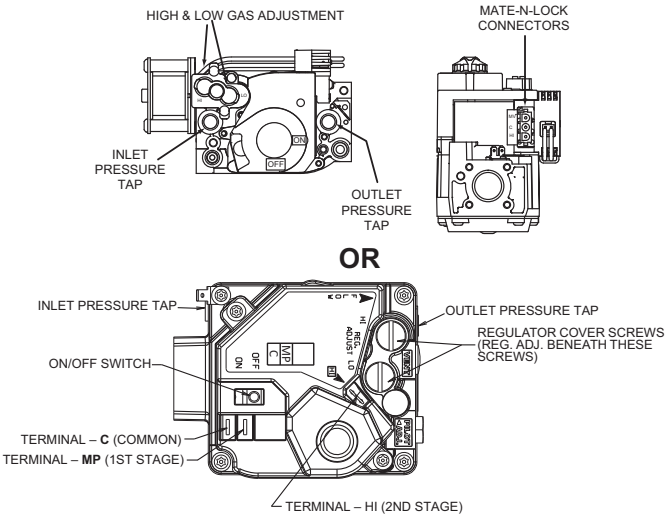


Figure 33: Typical Gas Valve

Charging The Unit

All J**ZJ units use Thermal Expansion Devices. Charge the unit to nameplate charge.

Control Board Navigation Components

The following components are needed to access the control points in the Smart Equipment™ control. Installation and operation guides are located on www.upgnet.com under Product Center \ Equipment Catalog \ Commercial Products \ Zoning Systems and Controls.

1. Local LCD on Unit Control Board.

OR

2. Mobile Access Portal (MAP) Gateway (Portable).
   - Source 1 P/N S1-JC-MAP1810-OP
   - MAP Gateway Quick Start Guide P/N 24-10737-16
   - MAP Gateway Instruction P/N 24-10737-8

NOTE: For more in-depth sequence of operation of the Smart Equipment™ control please refer to LIT-12011950 on www.upgnet.com under Product Center \ Equipment Catalog \ Commercial Products \ Zoning Systems and Controls.

SMART EQUIPMENT™ FIRMWARE VERSION 3.3 BASIC UNIT CONTROL BOARD NAVIGATION EXAMPLES:

The following document details the navigation and viewing of the LCD display screen equipped as a standard item on the Smart Equipment™ control installed within various commercial UPG packaged and split system equipment. The following information provides a step-by-step demonstration on how to navigate the basic status menu and how to change basic configuration settings. The basic navigation steps outlined in this short demonstration applies to most menus within the Smart Equipment™ control.

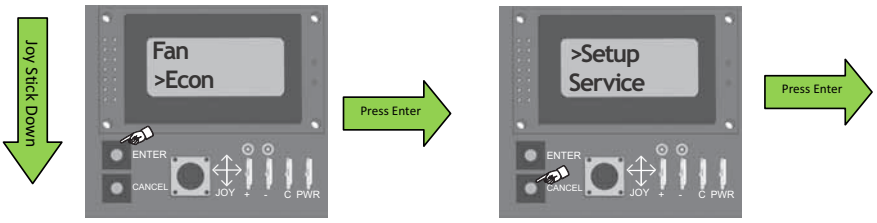
Understanding the Local LCD

After you apply power to your Rooftop Unit (RTU), a start-up countdown begins on the Unit Control Board (UCB) LCD. When the controller is ready, the screen is blank because no faults are present. Use the joystick and the two push buttons below the LCD, to navigate through the menus.

Step 1 - After the start-up countdown is complete the first screen displayed is the "Startup Delay" screen. Move Joystick. Scroll down to "Details" then press "ENTER".

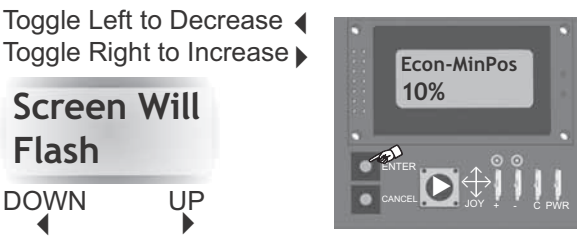
Step 2 - Scroll down to "Econ" and press "ENTER".

Step 3 - "Setup and Service" will now appear. Press "ENTER".



Step 4 - Scroll down to "Econ-MinPos" then press "ENTER".

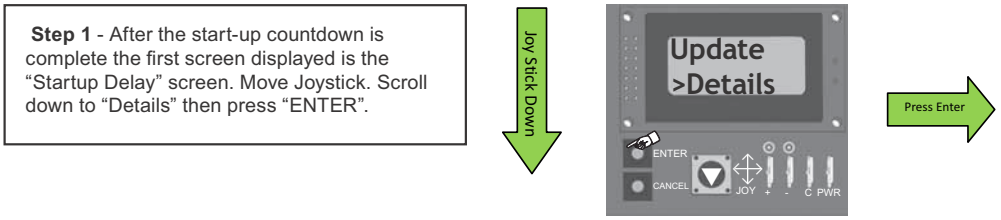
Step 5- To adjust the minimum position percentage move the joystick to the right to increase and to left decrease. Then Press "ENTER". **WAIT 5-7 SECONDS FOR VALUE ONSCREEN TO UPDATE!**



Press the "Cancel" button to exit each menu level. Repeatedly pressing "Cancel" returns the menu to the first "Status, Alarms" screen.

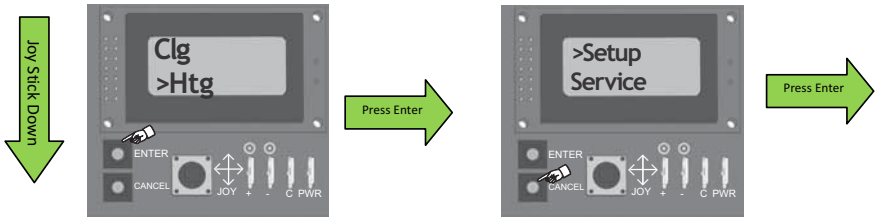
When the "Cancel" button is pressed multiple times to exit each menu level and the screen returns to the first "Status, Alarms" display the next demonstration can begin. In this demonstration the information below steps through the "Commissioning" menu.

Step 1 - After the start-up countdown is complete the first screen displayed is the "Startup Delay" screen. Move Joystick. Scroll down to "Details" then press "ENTER".

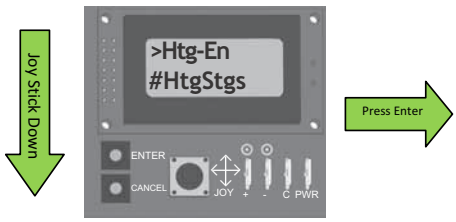


Step 2 - Scroll down to "Htg" and press "ENTER".

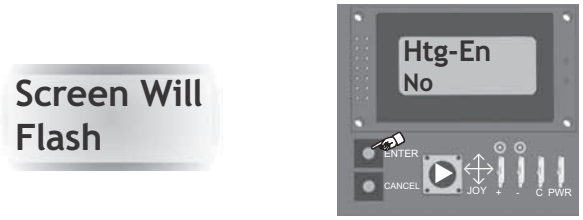
Step 3 - "Setup and Service" will now appear. Press "ENTER".



Step 4 - press "ENTER" to select "Htg-En".



Step 5- To change the selection move the joystick to the right and choose either "YES" or "NO". Then Press "ENTER". **WAIT 5-7 SECONDS FOR VALUE ONSCREEN TO UPDATE!**



These few pages provide a simple demonstration how to navigate the menu's of the Smart Equipment™ control containing Version 3.3 firmware. Please utilize this document along with the additional information in the Users Guide and detailed navigation menu to adjust the control to customer preferences or job specifications.

NOTE: IF OPERATING THE EQUIPMENT WITH A THERMOSTAT, THE UCB SETPOINTS AND PARAMETERS SHOULD NOT REQUIRE ALTERATION; HOWEVER, THERE MAY BE THE CASE WHERE MINIMUM OUTSIDE AIR, LEAD-LAG OR OTHER CUSTOM SETTINGS ARE REQUIRED. PLEASE READ THIS DOCUMENT IN DETAIL TO UNDERSTAND THE IMPLICATIONS OF MAKING CHANGES BEFORE PROCEEDING. IT IS STRONGLY RECOMMENDED THAT A BACKUP OF PARAMETER SETTINGS BE SAVED ON A USB DRIVE BEFORE MAKING ANY MAJOR CHANGES TO THE CONTROL!

Figure 34: Unit Control Board

Table 30: Smart Equipment™ UCB Details

Description		Function & Comments
Terminal Directional orientation: viewed with silkscreen labels upright		
Limit, 24 VAC power and shutdown connections from unit wiring harness at left on upper edge of UCB		
LIMIT	Monitored 24 VAC input through heat section limit switch(es)	If voltage is absent, indicating the heat section is over-temperature, the UCB will bring on the indoor blower
C	24 VAC, 75 VA transformer Common referenced to cabinet ground	Connects through circuit traces to thermostat connection strip C and indoor blower VFD pin C
24V	24 VAC, 75 VA transformer hot	Powers the UCB microprocessor, connects through circuit trace to the SD 24 terminal
SD 24	24 VAC hot out for factory accessory smoke detector, condensate overflow and/or user shutdown relay switching in series	Connects through circuit trace to thermostat connection strip SD-24. A wiring harness jumper plug connecting SD 24 to SD R is in place if factory accessories for unit shutdown are not used - this jumper plug must be removed if the switching of field-added external accessories for unit shutdown are wired between thermostat connection strip SD-24 and R
SD R	24 VAC hot return from factory accessory smoke detector, condensate overflow and user shutdown relay switching in series	Connects through circuit trace to the R terminal on the upper left of the board
R	24 VAC hot for switched inputs to the UCB	Connects through circuit trace to the thermostat connection strip R terminal, right FAN OVR pin, right HPS1 pin, right HPS2 pin, lower DFS pin and lower APS pin

Table 30: Smart Equipment™ UCB Details (Continued)

Description		Function & Comments
Terminal Thermostat connection strip on left edge of UCB		
W1	1st stage heating request, 24 VAC input switched from R	Not effective for cooling-only units
W2	2nd stage heating request, 24 VAC input switched from R	Not effective for cooling-only units or units with single-stage heat sections
Y1	1st stage cooling request, 24 VAC input switched from R	
Y2	2nd stage cooling request, 24 VAC input switched from R	Visible in the display menu when the #ClgStgs parameter is set for 2 or more, also effective for economizer free cooling supply air temperature reset when the #ClgStgs parameter is set for 1 or more
G	Continuous indoor blower request, 24 VAC input switched from R	
OCC	Occupancy request, 24 VAC input switched from R	Must have the OccMode parameter set for External to be effective
X	Hard lockout indicator, 24 volt output to a light thermostat LED	
R	24 VAC hot for thermostat switching and power	If field-added external accessories for unit shutdown are used, 24 VAC hot return from smoke detector, condensate overflow and/or user shutdown relay switching in series
SD-24	If field-added external accessories for unit shutdown are used, 24 VAC hot out for smoke detector, condensate over- flow and/or user shutdown relay switching in series	Unit wiring harness jumper plug for factory shutdown accessories must be removed if the switching of field-added external accessories for unit shutdown are wired between thermo- stat connection strip SD-24 and R
C	24 VAC common for thermostat power	
LEDs on left edge of UCB		
POWER	Green UCB power indicator	Lit indicates 24 VAC is present at C and 24V terminals
FAULT	Red hard lockout, networking error and firmware error indicator	1/2 second on/off flashing indicates one or more alarm is currently active, 1/10th second on/off flashing indicates a networking error (polarity, addressing, etc.) or a firmware error (likely correctable with re-loading from USB flash drive)
SA BUS	Green UCB SA bus communication transmission indicator	Lit/flickering indicates UCB SA bus communication is currently active, off indicates the UCB is awaiting SA bus communication
Terminal Space temperature sensor connections at center on upper edge of UCB		
ST	Space Temperature sensor input from 10KΩ @ 77°F, Type III negative temperature coefficient thermistor	Positive of VDC circuit (3.625 VDC reading to COM with open circuit), effective if “Thermo- stat-only Control” parameter is set OFF, space sensor override momentary shorts ST to COM to initiate/terminate temporary occupancy
COM	Common for ST and SSO inputs	Negative of VDC circuit for ST and SSO inputs
SSO	Space Sensor Offset input from 0 to 20KΩ potentiometer	Positive of VDC circuit (3.625 VDC reading to COM with open circuit), 10KΩ/2.5 VDC is 0°F offset, 0Ω/0 VDC is maximum above offset and 20KΩ/3.4 VDC is maximum below offset from active space temperature setpoint
Pin Temperature sensor connections at right on upper edge of UCB		
SAT+	Supply Air Temperature sensor input from 10KΩ @ 77°F, Type III negative temperature coefficient thermistor	Input required for operation; 3.625 VDC reading SAT+ to SAT– with open circuit. Used in heat/cool staging cutouts, free cooling operation, demand ventilation operation, comfort ventilation operation, economizer loading operation, VAV cooling operation, hydronic heat operation.

Table 30: Smart Equipment™ UCB Details (Continued)

Description		Function & Comments
RAT+	Return Air Temperature sensor input from 10KΩ @ 77°F, Type III negative temperature coefficient thermistor	Input required for operation; 3.625 VDC reading RAT+ to RAT– with open circuit. Used in return air enthalpy calculation. Substitutes for space temperature if no other space temperature input is present.
OAT+	Outside Air Temperature sensor input from 10KΩ @ 77°F, Type III negative temperature coefficient thermistor	Input required for operation but may be a communicated value; 3.625 VDC reading OAT+ to OAT– with open circuit. Used in heat/cool cutouts, low ambient cooling determination, dry bulb free cooling changeover, outside air enthalpy calculation, economizer loading operation, heat pump demand defrost calculation.
CC1+	#1 refrigerant circuit Condenser Coil temperature sensor input from 10KΩ @ 77°F, Type III negative temperature coefficient thermistor	Input required for heat pump units, not required for A/C units; 3.625 VDC reading CC1+ to CC1– with open circuit. Used in heat pump demand defrost calculation.
EC1+	#1 refrigerant circuit Evaporator Coil temperature sensor input from 10KΩ @ 77°F, Type III negative temperature coefficient thermistor	Input required for operation; 3.625 VDC reading EC1+ to EC1– with open circuit. Used in suction line temperature safety.
CC2+	#2 refrigerant circuit Condenser Coil temperature sensor input from 10KΩ @ 77°F, Type III negative temperature coefficient thermistor	Input required for 2-compressor heat pump units, not required for 2-compressor A/C units, not active for 1-compressor units; 3.625 VDC reading CC2+ to CC2– with open circuit. Used in heat pump demand defrost calculation.
EC2+	#2 refrigerant circuit Evaporator Coil temperature sensor input from 10KΩ @ 77°F, Type III negative temperature coefficient thermistor	Input required for operation of 2-compressor units, not active for 1-compressor units; 3.625 VDC reading EC2+ to EC2– with open circuit. Used in suction line temperature safety.
Pinned connections on right edge of UCB		
RAH+	Return Air Humidity input from 0-10 VDC @ 0-100% RH sensor	Input required for reheat units, optional in all other units, may be a communicated value. Used in return air enthalpy calculation, temperature/humidity setpoint reset, reheat operation.
DCT PRS+	Supply Duct Pressure input from 0-5 VDC @ 0-5" w.c. sensor	Input required for variable air volume units. Used in VAV indoor blower operation.
DFS (upper pin)	24 VAC hot return from Dirty Filter Switch	Optional input; switch closure for greater than 15 seconds during indoor blower operation initiates a notification alarm
DFS (lower pin)	24 VAC hot out for Dirty Filter Switch	Connects through circuit trace to the R terminal
APS (upper pin)	24 VAC hot return from Air Proving Switch	When this optional input is enabled: the air proving switch must close within 30 seconds of initiation of indoor blower operation and not open for greater than 10 seconds during indoor blower operation to allow heat/cool operation and prevent an "APS open" alarm; the air proving switch must open within 30 seconds of termination of indoor blower operation to prevent an "APS stuck closed" notification alarm
APS (lower pin)	24 VAC hot out for Air Proving Switch	Connects through circuit trace to the R terminal
C	Common for the VFD output	Negative of the VDC circuit for the VFD output
VFD	2-10 VDC (0-100%) output for the indoor blower Variable Frequency Drive	Output is active with indoor blower operation. For CV units: this output provides stepped IntelliSpeed control of the indoor blower VFD based on fan-only, cooling stage and heating stage outputs. For VAV units: this output provides control of the indoor blower VFD based on supply duct static pressure input and setpoint.
VFDFLT	24 VAC hot input from the normally open VFD alarm contact	The VFD alarm contact switches from R within the unit wiring harness. 24 VAC input results in unit shutdown and a "VFD fault" alarm

Table 30: Smart Equipment™ UCB Details (Continued)

Description		Function & Comments
Terminal at lower right corner of UCB		
24V FOR OUTPUTS	24 VAC hot for H1, H2, CN-FAN, AUX HGR, FAN C1 and C2 output relay contact switching	Output relay circuitry is isolated from other UCB components and the 24 VAC hot source may be from a second transformer in the unit
Pin Heat section connections at right on lower edge of UCB		
H1	24 VAC hot output for heat section stage 1	Not effective for cooling-only units. Output if demand is present and permissions allow one stage or two stages of heat section operation
H2	24 VAC hot output for heat section stage 2	Not effective for cooling-only units or units with single-stage heat sections. Output if demand is present and permissions allow two stages of heat section operation
MV	24 VAC hot input confirming heat section operation	Sourced from gas valve in gas heat units or first stage heat contactor in electric heat units. Input within 5 minutes from initiation of H1 output initiates the “Heat On Fan Delay” timer, loss of input following the termination of H1 output initiates the “Heat On Fan Delay” timer, no input within 5 minutes from initiation of H1 output initiates an “Ignition Failure” alarm, input for longer than 5 minutes without H1 output initiates a “Gas Valve Mis-wire” alarm
Pin Cooling and fan output connections at right on lower edge of UCB		
CN-FAN	24 VAC hot output for the condenser fan contactor coil	Output with either C1 or C2 output; interrupted during defrost cycle for heat pump units
AUX HGR	24 VAC hot output for hot gas reheat components	Effective only for reheat units, output with reheat operation
FAN	24 VAC hot output for indoor blower contactor coil/ indoor blower VFD enable relay coil	Output with heat/cool operation, G input or schedule demand
C1	24 VAC hot output for compressor 1	If demand is present and permissions allow compressor 1 operation; output with compressor cooling, comfort ventilation cooling, reheat or heat pump heating demands
C2	24 VAC hot output for compressor 2	Not effective for one stage compressor UCBs. If demand is present and permissions allow compressor 2 operation; output with compressor cooling, comfort ventilation cooling or heat pump heating demands
Pin Refrigerant circuit safety switch and indoor blower overload connections at center on lower edge of UCB		
HPS1 (right pin)	24 VAC hot out for refrigerant circuit 1 High Pressure Switch	Connects through circuit trace to the R terminal
HPS1 (left pin)	24 VAC hot return from refrigerant circuit 1 High Pressure Switch	Input is only considered if C1 output is needed; input must be present to allow C1 output. Three HPS1 trips in a two hour period cause a “High Pressure Switch 1 Lockout” and C1 output is then prevented until alarm reset. Connects through circuit trace to the right LPS1 pin.
LPS1 (right pin)	24 VAC hot out for refrigerant circuit 1 Low Pressure Switch	Connects through circuit trace to the left HSP1 pin
LPS1 (left pin)	24 VAC hot return from refrigerant circuit 1 Low Pressure Switch	Input is only considered after 30 seconds of C1 output; afterwards, input must be present to allow C1 output. Three LPS1 trips in a one hour period cause a “Low Pressure Switch 1 Lockout” and C1 output is then prevented until alarm reset.
HPS2 (right pin)	24 VAC hot out for refrigerant circuit 2 High Pressure Switch	Not effective for one stage compressor UCBs. Connects through circuit trace to the R terminal

Table 30: Smart Equipment™ UCB Details (Continued)

Description		Function & Comments
HPS2 (left pin)	24 VAC hot return from refrigerant circuit 2 High Pressure Switch	Not effective for one stage compressor UCBs. Input is only considered if C2 output is needed; input must be present to allow C1 output. Three HPS2 trips in a two hour period cause a “High Pressure Switch 1 Lockout” and C2 output is then prevented until alarm reset. Connects through circuit trace to the right LPS2 pin.
LPS2 (right pin)	24 VAC hot out for refrigerant circuit 2 Low Pressure Switch	Not effective for one stage compressor UCBs. Connects through circuit trace to the left HSP2 pin
LPS2 (left pin)	24 VAC hot return from refrigerant circuit 2 Low Pressure Switch	Not effective for one stage compressor UCBs. Input is only considered after 30 seconds of C2 output; afterwards, input must be present to allow C2 output. Three LPS2 trips in a one hour period cause a “Low Pressure Switch 2 Lockout” and C2 output is then prevented until alarm reset.
FAN OVR (right pin)	24 VAC hot out for indoor blower FAN Overload relay contact/motor protector switch	Connects through circuit trace to the R terminal
FAN OVR (left pin)	24 VAC hot return from indoor blower FAN Overload relay contact/motor protector switch	Input is only considered if FAN output is needed; input must be present to allow FAN output and unit operation. One FAN OVR trip lasting longer than 5 minutes or three FAN OVR trips in a two hour period cause a “Fan Overload Lockout” and unit operation is then prevented until alarm reset.
Terminal SA BUS[1] connections on at left on lower edge and center of UCB		
PWR	Power for SA (“Sensor-Actuator”) BUS devices	Also incorporated in the J8 6-pin phone jack connector at the left-center of the board. Positive of the 15 VDC (reading to C) circuit for powering an optional netstat and/or Multi Touch gateway
C	Common for SA BUS power and communication circuits	Also incorporated in the J8 6-pin phone jack connector at the left-center of the board. Negative of the SA BUS circuits
–	Communication for SA BUS devices	Also incorporated in the J8 6-pin phone jack connector at the left-center of the board. Positive of the VDC (typically, a fluctuating 1.5 to 3.5 volts reading to C; at least 0.25 volts lower than +) SA BUS communication circuit to optional economizer board, 4-stage board, fault detection & diagnostics board, netstat and/or Multi Touch gateway
+	Communication for SA BUS devices	Also incorporated in the J8 6-pin phone jack connector at the left-center of the board. Positive of the VDC (typically, a fluctuating 1.5 to 3.5 volts reading to C; at least 0.25 volts higher than –) SA BUS communication circuit to optional economizer board, 4-stage board, fault detection & diagnostics board, netstat and/or Multi Touch gateway
J8	6-pin phone jack connector	Incorporates the SA BUS terminals for convenience/alternate connection of SA BUS devices, primarily used for temporary service connection of the Multi Touch gateway
Item Integrated user interface at lower left corner of UCB		
Display	On-board, 2-line x 8-character back-lit display	On-board display, buttons and joystick allow access to UCB, economizer, 4-stage and FDD board parameters
ENTER	Button for display menu acknowledgment and navigation	
CANCEL	Button for display menu navigation and zeroing of active compressor ASCD timer	
JOY	4-way Joystick for display menu navigation	
Item USB connector at right of UCB		
J10	Type A female Universal Serial Bus connector	Used for backup, restoration, & copying of board parameters as well as board software updating through a flash drive

Table 30: Smart Equipment™ UCB Details (Continued)

Description		Function & Comments
J15	Factory wired SA Bus connector	
Optional communication sub-board at center of UCB		
Terminal FC BUS[1] connections on left edge of the communication board		
FC+	FC (“Field Connected”) BUS BACnet MSTP communication	Positive of the VDC (typically, a fluctuating 1.5 to 3.5 volts reading to COM; at least 0.25 volts higher than –) FC bus BACnet MSTP communication circuit
FC–	FC (“Field Connected”) BUS BACnet MSTP communication	Positive of the VDC (typically, a fluctuating 1.5 to 3.5 volts reading to COM; at least 0.25 volts lower than +) FC bus BACnet MSTP communication circuit
COM	Common for the FC (“Field Connected”) BUS BACnet MSTP communication circuit	Negative of the VDC FC bus BACnet MSTP communication circuit
SHLD	Shield for the FC (“Field Connected”) BUS BACnet MSTP communication circuit	Earth ground reference of the cable to prevent interference on the FC bus BACnet MSTP communication circuit
Item Selector in red housing at left on top edge of the communication board		
EOL switch	End Of Line selector switch for the FC BUS BACnet MSTP communication circuit	ON selected only for the UCB that is the terminus of the FC bus BACnet MSTP communication cable to prevent signal “bounce-back”
LEDs on the communication board		
EOL	Green End Of Line indicator	Lit indicates the EOL switch is selected ON
FC BUS	Green FC bus communication transmission indicator	Lit/flickering indicates outgoing UCB FC bus communication is currently active, off indicates the UCB is awaiting incoming FC bus communication
ISO PWR	Green communication board Isolated Power indicator	Lit indicates the UCB is supplying power to the communication sub-board

1. When wiring unit and other devices using the SA Bus and FC Bus, see Table 32.

Table 31: Cable for FC Buses and SA Buses in Order of Preference

Bus and Cable Type	Non-Plenum Applications		Plenum Applications	
	Part Number	O.D.	Part Number	O.D.
FC Bus: 22 AWG Stranded, 3-Wire Twisted Shielded Cable[1]	Anixter: CBL-22/3-FC-PVC Belden®: B5501FE	0.138 in.	Anixter: CBL-22/3-FC-PLN Belden: B6501FE	0.140 in.
SA Bus (Terminal Block): 22 AWG Stranded, 4-Wire, 2 Twisted-Pair Shielded Cable	Anixter: CBL-22/2P-SA-PVC Belden: B5541FE	0.209 in.	Anixter: CBL-22/2P-SA-PLN Belden: B6541FE	0.206 in.
SA Bus (Modular Jack): 26 AWG Solid 6-Wire, 3 Twisted-Pair Cable[2]	—	—	Anixter preassembled: CBL-NETWORK25 CBL-NETWORK50 CBL-NETWORK75 CBL-NETWORK100	0.15 in.
FC Bus: 22 AWG Stranded, 3-Wire Twisted Non-Shielded Cable	Belden: B5501UE	0.135 in.	Belden: B6501UE	0.131 in.
SA Bus (Terminal Block): 22 AWG Stranded, 4-Wire, 2 Twisted-Pair Non-Shielded Cable	Belden: B5541UE	0.206 in.	Belden: B6541UE	0.199 in.

1. We strongly recommend 3-wire (for FC bus) and 4-wire, 2 twisted-pair (for SA bus), 22 AWG stranded, shielded cable. A 22 gauge cable offers the best performance for various baud rates, cable distances, and number of trunk devices primarily due to lower conductor-to-conductor capacitance. Shielded cable offers better overall electrical noise immunity than non-shielded cable. Observe the shield grounding requirements.
2. We recommend 26 AWG solid, 6-wire (3 twisted pairs) cable as the best fit for fabricating modular cables with the modular jack housing assembly. Be sure the cable you use fits the modular jack housing. The preassembled cables that are available from Anixter (Part No. CBL-NETWORKxxx) use 24 gauge wire.

Table 32: Ignition Control Flash Codes

Flashes	Fault Conditions	Check
STEADY ON	Control Failure	Control
HEARTBEAT	Normal Operation	
1	Not Applicable	
2	Pressure Switch Stuck Closed	Pressure Switch
3	Pressure Switch Failed To Close	Venter Pressure Switch Vent Blocked
4	Limit Switch Open	Main Limit AUX Limit
5	Flame Present With Gas Off First Stage Gas Valve Energized With W1 Off Second Stage Gas Valve Energized With First Stage Gas Valve Off	Gas Valve
6	Ignition Lockout	Gas Flow Gas Pressure Gas Valve Flame Sensor
STEADY OFF	No Power Or Control Failure	24VAC or Control

Start-Up Sheet

START-UP & SERVICE DATA INSTRUCTION

COMMERCIAL PACKAGE UNITS

3.0 To 40.0 TONS

START-UP CHECKLIST

Date: _____

Job Name: _____

Customer Name: _____

Address: _____

City: _____ State: _____ Zip: _____

Model Number: _____ Serial Number: _____

Qualified Start-up Technician: _____ Signature: _____

HVAC Contractor: _____ Phone: _____

Address: _____

Contractor's E-mail Address: _____

Electrical Contractor: _____ Phone: _____

Distributor Name: _____ Phone: _____

WARRANTY STATEMENT

Johnson Controls/UPG is confident that this equipment will operate to the owner's satisfaction if the proper procedures are followed and checks are made at initial start-up. This confidence is supported by the 30 day dealer protection coverage portion of our standard warranty policy which states that Johnson Controls/UPG will cover parts and labor on new equipment start-up failures that are caused by a defect in factory workmanship or material, for a period of 30 days from installation. Refer to current standard warranty policy and warranty manual found on UPGnet for details.

In the event that communication with Johnson Controls/UPG is required regarding technical and/or warranty concerns, all parties to the discussion should have a copy of the equipment start-up sheet for reference. A copy of the original start-up sheet should be filed with the Technical Services Department.

The packaged unit is available in constant or variable air volume versions with a large variety of custom options and accessories available. Therefore, some variation in the startup procedure will exist depending upon the products capacity, control system, options and accessories installed.

This start-up sheet covers all startup check points common to all package equipment. In addition it covers essential startup check points for a number of common installation options. Depending upon the particular unit being started not all sections of this startup sheet will apply. Complete those sections applicable and use the notes section to record any additional information pertinent to your particular installation.

Warranty claims are to be made through the distributor from whom the equipment was purchased.

EQUIPMENT STARTUP

Use the local LCD or Mobile Access Portal (MAP) Gateway to complete the start-up.

A copy of the completed start-up sheet should be kept on file by the distributor providing the equipment and a copy sent to:

Johnson Controls/UPG
Technical Services Department
5005 York Drive
Norman, OK 73069

SAFETY WARNINGS

The inspections and recording of data outlined in this procedure are required for start-up of Johnson Controls/UPG's packaged products. Industry recognized safety standards and practices must be observed at all times. General industry knowledge and experience are required to assure technician safety. It is the responsibility of the technician to assess all potential dangers and take all steps warranted to perform the work in a safe manner. By addressing those potential dangers, prior to beginning any work, the technician can perform the work in a safe manner with minimal risk of injury.

⚠WARNING

Lethal voltages are present during some start-up checks. Extreme caution must be used at all times.

⚠WARNING

Moving parts may be exposed during some startup checks. Extreme caution must be used at all times.

NOTE: Read and review this entire document before beginning any of the startup procedures.

DESIGN APPLICATION INFORMATION

This information will be available from the specifying engineer who selected the equipment. If the system is a VAV system the CFM will be the airflow when the remote VAV boxes are in the full open position and the frequency drive is operating at 60 HZ. **Do not proceed with the equipment start-up without the design CFM information.**

Design Supply Air CFM: _____ Design Return Air CFM:_____

Design Outdoor Air CFM At Minimum Position: _____

Total External Static Pressure: _____

Supply Static Pressure: _____

Return Static Pressure: _____

Design Building Static Pressure: _____

Outside Air Dilution: Economizer Position Percentage: _____ CFM: _____

Supply Gas Pressure After Regulator W/o Heat Active _____ Inches_____

ADDITIONAL APPLICATION NOTES FROM SPECIFYING ENGINEER:

REFERENCE

General Inspection	Completed	See Notes
Unit inspected for shipping, storage, or rigging damage	☐	☐
Unit installed with proper clearances	☐	☐
Unit installed within slope limitations	☐	☐
Refrigeration system checked for gross leaks (presence of oil)	☐	☐
Terminal screws and wiring connections checked for tightness	☐	☐
Filters installed correctly and clean	☐	☐
Economizer hoods installed in operating position	☐	☐
Condensate drain trapped properly, refer to Installation Manual	☐	☐
Economizer damper linkage tight	☐	☐
Gas Heat vent hood installed	☐	☐
All field wiring (power and control) complete	☐	☐

Air Moving Inspection	Completed	See Notes
Alignment of drive components	☐	☐
Belt tension adjusted properly	☐	☐
Blower pulleys tight on shaft, bearing set screws tight, wheel tight to shaft	☐	☐
Pressure switch or transducer tubing installed properly	☐	☐

Exhaust Inspection Powered ☐ Barometric Relief ☐	Completed	See Notes
Check hub for tightness	☐	☐
Check fan blade for clearance	☐	☐
Check for proper rotation	☐	☐
Check for proper mounting (screen faces towards unit)	☐	☐
Prove operation by increasing minimum setting on economizer	☐	☐

Economizer Inspection Standard ☐ BAS ☐	Completed	See Notes
CO_2 sensor installed Yes ☐ No ☐	☐	☐
Check economizer setting (Reference Smart Equipment™ Control Board LCD menu location)	☐	☐
Prove economizer open/close through Smart Equipment™ Board Setting	☐	☐

Reheat Mode Normal ☐ or Alternate ☐ Not Applicable ☐
Humidity Sensor (2SH0401) _____

Operating Measurements - Air Flow

Fan operates with proper rotation (All VFD equipped units with the optional Manual Bypass must be phased for correct blower rotation with the Bypass switch set in the LINE position) ID Fans ☐ Exh. Fans ☐ Cond. Fans ☐	
Pressure drop across dry evaporator coil (At maximum design CFM) [1]	IWC
External Static Pressure	IWC
Return Static Pressure	IWC
Supply Static Pressure	IWC
Supply Air CFM Using Dry Coil Chart	CFM
Final Adjusted Supply Air CFM[2]	CFM

1. Consult the proper airflow to pressure drop table to obtain the actual airflow at the measured pressure differential.
2. Was a motor pulley adjustment or change required to obtain the correct airflow?
   Was it necessary to increase of decrease the airflow to meet the design conditions?
   If the motor pulley size was changed, measure the outside diameters of the motor and blower pulleys and record those diameters here;

Blower Motor HP _____FLA_____ RPM_____

Pulley Pitch Diameter _____Turns Out_____ Final Turns Out_____

Blower Pulley Pitch Diameter _____ Fixed Sheave_____

ELECTRICAL DATA

T1 - T2 _____ Volts T2 - T3 _____ Volts

Control Voltage _____ Volts T1 - T3 _____ Volts

Device	Nameplate	Measured List All Three Amperages
Supply Fan Motor[1, 2]	AMPS	AMPS
Exhaust Motor (Dampers 100%)	AMPS	AMPS
Condenser Fan #1	AMPS	AMPS
Condenser Fan #2 (if equipped)	AMPS	AMPS
Condenser Fan #3 (if equipped)	AMPS	AMPS
Condenser Fan #4 (if equipped)	AMPS	AMPS
Compressor #1	AMPS	AMPS
Compressor #2 (if equipped)	AMPS	AMPS
Compressor #3 (if equipped)	AMPS	AMPS
Compressor #4 (if equipped)	AMPS	AMPS

1. VAV units with heat section - simulate heat call to drive VAV boxes and VFD/IGV to maximum design airflow position.
2. VAV units without heat section - VAV boxes must be set to maximum design airflow position.

OPERATING MEASUREMENTS - COOLING

Stage	Discharge Pressure	Discharge Temp.	Liquid Line Temp.[1]	Subcooling[2]	Suction Pressure	Suction Temp.	Superheat
First	#	°	°	°	#	°	°
Second (if equipped)	#	°	°	°	#	°	°
Third (if equipped)	#	°	°	°	#	°	°
Fourth (if equipped)	#	°	°	°	#	°	°
Reheat 1st Stage	#	°	°	°	#	°	°

1. Liquid temperature should be taken before filter/drier.
2. Subtract 10 psi from discharge pressure for estimated liquid line pressure

Outside air temperature	_____	°F db	_____	°F wb	_____ %RH
Return Air Temperature	_____	°F db	_____	°F wb	_____ %RH
Mixed Air Temperature	_____	°F db	_____	°F wb	_____ %RH
Supply Air Temperature	_____	°F db	_____	°F wb	_____ %RH

REFRIGERANT SAFETIES

Action	Completed	See Notes
Prove Compressor Rotation (3 phase only) by gauge pressure	☐	☐
Prove High Pressure Safety, All Systems	☐	☐
Prove Low Pressure Safety, All Systems	☐	☐

OPERATING MEASUREMENTS - GAS HEATING

Fuel Type: ☐ Natural Gas ☐ LP Gas

Action		Completed	See Notes
Check for gas leaks		☐	☐
Prove Ventor Motor Operation		☐	☐
Prove Primary Safety Operation		☐	☐
Prove Auxiliary Safety Operation		☐	☐
Prove Rollout Switch Operation		☐	☐
Prove Smoke Detector Operation		☐	☐
Manifold Pressure	Stage 1	IWC	☐
	Stage 2 (If Equipped)	IWC	☐
	Stage 3 (If Equipped)	IWC	☐
Supply gas pressure at full fire		IWC	☐
Check temperature rise[1]	☐ measured at full fire	°F	☐

1. Input X Eff. (BTU output)
   1.08 X Temp. Rise

OPERATIONAL MEASUREMENTS - STAGING CONTROLS

Verify Proper Operation of Heating/Cooling Staging Controls	
Create a cooling demand at the Thermostat, BAS System or Smart Equipment™ Verify that cooling/economizer stages are energized.	☐
Create a heating demand at the Thermostat, BAS System or Smart Equipment™ Verify that heating stages are energized.	☐
Verify Proper Operation of the Variable Frequency Drive (If Required)	
Verify that motor speed modulates with duct pressure change.	☐

FINAL - INSPECTION

Verify that all operational control set points have been set to desired value Scroll through all setpoints and change as may be necessary to suit the occupant requirements.	☐
Verify that all option parameters are correct Scroll through all option parameters and ensure that all installed options are enabled in the software and all others are disabled in the software. (Factory software settings should match the installed options)	☐
Verify that all access panels have been closed and secured	☐
Save a backup file from the unit control board onto a USB flash drive.	☐

OBSERVED PRODUCT DEFICIENCIES & CONCERNS:

5167530-JIM-H-0218
Supersedes: 5167530-JIM-G-0118

York International Corporation
5005 York Drive
Norman, OK 73069

SECTION 23 0553
IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Tags.

B. Pipe markers.

1.2 REFERENCE STANDARDS

A. ASME A13.1 - Scheme for the Identification of Piping Systems; 2020.

1.3 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. List: Submit list of wording, symbols, letter size, and color coding for mechanical identification.

C. Chart and Schedule: Submit valve chart and schedule, including valve tag number, location, function, and valve manufacturer's name and model number.

D. Product Data: Provide manufacturers catalog literature for each product required.

PART 2 PRODUCTS

2.1 TAGS

A. Manufacturers:

1. Kolbi Pipe Marker Co: www.kolbipipemarkers.com/#sle.

2. Seton Identification Products, a Tricor Company: www.seton.com/#sle.

3. Brady Corporation: www.bradycorp.com.

4. Champion America, Inc: www.champion-america.com.

5. Substitutions: See Section 01 6000 - Product Requirements.

B. Plastic Tags: Laminated three-layer plastic with engraved black letters on light contrasting background color. Tag size minimum 1-1/2 inch diameter.

C. Metal Tags: Brass with stamped letters; tag size minimum 1-1/2 inch diameter with smooth edges.

D. Valve Tag Chart: Typewritten letter size list in anodized aluminum frame.

2.2 PIPE MARKERS

A. Manufacturers:

1. Kolbi Pipe Marker Co: www.kolbipipemarkers.com/#sle.

2. Seton Identification Products, a Tricor Company: www.seton.com/#sle.

3. Brady Corporation: www.bradycorp.com.

4. Champion America, Inc: www.champion-america.com.

5. Substitutions: See Section 01 6000 - Product Requirements.

B. Color: Comply with ASME A13.1.

C. Plastic Pipe Markers: Factory fabricated, flexible, semi- rigid plastic, preformed to fit around pipe or pipe covering; minimum information indicating flow direction arrow and identification of fluid being conveyed.

D. Underground Plastic Pipe Markers: Bright-colored continuously printed plastic ribbon tape, minimum 6 inches wide by 4 mil, 0.004 inch thick, manufactured for direct burial service.

PART 3 EXECUTION

3.1 PREPARATION

A. Degrease and clean surfaces to receive adhesive for identification materials.

3.2 INSTALLATION

A. Install nameplates with corrosive-resistant mechanical fasteners, or adhesive. Apply with sufficient adhesive to ensure permanent adhesion and seal with clear lacquer.

B. Install tags with corrosion resistant chain.

C. Install plastic pipe markers in accordance with manufacturer's instructions.

D. Install underground plastic pipe markers 6 to 8 inches below finished grade, directly above buried pipe.

E. Identify valves in main and branch piping with tags.

F. Identify piping, concealed or exposed, with pipe markers. Use tags on piping 3/4 inch diameter and smaller. Identify service, flow direction and pressure. Install in clear view and align with axis of piping. Locate identification not to exceed 20 feet on straight runs including risers and drops, adjacent to each valve and tee, at each side of penetration of structure or enclosure, and at each obstruction.

SECTION 23 1123
NATURAL-GAS PIPING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Pipe, pipe fittings, valves, and connections for natural gas piping systems.

1.2 RELATED REQUIREMENTS

A. Section 07 8400 - Firestopping.

B. Section 09 9113 - Exterior Painting.

C. Section 23 0516 - Expansion Fittings and Loops for HVAC Piping.

D. Section 23 0553 - Identification for HVAC Piping and Equipment.

E. Section 31 2316 - Excavation.

F. Section 31 2316.13 - Trenching.

G. Section 31 2323 - Fill.

H. Section 33 5216 - Gas Hydrocarbon Piping.

1.3 REFERENCE STANDARDS

A. ANSI Z21.18/CSA 6.3 - Gas Appliance Pressure Regulators; 2019.

B. ANSI Z21.80/CSA 6.22 - Line Pressure Regulators; 2019.

C. ANSI Z223.1 - National Fuel Gas Code; 2021.

D. ASME B16.3 - Malleable Iron Threaded Fittings: Classes 150 and 300; 2021.

E. ASME B31.1 - Power Piping; 2022.

F. ASME B31.9 - Building Services Piping; 2020.

G. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2022.

H. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.

I. ASTM A234/A234M - Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service; 2023a.

J. ASTM B813 - Standard Specification for Liquid and Paste Fluxes for Soldering of Copper and Copper Alloy Tube; 2016.

K. ASTM B828 - Standard Practice for Making Capillary Joints by Soldering of Copper and Copper Alloy Tube and Fittings; 2016.

L. AWWA C105/A21.5 - Polyethylene Encasement for Ductile-Iron Pipe Systems; 2018.

M. MSS SP-78 - Gray Iron Plug Valves, Flanged and Threaded Ends; 2011.

N. MSS SP-110 - Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends; 2010, with Errata .

1.4 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on pipe materials, pipe fittings, valves, and accessories. Provide manufacturers catalog information. Indicate valve data and ratings.

1.5 QUALITY ASSURANCE

A. Valves: Manufacturer's name and pressure rating marked on valve body.

1.6 FIELD CONDITIONS

A. Do not install underground piping when bedding is wet or frozen.

PART 2 PRODUCTS

2.1 NATURAL GAS PIPING, BURIED WITHIN 5 FEET OF BUILDING

A. Steel Pipe: ASTM A53/A53M, Grade B, Type F, Schedule 40 black.

1. Fittings: ASTM A234/A234M, wrought steel welding type.

2. Joints: ANSI Z223.1, welded.

3. Jacket: AWWA C105/A21.5 polyethylene jacket or double layer, half-lapped 10 mil polyethylene tape.

B. Flexible Gas Piping:

1. Pre-Sleeved Corrugated Stainless Steel Tubing: Comply with ANSI LC1 / CSA 6.26.

2. System shall be sleeved in a fully vent-capable polyethylene sleeve. Fittings shall have plastic containment coupling and 1/4" vent port.

3. Fittings: Provided by piping system manufacturer.

4. Manufacturers:

a. Omega Flex, Inc: www.omegaflex.com/#sle.

b. Substitutions: See Section 01 6000 - Product Requirements.

2.2 NATURAL GAS PIPING, ABOVE GRADE

A. Steel Pipe: ASTM A53/A53M, Grade B, Type F, Schedule 40 black.

1. Fittings: ASME B16.3, malleable iron, or ASTM A234/A234M, wrought steel welding type.

2. Joints: Threaded or welded to ASME B31.1.

3. Exterior Applications Only: Mechanical Press Sealed Fittings (Where approved by local AHJ): Double-pressed type and approved or certified, utilizing EPDM/HNBR, nontoxic, synthetic rubber sealing elements.

a. Manufacturers:

1) Viega LLC: www.viega.us/#sle.

2) Nibco: www.nibco.com

3) Substitutions: See Section 01 6000 - Product Requirements.

b. Listings and Certifications:

1) ANSI LC-4/CSA 6.32

2) ICC-ES PMG 1502

3) IAPMO/UPC LC-4

2.3 FLANGES, UNIONS, AND COUPLINGS

A. Unions for Pipe Sizes 3 Inches and Under:

1. Ferrous Pipe: Class 150 malleable iron threaded unions.

2. Copper Tube and Pipe: Class 150 bronze unions with soldered joints.

B. Flanges for Pipe Size Over 1 Inch:

1. Ferrous Pipe: Class 150 malleable iron threaded or forged steel slip-on flanges; preformed neoprene gaskets.

2. Copper Tube and Pipe: Class 150 slip-on bronze flanges; preformed neoprene gaskets.

2.4 PIPE HANGERS AND SUPPORTS

A. Provide hangers and supports that comply with MSS SP-58.

1. If type of hanger or support for a particular situation is not indicated, select appropriate type using MSS SP-58 recommendations.

2. Overhead Supports: Individual steel rod hangers attached to structure or to trapeze hangers.

3. Trapeze Hangers: Welded steel channel frames attached to structure.

4. Vertical Pipe Support: Steel riser clamp.

5. Rooftop Supports for Low-Slope Roofs: Steel pedestals with bases that rest on top of roofing membrane, not requiring any attachment to the roof structure and not penetrating the roofing assembly, with support fixtures as specified; and as follows:

   a. Bases: High density polypropylene.

   b. Base Sizes: As required to distribute load sufficiently to prevent indentation of roofing assembly.

   c. Steel Components: Stainless steel, or carbon steel hot-dip galvanized after fabrication in accordance with ASTM A123/A123M.

   d. Attachment/Support Fixtures: As recommended by manufacturer, same type as indicated for equivalent indoor hangers and supports; corrosion resistant material.

   e. Height: Provide minimum clearance of 6 inches under pipe to top of roofing.

2.5 BALL VALVES

A. Manufacturers:

1. Apollo Valves: www.apollovalves.com/#sle.

2. Milwaukee Valve Company: www.milwaukeevalve.com/#sle.

3. Nibco, Inc: www.nibco.com/#sle.

4. Jomar Valves: www.jomarvalve.com

5. Bonomi: www.bonominorthamerica.com

6. Substitutions: See Section 01 6000 - Product Requirements.

B. Construction, 2 Inches and Smaller: MSS SP-110, Class 150, 400 psi CWP, bronze or hot forged brass body, 304 stainless steel or chrome plated brass or bronze ball, regular port, Teflon seats and stuffing box ring, blow-out proof stem, lever handle, solder or threaded ends with union.

2.6 PLUG VALVES

A. Manufacturers:

1. Flomatic Valves: www.flomatic.com.

2. Homestead: www.homesteadvalve.com

3. Norgas Controls: www.norgascontrols.com

4. Substitutions: See Section 01 6000 - Product Requirements.

B. Construction 2-1/2 Inches and Larger: MSS SP-78, 200 psi CWP, cast iron body and plug, pressure lubricated, Teflon or Buna N packing, flanged ends. Provide lever operator with set screw.

2.7 LINE PRESSURE REGULATORS AND APPLIANCE REGULATORS INDICATORS

A. Manufacturers:

1. Maxitrol Company: www.maxitrol.com/#sle.

2. Fisher

3. Eaton

4. Harper Wyman Co

5. Pietro Fiorentini

6. Substitutions: See Section 01 6000 - Product Requirements.

B. Compliance Requirements:

1. Appliance Regulator: ANSI Z21.18/CSA 6.3.

2. Line Pressure Regulator: ANSI Z21.80/CSA 6.22.

C. Provide with inlet and outlet pressure gage on piping.

D. Regulator shall be capable of downturn from 10 psi (or max pressure required by Utility Company) to median pressure range of equipment served.

E. Regulator to be "ventless" where installed indoors, as approved by AHJ.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Provide non-conducting dielectric connections wherever jointing dissimilar metals.

C. Route piping in orderly manner and maintain gradient. Route parallel and perpendicular to walls.

D. Install piping to maintain headroom, conserve space, and not interfere with use of space.

E. Group piping whenever practical at common elevations.

F. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

G. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings.

H. Provide access where valves and fittings are not exposed.

I. Provide support for utility meters in accordance with requirements of utility companies.

J. Prepare exposed, unfinished pipe, fittings, supports, and accessories ready for finish painting.

K. Install valves with stems upright or horizontal, not inverted.

L. Pipe vents from gas pressure reducing valves to outdoors and terminate in weather proof hood.

M. Copper Pipe and Tube: Make soldered joints in accordance with ASTM B828, using specified solder, and flux meeting ASTM B813.

N. Sleeve pipes passing through partitions, walls and floors.

O. Pipe Hangers and Supports:

1. Install in accordance with ASME B31.9.

2. Provide copper plated hangers and supports for copper piping.

3. Prime coat exposed steel hangers and supports. Hangers and supports located in crawl spaces, pipe shafts, and suspended ceiling spaces are not considered exposed.

P. Underground piping shall be installed with warning tape that states: "WARNING BURIED GAS LINE BELOW." The tape shall be in trench at least 12 inches above the gas piping.

3.2 APPLICATION

A. Install unions downstream of valves and at equipment or apparatus connections.

B. Provide regulators at all pieces of equipment in project. Optionally, line regulators can be provided to protect groups of equipment from abnormal conditions that may cause pressure increases, including but not limited to unusual operating conditions of the Utility service regulator.

C. Provide with drip leg and isolation valve as required by IFGC.

D. For interior buried applications, utilize pre-sleeved CSST with accessories or provide vented conduit encasement as required by IFGC.

3.3 SERVICE CONNECTIONS

A. Provide new gas service complete with gas meter and regulators in accordance with local Utility requirements. Gas service distribution piping to have initial minimum pressure indicated on plans.

B. Contractor is responsible for coordinating new service with Utility, including any elevated pressure requests.

SECTION 26 0005
BASIC ELECTRICAL REQUIREMENTS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. This section applies to all sections of Division 26 and Division 28.

B. Drawings and general provisions of the contract, including Division 00 and Division 01 specification sections, apply to work of this section.

C. Provide all items, articles, materials, operations or methods listed, mentioned or scheduled on drawings and/or herein, including all labor, materials, equipment and incidentals necessary and required for their completion.

D. The items in this section are supplementary to the requirements set forth in other portions of the specifications as indicated under Item "A" above.

1.2 DRAWINGS

A. The drawings show the location and general arrangement of equipment, electrical systems and related items. They shall be followed as closely as elements of the construction will permit.

B. Examine the drawings of other trades and verify the conditions governing the work on the job site. Arrange work accordingly, providing such fittings, conduit, junction boxes and accessories as may be required to meet such conditions.

C. Deviations from the drawings, with the exception of minor changes in routing and other such incidental changes that do not affect the functioning or serviceability of the systems, shall not be made without the written approval of the Architect/Engineer.

D. The architectural and structural drawings take precedence in all matters pertaining to the building structure, mechanical drawings in all matters pertaining to mechanical trades and electrical drawings in all matters pertaining to electrical trades. Where there are conflicts or differences between the drawings for the various trades, report such conflicts or differences to the Architect/Engineer for resolution.

1.3 INSPECTION OF SITE

A. Visit the site, examine and verify the conditions under which the work must be conducted before submitting proposal.

B. The submitting of a proposal implies that the contractor has visited the site and understands the conditions under which the work must be conducted.

1.4 TEMPORARY FACILITIES

A. Provide and remove upon completion of the project, in accordance with the general conditions, a complete temporary electrical and telephone service during construction.

1.5 ALTERNATES AND SUBSTITUTIONS

A. Refer to Division 01 - General Requirements for procedures.

1.6 GUARANTEE

A. Contractor guarantees that the installation is free from defects and agrees to replace or repair, any part of this installation which becomes defective within a period of one year following final acceptance, unless noted otherwise, provided that such failure is due to defects in the equipment, material or installation or to follow the specifications and drawings. File with the Owner any and all guarantees from the equipment manufacturers.

1.7 CODES, PERMITS AND FEES

A. Unless otherwise indicated, all required permits, licenses, inspections, approvals and fees for electrical work shall be secured and paid for by the contractor. All work shall conform to all applicable codes, rules and regulations. Applicable publications listed in all sections of Division 26 shall be the latest issue, unless otherwise noted.

B. Rules of local utility companies shall be complied with. Check with the utility company supplying service to the installation and determine all devices including, but not limited to, all current and potential transformers, meter boxes, C.T. cabinets and meters which will be required and include the cost of all such items in proposal.

C. All work shall be executed in accordance with the rules and regulations set forth in local and state codes. Prepare any detailed drawings or diagrams which may be required by the governing authorities. Where the drawings and/or specifications indicate materials or construction in excess of code requirements, the drawings and/or specifications shall govern.

1.8 STANDARDS OF MATERIAL AND WORKMANSHIP:

A. All materials shall be new, unless noted otherwise. The electrical and physical properties of all materials, and the design, performance characteristics, and methods of construction of all items of equipment, shall be in accordance with the latest issue of the various, applicable standard specifications of the following recognized authorities:

1. A.N.S.I. - American National Standards Institute

2. A.S.T.M. - American Society for Testing Materials

3. I.C.E.A. - Insulated Cable Engineers Association

4. I.E.E.E. - Institute of Electrical and Electronics Engineers

5. N.E.C. - National Electrical Code (NFPA 70)

6. N.E.C.A. - National Electrical Contractors Association

7. N.E.M.A. - National Electrical Manufacturer's Association

8. N.F.P.A. - National Fire Protection Association

9. U.L. - Underwriters Laboratories, Inc.

B. Perform all work in a first class and workmanlike manner, in accordance with the latest accepted standards and practices for the Trades involved.

C. All equipment of the same or similar systems shall be by the same manufacturer.

1.9 RECORD DRAWINGS

A. Refer to Division 01 - General Requirements for procedures. All literature shall be furnished in accordance with requirements listed in Division 01.

B. Contractor shall provide the following record drawings as part of the Project closeout document process:

1. Contract Documents, specifications and submittals, indicating "As-Built" conditions and actual products selected for use.

2. Product and Maintenance manuals for all equipment listed within this specification manual and in Contract Documents. Provide with parts lists as applicable.

1.10 SUBMITTALS

A. Refer to Division 01 - General Requirements for procedures.

B. Contractor shall provide submittals where items are referred to by symbolic designation on the drawings. All submittals shall bear the same designation (light fixtures, wiring devices, etc.). Refer to other sections of the electrical specifications for additional requirements.

C. Engineer WILL NOT REVIEW:

1. Submittals not specified.

2. Submittals which do not indicate optional equipment being provided.

3. Submittals not reviewed by Contractor; including Contractor stamp with signature comments.

4. Submittals made after work is delivered to site and/or installed.

5. Submittal resubmissions unless resubmission is required by Architect/Engineer.

1.11 MANUFACTURERS LISTED

A. The listing of specific manufacturers does not imply acceptance of their products that do not meet the specified ratings, features and functions. Manufacturers listed are not relieved from meeting these specifications in their entirety.

B. Products in compliance with the specification and manufactured by others not named will be considered only if pre-approved by the Engineer five (5) days prior to bid date.

1.12 USE OF EQUIPMENT

A. The use of any equipment, or any part thereof for purposes other than testing even with the Owner's consent, shall not be construed to be an acceptance of the work on the part of the Owner, nor be construed to obligate the Owner in any way to accept improper work or defective materials.

B. Do not use Owner's light fixtures for temporary lighting except as allowed and directed by the Owner.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.1 INSTALLATION OF EQUIPMENT

A. Install all equipment in strict accordance with all directions and recommendations furnished by the manufacturer. Where such directions are in conflict with the drawings and specifications, report such conflicts to the Architect/Engineer for resolution.

B. Equipment location shall be as close as practical to locations shown on the drawings.

C. Working clearances shall not be less than specified in NFPA 70 (National Electric Code).

3.2 COORDINATION

A. Install work to avoid interference with work of other trades including, but not limited to, architectural and mechanical trades. Remove and relocate any work that causes an interference at Contractor's expense. Disputes regarding the cause of an interference will be resolved by the Construction Manager or Architect/Engineer.

3.3 CUTTING, PATCHING AND DAMAGE TO OTHER WORK

A. Refer to Division 01 - General Requirements and Division 02 - Existing Conditions.

B. All cutting, patching and repair work shall be performed by the contractor through approved, qualified subcontractors. Contractor shall include full cost of same in bid.

3.4 EXCAVATION AND BACKFILLING

A. Provide all excavation, trenching, tunneling, dewatering and backfilling required for the electrical work. Coordinate the work with other excavating and backfilling in the same area.

B. Where conduit is installed less than 30" below the surface of pavement, provide concrete encasement, 4" minimum coverage, all around or as shown on the electrical drawings.

C. Backfill all excavations inside building, under drives and parking areas with well-tamped granular material. Backfill all excavations under wall footings with lean mix concrete up to underside of footings and extend concrete within excavation a minimum of four (4) feet each side of footing. Granular backfill shall be placed in layers not more than 8 inches in thickness, 95 percent compaction throughout with approved compaction equipment. Tamp, roll as required. Excavated material shall not be used.

D. Backfill outside building with granular material to a height 12 inches over top of pipe compacted to 95 percent compaction as specified above. Backfill remainder of excavation with unfrozen, excavated material in such a way to prevent settling. Tamp, roll as required.

3.5 EQUIPMENT FOUNDATION AND SUPPORTS

A. Shall be as required or as shown on plans or specified.

B. Provide concrete house keeping bases 4" above finished floor, with leveling channels, where noted, for floor-mounted equipment. Coordinate requirements with Division 03 - Concrete.

C. For equipment suspended from ceilings or walls, furnish and install all inserts, rods, structural steel frames, brackets and platforms required.

3.6 EQUIPMENT CONNECTIONS

A. Make connections to equipment, motors, lighting fixtures, and other items included in the work in accordance with the approved shop drawings and rough-in measurements furnished by the manufacturers of the particular equipment furnished. All additional connections not shown on the drawings, but called out by the equipment manufacturer's shop drawings shall be provided.

3.7 ACCESS DOORS AND PANELS

A. Refer to Division 08 - Openings; Provide access doors in locations as required per N.E.C. Coordinate locations with architectural trades.

3.8 CLEANING

A. Refer to Division 01 - General Requirements; All equipment shall be cleaned as frequently as necessary through the construction process and again prior to project completion.

B. Final cleanup shall include, but not be limited to, washing of fixture lenses or louvers, switchboards, substations, motor control centers, panels, etc. Fixture reflectors and lenses or louvers shall be left with no water marks or cleaning streaks.

3.9 DELIVERY, STORAGE AND PROTECTION OF EQUIPMENT AND MATERIALS

A. Refer to Division 01 - General Requirements; All equipment and materials shall be delivered, stored and secured per manufacturer's recommendations.

B. On-site storage shall be coordinated with Construction Manager and be performed in a manner as to avoid damage, deterioration and loss.

3.10 DRAWINGS AND MEASUREMENTS

A. Electrical drawings are not intended to be scaled for rough-in measurements nor to serve as submittals. Field measurements necessary for ordering materials and fitting the installation to the building construction and arrangement shall be taken by the Contractor.

SECTION 26 0519
LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Single conductor building wire.

B. Metal-clad cable.

C. Wiring connectors.

D. Electrical tape.

E. Heat shrink tubing.

F. Oxide inhibiting compound.

G. Wire pulling lubricant.

H. Cable ties.

I. Firestop sleeves.

1.2 RELATED REQUIREMENTS

A. Division 01 - General Requirements: Project administrative and procedural requirements.

B. Division 02 - Existing Conditions: Demolition, cleaning and disposal requirements, cutting and patching requirements, and repairs.

C. Division 07 - Thermal and Moisture Protection: Firestopping.

D. Section 26 0005 - Basic Electrical Requirements.

E. Section 26 0526 - Grounding and Bonding for Electrical Systems: Additional requirements for grounding conductors and grounding connectors.

F. Section 26 0553 - Identification for Electrical Systems: Identification products and requirements.

G. Section 28 4600 - Fire Detection and Alarm: Fire alarm system conductors and cables.

H. Division 31 - Earthwork: Excavating, bedding, and backfilling.

1.3 REFERENCE STANDARDS

A. ASTM B3 - Standard Specification for Soft or Annealed Copper Wire; 2013 (Reapproved 2018).

B. ASTM B8 - Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft; 2011 (Reapproved 2017).

C. ASTM B33 - Standard Specification for Tin-Coated Soft or Annealed Copper Wire for Electrical Purposes; 2010, with Editorial Revision (2020).

D. ASTM B787/B787M - Standard Specification for 19 Wire Combination Unilay-Stranded Copper Conductors for Subsequent Insulation; 2004 (Reapproved 2020).

E. ASTM D3005 - Standard Specification for Low-Temperature Resistant Vinyl Chloride Plastic Pressure-Sensitive Electrical Insulating Tape; 2017.

F. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

G. NECA 120 - Standard for Installing Armored Cable (AC) and Type Metal-Clad (MC) Cable; 2018.

H. NEMA WC 70 - Power Cables Rated 2000 Volts or Less for the Distribution of Electrical Energy; 2021.

I. NETA ATS - Standard For Acceptance Testing Specifications For Electrical Power Equipment And Systems; 2021.

J. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

K. UL 44 - Thermoset-Insulated Wires and Cables; Current Edition, Including All Revisions.

L. UL 83 - Thermoplastic-Insulated Wires and Cables; Current Edition, Including All Revisions.

M. UL 267 - Outline of Investigation for Wire-Pulling Compounds; Current Edition, Including All Revisions.

N. UL 486A-486B - Wire Connectors; Current Edition, Including All Revisions.

O. UL 486C - Splicing Wire Connectors; Current Edition, Including All Revisions.

P. UL 486D - Sealed Wire Connector Systems; Current Edition, Including All Revisions.

Q. UL 510 - Polyvinyl Chloride, Polyethylene, and Rubber Insulating Tape; Current Edition, Including All Revisions.

R. UL 1569 - Metal-Clad Cables; Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate sizes of raceways, boxes, and equipment enclosures installed under other sections with the actual conductors to be installed, including adjustments for conductor sizes increased for voltage drop.

2. Coordinate with electrical equipment installed under other sections to provide terminations suitable for use with the conductors to be installed.

3. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.5 SUBMITTALS

A. Contractor shall provide submittals for equipment listed herein. Refer to Division 01 for submittal procedures.

1.6 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented 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 FIELD CONDITIONS

A. Do not install or otherwise handle thermoplastic-insulated conductors at temperatures lower than 14 degrees F, unless otherwise permitted by manufacturer's instructions. When installation below this temperature is unavoidable, notify Architect and obtain direction before proceeding with work.

PART 2 PRODUCTS

2.1 CONDUCTOR AND CABLE APPLICATIONS

A. Do not use conductors and cables for applications other than as permitted by NFPA 70 and product listing.

B. Provide single conductor building wire installed in suitable raceway unless otherwise indicated, permitted, or required.

C. Feeders provided for Emergency Power systems shall within a 2-hour rated raceway or enclosure and installed per NEC 700.11.

D. Nonmetallic-sheathed cable is not permitted.

E. Underground feeder and branch-circuit cable is not permitted.

F. Service entrance cable is not permitted.

G. Armored cable is not permitted.

H. Metal-clad cable is permitted only as follows:

1. Where not otherwise restricted, may be used:

    a. Where concealed above accessible ceilings for final connections from junction boxes to luminaires.

        1) Maximum Length: 6 feet.

    b. Where concealed in hollow stud walls, above accessible ceilings, and under raised floors for branch circuits up to 20 A.

I. Manufactured wiring systems are not permitted.

2.2 CONDUCTOR AND CABLE GENERAL REQUIREMENTS

A. Provide products that comply with requirements of NFPA 70.

B. Provide products listed, classified, and labeled as suitable for the purpose intended.

C. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, etc. as required for a complete operating system.

D. Comply with NEMA WC 70.

E. Thermoplastic-Insulated Conductors and Cables: Listed and labeled as complying with UL 83.

F. Thermoset-Insulated Conductors and Cables: Listed and labeled as complying with UL 44.

G. Conductor Material:

1. Provide copper conductors only. Aluminum conductors are not acceptable for this project. Conductor sizes indicated are based on copper.

2. Copper Conductors: Soft drawn annealed, 98 percent conductivity, uncoated copper conductors complying with ASTM B3, ASTM B8, or ASTM B787/B787M unless otherwise indicated.

3. Tinned Copper Conductors: Comply with ASTM B33.

H. Minimum Conductor Size:

1. Branch Circuits: 12 AWG.

    a. Exceptions:

        1) 20 A, 120 V circuits longer than 75 feet: 10 AWG, for voltage drop.

        2) 20 A, 120 V circuits longer than 150 feet: 8 AWG, for voltage drop.

        3) 20 A, 277 V circuits longer than 150 feet: 10 AWG, for voltage drop.

I. Where conductor size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.

J. Conductor Color Coding:

1. Color code conductors as indicated unless otherwise required by the authority having jurisdiction. Maintain consistent color coding throughout project.

2. Color Coding Method: Integrally colored insulation.

3. Color Code:

a. 208Y/120 V, 3 Phase, 4 Wire System:

1) Phase A: Black.

2) Phase B: Red.

3) Phase C: Blue.

4) Neutral/Grounded: White.

b. Equipment Ground, All Systems: Green.

c. For modifications or additions to existing wiring systems, comply with existing color code when existing code complies with NFPA 70 and is approved by the authority having jurisdiction.

2.3 SINGLE CONDUCTOR BUILDING WIRE

A. Manufacturers:

1. Copper Building Wire:

a. Cerro Wire LLC: www.cerrowire.com.

b. Encore Wire Corporation: www.encorewire.com.

c. General Cable Technologies Corporation: www.generalcable.com.

d. Southwire Company: www.southwire.com.

B. Description: Single conductor insulated wire.

C. Conductor Stranding:

1. Feeders and Branch Circuits:

a. Size 10 AWG and Smaller: Stranded.

b. Size 8 AWG and Larger: Stranded.

D. Insulation Voltage Rating: 600 V.

E. Insulation:

1. Copper Building Wire: Type THHN/THWN or THHN/THWN-2, except as indicated below.

2.4 METAL-CLAD CABLE

A. Manufacturers:

1. Cerro Wire LLC: www.cerrowire.com.

2. AFC Cable Systems Inc: www.afcweb.com.

3. Encore Wire Corporation: www.encorewire.com.

4. Southwire Company: www.southwire.com.

B. Description: NFPA 70, Type MC cable listed and labeled as complying with UL 1569, and listed for use in classified firestop systems to be used.

C. Conductor Stranding:

1. Size 10 AWG and Smaller: Stranded.

2. Size 8 AWG and Larger: Stranded.

D. Insulation Voltage Rating: 600 V.

E. Insulation: Type THHN, THHN/THWN, or THHN/THWN-2.

F. Provide oversized neutral conductors.

G. Grounding: Full-size integral equipment grounding conductor.

H. Armor: Steel, interlocked tape.

2.5 WIRING CONNECTORS

A. Description: Wiring connectors appropriate for the application, suitable for use with the conductors to be connected, and listed as complying with UL 486A-486B or UL 486C as applicable.

B. Connectors for Grounding and Bonding: Comply with Section 26 0526.

C. Wiring Connectors for Splices and Taps:

1. Copper Conductors Size 8 AWG and Smaller: Use twist-on insulated spring connectors.

2. Copper Conductors Size 6 AWG and Larger: Use mechanical connectors or compression connectors.

D. Wiring Connectors for Terminations:

1. Provide terminal lugs for connecting conductors to equipment furnished with terminations designed for terminal lugs.

2. Provide compression adapters for connecting conductors to equipment furnished with mechanical lugs when only compression connectors are specified.

3. Where over-sized conductors are larger than the equipment terminations can accommodate, provide connectors suitable for reducing to appropriate size, but not less than required for the rating of the overcurrent protective device.

4. Copper Conductors Size 8 AWG and Larger: Use mechanical connectors or compression connectors where connectors are required.

E. Do not use insulation-piercing or insulation-displacement connectors designed for use with conductors without stripping insulation.

F. Do not use push-in wire connectors as a substitute for twist-on insulated spring connectors.

G. Twist-on Insulated Spring Connectors: Rated 600 V, 221 degrees F for standard applications and 302 degrees F for high temperature applications; pre-filled with sealant and listed as complying with UL 486D for damp and wet locations.

H. Mechanical Connectors: Provide bolted type or set-screw type.

I. Compression Connectors: Provide circumferential type or hex type crimp configuration.

2.6 ACCESSORIES

A. Electrical Tape:

1. Vinyl Color Coding Electrical Tape: Integrally colored to match color code indicated; listed as complying with UL 510; minimum thickness of 7 mil; resistant to abrasion, corrosion, and sunlight; suitable for continuous temperature environment up to 221 degrees F.

2. Vinyl Insulating Electrical Tape: Complying with ASTM D3005 and listed as complying with UL 510; minimum thickness of 7 mil; resistant to abrasion, corrosion, and sunlight; conformable for application down to 0 degrees F and suitable for continuous temperature environment up to 221 degrees F.

B. Wire Pulling Lubricant:

1. Listed and labeled as complying with UL 267.

2. Suitable for use with conductors/cables and associated insulation/jackets to be installed.

3. Suitable for use at installation temperature.

C. Cable Ties: Material and tensile strength rating suitable for application.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that interior of building has been protected from weather.

B. Verify that work likely to damage wire and cable has been completed.

C. Verify that raceways, boxes, and equipment enclosures are installed and are properly sized to accommodate conductors and cables in accordance with NFPA 70.

D. Verify that field measurements are as indicated.

E. Verify that conditions are satisfactory for installation prior to starting work.

3.2 PREPARATION

A. Clean raceways thoroughly to remove foreign materials before installing conductors and cables.

3.3 INSTALLATION

A. Circuiting Requirements:

1. Unless dimensioned, circuit routing indicated is diagrammatic.

2. When circuit destination is indicated without specific routing, determine exact routing required.

3. Arrange circuiting to minimize splices.

4. Include circuit lengths required to install connected devices within 10 ft of location indicated.

5. Maintain separation of Class 1, Class 2, and Class 3 remote-control, signaling, and power-limited circuits in accordance with NFPA 70.

6. Maintain separation of wiring for emergency systems in accordance with NFPA 70.

7. Circuiting Adjustments: Unless otherwise indicated, when branch circuits are indicated as separate, combining them together in a single raceway is not permitted.

8. Common Neutrals: Unless otherwise indicated, sharing of neutral/grounded conductors among up to three single phase branch circuits of different phases installed in the same raceway is not permitted. Provide dedicated neutral/grounded conductor for each individual branch circuit.

9. Provide oversized neutral/grounded conductors where indicated and as specified below.

a. Provide 200 percent rated neutral for feeders fed from K-rated transformers.

b. Provide 200 percent rated neutral for feeders serving panelboards with 200 percent rated neutral bus.

B. Install products in accordance with manufacturer's instructions.

C. Perform work in accordance with NECA 1 (general workmanship).

D. Install metal-clad cable (Type MC) in accordance with NECA 120.

E. Installation in Raceway:

1. Tape ends of conductors and cables to prevent infiltration of moisture and other contaminants.

2. Pull all conductors and cables together into raceway at same time.

3. Do not damage conductors and cables or exceed manufacturer's recommended maximum pulling tension and sidewall pressure.

4. Use suitable wire pulling lubricant where necessary, except when lubricant is not recommended by the manufacturer.

F. Paralleled Conductors: Install conductors of the same length and terminate in the same manner.

G. Secure and support conductors and cables in accordance with NFPA 70 using suitable supports and methods approved by the authority having jurisdiction. Provide independent support from building structure. Do not provide support from raceways, piping, ductwork, or other systems.

H. Terminate cables using suitable fittings.

1. Metal-Clad Cable (Type MC):

a. Use listed fittings.

b. Cut cable armor only using specialized tools to prevent damaging conductors or insulation. Do not use hacksaw or wire cutters to cut armor.

I. Install conductors with a minimum of 12 inches of slack at each outlet.

J. Where conductors are installed in enclosures for future termination by others, provide a minimum of 5 feet of slack.

K. Neatly train and bundle conductors inside boxes, wireways, panelboards and other equipment enclosures.

L. Group or otherwise identify neutral/grounded conductors with associated ungrounded conductors inside enclosures in accordance with NFPA 70.

M. Make wiring connections using specified wiring connectors.

1. Make splices and taps only in accessible boxes. Do not pull splices into raceways or make splices in conduit bodies or wiring gutters.

2. Remove appropriate amount of conductor insulation for making connections without cutting, nicking or damaging conductors.

3. Do not remove conductor strands to facilitate insertion into connector.

4. Clean contact surfaces on conductors and connectors to suitable remove corrosion, oxides, and other contaminates. Do not use wire brush on plated connector surfaces.

5. Mechanical Connectors: Secure connections according to manufacturer's recommended torque settings.

6. Compression Connectors: Secure connections using manufacturer's recommended tools and dies.

N. Insulate splices and taps that are made with uninsulated connectors using methods suitable for the application, with insulation and mechanical strength at least equivalent to unspliced conductors.

O. Insulate ends of spare conductors using vinyl insulating electrical tape.

P. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Division 07.

Q. Unless specifically indicated to be excluded, provide final connections to all equipment and devices, including those furnished by others, as required for a complete operating system.

3.4 FIELD QUALITY CONTROL

A. Inspect and test in accordance with NETA ATS, except Section 4.

B. Perform inspections and tests listed in NETA ATS, Section 7.3.2. The insulation resistance test is required for all conductors. The resistance test for parallel conductors listed as optional is not required.

1. Disconnect surge protective devices (SPDs) prior to performing any high potential testing. Replace SPDs damaged by performing high potential testing with SPDs connected.

C. Correct deficiencies and replace damaged or defective conductors and cables.

SECTION 26 0526
GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Grounding and bonding requirements.

B. Conductors for grounding and bonding.

C. Connectors for grounding and bonding.

D. Ground bars.

E. Ground rod electrodes.

1.2 RELATED REQUIREMENTS

A. Division 01 - General Requirements: Project administrative and procedural requirements

B. Division 02 - Existing Conditions: Demolition, cleaning and disposal requirements, cutting and patching requirements, repairs.

C. Section 26 0005 - Basic Electrical Requirements

D. Section 26 0519 - Low-Voltage Electrical Power Conductors and Cables: Additional requirements for conductors for grounding and bonding, including conductor color coding.

E. Section 26 0553 - Identification for Electrical Systems: Identification products and requirements.

F. Division 31 - Earthwork: Excavating, trenching and fill.

1.3 REFERENCE STANDARDS

A. IEEE 81 - IEEE Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Grounding System; 2012.

B. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

C. NEMA GR 1 - Grounding Rod Electrodes and Grounding Rod Electrode Couplings; 2022.

D. NETA ATS - Standard For Acceptance Testing Specifications For Electrical Power Equipment And Systems; 2021.

E. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

F. UL 467 - Grounding and Bonding Equipment; Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Verify exact locations of underground metal water service pipe entrances to building.

2. Coordinate the work with other trades to provide steel reinforcement complying with specified requirements for concrete-encased electrode.

3. Notify Strategic Energy Solutions, Inc. of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

B. Sequencing:

1. Do not install ground rod electrodes until final backfill and compaction is complete.

1.5 SUBMITTALS

A. Contractor shall provide submittals for equipment listed herein. Refer to Division 01 for submittal procedures.

B. Project Record Documents: Record actual locations of grounding electrode system components and connections.

PART 2 PRODUCTS

2.1 GROUNDING AND BONDING REQUIREMENTS

A. Existing Work: Where existing grounding and bonding system components are indicated to be reused, they may be reused only where they are free from corrosion, integrity and continuity are verified, and where acceptable to the authority having jurisdiction.

B. Do not use products for applications other than as permitted by NFPA 70 and product listing.

C. Unless specifically indicated to be excluded, provide all required components, conductors, connectors, conduit, boxes, fittings, supports, accessories, etc. as necessary for a complete grounding and bonding system.

D. Where conductor size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.

E. Grounding System Resistance:

1. Achieve specified grounding system resistance under normally dry conditions unless otherwise approved by Architect. Precipitation within the previous 48 hours does not constitute normally dry conditions.

2. Grounding Electrode System: Not greater than 5 ohms to ground, when tested according to IEEE 81 using "fall-of-potential" method.

3. Between Grounding Electrode System and Major Electrical Equipment Frames, System Neutral, and Derived Neutral Points: Not greater than 0.5 ohms, when tested using "point-to-point" methods.

F. Grounding Electrode System:

1. Provide connection to required and supplemental grounding electrodes indicated to form grounding electrode system.

   a. Provide continuous grounding electrode conductors without splice or joint.

   b. Install grounding electrode conductors in raceway where exposed to physical damage. Bond grounding electrode conductor to metallic raceways at each end with bonding jumper.

2. Metal Underground Water Pipe(s):

   a. Provide connection to underground metal domestic and fire protection (where present) water service pipe(s) that are in direct contact with earth for at least 10 feet at an accessible location not more than 5 feet from the point of entrance to the building.

   b. Provide bonding jumper(s) around insulating joints/pipes as required to make pipe electrically continuous.

   c. Provide bonding jumper around water meter of sufficient length to permit removal of meter without disconnecting jumper.

3. Concrete-Encased Electrode:

   a. Provide connection to concrete-encased electrode consisting of not less than 20 feet of either steel reinforcing bars or bare copper conductor not smaller than 4 AWG embedded within concrete foundation or footing that is in direct contact with earth in accordance with NFPA 70.

4. Ground Rod Electrode(s):

   a. Provide three electrodes in an equilateral triangle configuration unless otherwise indicated or required.

   b. Space electrodes not less than 10 feet from each other and any other ground electrode.

   c. Where location is not indicated, locate electrode(s) at least 5 feet outside building perimeter foundation as near as possible to electrical service entrance; where possible, locate in softscape (uncovered) area.

5. Provide additional ground electrode(s) as required to achieve specified grounding electrode system resistance.

6. Ground Bar: Provide ground bar, separate from service equipment enclosure, for common connection point of grounding electrode system bonding jumpers as permitted in NFPA 70. Connect grounding electrode conductor provided for service-supplied system grounding to this ground bar.

    a. Ground Bar Size: 1/4 by 2 by 12 inches unless otherwise indicated or required.

    b. Where ground bar location is not indicated, locate in accessible location as near as possible to service disconnect enclosure.

    c. Ground Bar Mounting Height: 18 inches above finished floor unless otherwise indicated.

G. Bonding and Equipment Grounding:

1. Provide bonding for equipment grounding conductors, equipment ground busses, metallic equipment enclosures, metallic raceways and boxes, device grounding terminals, and other normally non-current-carrying conductive materials enclosing electrical conductors/equipment or likely to become energized as indicated and in accordance with NFPA 70.

2. Provide insulated equipment grounding conductor in each feeder and branch circuit raceway. Do not use raceways as sole equipment grounding conductor.

3. Where circuit conductor sizes are increased for voltage drop, increase size of equipment grounding conductor proportionally in accordance with NFPA 70.

4. Unless otherwise indicated, connect wiring device grounding terminal to branch circuit equipment grounding conductor and to outlet box with bonding jumper.

5. Terminate branch circuit equipment grounding conductors on solidly bonded equipment ground bus only. Do not terminate on neutral (grounded) or isolated/insulated ground bus.

6. Provide bonding jumper across expansion or expansion/deflection fittings provided to accommodate conduit movement.

7. Provide bonding for interior metal piping systems in accordance with NFPA 70. This includes, but is not limited to:

    a. Metal water piping where not already effectively bonded to metal underground water pipe used as grounding electrode.

    b. Metal gas piping.

8. Provide bonding for metal building frame.

9. Provide bonding for metal siding not effectively bonded through attachment to metal building frame.

2.2 GROUNDING AND BONDING COMPONENTS

A. General Requirements:

1. Provide products listed, classified, and labeled as suitable for the purpose intended.

2. Provide products listed and labeled as complying with UL 467 where applicable.

B. Conductors for Grounding and Bonding, in Addition to Requirements of Section 26 0526:

1. Use insulated copper conductors unless otherwise indicated.

a. Exceptions:

1) Use bare copper conductors where installed underground in direct contact with earth.

2) Use bare copper conductors where directly encased in concrete (not in raceway).

C. Connectors for Grounding and Bonding:

1. Description: Connectors appropriate for the application and suitable for the conductors and items to be connected; listed and labeled as complying with UL 467.

2. Unless otherwise indicated, use exothermic welded connections for underground, concealed and other inaccessible connections.

3. Unless otherwise indicated, use mechanical connectors, compression connectors, or exothermic welded connections for accessible connections.

4. Manufacturers - Mechanical and Compression Connectors:

a. Advanced Lightning Technology (ALT): www.altfab.com

b. Burndy LLC: www.burndy.com

c. Harger Lightning & Grounding: www.harger.com

d. nVent ERICO; _____: www.nvent.com/

e. Thomas & Betts Corporation: www.tnb.com

5. Manufacturers - Exothermic Welded Connections:

a. Burndy LLC: www.burndy.com

b. nVent ERICO; Cadweld: www.nvent.com

c. thermOweld, subsidiary of Continental Industries; division of Burndy LLC: www.thermoweld.com

D. Ground Bars:

1. Description: Copper rectangular ground bars with mounting brackets and insulators.

2. Size: As indicated.

3. Holes for Connections: As indicated or as required for connections to be made.

4. Manufacturers:

   a. Advanced Lightning Technology (ALT): www.altfab.com

   b. Harger Lightning & Grounding: www.harger.com

   c. nVent ERICO: www.nvent.com/

   d. thermOweld, subsidiary of Continental Industries; division of Burndy LLC: www.thermoweld.com

E. Ground Rod Electrodes:

1. Comply with NEMA GR 1.

2. Material: Copper-bonded (copper-clad) steel.

3. Size: 3/4 inch diameter by 10 feet length, unless otherwise indicated.

4. Where rod lengths of greater than 10 feet are indicated or otherwise required, sectionalized ground rods may be used.

5. Manufacturers:

   a. Advanced Lightning Technology (ALT): www.altfab.com/#sle.

   b. Galvan Industries, Inc: www.galvanelectrical.com/#sle.

   c. Harger Lightning & Grounding: www.harger.com/#sle.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that work likely to damage grounding and bonding system components has been completed.

B. Verify that field measurements are as indicated.

C. Verify that conditions are satisfactory for installation prior to starting work.

3.2 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Perform work in accordance with NECA 1 (general workmanship).

C. Ground Rod Electrodes: Unless otherwise indicated, install ground rod electrodes vertically. Where encountered rock prohibits vertical installation, install at 45 degree angle or bury horizontally in trench at least 30 inches (750 mm) deep in accordance with NFPA 70 or provide ground plates.

D. Make grounding and bonding connections using specified connectors.

1. Remove appropriate amount of conductor insulation for making connections without cutting, nicking or damaging conductors. Do not remove conductor strands to facilitate insertion into connector.

2. Remove nonconductive paint, enamel, or similar coating at threads, contact points, and contact surfaces.

3. Exothermic Welds: Make connections using molds and weld material suitable for the items to be connected in accordance with manufacturer's recommendations.

4. Mechanical Connectors: Secure connections according to manufacturer's recommended torque settings.

5. Compression Connectors: Secure connections using manufacturer's recommended tools and dies.

E. Identify grounding and bonding system components in accordance with Section 26 0553.

3.3 FIELD QUALITY CONTROL

A. Inspect and test in accordance with NETA ATS except Section 4.

B. Perform inspections and tests listed in NETA ATS, Section 7.13.

C. Perform ground electrode resistance tests under normally dry conditions. Precipitation within the previous 48 hours does not constitute normally dry conditions.

D. Investigate and correct deficiencies where measured ground resistances do not comply with specified requirements.

SECTION 26 0529
HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Support and attachment requirements and components for equipment, conduit, cable, boxes, and other electrical work.

1.2 RELATED REQUIREMENTS

A. Division 01 - General Requirements: Project administrative and procedural requirements

B. Division 02 - Existing Conditions: Demolition, cleaning and disposal requirements, and cutting and patching requirements.

C. Division 03 - Concrete: Concrete equipment pads.

D. Section 26 0005 - Basic Electrical Requirements

E. Section 26 0533.13 - Conduit for Electrical Systems: Additional support and attachment requirements for conduits.

F. Section 26 0533.16 - Boxes for Electrical Systems: Additional support and attachment requirements for boxes.

1.3 REFERENCE STANDARDS

A. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.

B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2023.

C. ASTM B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel; 2023.

D. MFMA-4 - Metal Framing Standards Publication; 2004.

E. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

F. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

G. UL 5B - Strut-Type Channel Raceways and Fittings; Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate sizes and arrangement of supports and bases with actual equipment and components to be installed.

2. Coordinate work to provide additional framing and materials required for installation.

3. Coordinate compatibility of support and attachment components with mounting surfaces at installed locations.

4. Coordinate arrangement of supports with ductwork, piping, equipment and other potential conflicts.

5. Notify Architect of conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

B. Sequencing:

1. Do not install products on or provide attachment to concrete surfaces until concrete has fully cured in accordance with Division 03.

1.5 QUALITY ASSURANCE

A. Product Listing Organization Qualifications: Organization recognized by OSHA as Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

PART 2 PRODUCTS

2.1 SUPPORT AND ATTACHMENT COMPONENTS

A. General Requirements:

1. Comply with the following. Where requirements differ, comply with most stringent.

a. NFPA 70.

b. Requirements of authorities having jurisdiction.

2. Provide required hangers, supports, anchors, fasteners, fittings, accessories, and hardware as necessary for complete installation of electrical work.

3. Provide products listed, classified, and labeled as suitable for purpose intended, where applicable.

4. Where support and attachment component types and sizes are not indicated, select in accordance with manufacturer's application criteria as required for the load to be supported. Include consideration for vibration, equipment operation, and shock loads where applicable.

5. Do not use products for applications other than as permitted by NFPA 70 and product listing.

6. Steel Components: Use corrosion-resistant materials suitable for environment where installed.

    a. Zinc-Plated Steel: Electroplated in accordance with ASTM B633.

    b. Galvanized Steel: Hot-dip galvanized after fabrication in accordance with ASTM A123/A123M or ASTM A153/A153M.

B. Conduit and Cable Supports: Straps and clamps suitable for conduit or cable to be supported.

1. Conduit Straps: One-hole or two-hole type; steel or malleable iron.

2. Conduit Clamps: Bolted type unless otherwise indicated.

C. Outlet Box Supports: Hangers and brackets suitable for boxes to be supported.

1. Manufacturers:

    a. ABB: www.electrification.us.abb.com

    b. Eaton Corporation: www.eaton.com

    c. Emerson Electric Co; O-Z/Gedney: www.emerson.com

    d. HoldRite, a brand of Reliance Worldwide Corporation: www.holdrite.com

    e. nVent; Caddy: www.nvent.com

D. Metal Channel/Strut Framing Systems:

1. Manufacturers:

    a. ABB: www.electrification.us.abb.com/#sle.

    b. Atkore International Inc; Unistrut: www.unistrut.us/#sle.

    c. Eaton Corporation: www.eaton.com/#sle.

2. Description: Factory-fabricated, continuous-slot, metal channel/strut and associated fittings, accessories, and hardware required for field assembly of supports.

3. Comply with MFMA-4.

4. Channel/Strut Used as Raceway, Where Indicated: Listed and labeled as complying with UL 5B.

E. Hanger Rods: Threaded, zinc-plated steel unless otherwise indicated.

1. Minimum Size, Unless Otherwise Indicated or Required:

    a. Equipment Supports: 1/2-inch diameter.

b. Single Conduit up to 1-inch (27 mm) Trade Size: 1/4-inch diameter.

c. Single Conduit Larger than 1-inch (27 mm) Trade Size: 3/8-inch diameter.

d. Trapeze Support for Multiple Conduits: 3/8-inch diameter.

e. Outlet Boxes: 1/4-inch diameter.

f. Luminaires: 1/4-inch diameter.

F. Nonpenetrating Rooftop Supports for Low-Slope Roofs:

1. Manufacturers:

a. Atkore International Inc; Unistrut: www.unistrut.us/#sle.

b. Eaton Corporation: www.eaton.com/#sle.

c. nVent; Caddy: www.nvent.com/#sle.

d. PHP Systems/Design: www.phpsd.com/#sle.

2. Description: Steel pedestals with thermoplastic or rubber bases that rest on top of roofing membrane, not requiring attachment to roof structure and not penetrating roofing assembly, with support fixtures as specified.

3. Base Sizes: As required to distribute load sufficiently to prevent indentation of roofing assembly.

4. Attachment/Support Fixtures: As recommended by manufacturer, same type as indicated for equivalent indoor hangers and supports.

5. Mounting Height: Provide minimum clearance of 6 inches under supported component to top of roofing.

G. Anchors and Fasteners:

1. Manufacturers - Mechanical Anchors:

a. Dewalt: anchors.dewalt.com

b. Hilti, Inc: www.hilti.com

c. ITW Red Head, a division of Illinois Tool Works, Inc: www.itwredhead.com

d. Simpson Strong-Tie Company Inc: www.strongtie.com

2. Unless otherwise indicated and where not otherwise restricted, use anchor and fastener types indicated for specified applications.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Install hangers and supports in accordance with NECA 1.

C. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.

D. Unless specifically indicated or approved by Architect, do not provide support from suspended ceiling support system or ceiling grid.

E. Unless specifically indicated or approved by Architect, do not provide support from roof deck.

F. Do not penetrate or otherwise notch or cut structural members without approval of Structural Engineer.

G. Equipment Support and Attachment:

1. Use metal, fabricated supports or supports assembled from metal channel/strut to support equipment as required.

2. Use metal channel/strut secured to studs to support equipment surface mounted on hollow stud walls when wall strength is not sufficient to resist pull-out.

3. Use metal channel/strut to support surface-mounted equipment in wet or damp locations to provide space between equipment and mounting surface.

4. Unless otherwise indicated, mount floor-mounted equipment on properly sized 4 inch high concrete pad constructed in accordance with Division 03.

5. Securely fasten floor-mounted equipment. Do not install equipment such that it relies on its own weight for support.

H. Conduit Support and Attachment: See Section 26 0533.13 for additional requirements.

I. Box Support and Attachment: See Section 26 0533.16 for additional requirements.

J. Secure fasteners in accordance with manufacturer's recommended torque settings.

K. Remove temporary supports.

L. Identify independent electrical component support wires above accessible ceilings, where permitted, with color distinguishable from ceiling support wires in accordance with NFPA 70.

3.2 FIELD QUALITY CONTROL

A. Inspect support and attachment components for damage and defects.

B. Repair cuts and abrasions in galvanized finishes using zinc-rich paint recommended by manufacturer. Replace components that exhibit signs of corrosion.

C. Correct deficiencies and replace damaged or defective support and attachment components.

SECTION 26 0533.13
CONDUIT FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Galvanized steel rigid metal conduit (RMC).

B. Aluminum rigid metal conduit (RMC).

C. Flexible metal conduit (FMC).

D. Galvanized steel electrical metallic tubing (EMT).

E. Aluminum electrical metallic tubing (EMT).

F. Rigid polyvinyl chloride (PVC) conduit.

1.2 RELATED REQUIREMENTS

A. Division 01 - General Requirements: Project administrative and procedural requirements.

B. Division 02 - Existing Conditions: Demolition, cleaning and disposal requirements, cutting and patching requirements, and repairs.

C. Division 03 - Concrete: Concrete encasement of conduits.

D. Division 07 - Thermal and Moisture Protection: Firestopping.

E. Section 26 0005 - Basic Electrical Requirements

F. Section 26 0519 - Low-Voltage Electrical Power Conductors and Cables.

G. Section 26 0526 - Grounding and Bonding for Electrical Systems.

1. Includes additional requirements for fittings for grounding and bonding.

H. Section 26 0529 - Hangers and Supports for Electrical Systems.

I. Section 26 0533.16 - Boxes for Electrical Systems.

J. Section 26 0553 - Identification for Electrical Systems: Identification products and requirements.

K. Section 28 4600 - Fire Detection and Alarm: Fire alarm wiring in conduit.

L. Division 31 - Earthwork: Excavating, trenching and fill.

1.3 REFERENCE STANDARDS

A. ANSI C80.1 - American National Standard for Electrical Rigid Steel Conduit (ERSC); 2020.

B. ANSI C80.3 - American National Standard for Electrical Metallic Tubing -- Steel (EMT-S); 2020.

C. ANSI C80.5 - American National Standard for Electrical Rigid Metal Conduit -- Aluminum (ERMC-A); 2020.

D. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

E. NECA 101 - Standard for Installing Steel Conduits (Rigid, IMC, EMT); 2020.

F. NECA 102 - Standard for Installing Aluminum Rigid Metal Conduit; 2004.

G. NECA 111 - Standard for Installing Nonmetallic Raceways (RNC, ENT, LFNC); 2017.

H. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable; 2014.

I. NEMA RN 1 - Polyvinyl-Chloride (PVC) Externally Coated Galvanized Rigid Steel Metal Conduit and Intermediate Metal Conduit; 2018.

J. NEMA TC 2 - Electrical Polyvinyl Chloride (PVC) Conduit; 2020.

K. NEMA TC 3 - Polyvinyl Chloride (PVC) Fittings for Use with Rigid PVC Conduit and Tubing; 2021.

L. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

M. UL 1 - Flexible Metal Conduit; Current Edition, Including All Revisions.

N. UL 6 - Electrical Rigid Metal Conduit-Steel; Current Edition, Including All Revisions.

O. UL 6A - Electrical Rigid Metal Conduit-Aluminum, Red Brass, and Stainless Steel; Current Edition, Including All Revisions.

P. UL 514B - Conduit, Tubing, and Cable Fittings; Current Edition, Including All Revisions.

Q. UL 651 - Schedule 40, 80, Type EB and A Rigid PVC Conduit and Fittings; Current Edition, Including All Revisions.

R. UL 797 - Electrical Metallic Tubing-Steel; Current Edition, Including All Revisions.

S. UL 797A - Electrical Metallic Tubing - Aluminum and Stainless Steel; Current Edition, Including All Revisions.

T. UL 2419 - Outline of Investigation for Electrically Conductive Corrosion Resistant Compounds; Current Edition, Including All Revisions.

PART 2 PRODUCTS

2.1 CONDUIT APPLICATIONS

A. Do not use conduit and associated fittings for applications other than as permitted by NFPA 70, manufacturer's instructions, and product listing.

B. Unless otherwise indicated and where not otherwise restricted, use conduit types indicated for specified applications. Where more than one listed application applies, comply with most restrictive requirements. Where conduit type for particular application is not specified, use galvanized steel rigid metal conduit.

C. Underground:

1. Under Slab on Grade: Use galvanized steel rigid metal conduit or rigid PVC conduit.

2. Exterior, Direct-Buried: Use galvanized steel rigid metal conduit or rigid PVC conduit.

3. Exterior, Embedded Within Concrete: Use galvanized steel rigid metal conduit or rigid PVC conduit.

4. Where rigid polyvinyl chloride (PVC) conduit is provided, transition to galvanized steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), or schedule 80 rigid PVC conduit where emerging from underground.

5. Where rigid polyvinyl (PVC) conduit larger than 2-inch (53 mm) trade size is provided, use galvanized steel rigid metal conduit (RMC) elbows, galvanized steel intermediate metal conduit (IMC) elbows, stainless steel intermediate metal conduit (IMC) elbows, PVC-coated galvanized steel rigid metal conduit (RMC) elbows, or concrete-encased PVC elbows for bends.

6. Where galvanized steel rigid metal conduit (RMC) or galvanized steel intermediate metal conduit (IMC) is installed in direct contact with earth where soil has resistivity of less than 2000 ohm-centimeters or is characterized as severely corrosive based on soils report or local experience, use corrosion protection tape, factory-applied corrosion protection coating, or field-applied corrosion protection compound acceptable to authorities having jurisdiction to provide supplementary corrosion protection.

7. Where galvanized steel electrical metallic tubing (EMT) is installed in direct contact with earth, use corrosion protection tape, factory-applied corrosion protection coating, or field-applied corrosion protection compound acceptable to authorities having jurisdiction to provide supplementary corrosion protection.

8. Where aluminum rigid metal conduit (RMC) or aluminum electrical metallic tubing (EMT) is installed in direct contact with earth, use corrosion protection tape, factory-applied corrosion protection coating, or field-applied corrosion protection compound acceptable to authorities having jurisdiction to provide supplementary corrosion protection.

9. Where galvanized rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), or galvanized steel electrical metallic tubing (EMT) emerges from concrete into soil, use corrosion protection tape, factory-applied corrosion protection coating, or field-applied corrosion protection compound acceptable to authorities having jurisdiction to provide supplementary corrosion protection for minimum of 4 inches on either side of where conduit emerges.

D. Embedded Within Concrete:

1. Within Slab on Grade (within structural slabs only where approved by Structural Engineer): Use galvanized steel rigid metal conduit or rigid PVC conduit.

2. Within Slab Above Ground (within structural slabs only where approved by Structural Engineer): Use PVC-coated galvanized steel rigid metal conduit or rigid PVC conduit.

E. Concealed Within Masonry Walls: Use intermediate metal conduit (IMC) or electrical metallic tubing (EMT).

F. Concealed Within Hollow Stud Walls: Use intermediate metal conduit (IMC) or electrical metallic tubing (EMT).

G. Concealed Above Accessible Ceilings: Use intermediate metal conduit (IMC) or electrical metallic tubing (EMT).

H. Interior, Damp or Wet Locations: Use galvanized steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), or galvanized steel electrical metallic tubing (EMT).

I. Exposed, Interior, Not Subject to Physical Damage: Use galvanized steel rigid metal conduit, aluminum rigid metal conduit, or electrical metallic tubing (EMT).

J. Exposed, Interior, Subject to Physical Damage: Use stainless steel rigid metal conduit (RMC), aluminum rigid metal conduit (RMC), stainless steel intermediate metal conduit (IMC), stainless steel electrical metallic tubing (EMT), or schedule 80 rigid PVC conduit.

K. Exposed, Interior, Subject to Severe Physical Damage: Use stainless steel rigid metal conduit (RMC), aluminum rigid metal conduit (RMC), or stainless steel intermediate metal conduit (IMC).

L. Exposed, Exterior: Use PVC-coated galvanized steel rigid metal conduit or aluminum rigid metal conduit.

M. Exposed, Exterior, Subject to Severe Physical Damage: Use stainless steel rigid metal conduit (RMC) or stainless steel intermediate metal conduit (IMC).

N. Concealed, Exterior, Not Embedded in Concrete or in Contact With Earth: Use intermediate metal conduit (IMC).

O. Flexible Connections to Luminaires Above Accessible Ceilings: Use flexible metal conduit (FMC).

1. Maximum Length: 6 feet.

P. Flexible Connections to Vibrating Equipment:

1. Dry Locations: Use flexible metal conduit (FMC).

2. Damp, Wet, or Corrosive Locations: Use liquidtight flexible metal conduit (LFMC).

3. Vibrating equipment includes, but is not limited to:

a. Transformers.

b. Motors.

Q. Fished in Existing Walls, Where Necessary: Use flexible metal conduit (FMC) or galvanized steel electrical metallic tubing (EMT).

2.2 CONDUIT - GENERAL REQUIREMENTS

A. Comply with NFPA 70.

B. Provide conduit, fittings, supports, and accessories required for complete raceway system.

C. Provide products listed, classified, and labeled as suitable for purpose intended.

D. Minimum Conduit Size, Unless Otherwise Indicated:

1. Branch Circuits: 3/4 inch (21 mm) trade size.

2. Underground, Interior: 1 inch (27 mm) trade size.

3. Underground, Exterior: 1-inch trade size.

E. Where conduit size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.

2.3 GALVANIZED STEEL RIGID METAL CONDUIT (RMC)

A. Manufacturers:

1. Allied Tube & Conduit: www.alliedeg.com

2. Republic Conduit: www.republic-conduit.com

3. Wheatland Tube, a Division of Zekelman Industries: www.wheatland.com

B. Description: NFPA 70, Type RMC galvanized steel rigid metal conduit complying with ANSI C80.1 and listed and labeled as complying with UL 6.

C. Fittings:

1. Nonhazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B or UL 6.

2. Material: Use steel or malleable iron.

3. Connectors and Couplings: Use threaded type fittings only. Threadless fittings, including set screw and compression/gland types, are not permitted.

2.4 ALUMINUM RIGID METAL CONDUIT (RMC)

A. Manufacturers:

1. Allied Tube & Conduit, a division of Atkore International: www.alliedeg.com/#sle.

2. Western Tube, a division of Zekelman Industries: www.westerntube.com/#sle.

3. Wheatland Tube, a division of Zekelman Industries: www.wheatland.com/#sle.

B. Description: NFPA 70, Type RMC aluminum rigid metal conduit complying with ANSI C80.5 and listed and labeled as complying with UL 6A.

C. Fittings:

1. Manufacturers:

a. ABB; T&B: www.electrification.us.abb.com/#sle.

b. Allied Tube & Conduit, a division of Atkore International: www.alliedeg.us/#sle.

c. Bridgeport Fittings, LLC: www.bptfittings.com/#sle.

d. Emerson Electric Co; O-Z/Gedney: www.emerson.com/#sle.

2. Nonhazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B or UL 6A.

3. Material: Use aluminum.

4. Connectors and Couplings: Use threaded type fittings only. Threadless fittings, including set screw and compression/gland types, are not permitted.

2.5 FLEXIBLE METAL CONDUIT (FMC)

A. Manufacturers:

1. AFC Cable Systems, Inc: www.afcweb.com

2. Electri-Flex Company: www.electriflex.com

3. International Metal Hose: www.metalhose.com

B. Description: NFPA 70, Type FMC standard-wall steel flexible metal conduit listed and labeled as complying with UL 1, and listed for use in classified firestop systems.

C. Fittings:

1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.

2. Material: Use steel or malleable iron.

2.6 GALVANIZED STEEL ELECTRICAL METALLIC TUBING (EMT)

A. Manufacturers:

1. Allied Tube & Conduit: www.alliedeg.com

2. Republic Conduit: www.republic-conduit.com

3. Wheatland Tube, a Division of Zekelman Industries: www.wheatland.com

B. Description: NFPA 70, Type EMT galvanized steel electrical metallic tubing complying with ANSI C80.3 and listed and labeled as complying with UL 797.

C. Fittings:

1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.

2. Material: Use steel or malleable iron.

3. Connectors and Couplings: Use compression/gland or set-screw type.

a. Do not use indenter type connectors and couplings.

4. Damp or Wet Locations, Where Permitted: Use fittings listed for use in wet locations.

5. Embedded Within Concrete, Where Permitted: Use fittings listed as concrete-tight. Fittings that require taping to be concrete-tight are acceptable.

2.7 ALUMINUM ELECTRICAL METALLIC TUBING (EMT)

A. Description: NFPA 70, Type EMT aluminum electrical metallic tubing listed and labeled as complying with UL 797A.

B. Fittings:

1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B; listed for use with aluminum EMT.

2. Material: Use aluminum.

3. Connectors and Couplings: Use compression/gland or set-screw type.

a. Do not use indenter type connectors and couplings.

2.8 RIGID POLYVINYL CHLORIDE (PVC) CONDUIT

A. Manufacturers:

1. ABB; Carlon: www.carlon.com/#sle.

2. Cantex Inc: www.cantexinc.com

3. JM Eagle: www.jmeagle.com

B. Description: NFPA 70, Type PVC rigid polyvinyl chloride conduit complying with NEMA TC 2 and listed and labeled as complying with UL 651; Schedule 40 unless otherwise indicated, Schedule 80 where subject to physical damage; rated for use with conductors rated 90 degrees C.

C. Fittings:

1. Manufacturer: Same as manufacturer of conduit to be connected.

2. Description: Fittings complying with NEMA TC 3 and listed and labeled as complying with UL 651; material to match conduit.

2.9 ACCESSORIES

A. Corrosion Protection Tape: PVC-based, minimum thickness of 20 mil, 0.020 inch.

B. Conduit Joint Compound: Corrosion-resistant, electrically conductive compound listed as complying with UL 2419; suitable for use with conduit to be installed.

C. Solvent Cement for PVC Conduit and Fittings: As recommended by manufacturer of conduit and fittings to be installed.

D. Pull Strings: Use nylon or polyester tape with average breaking strength of not less than 1,250 lbf.

E. Foam Conduit Sealant:

1. Removable, two-part, closed-cell foam, specifically designed for sealing conduit openings against water, moisture, gases, and dust.

2. Suitable for use with conductors/cables and associated insulation/jackets to be installed.

3. Rated to hold minimum of 10 ft water head pressure.

F. Conduit Mechanical Seals:

1. Listed as complying with UL 514B.

2. Specifically designed for sealing conduit openings against water, moisture, gases, and dust.

3. Suitable for sealing around conductors/cables to be installed.

G. Sealing Compound for Hazardous/Classified Location Sealing Fittings: Listed for use with particular fittings to be installed.

H. Sealing Systems for Concrete Penetrations:

1. Sleeves: Provide water stop ring or cement coating that bonds to concrete to prevent water infiltration.

2. Rate for minimum of 40 psig; suitable for sealing around conduits to be installed.

I. Sealing Systems for Roof Penetrations: Premanufactured components and accessories as required to preserve integrity of roofing system and maintain roof warranty; suitable for conduits and roofing system to be installed; designed to accommodate existing penetrations where applicable.

J. Firestop Sleeves: Listed; provide as required to preserve fire resistance rating of building elements.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that mounting surfaces are ready to receive conduits.

C. Verify that conditions are satisfactory for installation prior to starting work.

3.2 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Install conduit in accordance with NECA 1.

C. Install galvanized steel rigid metal conduit (RMC) in accordance with NECA 101.

D. Install aluminum rigid metal conduit (RMC) in accordance with NECA 102.

E. Install rigid polyvinyl chloride (PVC) conduit in accordance with NECA 111.

F. Conduit Routing:

1. Unless dimensioned, conduit routing indicated is diagrammatic.

2. When conduit destination is indicated without specific routing, determine exact routing required.

3. Conceal conduits unless specifically indicated to be exposed.

4. Conduits in the following areas may be exposed, unless otherwise indicated:

   a. Electrical rooms.

   b. Mechanical equipment rooms.

5. Unless otherwise approved, do not route exposed conduits:

   a. Across floors.

   b. Across roofs.

   c. Across top of parapet walls.

   d. Across building exterior surfaces.

6. Conduits installed underground or embedded in concrete may be routed in shortest possible manner unless otherwise indicated. Route other conduits parallel or perpendicular to building structure and surfaces, following surface contours where practical.

7. Arrange conduit to maintain adequate headroom, clearances, and access.

8. Arrange conduit to provide no more than equivalent of four 90-degree bends between pull points.

9. Arrange conduit to prevent moisture traps. Provide drain fittings at low points and at sealing fittings where moisture may collect.

10. Group parallel conduits in same area on common rack.

G. Conduit Support:

1. Secure and support conduits in accordance with NFPA 70 using suitable supports and methods approved by authorities having jurisdiction; see Section 26 0529.

2. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.

3. Installation Above Suspended Ceilings: Do not provide support from ceiling support system. Do not provide support from ceiling grid or allow conduits to lay on ceiling tiles.

4. Use conduit strap to support single surface-mounted conduit.

   a. Use clamp back spacer with conduit strap for damp and wet locations to provide space between conduit and mounting surface.

5. Use metal channel/strut with accessory conduit clamps to support multiple parallel surface-mounted conduits.

6. Use trapeze hangers assembled from threaded rods and metal channel/strut with accessory conduit clamps to support multiple parallel suspended conduits.

7. Use of wire for support of conduits is not permitted.

H. Connections and Terminations:

1. Use approved zinc-rich paint or conduit joint compound on field-cut threads of galvanized steel conduits prior to making connections.

2. Where two threaded conduits must be joined and neither can be rotated, use three-piece couplings or split couplings. Do not use running threads.

3. Use suitable adapters where required to transition from one type of conduit to another.

4. Terminate threaded conduits in boxes and enclosures using threaded hubs or double lock nuts for dry locations and raintight hubs for wet locations.

5. Provide insulating bushings, insulated throats, or listed metal fittings with smooth, rounded edges at conduit terminations to protect conductors.

6. Secure joints and connections to provide mechanical strength and electrical continuity.

I. Penetrations:

1. Do not penetrate or otherwise notch or cut structural members, including footings and grade beams, without approval of Structural Engineer.

2. Make penetrations perpendicular to surfaces unless otherwise indicated.

3. Provide sleeves for penetrations as indicated or as required to facilitate installation. Set sleeves flush with exposed surfaces unless otherwise indicated or required.

4. Conceal bends for conduit risers emerging above ground.

5. Where conduits penetrate waterproof membrane, seal as required to maintain integrity of membrane.

6. Make penetrations for roof-mounted equipment within associated equipment openings and curbs where possible to minimize roofing system penetrations. Where penetrations are necessary, seal as indicated or as required to preserve integrity of roofing system and maintain roof warranty.

7. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Division 07.

J. Underground Installation:

1. Provide trenching and backfilling in accordance with Division 31.

K. Concrete Encasement: Where conduits not otherwise embedded within concrete are indicated to be concrete-encased, provide concrete in accordance with Division 03 with minimum concrete cover of 2 inches on all sides unless otherwise indicated.

L. Conduit Movement Provisions: Where conduits are subject to movement, provide expansion and expansion/deflection fittings to prevent damage to enclosed conductors or connected equipment. This includes, but is not limited to:

1. Where conduits cross structural joints intended for expansion, contraction, or deflection.

2. Where calculated in accordance with NFPA 70 for rigid polyvinyl chloride (PVC) conduit installed above ground to compensate for thermal expansion and contraction.

3. Where conduits are subject to earth movement by settlement or frost.

M. Conduit Sealing:

1. Use foam conduit sealant to prevent entry of moisture and gases. This includes, but is not limited to:

a. Where conduits enter building from outside.

b. Where service conduits enter building from underground distribution system.

c. Where conduits enter building from underground.

d. Where conduits may transport moisture to contact live parts.

2. Where conduits cross barriers between areas of potential substantial temperature differential, use foam conduit sealant at accessible point near penetration to prevent condensation. This includes, but is not limited to:

a. Where conduits pass from outdoors into conditioned interior spaces.

b. Where conduits pass from unconditioned interior spaces into conditioned interior spaces.

N. Provide grounding and bonding; see Section 26 0526.

O. Identify conduits; see Section 26 0553.

3.3 PROTECTION

A. Immediately after installation of conduit, use suitable manufactured plugs to provide protection from entry of moisture and foreign material and do not remove until ready for installation of conductors.

SECTION 26 0533.16
BOXES FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Outlet and device boxes up to 100 cubic inches, including those used as junction and pull boxes.

B. Cabinets and enclosures, including junction and pull boxes larger than 100 cubic inches.

1.2 RELATED REQUIREMENTS

A. Division 01 - General Requirements: Project administrative and procedural requirements.

B. Division 03 - Concrete: Concrete.

C. Division 07 - Thermal and Moisture Protection: Firestopping.

D. Division 08 - Openings: Access Doors.

E. Section 08 3100 - Access Doors and Panels: Panels for maintaining access to concealed boxes.

F. Section 26 0005 - Basic Electrical Requirements.

G. Section 26 0526 - Grounding and Bonding for Electrical Systems.

H. Section 26 0529 - Hangers and Supports for Electrical Systems.

I. Section 26 0533.13 - Conduit for Electrical Systems:

1. Conduit bodies and other fittings.

2. Additional requirements for locating boxes to limit conduit length and/or number of bends between pulling points.

J. Section 26 0553 - Identification for Electrical Systems: Identification products and requirements.

K. Section 26 2726 - Wiring Devices:

1. Wall plates.

1.3 REFERENCE STANDARDS

A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

B. NECA 130 - Standard for Installing and Maintaining Wiring Devices; 2016.

C. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2020.

D. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable; 2014.

E. NEMA OS 1 - Sheet-Steel Outlet Boxes, Device Boxes, Covers, and Box Supports; 2013 (Reaffirmed 2020).

F. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

G. SCTE 77 - Specifications for Underground Enclosure Integrity; 2017.

H. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations; Current Edition, Including All Revisions.

I. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations; Current Edition, Including All Revisions.

J. UL 508A - Industrial Control Panels; Current Edition, Including All Revisions.

K. UL 514A - Metallic Outlet Boxes; Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and working clearances for electrical equipment required by NFPA 70.

2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.

3. Coordinate minimum sizes of boxes with the actual installed arrangement of conductors, clamps, support fittings, and devices, calculated according to NFPA 70.

4. Coordinate minimum sizes of pull boxes with the actual installed arrangement of connected conduits, calculated according to NFPA 70.

5. Coordinate the placement of boxes with millwork, furniture, devices, equipment, etc. installed under other sections or by others.

6. Coordinate the work with other trades to preserve insulation integrity.

7. Coordinate the work with other trades to provide walls suitable for installation of flush-mounted boxes where indicated.

8. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.5 SUBMITTALS

A. Contractor shall provide submittals for equipment listed herein. Refer to Division 01 for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for cabinets and enclosures, boxes for hazardous (classified) locations, floor boxes, and underground boxes/enclosures.

1. Underground Boxes/Enclosures: Include reports for load testing in accordance with SCTE 77 certified by a professional engineer or an independent testing agency upon request.

C. Project Record Documents: Record actual locations for outlet and device boxes, pull boxes, cabinets and enclosures, floor boxes, and underground boxes/enclosures.

D. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.

1. See Section 01 6000 - Product Requirements, for additional provisions.

2. Keys for Lockable Enclosures: Two of each different key.

PART 2 PRODUCTS

2.1 BOXES

A. General Requirements:

1. Do not use boxes and associated accessories for applications other than as permitted by NFPA 70 and product listing.

2. Provide all boxes, fittings, supports, and accessories required for a complete raceway system and to accommodate devices and equipment to be installed.

3. Provide products listed, classified, and labeled as suitable for the purpose intended.

4. Where box size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.

5. Provide grounding terminals within boxes where equipment grounding conductors terminate.

B. Outlet and Device Boxes Up to 100 cubic inches, Including Those Used as Junction and Pull Boxes:

1. Use sheet-steel boxes for dry locations unless otherwise indicated or required.

2. Use cast iron boxes or cast aluminum boxes for damp or wet locations unless otherwise indicated or required; furnish with compatible weatherproof gasketed covers.

3. Use suitable concrete type boxes where flush-mounted in concrete.

4. Use suitable masonry type boxes where flush-mounted in masonry walls.

5. Use raised covers suitable for the type of wall construction and device configuration where required.

6. Use shallow boxes where required by the type of wall construction.

7. Do not use "through-wall" boxes designed for access from both sides of wall.

8. Sheet-Steel Boxes: Comply with NEMA OS 1, and list and label as complying with UL 514A.

9. Cast Metal Boxes: Comply with NEMA FB 1, and list and label as complying with UL 514A; furnish with threaded hubs.

10. Boxes for Supporting Luminaires and Ceiling Fans: Listed as suitable for the type and weight of load to be supported; furnished with fixture stud to accommodate mounting of luminaire where required.

11. Boxes for Ganged Devices: Use multigang boxes of single-piece construction. Do not use field-connected gangable boxes unless specifically indicated or permitted.

12. Wall Plates: Comply with Section 26 2726.

13. Manufacturers:

    a. Cooper Crouse-Hinds, a division of Eaton Corporation: www.cooperindustries.com

    b. Hubbell Incorporated; Bell Products: www.hubbell-rtb.com

    c. Hubbell Incorporated; RACO Products: www.hubbell-rtb.com

    d. O-Z/Gedney, a brand of Emerson Electric Co: www.emerson.com

    e. Thomas & Betts Corporation: www.tnb.com

C. Cabinets and Enclosures, Including Junction and Pull Boxes Larger Than 100 cubic inches:

1. Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E, or UL 508A.

2. NEMA 250 Environment Type, Unless Otherwise Indicated:

3. Junction and Pull Boxes Larger Than 100 cubic inches:

    a. Provide screw-cover or hinged-cover enclosures unless otherwise indicated.

    b. Boxes 6 square feet and Larger: Provide sectionalized screw-cover or hinged-cover enclosures.

4. Cabinets and Hinged-Cover Enclosures, Other Than Junction and Pull Boxes:

a. Provide lockable hinged covers, all locks keyed alike unless otherwise indicated.

b. Back Panels: Painted steel, removable.

c. Terminal Blocks: Provide voltage/current ratings and terminal quantity suitable for purpose indicated, with 25 percent spare terminal capacity.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that mounting surfaces are ready to receive boxes.

C. Verify that conditions are satisfactory for installation prior to starting work.

3.2 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Install boxes in accordance with NECA 1 (general workmanship) and, where applicable, NECA 130, including mounting heights specified in those standards where mounting heights are not indicated.

C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.

D. Provide separate boxes for emergency power and normal power systems.

E. Unless otherwise indicated, provide separate boxes for line voltage and low voltage systems.

F. Flush-mount boxes in finished areas unless specifically indicated to be surface-mounted.

G. Unless otherwise indicated, boxes may be surface-mounted where exposed conduits are indicated or permitted.

H. Box Locations:

1. Locate boxes to be accessible. Provide access panels in accordance with Division 08 as required where approved by the Architect.

2. Unless dimensioned, box locations indicated are approximate.

3. Locate boxes as required for devices installed under other sections or by others.

4. Locate boxes so that wall plates do not span different building finishes.

5. Locate boxes so that wall plates do not cross masonry joints.

6. Do not install flush-mounted boxes on opposite sides of walls back-to-back. Provide minimum 6 inches horizontal separation unless otherwise indicated.

7. Fire Resistance Rated Walls: Install flush-mounted boxes such that the required fire resistance will not be reduced.

    a. Do not install flush-mounted boxes on opposite sides of walls back-to-back; provide minimum 24 inches separation where wall is constructed with individual noncommunicating stud cavities or protect both boxes with listed putty pads.

8. Locate junction and pull boxes as indicated, as required to facilitate installation of conductors, and to limit conduit length and/or number of bends between pulling points in accordance with Section 26 0533.13.

I. Box Supports:

1. Secure and support boxes in accordance with NFPA 70 and Section 26 0529 using suitable supports and methods approved by the authority having jurisdiction.

2. Provide independent support from building structure except for cast metal boxes (other than boxes used for fixture support) supported by threaded conduit connections in accordance with NFPA 70. Do not provide support from piping, ductwork, or other systems.

J. Install boxes plumb and level.

K. Flush-Mounted Boxes:

1. Install boxes in noncombustible materials such as concrete, tile, gypsum, plaster, etc. so that front edge of box or associated raised cover is not set back from finished surface more than 1/4 inch or does not project beyond finished surface.

2. Install boxes in combustible materials such as wood so that front edge of box or associated raised cover is flush with finished surface.

3. Repair rough openings around boxes in noncombustible materials such as concrete, tile, gypsum, plaster, etc. so that there are no gaps or open spaces greater than 1/8 inch at the edge of the box.

L. Install boxes as required to preserve insulation integrity.

M. Install permanent barrier between ganged wiring devices when voltage between adjacent devices exceeds 300 V.

N. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 07 8400.

O. Close unused box openings.

P. Install blank wall plates on junction boxes and on outlet boxes with no devices or equipment installed or designated for future use.

Q. Provide grounding and bonding in accordance with Section 26 0526.

3.3 PROTECTION

A. Immediately after installation, protect boxes from entry of moisture and foreign material until ready for installation of conductors.

SECTION 26 0553
IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Electrical identification requirements.

B. Identification nameplates and labels.

C. Wire and cable markers.

D. Voltage markers.

E. Underground warning tape.

F. Floor marking tape.

G. Warning signs and labels.

1.2 RELATED REQUIREMENTS

A. Division 01 - General Requirements: Project administrative and procedural requirements.

B. Division 09 - Finishes: Interior and Exterior Painting.

C. Section 26 0005 - Basic Electrical Requirements

D. Section 26 0519 - Low-Voltage Electrical Power Conductors and Cables: Color coding for power conductors and cables 600 V and less; vinyl color coding electrical tape.

E. Section 26 0573 - Power System Studies: Arc flash hazard warning labels.

F. Section 26 2726 - Wiring Devices: Device and wallplate finishes; factory pre-marked wallplates.

1.3 REFERENCE STANDARDS

A. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

B. UL 969 - Marking and Labeling Systems; Current Edition, Including All Revisions.

1.4 FIELD CONDITIONS

A. Do not install adhesive products when ambient temperature is lower than recommended by manufacturer.

PART 2 PRODUCTS

2.1 IDENTIFICATION REQUIREMENTS

A. Existing Work: Unless specifically excluded, identify existing elements to remain that are not already identified in accordance with specified requirements.

B. Identification for Equipment:

1. Use identification nameplate to identify each piece of electrical distribution and control equipment and associated sections, compartments, and components.

a. Panelboards:

1) Identify ampere rating.

2) Identify voltage and phase.

3) Identify power source and circuit number. Include location when not within sight of equipment.

4) Use typewritten circuit directory to identify load(s) served for panelboards with a door. Identify spares and spaces using pencil.

5) For power panelboards without a door, use identification nameplate to identify load(s) served for each branch device. Do not identify spares and spaces.

b. Enclosed switches, circuit breakers, and motor controllers:

1) Identify voltage and phase.

2) Identify power source and circuit number. Include location when not within sight of equipment.

3) Identify load(s) served. Include location when not within sight of equipment.

2. Service Equipment:

a. Use identification nameplate to identify each service disconnecting means.

3. Use identification nameplate to identify disconnect location for equipment with remote disconnecting means.

4. Use identification label or handwritten text using indelible marker on inside of door at each fused switch to identify required NEMA fuse class and size.

5. Use field-painted floor markings, floor marking tape, or warning labels to identify required equipment working clearances where indicated or where required by the authority having jurisdiction.

a. Field-Painted Floor Markings: Alternating black and white stripes, 3 inches wide, painted in accordance with Section 09 9123 and 09 9113.

6. Available Fault Current Documentation: Use identification label to identify the available fault current and date calculations were performed at locations requiring documentation by NFPA 70 including but not limited to the following.

    a. Service equipment.

C. Identification for Conductors and Cables:

1. Color Coding for Power Conductors 600 V and Less: Comply with Section 26 0519.

2. Use identification nameplate or identification label to identify color code for ungrounded and grounded power conductors inside door or enclosure at each piece of feeder or branch-circuit distribution equipment when premises has feeders or branch circuits served by more than one nominal voltage system.

D. Identification for Raceways:

1. Use voltage markers to identify highest voltage present for accessible conduits at maximum intervals of 20 feet.

2. Use voltage markers, color-coded bands, or factory-painted conduits to identify systems other than normal power system for accessible conduits.

    a. Maximum Intervals: 20 feet.

    b. Color-Coded Bands: Use field-painting or vinyl color coding electrical tape to mark bands 3 inches wide.

        1) Field-Painting: Comply with Section 09 9123 and 09 9113.

        2) Vinyl Color Coding Electrical Tape: Comply with Section 26 0519.

    c. Color Code:

3. Use identification labels, handwritten text using indelible marker, or plastic marker tags to identify spare conduits at each end. Identify purpose and termination location.

4. Use underground warning tape to identify underground raceways.

5. Use voltage markers to identify highest voltage present for wireways at maximum intervals of 20 feet.

E. Identification for Boxes:

1. Use voltage markers to identify highest voltage present.

2. Use voltage markers or color coded boxes to identify systems other than normal power system.

    a. Color-Coded Boxes: Field-painted in accordance with Division 09 per the same color code used for raceways.

F. Identification for Devices:

1. Wiring Device and Wallplate Finishes: Comply with Section 26 2726.

2. Use identification label to identify fire alarm system devices.

   a. For devices concealed above suspended ceilings, provide additional identification on ceiling tile below device location.

3. Use identification label to identify serving branch circuit for all receptacles.

   a. For receptacles in public areas or in areas as directed by Architect, provide identification on inside surface of wallplate.

2.2 IDENTIFICATION NAMEPLATES AND LABELS

A. Identification Nameplates:

1. Manufacturers:

   a. Brimar Industries, Inc: www.brimar.com/#sle.

   b. Kolbi Pipe Marker Co: www.kolbipipemarkers.com/#sle.

   c. Seton Identification Products: www.seton.com/#sle.

2. Materials:

   a. Indoor Clean, Dry Locations: Use plastic nameplates.

   b. Outdoor Locations: Use plastic, stainless steel, or aluminum nameplates suitable for exterior use.

3. Plastic Nameplates: Two-layer or three-layer laminated acrylic or electrically non-conductive phenolic with beveled edges; minimum thickness of 1/16 inch; engraved text.

4. Stainless Steel Nameplates: Minimum thickness of 1/32 inch; engraved or laser-etched text.

5. Aluminum Nameplates: Anodized; minimum thickness of 1/32 inch; engraved or laser-etched text.

6. Mounting Holes for Mechanical Fasteners: Two, centered on sides for sizes up to 1 inch high; Four, located at corners for larger sizes.

B. Identification Labels:

1. Manufacturers:

   a. Brady Corporation: www.bradyid.com/#sle.

   b. Brother International Corporation: www.brother-usa.com/#sle.

c. Panduit Corp: www.panduit.com/#sle.

2. Materials: Use self-adhesive laminated plastic labels; UV, chemical, water, heat, and abrasion resistant.

3. Text: Use factory pre-printed or machine-printed text. Do not use handwritten text unless otherwise indicated.

C. Format for Caution and Warning Messages:

1. Minimum Size: 2 inches by 4 inches.

2. Legend: Include information or instructions indicated or as required for proper and safe operation and maintenance.

3. Text: All capitalized unless otherwise indicated.

4. Minimum Text Height: 1/2 inch.

5. Color: Black text on yellow background unless otherwise indicated.

D. Format for Receptacle Identification:

1. Minimum Size: 3/8 inch by 1.5 inches.

2. Legend: Power source and circuit number or other designation indicated.

3. Text: All capitalized unless otherwise indicated.

4. Minimum Text Height: 3/16 inch.

5. Color: Black text on clear background.

E. Format for Fire Alarm Device Identification:

1. Minimum Size: 3/8 inch by 1.5 inches.

2. Legend: Designation indicated and device zone or address.

3. Text: All capitalized unless otherwise indicated.

4. Minimum Text Height: 3/16 inch.

5. Color: Red text on white background.

2.3 WIRE AND CABLE MARKERS

A. Markers for Conductors and Cables: Use wrap-around self-adhesive vinyl cloth, wrap-around self-adhesive vinyl self-laminating, heat-shrink sleeve, plastic sleeve, plastic clip-on, or vinyl split sleeve type markers suitable for the conductor or cable to be identified.

B. Markers for Conductor and Cable Bundles: Use plastic marker tags secured by nylon cable ties.

C. Legend: Power source and circuit number or other designation indicated.

D. Text: Use factory pre-printed or machine-printed text, all capitalized unless otherwise indicated.

E. Minimum Text Height: 1/8 inch.

F. Color: Black text on white background unless otherwise indicated.

2.4 VOLTAGE MARKERS

A. Markers for Conduits: Use factory pre-printed self-adhesive vinyl, self-adhesive vinyl cloth, or vinyl snap-around type markers.

B. Markers for Boxes and Equipment Enclosures: Use factory pre-printed self-adhesive vinyl or self-adhesive vinyl cloth type markers.

C. Minimum Size:

1. Markers for Conduits: As recommended by manufacturer for conduit size to be identified.

2. Markers for Pull Boxes: 1 1/8 by 4 1/2 inches.

3. Markers for Junction Boxes: 1/2 by 2 1/4 inches.

D. Legend:

1. Markers for Voltage Identification: Highest voltage present.

2. Markers for System Identification:

E. Color: Black text on orange background unless otherwise indicated.

2.5 UNDERGROUND WARNING TAPE

A. Materials: Use non-detectable type polyethylene tape suitable for direct burial, unless otherwise indicated.

B. Non-detectable Type Tape: 6 inches wide, with minimum thickness of 4 mil.

C. Legend: Type of service, continuously repeated over full length of tape.

D. Color:

1. Tape for Buried Power Lines: Black text on red background.

2. Tape for Buried Communication, Alarm, and Signal Lines: Black text on orange background.

2.6 FLOOR MARKING TAPE

A. Floor Marking Tape for Equipment Working Clearance Identification: Self-adhesive vinyl or polyester tape with overlaminate, 3 inches wide, with alternating black and white stripes.

2.7 WARNING SIGNS AND LABELS

A. Comply with ANSI Z535.2 or ANSI Z535.4 as applicable.

B. Warning Signs:

1. Materials:

a. Indoor Dry, Clean Locations: Use factory pre-printed rigid plastic or self-adhesive vinyl signs.

b. Outdoor Locations: Use factory pre-printed rigid aluminum signs.

2. Rigid Signs: Provide four mounting holes at corners for mechanical fasteners.

3. Minimum Size: 7 by 10 inches unless otherwise indicated.

C. Warning Labels:

1. Materials: Use factory pre-printed or machine-printed self-adhesive polyester or self-adhesive vinyl labels; UV, chemical, water, heat, and abrasion resistant; produced using materials recognized to UL 969.

2. Machine-Printed Labels: Use thermal transfer process printing machines and accessories recommended by label manufacturer.

3. Minimum Size: 2 by 4 inches unless otherwise indicated.

PART 3 EXECUTION

3.1 PREPARATION

A. Clean surfaces to receive adhesive products according to manufacturer's instructions.

3.2 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Install identification products to be plainly visible for examination, adjustment, servicing, and maintenance. Unless otherwise indicated, locate products as follows:

1. Surface-Mounted Equipment: Enclosure front.

2. Flush-Mounted Equipment: Inside of equipment door.

3. Free-Standing Equipment: Enclosure front; also enclosure rear for equipment with rear access.

4. Elevated Equipment: Legible from the floor or working platform.

5. Branch Devices: Adjacent to device.

6. Interior Components: Legible from the point of access.

7. Conduits: Legible from the floor.

8. Boxes: Outside face of cover.

9. Conductors and Cables: Legible from the point of access.

10. Devices: Outside face of cover.

C. Install identification products centered, level, and parallel with lines of item being identified.

D. Secure nameplates to exterior surfaces of enclosures using stainless steel screws and to interior surfaces using self-adhesive backing or epoxy cement.

E. Install self-adhesive labels and markers to achieve maximum adhesion, with no bubbles or wrinkles and edges properly sealed.

F. Install underground warning tape above buried lines with one tape per trench at 3 inches below finished grade.

G. Secure rigid signs using stainless steel screws.

H. Mark all handwritten text, where permitted, to be neat and legible.

SECTION 26 0573
POWER SYSTEM STUDIES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Short-circuit study.

B. Protective device coordination study.

C. Arc flash and shock risk assessment.

1. Includes arc flash hazard warning labels.

D. Criteria for the selection and adjustment of equipment and associated protective devices not specified in this section, as determined by studies to be performed.

1.2 RELATED REQUIREMENTS

A. Division 01 - General Requirements: Project administrative and procedural requirements.

B. Section 26 0005 - Basic Electrical Requirements.

C. Section 26 0553 - Identification for Electrical Systems: Additional requirements for arc flash hazard warning labels.

D. Section 26 2416 - Panelboards.

1.3 REFERENCE STANDARDS

A. ANSI Z535.4 - American National Standard for Product Safety Signs and Labels; 2011 (Reaffirmed 2017).

B. IEEE 141 - IEEE Recommended Practice for Electric Power Distribution for Industrial Plants; 1993 (Reaffirmed 1999).

C. IEEE 242 - IEEE Recommended Practice for Protection and Coordination of Industrial and Commercial Power Systems; 2001, with Errata (2003).

D. IEEE 399 - IEEE Recommended Practice for Industrial and Commercial Power Systems Analysis; 1997.

E. IEEE 551 - IEEE Recommended Practice for Calculating Short-Circuit Currents in Industrial and Commercial Power Systems; 2006.

F. IEEE 1584 - IEEE Guide for Performing Arc-Flash Hazard Calculations; 2018, with Errata (2019).

G. NEMA MG 1 - Motors and Generators; 2021.

H. NETA ATS - Standard For Acceptance Testing Specifications For Electrical Power Equipment And Systems; 2021.

I. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

J. NFPA 70E - Standard for Electrical Safety in the Workplace; 2024.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Existing Installations: Coordinate with equipment manufacturer(s) to obtain data necessary for completion of studies.

2. Coordinate the work to provide equipment and associated protective devices complying with criteria for selection and adjustment, as determined by studies to be performed.

3. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

B. Sequencing:

1. Submit study reports prior to or concurrent with product submittals.

2. Do not order equipment until matching study reports and product submittals have both been evaluated by Architect.

1.5 SUBMITTALS

A. Contractor shall provide submittals for equipment listed herein. Refer to Division 01 for submittal procedures.

B. Study reports, stamped or sealed and signed by study preparer.

C. Product Data: In addition to submittal requirements specified in other sections, include manufacturer's standard catalog pages and data sheets for equipment and protective devices indicating information relevant to studies.

1. Identify modifications made in accordance with studies that:

a. Can be made at no additional cost to Owner.

b. As submitted will involve a change to the contract sum.

1.6 POWER SYSTEM STUDIES

A. Scope of Studies:

1. Perform analysis of new electrical distribution system as indicated on drawings.

2. Except where study descriptions below indicate exclusions, analyze system at each bus from primary protective devices of utility source down to each piece of equipment involved, including parts of system affecting calculations being performed (e.g. fault current contribution from motors).

3. Include in analysis alternate sources and operating modes (including known future configurations) to determine worst case conditions.

B. General Study Requirements:

1. Comply with NFPA 70.

2. Perform studies utilizing computer software complying with specified requirements; manual calculations are not permitted.

C. Data Collection:

1. Compile information on project-specific characteristics of actual installed equipment, protective devices, feeders, etc. as necessary to develop single-line diagram of electrical distribution system and associated input data for use in system modeling.

a. Utility Source Data: Include primary voltage, maximum and minimum three-phase and line-to-ground fault currents, impedance, X/R ratio, and primary protective device information.

1) Obtain up-to-date information from Utility Company.

b. Motors: Include manufacturer/model, type (e.g. induction, synchronous), horsepower rating, voltage rating, full load amps, and locked rotor current or NEMA MG 1 code letter designation.

c. Protective Devices:

1) Circuit Breakers: Include manufacturer/model, type (e.g. thermal magnetic, electronic trip), frame size, trip rating, voltage rating, interrupting rating, available field-adjustable trip response settings, and features (e.g. zone selective interlocking).

2) Fuses: Include manufacturer/model, type/class (e.g. Class J), size/rating, and speed (e.g. time delay, fast acting).

d. Protective Relays: Include manufacturer/model, type, settings, current/potential transformer ratio, and associated protective device.

e. Conductors: Include feeder size, material (e.g. copper, aluminum), insulation type, voltage rating, number per phase, raceway type, and actual length.

D. Short-Circuit Study:

1. Comply with IEEE 551 and applicable portions of IEEE 141, IEEE 242, and IEEE 399.

2. For purposes of determining equipment short circuit current ratings, consider conditions that may result in maximum available fault current, including but not limited to:

    a. Maximum utility fault currents.

    b. Maximum motor contribution.

    c. Known operating modes (e.g. utility as source, generator as source, utility/generator in parallel, bus tie breaker open/close positions).

3. For each bus location, calculate the maximum available three-phase bolted symmetrical and asymmetrical fault currents. For grounded systems, also calculate the maximum available line-to-ground bolted fault currents.

E. Arc Flash and Shock Risk Assessment:

1. Comply with NFPA 70E.

2. Perform incident energy and arc flash boundary calculations in accordance with IEEE 1584 (as referenced in NFPA 70E Annex D), where applicable.

3. Analyze alternate scenarios considering conditions that may result in maximum incident energy, including but not limited to:

    a. Maximum and minimum utility fault currents.

    b. Maximum and minimum motor contribution.

    c. Known operating modes (e.g. utility as source, generator as source, utility/generator in parallel, bus tie breaker open/close positions).

F. Study Reports:

1. General Requirements:

    a. Identify date of study and study preparer.

    b. Identify study methodology and software product(s) used.

    c. Identify scope of studies, assumptions made, implications of possible alternate scenarios, and any exclusions from studies.

    d. Identify base used for per unit values.

    e. Include single-line diagram and associated input data used for studies; identify buses on single-line diagram as referenced in reports, and indicate bus voltage.

    f. Include conclusions and recommendations.

2. Short-Circuit Study:

a. For each scenario, identify at each bus location:

1) Calculated maximum available symmetrical and asymmetrical fault currents (both three-phase and line-to-ground where applicable).

2) Fault point X/R ratio.

3) Associated equipment short circuit current ratings.

b. Identify locations where the available fault current exceeds the equipment short circuit current rating, along with recommendations.

3. Arc Flash and Shock Risk Assessment:

a. For the worst case for each scenario, identify at each bus location:

1) Calculated incident energy and associated working distance.

2) Calculated arc flash boundary.

3) Bolted fault current.

4) Arcing fault current.

5) Clearing time.

6) Arc gap distance.

b. For purposes of producing arc flash hazard warning labels, summarize the maximum incident energy and associated data reflecting the worst case condition of all scenarios at each bus location.

1.7 QUALITY ASSURANCE

A. Study Preparer Qualifications: Professional electrical engineer licensed in the State in which the Project is located and with minimum five years experience in preparation of studies of similar type and complexity using specified computer software.

B. Computer Software for Study Preparation: Use the latest edition of commercially available software utilizing specified methodologies.

PART 2 PRODUCTS

2.1 ARC FLASH HAZARD WARNING LABELS

A. Provide warning labels complying with ANSI Z535.4 to identify arc flash hazards for each work location analyzed by the arc flash and shock risk assessment.

1. Materials: Comply with Section 26 0553.

2. Legend: Provide custom legend in accordance with NFPA 70E based on equipment-specific data as determined by arc flash and shock risk assessment.

a. Include the following information:

1) Arc flash boundary.

2) Available incident energy and corresponding working distance.

3) Nominal system voltage.

4) Equipment identification.

5) Study preparer, report reference, and date calculations were performed.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install arc flash warning labels in accordance with Section 26 0553.

3.2 FIELD QUALITY CONTROL

A. Provide the services of field testing agency or equipment manufacturer's representative to perform inspection, testing, and adjusting.

B. Inspect and test in accordance with NETA ATS, except Section 4.

C. Adjust equipment and protective devices for compliance with studies and recommended settings.

D. Notify Strategic Energy Solutions, Inc. of any conflicts with or deviations from studies. Obtain direction before proceeding.

SECTION 26 2416
PANELBOARDS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Power distribution panelboards.

B. Overcurrent protective devices for panelboards.

1.2 RELATED REQUIREMENTS

A. Division 01 - General Requirements: Project administrative and procedural requirements.

B. Division 02 - Existing Conditions: Demolition, cleaning and disposal requirements, cutting and patching requirements, and repairs.

C. Division 03 - Concrete: Concrete equipment pads.

D. Section 26 0005 - Basic Electrical Requirements.

E. Section 26 0526 - Grounding and Bonding for Electrical Systems.

F. Section 26 0529 - Hangers and Supports for Electrical Systems.

G. Section 26 0553 - Identification for Electrical Systems: Identification products and requirements.

H. Section 26 0573 - Power System Studies: Additional criteria for the selection and adjustment of equipment and associated protective devices specified in this section.

I. Section 26 4300 - Surge Protective Devices.

1.3 REFERENCE STANDARDS

A. FS W-C-375 - Circuit Breakers, Molded Case; Branch Circuit and Service; 2013e, with Amendments (2022).

B. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

C. NECA 407 - Standard for Installing and Maintaining Panelboards; 2015.

D. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2020.

E. NEMA PB 1 - Panelboards; 2011.

F. NEMA PB 1.1 - General Instructions for Proper Installation, Operation and Maintenance of Panelboards Rated 1000 Volts or Less; 2023.

G. NETA ATS - Standard For Acceptance Testing Specifications For Electrical Power Equipment And Systems; 2021.

H. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

I. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations; Current Edition, Including All Revisions.

J. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations; Current Edition, Including All Revisions.

K. UL 67 - Panelboards; Current Edition, Including All Revisions.

L. UL 489 - Molded-Case Circuit Breakers, Molded-Case Switches and Circuit Breaker Enclosures; Current Edition, Including All Revisions.

M. UL 869A - Reference Standard for Service Equipment; Current Edition, Including All Revisions.

N. UL 943 - Ground-Fault Circuit-Interrupters; Current Edition, Including All Revisions.

O. UL 1699 - Arc-Fault Circuit-Interrupters; Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and working clearances for electrical equipment required by NFPA 70.

2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.

3. Verify with manufacturer that conductor terminations are suitable for use with the conductors to be installed.

4. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.5 SUBMITTALS

A. Contractor shall provide submittals for equipment listed herein. Refer to Division 01 for submittal procedures.

B. Shop Drawings: Indicate outline and support point dimensions, voltage, main bus ampacity, overcurrent protective device arrangement and sizes, short circuit current ratings, conduit entry locations, conductor terminal information, and installed features and accessories.

1. Include documentation of listed series ratings as indicated in Section 26 0573.

C. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

D. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.

1. Panelboard Keys: Two of each different key.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. ABB/GE: www.geindustrial.com

B. Eaton Corporation: www.eaton.com

C. Schneider Electric; Square D Products: www.schneider-electric.us

D. Siemens Industry, Inc: www.usa.siemens.com

E. Source Limitations: Furnish panelboards and associated components produced by the same manufacturer as the other electrical distribution equipment used for this project and obtained from a single supplier.

2.2 PANELBOARDS - GENERAL REQUIREMENTS

A. Provide products listed, classified, and labeled as suitable for the purpose intended.

B. Unless otherwise indicated, provide products suitable for continuous operation under the following service conditions:

1. Altitude: Less than 6,600 feet.

2. Ambient Temperature:

a. Panelboards Containing Circuit Breakers: Between 23 degrees F and 104 degrees F.

b. Panelboards Containing Fusible Switches: Between -22 degrees F and 104 degrees F.

C. Short Circuit Current Rating:

1. Provide panelboards with listed short circuit current rating not less than the available fault current at the installed location as indicated on the drawings.

D. Panelboards Used for Service Entrance: Listed and labeled as suitable for use as service equipment according to UL 869A.

E. Mains: Configure for top or bottom incoming feed as indicated or as required for the installation.

F. Branch Overcurrent Protective Devices: Replaceable without disturbing adjacent devices.

G. Bussing: Sized in accordance with UL 67 temperature rise requirements.

1. Provide solidly bonded equipment ground bus in each panelboard, with a suitable lug for each feeder and branch circuit equipment grounding conductor.

H. Conductor Terminations: Suitable for use with the conductors to be installed.

I. Enclosures: Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E.

1. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:

a. Indoor Clean, Dry Locations: Type 1.

b. Outdoor Locations: Type 3R.

2. Boxes: Galvanized steel unless otherwise indicated.

a. Provide wiring gutters sized to accommodate the conductors to be installed.

b. Increase gutter space as required where sub-feed lugs, feed-through lugs, gutter taps, or oversized lugs are provided.

3. Fronts:

a. Fronts for Surface-Mounted Enclosures: Same dimensions as boxes.

b. Fronts for Flush-Mounted Enclosures: Overlap boxes on all sides to conceal rough opening.

4. Lockable Doors: All locks keyed alike unless otherwise indicated.

J. Future Provisions: Prepare all unused spaces for future installation of devices including bussing, connectors, mounting hardware and all other required provisions.

K. Surge Protective Devices: Where factory-installed, internally mounted surge protective devices are provided in accordance with Section 26 4300, list and label panelboards as a complete assembly including surge protective device.

1. Provide Surge Protective Devices internally mounted within all panels which are specified as part of the Emergency distribution power system.

L. Multi-Section Panelboards: Provide enclosures of the same height, with feed-through lugs or sub-feed lugs and feeders as indicated or as required to interconnect sections.

M. Load centers are not acceptable.

2.3 POWER DISTRIBUTION PANELBOARDS

A. Description: Panelboards complying with NEMA PB 1, power and feeder distribution type, circuit breaker type, and listed and labeled as complying with UL 67; ratings, configurations and features as indicated on the drawings.

B. Conductor Terminations:

1. Main and Neutral Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.

2. Main and Neutral Lug Type: Mechanical.

C. Bussing:

1. Phase and Neutral Bus Material: Aluminum.

2. Ground Bus Material: Aluminum.

D. Circuit Breakers:

1. Provide bolt-on type or plug-in type secured with locking mechanical restraints.

E. Enclosures:

1. Provide surface-mounted enclosures unless otherwise indicated.

2. Fronts: Provide trims to cover access to load terminals, wiring gutters, and other live parts, with exposed access to overcurrent protective device handles.

3. Provide clear plastic circuit directory holder mounted on inside of door.

2.4 OVERCURRENT PROTECTIVE DEVICES

A. Molded Case Circuit Breakers:

1. Description: Quick-make, quick-break, over center toggle, trip-free, trip-indicating circuit breakers listed and labeled as complying with UL 489, and complying with FS W-C-375 where applicable; ratings, configurations, and features as indicated on the drawings.

2. Interrupting Capacity:

a. Provide circuit breakers with interrupting capacity as required to provide the short circuit current rating indicated.

b. Fully Rated Systems: Provide circuit breakers with interrupting capacity not less than the short circuit current rating indicated.

3. Conductor Terminations:

a. Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.

4. Multi-Pole Circuit Breakers: Furnish with common trip for all poles.

5. Provide the following circuit breaker types where indicated:

   a. Ground Fault Circuit Interrupter (GFCI) Circuit Breakers: Listed as complying with UL 943, class A for protection of personnel.

   b. Ground Fault Equipment Protection Circuit Breakers: Designed to trip at 30 mA for protection of equipment.

   c. Arc-Fault Circuit Interrupter (AFCI) Circuit Breakers: Combination type listed as complying with UL 1699.

   d. 100 Percent Rated Circuit Breakers: Listed for application within the panelboard where installed at 100 percent of the continuous current rating.

6. Do not use tandem circuit breakers.

7. Do not use handle ties in lieu of multi-pole circuit breakers.

8. Provide multi-pole circuit breakers for multi-wire branch circuits as required by NFPA 70.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that the ratings and configurations of the panelboards and associated components are consistent with the indicated requirements.

C. Verify that mounting surfaces are ready to receive panelboards.

D. Verify that conditions are satisfactory for installation prior to starting work.

3.2 INSTALLATION

A. Perform work in accordance with NECA 1 (general workmanship).

B. Install products in accordance with manufacturer's instructions.

C. Install panelboards in accordance with NECA 407 and NEMA PB 1.1.

D. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.

E. Provide required support and attachment in accordance with Section 26 0529.

F. Install panelboards plumb.

G. Mount panelboards such that the highest position of any operating handle for circuit breakers or switches does not exceed 79 inches above the floor or working platform.

H. Provide grounding and bonding in accordance with Section 26 0526.

I. Install all field-installed branch devices, components, and accessories.

J. Provide filler plates to cover unused spaces in panelboards.

K. Provide circuit breaker lock-on devices to prevent unauthorized personnel from de-energizing essential loads where indicated. Also provide for the following:

1. Fire detection and alarm circuits.

3.3 FIELD QUALITY CONTROL

A. Inspect and test in accordance with NETA ATS, except Section 4.

B. Fusible Switches: Perform inspections and tests listed in NETA ATS, Section 7.5.1.1.

C. Molded Case Circuit Breakers: Perform inspections and tests listed in NETA ATS, Section 7.6.1.1 for all main circuit breakers and circuit breakers larger than 225 amperes. Tests listed as optional are not required.

D. Ground Fault Protection Systems: Test in accordance with manufacturer's instructions as required by NFPA 70.

E. Test GFCI circuit breakers to verify proper operation.

F. Test AFCI circuit breakers to verify proper operation.

G. Correct deficiencies and replace damaged or defective panelboards or associated components.

3.4 ADJUSTING

A. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.

B. Adjust alignment of panelboard fronts.

C. Load Balancing: For each panelboard, rearrange circuits such that the difference between each measured steady state phase load does not exceed 20 percent and adjust circuit directories accordingly. Maintain proper phasing for multi-wire branch circuits.

SECTION 26 2726
WIRING DEVICES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Receptacles.

B. Wall plates and covers.

1.2 RELATED REQUIREMENTS

A. Division 01 - General Requirements: Project administrative and procedural requirements.

B. Division 02 - Existing Conditions: Demolition, cleaning and disposal requirements, cutting and patching requirements, and repairs.

C. Section 26 0005 - Basic Electrical Requirements.

D. Section 26 0519 - Low-Voltage Electrical Power Conductors and Cables: Manufactured wiring systems for use with access floor boxes with compatible pre-wired connectors.

E. Section 26 0526 - Grounding and Bonding for Electrical Systems.

F. Section 26 0533.16 - Boxes for Electrical Systems.

G. Section 26 0533.23 - Surface Raceways for Electrical Systems: Surface raceway systems, including multioutlet assemblies.

H. Section 26 0553 - Identification for Electrical Systems: Identification products and requirements.

I. Section 26 0583 - Wiring Connections: Cords and plugs for equipment.

1.3 REFERENCE STANDARDS

A. FS W-C-596 - Connector, Electrical, Power, General Specification for; 2014h, with Amendments (2017).

B. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

C. NECA 130 - Standard for Installing and Maintaining Wiring Devices; 2016.

D. NEMA WD 1 - General Color Requirements for Wiring Devices; 1999 (Reaffirmed 2020).

E. NEMA WD 6 - Wiring Devices - Dimensional Specifications; 2021.

F. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

G. UL 498 - Attachment Plugs and Receptacles; Current Edition, Including All Revisions.

H. UL 514D - Cover Plates for Flush-Mounted Wiring Devices; Current Edition, Including All Revisions.

I. UL 943 - Ground-Fault Circuit-Interrupters; Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate the placement of outlet boxes with millwork, furniture, equipment, etc. installed under other sections or by others.

2. Coordinate wiring device ratings and configurations with the electrical requirements of actual equipment to be installed.

3. Coordinate the placement of outlet boxes for wall switches with actual installed door swings.

4. Coordinate the installation and preparation of uneven surfaces, such as split face block, to provide suitable surface for installation of wiring devices.

5. Coordinate the core drilling of holes for poke-through assemblies with the work covered under other sections.

6. Notify Architect of any conflicts or deviations from Contract Documents to obtain direction prior to proceeding with work.

B. Sequencing:

1. Do not install wiring devices until final surface finishes and painting are complete.

1.5 SUBMITTALS

A. Contractor shall provide submittals for equipment listed herein. Refer to Division 01 for submittal procedures.

PART 2 PRODUCTS

2.1 WIRING DEVICES - GENERAL REQUIREMENTS

A. Provide wiring devices suitable for intended use with ratings adequate for load served.

2.2 WIRING DEVICE APPLICATIONS

A. Provide wiring devices suitable for intended use and with ratings adequate for load served.

B. For single receptacles installed on an individual branch circuit, provide receptacle with ampere rating not less than that of the branch circuit.

C. Provide weather resistant GFCI receptacles with specified weatherproof covers for receptacles installed outdoors or in damp or wet locations.

D. Provide tamper resistant receptacles for receptacles installed in areas listed below:

1. All 15 and 20-ampere 125 and 250-volt nonlocking type receptacles in the areas listed below shall be listed tamper-resistant receptacles, unless otherwise excluded in NEC.

a. Dwelling units in all areas specified in NEC 210.52 and 550.13.

b. All areas listed in NEC 406.12.

E. Provide GFCI protection for receptacles installed within 6 feet of sinks.

F. Provide GFCI protection for receptacles installed in kitchens.

G. Provide GFCI protection for receptacles serving electric drinking fountains.

1. Outlet shall be readily accessible.

H. Provide GFCI protection for outlets serving vending machines. Outlets shall be readily accessible.

2.3 WIRING DEVICE FINISHES

A. Provide wiring device finishes as described below unless otherwise indicated.

B. Wiring Devices, Unless Otherwise Indicated: White with gray stainless steel wall plate.

C. Wiring Devices Connected to Emergency Power: Red with stainless steel wall plate factory engraved "Emergency".

2.4 RECEPTACLES

A. Manufacturers:

1. Hubbell Incorporated: www.hubbell.com

2. Leviton Manufacturing Company, Inc: www.leviton.com

3. Lutron Electronics Company, Inc; Designer Style: www.lutron.com

4. Pass & Seymour, a brand of Legrand North America, Inc: www.legrand.us

B. Receptacles - General Requirements: Self-grounding, complying with NEMA WD 1 and NEMA WD 6, and listed as complying with UL 498, and where applicable, FS W-C-596; types as indicated on the drawings.

1. Wiring Provisions: Terminal screws for side wiring or screw actuated binding clamp for back wiring with separate ground terminal screw.

2. NEMA configurations specified are according to NEMA WD 6.

C. Convenience Receptacles:

1. Standard Convenience Receptacles: Industrial specification grade, 20A, 125V, NEMA 5-20R; single or duplex as indicated on the drawings.

2. Tamper Resistant Convenience Receptacles: Industrial specification grade, 20A, 125V, NEMA 5-20R, listed and labeled as tamper resistant type; single or duplex as indicated on the drawings.

3. Tamper Resistant and Weather Resistant Convenience Receptacles: Industrial specification grade, 20A, 125V, NEMA 5-20R, listed and labeled as tamper resistant type and as weather resistant type complying with UL 498 Supplement SD suitable for installation in damp or wet locations; single or duplex as indicated on the drawings.

D. GFCI Receptacles:

1. GFCI Receptacles - General Requirements: Self-testing, with feed-through protection and light to indicate ground fault tripped condition and loss of protection; listed as complying with UL 943, class A.

   a. Provide test and reset buttons of same color as device.

2. Standard GFCI Receptacles: Industrial specification grade, duplex, 20A, 125V, NEMA 5-20R, rectangular decorator style.

3. Weather Resistant GFCI Receptacles: Industrial specification grade, duplex, 20A, 125V, NEMA 5-20R, rectangular decorator style, listed and labeled as weather resistant type complying with UL 498 Supplement SD suitable for installation in damp or wet locations.

4. Tamper Resistant GFCI Receptacles: Industrial specification grade, duplex, 20A, 125V, NEMA 5-20R, rectangular decorator style, listed and labeled as tamper resistant type.

2.5 WALL PLATES AND COVERS

A. Manufacturers:

1. Hubbell Incorporated: www.hubbell-wiring.com

2. Leviton Manufacturing Company, Inc: www.leviton.com

3. Lutron Electronics Company, Inc: www.lutron.com

4. Pass & Seymour, a brand of Legrand North America, Inc: www.legrand.us

5. Source Limitations: Where wall controls are furnished as part of lighting control system, provide accessory matching receptacles and wallplates by the same manufacturer in locations indicated.

B. Wall Plates: Comply with UL 514D.

1. Configuration: One piece cover as required for quantity and types of corresponding wiring devices.

2. Size: Standard.

3. Screws: Metal with slotted heads finished to match wall plate finish.

C. Stainless Steel Wall Plates: Brushed satin finish, Type 302 stainless steel.

D. Weatherproof Receptacle Covers for Damp Locations: Gasketed, cast aluminum, with self-closing hinged cover and corrosion-resistant screws; listed as suitable for use in wet locations with cover closed.

E. Weatherproof Receptacle Covers for Wet Locations: Gasketed, cast aluminum, with hinged lockable cover and corrosion-resistant screws; listed as suitable for use in wet locations while in use with attachment plugs connected and identified as extra-duty type.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate devices and conductors in accordance with NFPA 70.

C. Verify that wall openings are neatly cut and will be completely covered by wall plates.

D. Verify that final surface finishes are complete, including painting.

E. Verify that branch circuit wiring installation is completed, tested, and ready for connection to wiring devices.

F. Verify that conditions are satisfactory for installation prior to starting work.

3.2 PREPARATION

A. Provide extension rings to bring outlet boxes flush with finished surface.

B. Clean dirt, debris, plaster, and other foreign materials from outlet boxes.

3.3 INSTALLATION

A. Perform work in accordance with NECA 1 (general workmanship) and, where applicable, NECA 130, including mounting heights specified in those standards unless otherwise indicated.

B. Coordinate locations of outlet boxes provided under Section 26 0533.16 as required for installation of wiring devices provided under this section.

1. Mounting Heights: Unless otherwise indicated, as follows:

a. Receptacles: 18 inches above finished floor or 6 inches above counter.

2. Where multiple receptacles, wall switches, or wall dimmers are installed at the same location and at the same mounting height, gang devices together under a common wall plate.

3. Locate wall switches on strike side of door with edge of wall plate 3 inches from edge of door frame. Where locations are indicated otherwise, notify Architect to obtain direction prior to proceeding with work.

C. Install wiring devices in accordance with manufacturer's instructions.

D. Install permanent barrier between ganged wiring devices when voltage between adjacent devices exceeds 300 V.

E. Where required, connect wiring devices using pigtails not less than 6 inches long. Do not connect more than one conductor to wiring device terminals.

F. Connect wiring devices by wrapping conductor clockwise 3/4 turn around screw terminal and tightening to proper torque specified by the manufacturer. Where present, do not use push-in pressure terminals that do not rely on screw-actuated binding.

G. Unless otherwise indicated, connect wiring device grounding terminal to branch circuit equipment grounding conductor and to outlet box with bonding jumper.

H. Provide GFCI receptacles with integral GFCI protection at each location indicated. Do not use feed-through wiring to protect downstream devices.

I. Install wiring devices plumb and level with mounting yoke held rigidly in place.

J. Install wall switches with OFF position down.

K. Install vertically mounted receptacles with grounding pole on top and horizontally mounted receptacles with grounding pole on left.

L. Install wall plates to fit completely flush to wall with no gaps and rough opening completely covered without strain on wall plate. Repair or reinstall improperly installed outlet boxes or improperly sized rough openings. Do not use oversized wall plates in lieu of meeting this requirement.

M. Install blank wall plates on junction boxes and on outlet boxes with no wiring devices installed or designated for future use.

N. Identify wiring devices in accordance with Section 26 0553.

3.4 FIELD QUALITY CONTROL

A. Inspect each wiring device for damage and defects.

B. Operate each wall switch, wall dimmer, and fan speed controller with circuit energized to verify proper operation.

C. Test each receptacle to verify operation and proper polarity.

D. Test each GFCI receptacle for proper tripping operation according to manufacturer's instructions.

E. Correct wiring deficiencies and replace damaged or defective wiring devices.

SECTION 26 4300
SURGE PROTECTIVE DEVICES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Surge protective devices for service entrance locations.

B. Surge protective devices for distribution locations.

1.2 RELATED REQUIREMENTS

A. Section 26 0005 - General Electrical Requirements.

B. Section 26 0526 - Grounding and Bonding for Electrical Systems.

C. Section 26 2416 - Panelboards.

1.3 ABBREVIATIONS AND ACRONYMS

A. SPD: Surge Protective Device.

1.4 REFERENCE STANDARDS

A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

B. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2020.

C. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

D. UL 1449 - Standard for Surge Protective Devices; Current Edition, Including All Revisions.

1.5 SUBMITTALS

A. Contractor shall provide submittals for equipment listed herein. Refer to Division 01 for submittal procedures.

B. Product Data: Include detailed component information, voltage, surge current ratings, repetitive surge current capacity, voltage protection rating (VPR) for all protection modes, maximum continuous operating voltage (MCOV), nominal discharge current (I-n), short circuit current rating (SCCR), connection means including any required external overcurrent protection, enclosure ratings, outline and support point dimensions, weight, service condition requirements, and installed features.

C. Shop Drawings: Include wiring diagrams showing all factory and field connections with wire and circuit breaker/fuse sizes.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Factory-installed, Internally Mounted Surge Protective Devices:

1. Same as manufacturer of equipment containing surge protective device, to provide complete listed assembly including SPD.

2.2 SURGE PROTECTIVE DEVICES - GENERAL REQUIREMENTS

A. Description: Factory-assembled surge protective devices (SPDs) for 60 Hz service; listed, classified, and labeled as suitable for the purpose intended; system voltage as indicated on the drawings.

B. Unless otherwise indicated, provide field-installed, externally-mounted or factory-installed, internally-mouonted SPDs.

C. List and label as complying with UL 1449, Type 1 when connected on line side of service disconnect overcurrent device and Type 1 or 2 when connected on load side of service disconnect overcurrent device.

D. Protected Modes:

1. Wye Systems: L-N, L-G, N-G, L-L.

E. UL 1449 Voltage Protection Ratings (VPRs):

1. 208Y/120V System Voltage: Not more than 1,000 V for L-N, L-G, and N-G modes and 1,200 V for L-L mode.

F. UL 1449 Maximum Continuous Operating Voltage (MCOV): Not less than 115% of nominal system voltage.

G. Enclosure Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:

1. Indoor clean, dry locations: Type 1.

H. Mounting for Field-installed, Externally Mounted SPDs: Unless otherwise indicated, as specified for the following locations:

1. Provide surface-mounted SPD where mounted in non-public areas or adjacent to surface-mounted equipment.

2. Provide flush-mounted SPD where mounted in public areas or adjacent to flush-mounted equipment.

I. Equipment Containing Factory-installed, Internally Mounted SPDs: Listed and labeled as a complete assembly including SPD.

1. Panelboards: See Section 26 2416.

2.3 SURGE PROTECTIVE DEVICES FOR SERVICE ENTRANCE LOCATIONS

A. Surge Protective Device:

1. Protection Circuits: Field-replaceable modular or non-modular.

2. Surge Current Rating: Not less than 160 kA per mode/320 kA per phase.

3. UL 1449 Nominal Discharge Current (I-n): 20 kA.

4. UL 1449 Short Circuit Current Rating (SCCR): Not less than the available fault current at the installed location as indicated on the drawings.

5. Diagnostics:

a. Protection Status Monitoring: Provide indicator lights to report the protection for each phase.

b. Alarm Notification: Provide indicator light and audible alarm to report alarm condition. Provide button to manually silence audible alarm.

c. Remote Status Monitoring: Provide Form C dry type contacts (normally open and normally closed) for remote annunciation of status.

d. Surge Counter: Provide surge event counter with manual reset button, surge count retention upon power loss, and six digit LCD display that indicates quantity of surge events.

2.4 SURGE PROTECTIVE DEVICES FOR DISTRIBUTION LOCATIONS

A. Distribution locations include SPDs connected to distribution panelboards, motor control centers, and busway.

B. Surge Protective Device:

1. Protection Circuits: Field-replaceable modular or non-modular.

2. Surge Current Rating: Not less than 80 kA per mode/160 kA per phase.

3. UL 1449 Nominal Discharge Current (I-n): 20 kA.

4. UL 1449 Short Circuit Current Rating (SCCR): Not less than the available fault current at the installed location as indicated on the drawings.

5. Diagnostics:

a. Protection Status Monitoring: Provide indicator lights to report the protection status for each phase.

b. Alarm Notification: Provide indicator light and audible alarm to report alarm condition. Provide button to manually silence audible alarm.

c. Remote Status Monitoring: Provide Form C dry type contacts (normally open and normally closed) for remote annunciation of status.

d. Surge Counter: Provide surge event counter with manual reset button, surge count retention upon power loss, and six digit LCD display that indicates quantity of surge events.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that the service voltage and configuration marked on the SPD are consistent with the service voltage and configuration at the location to be installed.

C. Verify system grounding and bonding is in accordance with Section 26 0526, including bonding of neutral and ground for service entrance and separately derived systems where applicable. Do not energize SPD until deficiencies have been corrected.

D. Verify that conditions are satisfactory for installation prior to starting work.

3.2 INSTALLATION

A. Perform work in accordance with NECA 1 (general workmanship).

B. Install products in accordance with manufacturer's instructions.

C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.

D. Unless indicated otherwise, connect service entrance surge protective device on load side of service disconnect main overcurrent device.

E. Provide conductors with minimum ampacity as indicated on the drawings, as required by NFPA 70, and not less than manufacturer's recommended minimum conductor size.

F. Install conductors between SPD and equipment terminations as short and straight as possible, not exceeding manufacturer's recommended maximum conductor length. Breaker locations may be reasonably rearranged in order to provide leads as short and straight as possible. Twist conductors together to reduce inductance.

G. Do not energize SPD until bonding of neutral and ground for service entrance and separately derived systems is complete in accordance with Section 26 0526 where applicable. Replace SPDs damaged by improper or missing neutral-ground bond.

H. Disconnect SPD prior to performing any high potential testing. Replace SPDs damaged by performing high potential testing with SPD connected.

SECTION 27 0000 – GENERAL TECHNOLOGY REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This section includes general administrative and procedural requirements. The following requirements are included to supplement the requirements specified in Division 1 Specification Sections.

B. Along with the drawings and details, these specifications establish the requirements for the new Willow School

C. The project consists of the following major systems:

1. Structured cabling system
2. Audiovisual systems
3. Security systems
4. PA system
5. Clock system

1.3 GENERAL REQUIREMENTS

A. Bidders must submit a bill of materials with the proposal. BOM must list all major components, quantities, and extended price. BOM is provided for information only to assist in evaluating the various bid proposals. Bidder agrees to the scope of work outlined in the bid documents.

B. The bid documentation does not provide for every component or requirement of installation; however, it does establish minimum requirements for the system. The final solution shall be well documented within the bid proposal. Drawings are not intended to be scaled for rough-in or to serve as shop drawings. Take all field measurements required to complete the work. Installation within a reasonable distance from the locations shown on the drawing will be performed without additional cost.

C. The submitting of a bid response implies that the Contractor understands the conditions under which the work must be conducted. Additional charges will not be allowed because of failure to make this examination or to include all materials and labor to complete the work.

D. If backend systems (power supplies, master clock, master PA console, etc.) need dedicated or hardwired electrical connections, each Contractor is to provide the requirements for their systems as part of the bid response. If the electrical requirements are not specifically called out in the bid response, the Contractor will subcontract to a licensed electrical contractor to complete the electrical work as part of the Contractor’s cost.

E. Additional information provided with a bid response shall be used in the evaluation of bids, but do not replace the requirements established by the contract documents (project manual, drawings, specifications, etc.). The Technology Designer and Owner will not be responsible for reviewing equipment lists for completeness or conformance to the contract documents. Lists of material, bills of material, etc. submitted by the contractor do not replace the submittal requirements and do not replace the requirements established by the contract.

F. The Contractor shall provide the services necessary to engineer, procure, install, test, and certify the systems described in the bid documents conforming to manufacturer specifications and applicable industry standards.

G. All materials and equipment shall be furnished complete with all accessories normally supplied for a complete and operating system. All materials and equipment shall be new and shall be standard products in production and shall be of the manufacturer's current design. Any items with a known end of manufacture date will be specifically called out for approval before procurement. All equipment of the same or similar systems shall be by the same manufacturer.

H. The methods of implementation shall be in accordance with the latest issue of the various authorities including but not limited to:

1.	ANSI	American National Standards Institute
2.	ASTM	American Society for Testing and Materials
3.	BICSI	Building Industries Consulting Services International
4.	EIA	Electronics Industries Association
5.	FCC	Federal Communications Commission
6.	ICEA	Insulated Cable Engineers Association
7.	IEEE	Institute of Electrical and Electronics Engineers
8.	ISO	International Organization for Standardization
9.	NEC	National Electrical Code
10.	NECA	National Electrical Contractors Association
11.	NEMA	National Electrical Manufacturer's Association
12.	NFPA	National Fire Protection Association
13.	TIA	Telecommunications Industry Association
14.	UL	Underwriters Laboratories, Inc.

I. Notify the Technology Designer before the bid period question deadline should any changes in bid documents be required to conform to recommended manufacturer guidelines or the applicable codes, rules, or regulations. After entering into Contract, make all changes required to conform to applicable guidelines, ordinances, rules, and regulations without additional expense to the Owner.

J. Any required permits, licenses, inspections, approvals, and fees for the work shall be secured and paid for by the Contractor. All work shall conform to all applicable codes, rules, and regulations. Perform all tests required by state, city, county and/or other agencies having jurisdiction. Provide all materials, equipment, etc., and labor required for tests.

K. Contractor shall comply with all rules and regulations of local utility companies. Coordinate requirements with applicable companies supplying service and include the cost of all such items in proposal.

L. Each contractor is to provide any backboards and access panels necessary for their installation. Materials are to be fire-rated. Provide D-rings, spaced no greater than 12" apart, to support cables routed to and along backboards.

M. Each contractor is to use plenum rated cabling and accessories throughout the project.

N. Where not provided by the electrical contractor, each contractor is required to provide their own penetrations, sleeves, and cores with firestopping. Sleeves and cores shall have nylon bushings.

O. Install surge suppressors where ac-power-operated devices are not protected against voltage transients by integral surge suppressors specified in UL 1449. Install surge suppressors at the devices' power-line terminals. All surge suppression devices shall warranty protection of all downstream equipment.

P. Unit prices established for the project shall remain in effect throughout the duration of the contract.

1.4 DEFINITIONS

A. ADA: Americans with Disabilities Act.

B. AIA: American Institute of Architects.

C. FBO: Furnished By Others.

D. IR: Infrared.

E. MC: Main Cross-Connect. (Applies to MDF or Headend references).

F. OFE: Owner Furnished Equipment. (Applies to OFCI references)

G. POE: Power over Ethernet.

H. RF: Radio Frequency.

I. TR: Telecommunications Room. (Applies to MDF or IDF references).

1.5 SUBMITTALS

A. All submittals shall be complete and organized by related items. Incomplete submittal packets will be returned unchecked. Any modifications to or deviations from the bid documents shall be specifically highlighted on the submittals. In addition to requirements specified in Division 1, include the following:

B. Lists of material, bills of material, etc. submitted by the contractor do not replace the submittal requirements and do not replace the requirements established by the contract documents. The Technology Designer and Owner will not be responsible for reviewing lists of material for completeness or conformance to the contract documents.

C. Copies of any professional licenses or certifications requested in the documents.

D. Product Data: For each product indicated in the specifications or included in the scope, provide a product data sheet in PDF format. Data sheets indicating multiple products must have the applicable product highlighted or marked.

E. Shop Drawings: Shop drawings are to be provided in both PDF and native electronic format (eg AutoCAD, Revit, Excel format, etc.).

F. Closeout documents will include a spreadsheet identifying system components, installed location, model number, serial number, label designation, and any other pertinent data. Submittals shall include spreadsheet format for approval.

1.6 QUALITY ASSURANCE

A. The Contractor and their Sub-Contractors shall be experienced in all aspects of the work and shall demonstrate direct experience on recent systems of similar type, complexity, and size.

1. Upon request, Contractor shall furnish for both the Contractor and all Sub-Contractors information on the corporation, project manager, and installers indicating recently completed projects, technical experience, and completed training.
2. The Contractor shall maintain consistent staffing for Project Management and lead installers throughout the project, except for illness or loss of personnel. The Technology Designer and Owner reserve the right to require staffing substitutions if deemed beneficial to satisfactory completion of the project.

B. The Contractor shall utilize equipment from manufacturers regularly engaged in the production of similar systems and components for a minimum of five (5) years.

C. The Contractor must be a certified reseller and installer for the products/solutions provided and/or installed.

D. The Contractor shall install in accordance with all applicable codes and standards, including federal, state, and local codes and authorities.

1.7 COORDINATION

A. Contractor is to coordinate with other construction and technology contractors.

B. Contractors shall be responsible for coordinating their configuration with the Owner, access providers, and other integrators whose systems will interact. If problems occur during implementation or commissioning, all contractors will be responsible for ongoing/additional coordination regarding configuring, testing, and troubleshooting of related/ inter-related devices until a resolution acceptable to the Owner is achieved. This includes coordination with outside agencies such as telephone service providers and internet service providers when necessary

C. Coordinate layout, rough-in requirements, and installation of the work of this section with the Owner's equipment, furniture, electrical, mechanical, architectural, and other technology trades.

D. Coordinate with the appropriate utility companies for installation and cutover.

E. Where multiple contractors will share a common pathway or faceplate, coordinate requirements and installation.

F. Contractor shall uncover Work as needed for review by the Owner, Technology Designer, Architect, Construction Manager, or contractors performing related work. Work uncovered for observation will be replaced at the Contractor’s expense without change in the Contract Time or Contract Sum.

G. Where the cabling and A/V contractor(s) will be sharing a faceplate, the A/V contractor is to provide the faceplate and any blank modules. The faceplate must be able to accept the

termination jack chosen by the data cabling contractor. Contractors shall coordinate all faceplate and termination requirements.

1.8 WARRANTY

A. All division 27 and 27 systems shall be provided with a three (3) year warranty unless noted otherwise in scope specific specification sections. Manufacturer and contractor warranties are to include the entire system (equipment, software updates, licensing, installation, etc.).

B. Unless a specification section has a specific requirement, manufacturer warranties for each component shall begin on the date that equipment is delivered from the manufacturer/supplier. The contractor warranty period shall begin at the date indicated on the certificate of substantial completion or the date of Owner acceptance (to be received in writing and approved by the Owner), whichever comes later.

C. Contractor is to provide:

1. Evidence of the manufactures warranty end date.
2. Procedures for warranty issues (e.g. phone number to call, warranty ID numbers, etc.)
3. Documentation for all manufacturer's warranties including the operating conditions required for the warranty.
4. Contractor's guarantee.

D. The manufacturer warranty shall include phone support and software assurance including patches, updates and version upgrades for both major and minor releases throughout the warranty period.

E. The Owner shall not be responsible for additional charges during the equipment warranty period. Labor, service charges, trip charges, etc. to configure and install equipment during the warranty period shall be included in the contractor's warranty.

F. Contractor is to register all equipment in the Owner's name, not the Contractor's. All manufacturer warranty and support must be available to the Owner directly and not required to channel through the Contractor, distributor, or other entity.

G. When a manufacturer's warranty is provided, it is the Bidder's responsibility to make sure the manufacturer's records reflect the correct warranty period start date as established in the contract terms.

H. The contractor warrants the system to be free of product, workmanship, and configuration defects and will inspect and repair the system before the next school day (or within 48 hours during school breaks) during the warranty period at no additional cost to the Owner. The Contractor shall respond on site within four (4) hours notice, and without cost to the Owner, during this warranty period. Contractor agrees to correct system deficiencies and replace components that fail in materials or workmanship including deficiencies arising when used according to the manufacturer or Contractor's written instructions. No warranty or terms therein shall limit or be interpreted to limit remedies as provided by law.

I. Contractor will be responsible for repairing/replacing any aspect of the system unless a specific specification section states that the Owner will install replacement equipment.

J. Contractor is also to provide terms of any additional warranties as a manufacturer's standard. Special warranty specified shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.

PART 2 - PRODUCTS

2.1 GENERAL

A. Contractor is responsible for ensuring that no asbestos containing building materials (ACBM) are used and must certify to the Owner and Technology Designer that none was used.

B. Any equipment, software, system, etc. with time dependent functions (e.g. bell systems) shall automatically adjust for daylight saving time without human intervention.

2.2 MANUFACTURERS

A. Permit Competition. The name of a model, manufacturer or brand in this RFP shall not be considered as exclusive of other brands. Brands and models specified in this RFP are preferred. Owner expects all supplies, materials, equipment, or products bid by a Bidder to meet or exceed the specifications set forth in this RFP. Further, it is Owner's intent that this RFP permit competition. Accordingly, the use of any patent, proprietary name or manufacturer's name is for demonstrative purposes only and is not intended to curtail competition. Whenever any supplies, material, equipment or products requested in this RFP are specified by patent, proprietary name or by the name of the manufacturer, unless stated differently, such specification shall be considered as if followed by the words "or comparable equivalent," whether or not such words appear. Owner, in its sole and absolute discretion, shall have the right to determine if the proposed equivalent products/brands submitted by Bidder meet the specifications contained in this RFP and possess equivalent and/or better qualities. It is the Bidder's responsibility to notify Owner in writing if any specifications or suggested comparable equivalent products/brands require clarification by Owner prior to the Due Date for Bids. All Bid deviations from specifications must be noted on the Proposal Form.

B. Base bid shall utilize manufacturers listed in the applicable specification sections. Contractor may include deviations as voluntary alternates in addition to the base bid, not in lieu of the base bid.

C. The Owner expects all supplies, materials equipment or products proposed by a Bidder to meet or exceed the Specifications set forth in the Bidding Documents. Further, it is the Owner's intent that the Bidding Documents permit competition. Accordingly, the use of any patent, proprietary name or manufacturer's name is for demonstrative purposes only and is not intended to curtail competition. Whenever any supplies, material, equipment or products requested in the Bidding Documents are specified by patent, proprietary name or by the name of the manufacturer, unless stated differently, such specification shall be considered as if followed by the words "or comparable equivalent," whether or not such words appear. The Owner, in its sole and absolute discretion, shall have the right to determine if the proposed equivalent products/brands submitted by Bidder meet the Specifications contained in the Bidding Documents and possess equivalent and/or better qualities. It shall be the Bidder's responsibility to notify the Owner in writing if any Specifications or suggested comparable equivalent products/brands require clarification by the Owner prior to the Due Date for Bid Proposals.

PART 3 - EXECUTION

3.1 EXAMINATION

A. It is the Contractor's responsibility to review the site work, architectural, structural, mechanical, and electrical drawings, specifications, and field conditions, for any details that may impact the installation or provisioning of the system.

B. Failure or omission of the Contractor to examine the site or documents does not relieve the Contractor. No additional payment will be made to the Contractor for failure to comply.

C. Review building plans and installations to confirm outlet and conduit installation and location. Check outlets, conduits, raceways, cable trays, and other elements in the proposed pathways for compliance with space allocations, clearances, installation tolerances, hazards to cable installation, and other conditions affecting installation in compliance with manufacturer requirements.

D. Device locations shown on drawings are diagrammatic only and may not represent intended location due to conflicts with other CAD symbols, room names, etc. Field verify conditions and coordinate device locations with other trades. Devices shall be installed to perform optimally for the usage and conditions of the space. Notify Barton Malow of conflicts that negatively affect performance prior to installation.

E. Contractor shall choose appropriate mounting method and materials for each location based on manufacturer's requirements, wall construction, building structure, etc.

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

3.2 DEMOLITION [Not Used]

3.3 INSTALLATION

A. Equipment that extends more than 4" from the wall will be mounted above 80" above finished floor unless reviewed and approved by Technology Designer or Owner.

B. Consult with the Owner's Representative as to the method of completing work to avoid interfering with the Owner's operation. All systems shall remain operational and shall only be interrupted at times coordinated with the Owner's Representative.

C. The Contractor shall provide all miscellaneous items and accessories required to make the system operational whether or not such items are specifically mentioned in the plans or specifications.

D. The Contractor shall be familiar with the site and the rooms to ensure a proper installation. The final installation methods are left to the discretion of the contractor in accordance with this specification, within standards of generally accepted workmanship, and in accordance with manufacturer's recommended installation practices.

E. The Contractor shall protect equipment and components during installation. Damage resulting from the Contractor's work shall be promptly replaced or repaired at the Contractor's expense.

F. The Contractor shall provide all lifts and temporary supports necessary to accomplish their installation.

G. The Contractor shall accomplish all cutting, removal and replacement of ceiling tile, drilling, coring and patching of walls, floors, casework, and ceilings required to complete their work. Contractor is responsible for replacing any damaged tiles and cleaning the ceiling grid upon completion of their work.

H. Contractor to ensure Owner and Technology Designer have reviewed above ceiling or concealed work before reinstalling ceiling tiles or other obstructions. If work is performed in occupied areas where ceiling tiles or other obstructions must be re-installed upon completion of work, Contractor will be required to remove and reinstall in selected areas for inspection by Owner or Technology Designer.

I. The Contractor, in accordance with all applicable codes, shall provide fire and smoke stopping through all partitions. Verify that penetrations of rated fire walls are made using products labeled for type of partition penetrated.

J. All cables within racks, cabinets, or enclosures will be cable wrapped with hook and loop tape (Velcro) at no greater than one-foot intervals. Cabling housed in wiring management shall be tied at no less than two-foot intervals.

K. Due to field conditions or other situations, installation locations may have to be relocated a reasonable distance from the plan location. Unless relocations, modifications and reengineering are consistently or substantially unfavorable to either the Contractor or the Owner, there will be no additional charge or credit for this work.

L. No additional compensation will be provided for moving installed equipment for reasons including, but not limited to:

1. Performance issues.
2. Failure to coordinate with other trades for existing conditions and renovations or new construction.
    a. All drawings (including Architectural, Mechanical, Electrical, etc.) are available for review at the jobsite.
3. Locations deviating from design drawings (unless approval has been obtained prior to installation).
4. Failing to follow manufacturer’s recommendations.

M. The lack of permanent power does not relieve contractor of installation requirements as dictated in the specifications. If permanent power is not available, contractor must provide temporary power (e.g. UL approved extension cords) to complete installation, configuration, and testing of equipment (e.g. projectors, interactive whiteboards, etc.). Extension cords and/or other means of temporary power are to be removed immediately after the initial installation/configuration. At the time permanent power is completed, contractor to return to make final equipment connections and any necessary adjustments. Refer to the safety section of the project manual for guidelines of proper use with regards to temporary power.

3.4 CLEANING

A. All debris shall be removed daily as required to maintain the work area in a neat, orderly condition.

B. Contractors working above ceiling or drilling are to bring their own vacuums unless the building custodian allows theirs to be used.

C. Contractor shall clean all equipment before Owner acceptance using methods and materials recommended by the manufacturer.

3.5 PROTECTION AND HANDLING OF EQUIPMENT AND MATERIALS

A. Equipment and materials shall be protected from theft, injury, or damage. Equipment set in place must be provided with temporary protection.

B. Provide adequate storage for all equipment and materials delivered to the site. Owner shall not be required to provide secure storage but will attempt to accommodate the Contractor's requirements.

C. Contractor will be required to protect any Owner-Furnished-Contractor-Installed (OFCI) equipment and will be responsible for replacing any missing or damaged equipment.

3.6 IDENTIFICATION

A. Unless noted otherwise, use logical and systematic designations for facility's architectural arrangement and nomenclature.

B. Contractor is responsible for permanently identifying all major components used in the project. Component list, identification method, and nomenclature to be coordinated with and approved by the Technology Designer.

C. All cross-connecting cable shall be adequately tagged as "to" and "from."

3.7 FIELD QUALITY CONTROL

A. All ancillary accessories (e.g. remote controls, keys, etc.) shall be collected, identified by installation location, and turned over to the Owner. Coordinate delivery with Technology Designer to ensure appropriate signoffs are received.

B. The Owner and/or Technology Designer may designate an agent who may be present during testing and may provide additional testing to verify cabling installer results. The agent shall accept or reject the installation.

3.8 DEMONSTRATION AND STARTUP

A. All training and demonstration will be provided at no cost to the District.

B. Additional training requirements are listed in individual specification sections.

3.9 DOCUMENTATION

A. For multi-phase projects, adequate documentation for completed work shall be submitted as each phase is completed to allow the owner and project team to utilize the system.

B. Provide progressive “as-builts” to the Owner as devices are installed, including MAC address, serial number information, and specific installed location. Provide this information to the Owner daily as necessary, through a collaborative software (ex. Google Sheets, or Office365) and format approved by the Owner and Technology Designer. Handwritten notes will not be accepted.

C. At the conclusion of the project (or major phase for multi-phase projects), all documentation is to be compiled into an organized, comprehensive package. Copies are to be submitted both in hard copy and electronic formats. CAD drawings shall be in AutoCAD or Revit format. The Contractor is responsible for any fees charged by the architect for providing CAD backgrounds.

D. Contractor responsible for all equipment registration per manufacturer’s instructions.

E. As-Built: In addition to requirements specified in Division 1, include the following:

1. As-built drawings are to reflect all changes between the bid documents and the final installation, including final location of all equipment, outlets, racks, penetrations, etc. inclusive of the base bid, implementation add/changes, and all change orders.
2. Drawings for systems showing location and cabinet/enclosure layout. Include all components identifying component manufacturer and model, serial numbers, and connections.
3. Cable tests, OTDR traces, etc. are to be provided in both hardcopy format as well as electronic format. Any software necessary to view the tests must be provided to the Owner.
4. Wiring and systems certification.
5. Certificate of manufacturer’s extended warranty, where applicable.
6. Spreadsheet identifying system components, installed location, model number, serial number, label designation, warranty expiration, and any other project-specific pertinent data. Spreadsheet format to be approved by Technology Designer.
7. Schematics shall be created in AutoCAD or Visio format. Handwritten drawings shall be accepted for draft or working copies only.
8. Drawings with floorplans shall be created in AutoCAD or Revit format. Handwritten drawings shall be accepted for draft or working copies only.
9. All as-built and other closeout documentation to be submitted as a PDF in addition to the native file format.

F. Maintenance Data:

1. Detailed operating instructions covering operation under both normal and abnormal conditions.
2. Routine maintenance procedures for system operation, customized for the installation.
3. Lists of spare parts and replacement components recommended being stored at the site.

END OF SECTION 27 0000

SECTION 27 1000 – GENERAL CABLING REQUIREMENT

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.

B. Specification Sections:

1. 27 0000 General Technology Requirements
2. Any specification sections that include cabling and/or cabling installation.

1.2 SUMMARY

A. This Section includes general cabling requirements for contractors installing cabling within their scope of work.

B. Contractor is required to furnish and install cables and accessories in locations as shown on plan drawings, details, and specifications.

C. Scope of work includes all physical cable management hardware, including, but not limited to backboards, cable supports, raceway, and cable management required to complete the system.

D. Where adequate pathways are not provided by the electrical contractor, each Contractor is required to provide their own penetrations, sleeves, and cores with firestopping. Sleeves and cores shall have nylon bushings. Contractors are to control dust generated from penetrations, protect nearby equipment and surfaces from dust, and follow all OSHA regulations.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated, provide a product data sheet in both hard-copy and electronic (PDF) formats. Data sheets indicating multiple products must have the applicable product highlighted or marked.

1. All cable types
2. Terminations components for each system
3. Faceplates

B. Shop Drawings:

1. Include all labeling schemes for all systems such as station outlets, cable runs, patch panels, punchdown blocks, racks, etc.

C. Samples:

1. Sample outlet including faceplate, modules, and labeling.

D. Qualification Data:

1. Include written confirmation from the manufacturer that the bidder is a certified installer for the structured cable plant solution.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Contractor must be certified by the manufacturer of the solution being installed.

B. Installation Supervision: Installation and testing shall be performed by BICSI Registered Installers or manufacturer certified installers, with a consistent supervisor who shall be present at all times when work of this section is performed.

C. Comply with all requirements of the 2017 NEC unless jurisdiction requires a different version. Cables must comply with temperature rating requirements including Table 725.144.

D. Comply with EIA/TIA 568B-2.1, EIA/TIA 569, and EIA/TIA 606.

1.5 COORDINATION

A. Coordinate layout and installation of the work of this section with the Owner's equipment, furniture, electrical, mechanical, architectural, and other technology trades.

B. All Contractors utilizing a shared pathway shall be responsible for coordinating and ensuring that firestopping requirements are fulfilled. Any unused penetrations installed by the electrical contractor for future use shall be firestopped by the data cabling contractor.

C. All Contractors utilizing penetrations shall be present during electrical and fire marshal inspections with adequate firestopping material and shall immediately correct any issues identified during the inspections.

D. Each Contractor is to protect their own cables during installation. Rough cables are to be properly supported and not left on the floor. If conditions necessitate leaving cables Contractor is to put a note on the cables to reduce chance of damage by others and note cable location to controlling contractor.

E. Each Contractor to protect their cables in areas where ceilings will be painted to ensure cable sheath is not painted.

F. For projects where the structured cabling for access points, video surveillance cameras, etc. is being provided by a different contractor, the Contractor installing the equipment (access point, video surveillance camera, etc.) will be responsible for coordinating the cable locations with the structured cabling contractor. In general:

1. Equipment contractor is to extend the cable to the final equipment mounting location including penetrations, firestopping, waterproofing, raceway, etc. Equipment contractor to provide longer patch cables if needed to reach the mounted equipment location.

2. For areas where equipment will be mounted in accessible ceiling, cabling contractor is to run the cable to the center of the space for wireless access points or the general area where video surveillance cameras or other equipment are shown. Coil adequate cable to reasonably relocate the equipment within the space.

3. For outdoor equipment, stairwells, equipment in open ceiling spaces to be mounted adjacent to accessible the accessible ceiling in an adjacent space (corridor, etc.) cabling contractor is to run the cable to the adjacent interior space. Equipment contractor is to create the penetration and extend cable to final equipment location, and seal the penetration as required for weatherproofing or firestopping.

4. For open ceiling areas where cabling will be routed away from the adjacent accessible ceiling (e.g. along the perimeter of the space or along the beams/trusses and dropped down to the equipment location in a gymnasium, natatorium, atrium, etc.), the cabling contractor is to run the cable near/above the equipment location. Equipment contractor is to extend cable to final equipment location.

1.6 WARRANTY

A. The contractor warrants the system to be free of defects of workmanship or products and will inspect and repair the system during the warranty period at no additional cost to the Owner. Contractor agrees to correct system deficiencies and replace components that fail in materials or workmanship including deficiencies arising when used according to the manufacturer or Contractor's written instructions No warranty or terms therein shall limit or be interpreted to limit remedies as provided by law

B. Contractor is also to provide terms of any additional warranties as a manufacturer's standard. Special warranty specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.

C. The data and voice structured cable plant shall be covered by the manufacturer's extended warranty (eg. Panduit Certification Plus System Warranty, Hubbell Premise Wiring Mission Critical Warranty and System Performance Guarantee, etc.).

PART 2 - PRODUCTS

2.1 SYSTEM REQUIREMENTS

A. Coordinate the features of materials and equipment so they form an integrated system complying with TIA/EIA-568B. Match components and interconnections for optimum future performance.

B. The Contractor is to use plenum rated cabling and accessories throughout the project. All cables shall be continuous and free from splices.

2.2 FACEPLATES, CONDUIT, AND SURFACE-MOUNTED RACEWAYS

A. These general requirements apply to all contractor(s) unless more specific information is included in a particular contractor's specification sections (i.e. structured cabling, audiovisual cabling, etc.).

B. Where the data and audio/video contractor(s) will be sharing a faceplate, the video contractor is to provide the faceplate and any required blank modules. The faceplate must be able to accept

the termination jack chosen by the data cabling contractor. Contractors shall coordinate all faceplate and termination requirements.

C. Coordinate faceplate requirements with the furniture installer, where applicable.

D. Each contractor shall provide and install blank faceplates / insert on any outlets provided by the electrical contractor for their potential technology use (video outlets, security outlets, data/voice general purpose telecommunication outlets, etc.).

E. Faceplate labels shall be secured to the faceplate (loose or removable labels on the screw covers are not permanent and not acceptable).

F. Each Contractor is responsible for all surface-mounted raceways and conduit for cabling not provided by the electrical contractor. Common potential locations requiring conduit for cables are described below:

1. Conduit for security cameras, wireless access points, audiovisual components, or general communications outlets installed outdoor or in large open spaces without drop ceilings (i.e. gymnasium, cafeteria).
2. Security cabling for access control systems and intrusion detection systems in vestibules, entrances, doorways, or other areas where cabling cannot be concealed.
3. Other public spaces where cabling cannot be concealed, and contractor could have reasonably known they existed.
4. In all other instances requiring surface-mounted raceways that the contractor could not have reasonably known about from construction coordination drawings (e.g. ceiling plans) or pre-bid walkthroughs made available to the contractor whether or not they participated, unit pricing will be utilized. Approval must be obtained prior to installation.

G. The following are general guidelines for raceways:

1. Surface-mounted raceway shall not be used unless the wall or other structure cannot be fished and cut into. Contractor to obtain approval prior to installing surface-mounted raceway in areas not already indicated on the drawings.
2. Surface-mounted raceways shall be sized appropriately for each installation following all manufacturers' guidelines.
3. Steel raceway (e.g. Legrand/Wiremold) shall be used in classroom and office areas. EMT conduit may be used in lieu of steel raceways in gymnasiums or other similar spaces and only after approval is received.
4. All surface-mounted raceways shall be steel construction (e.g. Legrand/Wiremold V700, V4000, etc.).
5. All steel raceways shall be ivory.

H. The following are general guidelines for faceplates:

1. For recessed boxes and surface-mounted faceplates, data faceplates shall be stainless steel with module frames or decora inserts. A/V faceplates may be plastic if necessary to provide the required A/V inserts.
2. Where single-channel surface-mounted raceway and boxes are used, faceplates shall match the raceway color.
3. Where dual-channel surface-mounted raceway is used (e.g. Legrand/Wiremold V4000), faceplate shall match the faceplates used in the existing installation.
4. Plastic faceplates are to be used where necessary to coordinate and match modular furniture systems.

5. Blank faceplates are to be stainless steel. Blank inserts for dual-channel raceway shall match the faceplate type and color.

PART 3 - EXECUTION

3.1 EXAMINATION

A. It is the Contractor's responsibility to review the site work, architectural, structural, mechanical, and electrical drawings, specifications, and field conditions, for any details that may impact the installation or provisioning of the system.

B. Review building plans and installations to confirm outlet and conduit installation and location. Check outlets, conduits, raceways, cable trays, and other elements in the proposed pathways for compliance with space allocations, clearances, installation tolerances, hazards to cable installation, and other conditions affecting installation in compliance with manufacturer requirements.

C. Contractors are to examine existing telecommunication rooms, equipment, cabinets, racks, etc. to ensure the conditions will not interfere with their installation. Contractors will be responsible for moving existing items where possible to allow for their installation (e.g. shifting patch panels, wire management, and equipment within a rack or cabinet; moving items on a backboard, etc. to make room for the new installation). If the rework requires re-ordering the existing items or removing wire management, review the layout with the Technology Designer and Owner.

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

3.2 INSTALLATION

A. The Contractor shall provide all miscellaneous items and accessories required to make the system operational whether such items are specifically mentioned in the plans and specifications.

B. The Contractor shall be familiar with the site and the rooms to ensure a proper installation. The final installation methods are left to the discretion of the contractor in accordance with this specification, manufacturer's specifications, and within standards of generally accepted workmanship.

C. Contractor shall be familiar and install in accordance with all applicable codes and standards, including FCC, NEC (NFPA 70), EIA/TIA 568, 569 and 606, BICSI (Telecommunications Distribution Methods Manual, Current Edition), federal, state, and local building/fire codes.

D. All cable above the ceiling must be independently and properly supported to the building structure with hangers or cable tray independent from the ceiling grid or other support systems (e.g. cables shall not be run through trusses). Each contractor will provide all supports necessary for their work.

1. Separate supports are to be used for each type of cabling runs (e.g. data, fiber, video, PA, security, etc.).
2. Cable supports (e.g. J-Hooks) shall be wide enough to maintain required cable bend radius and to avoid pinch points on the corners of the support.
3. All cable hangers/supports shall be no more than 60" apart.
4. Each cable bundle shall include a maximum of 192 cables.

5. Special care will be taken to avoid damage to ceiling grid, ceiling tiles, or other installed work. Cable “draped” across ceiling tiles is unacceptable.

E. Ensure all cables within cable trays are arranged to avoid individual cables supporting the weight of the cable bundle. Cable trays shall have appropriate bend radii for cable and fiber. Provide elbows, supports, and ties to assist in offloading the weight of the cable and adequately support the tray.

F. Support riser cables every floor and at the top of the run with cable grips. Limit number of four-pair data riser cables per grip to fifty (50).

G. Fiber optic cable shall be plenum rated armored cable.

H. Fill rates for all cable supports must not exceed the lesser of 50 percent, or as recommended by the manufacturer(s).

I. All wiring shall be protected from moving mechanical or physical contacts. All cabling shall be free from tension at both ends, as well as the length of each run.

J. Cables to be kept a minimum of 18” from power lines, fluorescent fixtures, or heat generating devices. All cross-connecting cable shall meet or exceed the transmission characteristics for the cable used in the adjoining segments.

K. All cabling shall be bundled and properly secured and terminated in the telecommunication room cabinet. Cables must be properly supported and separated to avoid crushing or cinching by supports, protective covers, doors, etc. All cables within wire management cabinets will be cable wrapped with Velcro cable ties at no greater than one-foot intervals. Velcro tie-wraps only are to be used.

L. For general communications outlets, Contractor to provide additional 10' of cabling coiled above nearest accessible ceiling at each drop and 10’ of cable at each telecommunication room. Unless noted otherwise, specialized systems (i.e. security and wireless) shall have 20’ of cable coiled above the ceiling at each drop and 10’ of cable at each telecommunication room. The additional lengths of cable shall be included in distance calculations. Cable routing within the telecommunication closet is to be approved by the Technology Designer before beginning termination.

M. In general, adhesives and non-mechanical fastening methods of installation will not be accepted. All conduit, cable and raceway installation support must be mechanically fastened to walls, decks, slab, structure, etc.

N. Install parallel to building lines, follow surface contours, and support the cable according to manufacturer's written instructions. Do not run adjacent and parallel to power or data cables.

O. All horizontal cabling terminations shall be provided with sufficient additional cabling to permit re-termination within the cabinet. The additional lengths of cable shall be included in distance calculations. Service loops shall be irregularly coiled to avoid electromagnetic or antenna effects.

P. All connections of twisted wiring shall be made in such a way as to minimize the extent in which each twisted pair is unraveled at the point of its physical termination. No more than 0.5 inches of exposed untwisted pairs shall be present at these locations.

Q. Provide sufficient pulling lubrication for all underground cable pulls. Do not exceed the manufacturers tension requirements for any installation.

R. Exposed wiring will not be accepted unless approved in writing by the Technology Designer. Cabling shall be in the wall, above the ceiling, or in conduit (or raceways if approved by Technology Designer) designed for the application. A difficult installation will not be sufficient to avoid the requirement for non-exposed wiring.

1. Contractor to install conduit in exposed areas along cable pathway. Raceway can be used for the vertical segment transitioning to the outlet location (e.g. from ceiling space down wall to outlet). Conduit in exposed areas are to be painted to match surrounding conduits/ceiling color.
2. Exposed wiring will be acceptable in crawl spaces.
3. Exposed wiring will be acceptable in high bay gymnasiums if the cables are run along a joist and hidden from view. Cables must be concealed from the wall to the joist.
4. No exposed cabling will be allowed in natatoriums.
5. No exposed cabling will be allowed in architecturally significant spaces, such as a media center or entrance lobby.
6. In instances greater than 15’ requiring conduit that the contractor could not have reasonably known about from available drawings (e.g. ceiling plans) or pre-bid walkthroughs made available to the contractor whether or not they participated, the contractor may request reimbursement for the installation. Approval must be obtained prior to installation.

S. In unheated crawl spaces, contractor is to install the cable at least four feet (4’) from the exterior wall mounted securely to the slab or structure.

3.3 UNDERGROUND INSTALLATION

A. Prior to beginning any underground work, Contractor shall contact MISS DIG, local utility survey staff, and utility companies for the location of all existing underground services and provide, if requested, documentation of such contact to Barton Malow Company. If necessary, Contractor shall pay for appropriate layout and locating of all existing utilities, and stake said utilities.

B. Utilities and/or other services which are shown, or not shown but encountered, shall be protected by the Contractor from any damage arising or resulting from work, unless or until they are abandoned. If the utilities or services are damaged from Contractor’s work, Contractor shall notify the Technology Designer immediately. Contractor shall repair any damage and restore the utilities and services to an equal or better condition than that which existed prior to the damage within four (4) hours. If the Contractor does not repair the work or the Owner or Barton Malow considers the damage unresolved in a timely manner, repairs will be made at Contractor expense.

C. Contractor shall provide and maintain proper shoring and bracing during its excavation, to protect from collapse or movement, or other type of damage until such time as they are to be removed, incorporated into the new Work or can be properly backfilled upon completion of the work and inspections.

D. Contractor shall photograph and document the environment immediately before beginning work, upon exposing any utilities, and after work and/or repair is completed. Barton Malow shall review the work and/or repairs before any work is buried.

E. Contractor will be responsible for all liabilities, damages, expenses, lawsuits or claims arising or resulting from such damage and will defend, hold harmless and indemnify Owner and Barton Malow from any claims or lawsuits or other expenses.

3.4 IDENTIFICATION

A. In addition to requirements in this Article, comply with TIA/EIA-606.

B. Use logical and systematic designations for facility's architectural arrangement and nomenclature, and a consistent color-coded identification of individual conductors. All rack fields, devices, components, etc. shall be tagged with appropriate designations on the front and rear of the equipment. All devices are to be installed and labeled in a sequential, logical order.

C. Adhesive labels shall meet the legibility, defacement, and adhesion requirements specified in UL969 for indoor use. Cable labels shall have a durable substrate, such as vinyl, suitable for wrapping. Labeling practices shall be consistent across the installation.

D. Cable runs shall be machine labeled within 1” of each termination. All cabling and fiber optics are to be tagged in a consistent manner, approved by the Technology Designer.

E. Fiber Optic Safety Installation. Label all fiber optic junction boxes and termination points with "fiber-optic cable - lasers in-use - possible eye injury" warnings inside and outside of the location.

F. At junction boxes, label with a description of the cable, termination location, and strand count.

3.5 FIELD QUALITY CONTROL

A. Contractor will provide cabling acceptance testing. Agent of owner may provide additional testing and cable acceptance. Contractor is responsible for correcting any instances of test failures.

B. Indicate and interpret test results for compliance with performance requirements of installed systems. All test results shall be marked as “Pass” or “Fail”.

C. All test results must be provided in both hard copy and electronic format.

D. Contractor is responsible for correcting any instances of marginal test results or test failures.

3.6 DOCUMENTATION

A. As-Built Documentation:

1. Include scaled drawings reflecting all changes between the bid documents and the final installation, including final location of all telecommunication rooms, equipment, cable paths, outlets, etc.
2. Drawings shall include all cable routing, outlet locations, and outlet labels.
3. Drawings shall be created in AutoCAD or Revit format. Handwritten drawings shall be accepted for draft or working copies only.

END OF SECTION 27 1000

SECTION 27 1116 – RACKS AND CABINETS

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.

B. Specification Sections:

1. 27 0000 – General Technology Requirements
2. 27 1000 – General Cabling Requirements

1.2 SUMMARY

A. This section includes specifications and requirements for racks and cabinets to be used throughout the technology project.

B. Refer to appropriate drawings and specification sections for cabinet types, quantities, and locations.

1.3 DEFINITIONS

A. For general requirements the term “cabinet” refers to cabinets, relay racks, etc.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated, provide a product data sheet in both hard-copy and electronic (PDF) formats. Data sheets indicating multiple products must have the applicable product highlighted or marked.

1. Cabinet or Rack
2. Wire Management
3. Cabinet Accessories

B. Shop Drawings: Include dimensioned plan and elevation views of telecommunications equipment rooms, with each individual component labeled. Show cabinet assemblies, workspace requirements, and access requirements.

1.5 COORDINATION

A. Coordinate layout and installation of the work of this section with the Owner's equipment, furniture, electrical, mechanical, architectural, and other technology trades.

B. The cabling contractor will provide cabinets and racks in telecommunication rooms. The A/V contractor will provide the cabinets associated with the A/V systems. The Owner and/or other technology contractors will utilize these cabinets for their installation and adequate space is to

be factored into the cabinet layouts (Owner-furnished source equipment, security equipment, fiber optic WAN, public address, master clock, etc.).

C. Coordinate telecommunication room and cabinet layouts with related contractors.

PART 2 - PRODUCTS

2.1 SYSTEM REQUIREMENTS

A. All materials shall be installed with matching color and quality to ensure a high-quality finished installation. Unless noted otherwise or approved in writing by Technology Designer, all materials shall have a black finish.

B. All lockable cabinets are to be keyed alike. Contractor to coordinate keying with Technology Designer.

C. For each cabinet or rack section:

1. Provide one rack mounted surge suppression outlet power strip and/or vertical power strip as appropriate.
2. Provide rack-grounding termination.

2.2 RACKS [Not Used]

2.3 WALL MOUNTED CABINET

A. General Requirements:

1. Cabinets are to be a minimum of 24” wide and 48” high (unless noted otherwise on drawings), black painted steel, with final depth confirmed with verification of equipment size and front cabling requirements. Assume 30” deep for pricing if depth is unknown at bid time.
2. Lockable scratch-resistant tinted glass front door and standard rear door.
3. Cabinet enclosures shall be field-reversible (Left or Right) hinged
4. Entire unit shall swing at each door to permit front and rear equipment and cabling access.
5. All cables running to the cabinet will be installed in either raceway or conduit.

B. Manufacturer:

1. Hoffman Accessplus II or EWMW
2. Approved equivalent

2.4 RACK AND CABINET COMPONENTS

A. Power Strip / PDU

1. Manufacturer standard nine (9) minimum outlet or greater receptacle strip rated at 20A minimum with surge suppression plug, and circuit breaker. Contractor to supply proper power strip for voltage supplied

2. Unit shall be provided with rack bolting.

B. Cable Ties

1. Cable ties shall be plenum rated.
2. Cabinet and rack ties shall be Velcro-type ties

2.5 SPARES

A. Provide spare of the following spare equipment and/or parts

1. Provide one (1) box of mounting bolts or screws for each type of cabinet.

PART 3 - EXECUTION

3.1 EXAMINATION

A. It is the Contractor's responsibility to review the site work, architectural, structural, mechanical, and electrical drawings, specifications, and field conditions, for any details that may impact the installation or provisioning of the system.

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

3.2 INSTALLATION

A. The Contractor shall provide all miscellaneous items and accessories required to make the system operational whether such items are specifically mentioned in the plans and specifications.

B. The Contractor shall be familiar with the site and the rooms to ensure a proper installation. The final installation methods are left to the discretion of the contractor in accordance with this specification, manufacturer's specifications, and within standards of generally accepted workmanship.

C. The contractor shall protect equipment and components during installation and clean all equipment before owner acceptance using methods and materials recommended by the manufacturer.

D. All units shall be aligned and perpendicular to adjacent walls.

E. Racks and cabinets are to be properly installed and secured to handle equipment load. The racks shall be bolted to floor, cable tray, and/or wall for added rigidity. Adjacent cabinets shall be bolted together at the top and bottom at both the front and rear of the units.

F. Provide independent circuit grounding recommended by manufacturer. Grounding is to be consistent with ANSI/TIA/EIA 607 and NEC requirements as a minimum. Each contractor to connect their cabinets to a single-point ground which is connected to the building ground system via #6 AWG green insulted copper grounding conductor.

G. Contractor to adjust side mounting rails to optimize front and rear cabinet clearances. No less than three inches of clearance must be provided between the equipment and the cabinet door for cabling.

H. Equipment Mounting Positions (From Top):

1. LAN fiber panel
2. Alternating patch panels and switches
3. Power Strip
4. UPS
5. Verify master clock system, PA, etc. location if mounted in cabinets

END OF SECTION 27 1116

SECTION 27 1300 – BACKBONE AND OUTDOOR CABLING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

B. Specification Sections:

1. 27 0000 – General Technology Requirements
2. 27 1000 – General Cabling Requirements
3. 27 1116 – Racks and Cabinets
4. 27 1500 – Data and Voice Horizontal Cabling

1.2 SUMMARY

A. Extent of the cabling systems work is indicated by the drawings and schedules, and is hereby defined to include, but not by of limitation, the provisions of:

1. Backbone cables between the telecommunication rooms.
2. Indoor/outdoor station cabling
3. Campus backbone cabling between buildings.
4. All termination blocks, outlets/jacks, patch panels, patch cords, etc.
5. Termination, cross connect, and patching.

B. The data cabling infrastructure shall compliant with EIA/TIA standards under T568B-2.1. Campus voice, fiber optic, data and video infrastructure shall be implemented compliant with applicable standards.

C. Data cables shall be routed so as not to exceed 90 meters in length. Notify the Technology Designer before bid period question deadline, established at the pre-bid meeting, should any changes in bid documents be required to conform to this limitation. After entering into Contract, Contractor shall provide Technology Designer-approved solution to meet the 90-meter requirement without additional expense to the Owner.

D. Provide coordination and installation in accordance with standards, rules, regulations and requirements of utilities, ROW owners, state, county, cities, villages, townships, municipalities, and any other authority having jurisdiction.

1.3 DEFINITIONS

A. AHJ: Authority Having Jurisdiction

B. ER: Equipment Room

C. HH: Handhole

D. MC: Main Cross-connect [Applies to references to MDF]

E. MMF: Multimode fiber

F. SMF: Single-mode fiber

G. TR: Telecommunication Rooms [Applies to references to IDF]

H. TP: Transition point

1.4 SUBMITTALS

A. Product Data: For each type of product indicated, provide a product data sheet in both hard-copy and electronic (PDF) formats. Data sheets indicating multiple products must have the applicable product highlighted or marked.

1. Cable
2. Terminations (Patch panels, punchdown blocks, etc.)

B. Qualification Data:

1. Include written confirmation from the manufacturer that the bidder is a certified installer for the cable plant solution.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Cabling Installer must have on-staff personnel certified by the cable solution manufacturer.

B. Installation Supervision: Installation and testing shall be performed by BICSI Registered Installers or manufacturer certified installers, with a consistent supervisor who shall be present at all times when work of this section is performed.

1.6 COORDINATION

A. Coordinate cables installed in this section with the Owner and phone, data, security, network, etc. contractors whose equipment will be using the cabling.

1.7 WARRANTY

A. Contractor is also to provide terms of any additional warranties as a manufacturer's standard. Special warranty specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.

B. The cable plant shall be covered by the manufacturer's warranty (eg. Panduit Certification Plus System Warranty, Hubbell Premise Wiring Mission Critical Warranty and System Performance Guarantee, etc.).

PART 2 - PRODUCTS

2.1 SYSTEM REQUIREMENTS

A. Coordinate the features of materials and equipment so they form an integrated system complying with TIA/EIA standards. Match components and interconnections for optimum future performance.

B. Contractor is to use plenum rated cable and cabling accessories throughout this installation.

2.2 MANUFACTURERS

A. The following are acceptable manufacturers for general equipment within this section, unless noted otherwise for any product. Any deviations must be approved in writing by the Technology Designer before installation.

1. Indoor/Outdoor UTP Voice/Data Cable
    a. Berk-Tek
    b. Belden
    c. Commscope
    d. General
    e. Hitachi
    f. Lucent
    g. Mohawk
    h. Superior Essex
2. Fiber Optic Cable
    a. Berk-Tek
    b. Belden
    c. Commscope
    d. Draka Comteq
    e. General
    f. Legrand Infinium Quantum
    g. Lucent
    h. Siecor
    i. Tyco
3. Patch Panels, Faceplates, Station Terminations, Jacks, other Accessories
    a. Cable manufacturer
    b. Hubbell
    c. Panduit

2.3 INDOOR/OUTDOOR DATA STATION CABLING

A. Cable Standards:

1. Cable is to be continuous, Category 6 compliant UTP cable rated for indoor and outdoor underground in-duct installations.
2. Plenum-rated required when cabling indoors extend beyond 50’ from the building entry location.
3. Cable shall have an UV-resistant sheath and a core of solid-copper conductors, dual insulated with foam skin and plastic, surrounded by a gel-filling compound.

4. Cabling shall be certified as a complete system with other components required herein to achieve manufacturer's cabling system extended warranty.

B. Manufacturer:

1. Hitachi Cable Drybit Category 6 Indoor-Outdoor Cable
2. Approved equivalent

C. Termination standards:

1. Contractor shall install lightning protectors in telecommunication room for each data/voice cable.
2. Terminate at station location in "biscuit box" in nearest accessible ceiling or as recommended by station equipment manufacturer/installer.

2.4 FIBER OPTIC CABLING BACKBONE

A. Cable Standards:

1. Indoor backbone cable is to be continuous, armored, plenum-rated, tight-buffered multimode fiber optic cable.
    a. In lieu of armored cable, contractor can request to provide innerduct for the entire cable pathway. Fiber optic cable shall be installed in orange, plenum-rated innerduct. Maximum fill is 40%.
2. Outdoor backbone cable is to be continuous, single armored dry buffer, loose-tube ITU G.652D single-mode fiber optic cable rated for aerial and underground applications.
    a. Any facilities in which the termination point is greater than 50' from the location the fiber enters the building will be fusion spliced to plenum rated cable in a wall-mounted fiber optic splice enclosure. Utilize indoor fiber optic standards for the remaining portion of the work modifying applicable language for single-mode installations to reflect cable type and yellow sheathing.
3. Each fiber must be individually jacketed.
4. Call shall have EIA/TIA -598 color coding for fiber optic cable.
5. All multi-mode fiber is to be OM4. Use single mode fiber for distances exceeding 500m and all outdoor applications.
6. All pig tails and patch cables are to match the type of fiber optic cable installed.
7. All fiber is to be fusion spliced; no field terminations or mechanical splices will be accepted.
8. Indoor cable sheath and accessories are to follow the following color designation:
    a. OM4 Violet preferred, Aqua allowed
    b. Singlemode Yellow

B. Termination Standards:

1. Provide 19" rack mounted (sized as necessary, 72-port maximum) optical fiber termination panels with cable strain relief and slack storage. Provide breakout and storage of 5' of cable. Size the patch panel for an additional space for 12 future terminations.
2. **ST** terminations are to be used, or as required by the equipment manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. It is the Contractor's responsibility to review the site work, architectural, structural, mechanical, and electrical drawings, specifications, and field conditions, for any details that may impact the installation or provisioning of the system.

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

3.2 INSTALLATION

A. Contractor shall be familiar and install in accordance with all applicable codes and standards, including FCC, NEC (NFPA 70), EIA/TIA 568, 569 and 606, BICSI (Customer-Owned Outside Plant Design Manual, current edition), BICSI (Telecommunications Distribution Methods Manual, current edition), federal, state, and local building/fire codes.

B. Installation must be in accordance with applicable utility company standards.

C. Contractor to follow the applicable grounding and bonding requirements.

D. Contractor to provide additional cabling coiled above ceiling at both the workstation locations and in telecommunication rooms. The additional lengths of cable shall be included in distance calculations. Cable routing within the telecommunication closet is to be approved by the Owner's Representative before beginning termination.

E. Fiber optic cables shall be marked with warning labels every twenty feet (20').

3.3 UNDERGROUND INSTALLATIOIN AND BUILDING ENTRANCE REQUIREMENTS

A. Prior to beginning any underground work, Contractor shall contact MISS DIG, local utility survey staff, and utility companies for the location of all existing underground services and provide, if requested, documentation of such contact to the CM. If necessary, Contractor shall pay for appropriate layout and locating of all existing utilities, and stake said utilities.

B. Contractor to install new underground pathway and conduit between the building(s) and outdoor equipment location.

C. Provide conduit and sealed junction box at all exterior wall penetrations designed to maintain the required bend radii. All entrances into the building will be properly water and fire stopped. Penetrations through exterior walls will be core or drilled hole, and finished with adequate seal and weatherproofing. Chiseling of bricks or portions of bricks is not acceptable. Filling penetrations with expanding foam insulation is not acceptable.

D. Provide a minimum 2" conduit (or as shown on the drawings) with material appropriate to the installation. All joints shall be cleaned, coupled, connected, and sealed to prevent infiltration of water.

E. Provide and install a trace wire in each underground segment.

F. Provide underground handholes where required. The top of the handhole shall be stamped or etched "Communication" or manufacturer's equivalent. Install the handholes with ¼ inch of the

final ground level, at a distance of no greater than 300' apart. Handholes shall also be installed whenever the combination of elbows and bends totals greater that 180 degrees. Handhole sizes shall be based on NEC Article 314.16 and Article 315.28; however larger than 4'x4'x4' shall not be used without written approval.

G. Contractor may utilize a directional bore or trench to install the conduit. Conduits to be installed to a minimum of 36" below grade. Installation shall follow OSHA requirements.

H. Compact all backfilled materials and level site. Restore remainder of topsoil for grass installations and re-sod restored excavation. Any concrete or asphalt damage shall be restored. Backfill excavation and trenches with compacted sand to 1' below grade and provide warning tape. Restore remainder of topsoil for grass installations. Compact crushed stone/sand for concrete/asphalt installations and restore to original condition.

I. Any installation in a public right of way, easement, or public roadways or other property not owned by the Owner shall be restored in accordance with property owners' or governing agency regulations and requirements. If no regulations govern, as a minimum restore to a condition similar to pre-installation quality.

J. Utilities and/or other services which are identified, or not identified but encountered, shall be protected by the Contractor from any damage arising or resulting from work, unless or until they are abandoned. If the utilities or services are damaged from Contractor's work, Contractor shall notify the Technology Designer immediately. Contractor shall repair any damage and restore the utilities and services to an equal or better condition than that which existed prior to the damage within four (4) hours. If the Contractor does not repair the work or the Owner or Barton Malow considers the damage unresolved in a timely manner, repairs will be made at Contractor expense.

1. Contractor shall photograph and document the environment immediately before beginning work, upon exposing any utilities, and after work and/or repair is completed. Barton Malow shall review the work and/or repairs before any work is buried.
2. Contractor will be responsible for all liabilities, damages, expenses, lawsuits or claims arising or resulting from such damage and will defend, hold harmless and indemnify Owner, Barton Malow Builders, c2ae, and Christman Construction from any claims or law suits or other expenses.

K. Contractor shall provide and maintain proper shoring and bracing during its excavation, to protect from collapse or movement, or other type of damage until such time as they are to be removed, incorporated into the new Work or can be properly backfilled upon completion of the work and inspections.

L. Unless specifically noted on the drawings as a direct-buried installation, underground installations shall be in conduit.

3.4 HANDHOLE REQUIREMENTS

A. Provide underground handholes as needed to facilitate the installation and future servicing of the backbone cables.

B. Provide Quazite underground handhole enclosures rated to 15,000 lbs.

C. The top of the handhole shall be stamped or etched "Fiber Optic Cabling" or manufacturer's equivalent.

D. Install the handholes at final ground level, at a distance of no greater than 1,000' apart. Handholes shall also be installed whenever the combination of elbows and bends totals greater that 180 degrees.

E. Handhole sizes shall be based on NEC Article 314.16 and Article 315.28; however larger than 2'x2'x2' shall not be used without written approval.

F. Conduits are to sweep up through the bottom of the handhole with the handhole bottom filled with gravel.

G. Install a ground rod in each vault or handhole and connect to wire electrode.

3.5 INSIDE CABLE INSTALLATION

A. Contractor is to follow the requirements established in section 27 1000.

B. If the termination location is greater than 50' from the building point of entrance, or as required by applicable codes, cable will be fusion spliced to plenum rated cable in a wall-mounted fiber optic splice enclosure. Point of entrance is the point within the building where the cable emerges from an external wall, from a concrete floor slab, or from rigid metal conduit or intermediate metal conduit connected to an electrode by a grounding conductor in accordance with NEC 2014 800.100 and 800.2.

C. Due to field conditions or other situations, installation locations may have to be relocated a reasonable distance from the plan location. Unless relocations, modifications and reengineering are consistently or substantially unfavorable to either the contractor or the owner, there will be no additional charge or credit for this work.

D. The contractor shall be familiar with the site and the rooms to ensure a proper installation. The final installation methods are left to the discretion of the contractor in accordance with this specification and within standards of generally accepted workmanship.

E. If non-armored fiber is approved for use, fiber optic cable shall be installed in orange, plenum-rated innerduct. Maximum fill is 40%.

F. Ensure all cables within cable trays are arranged to avoid individual cables supporting the weight of the cable bundle. Cable trays shall have appropriate bend radii for cable and fiber. Provide elbows, supports, and ties to assist in offloading the weight of the cable and adequately support the tray.

3.6 IDENTIFICATION

A. In addition to requirements in this Article, comply with TIA/EIA-606-A

B. The cable run shall be machine labeled or legibly hand labeled with indelible ink within 1" of termination. Final termination at the distribution frame is also to be appropriately tagged. All cabling and fiber optics are to be tagged in a consistent manner.

C. Fiber Optic Safety Installation. Label all fiber optic junction boxes and termination points with "fiber-optic cable - lasers in-use - possible eye injury" warnings inside and outside of the location.

D. At junction boxes, label with a description of the cable, termination location, and strand count.

3.7 FIELD QUALITY CONTROL

A. The UTP installation is to be tested to the current EIA/TIA TSB Channel Performance Testing Standard, or equivalent as approved by the Technology Designer.

1. Cables are to be tested with a Fluke OmniScanner2, or equivalent by Agilent or Wavetek, using the correct software version and adapter for the cable installation or as required for manufacturers warranty program.
2. Cables are to be tested consistently with the tester in the MC, and the injector at the remote TR.

B. Document for each pair as well as the worst margin the following test results:

1. Cable identification (Building and Circuit ID)
2. Test date
3. Cable length (ft.)
4. Wiremap
5. Delay (ns)
6. Skew (ns)
7. Resistance (Ohms)
8. Attenuation
9. NEXT
10. ELFEXT
11. Return Loss
12. PSNEXT
13. PSELFEXT

C. Optical Time Domain Reflectometer (OTDR) testing is required on all terminated fiber optic cables. The operator of the test equipment must be properly trained and have experience in the operation of this equipment and interpreting and certifying test results. While preterminated, factory-certified cables may be installed; the contractor must provide a field verifiable method of determining attenuation, continuity, bandwidth, etc. Contractor is to provide an OTDR test of each fiber spool before installation to verify fiber is not damaged upon delivery.

D. Any cables that do not meet the minimum performance criteria established by the standards or manufacturer shall be corrected or replaced at no additional cost to the Owner. If the copper backbone cable contains more than one (1) percent bad pairs, remove and replace entire cable.

3.8 DEMONSTRATION

A. Contractor shall train the Owner on the layout of the backbone cabling system including the pathways, termination methods, and interconnections.

3.9 DOCUMENTATION

A. As-Built Documentation:

1. Include scaled drawings documenting the final installation, including final location of all telecommunication rooms, cable paths, etc.
2. Drawings shall be created in AutoCAD or Revit format. Hand written drawings shall be accepted for draft or working copies only.
3. Include photographs of the completed fiber splice trays for each telecommunication closet location.

B. Cable Testing

1. Cable test results are to be provided electronically (PDFs) organized by building and telecommunication room.
2. Contractor is to review fiber/OTDR test results with Owner and annotate a sample test result indicating key indicators.

C. Underground Conduit Labeling

1. For each underground conduit used, Contractor is to label both ends of the **conduit** identifying where the conduit runs (e.g. “Fiber to Press Box”)

D. Warranty

1. Provide certificate of manufacturer’s extended warranty for the cabling system.

END OF SECTION 27 1300

SECTION 27 1500 – DATA HORIZONTAL CABLING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

B. Specification Sections:

1. 27 0000 – General Technology Requirements
2. 27 1000 – General Cabling Requirements
3. 27 1116 – Racks and Cabinets
4. 27 1300 – Backbone Cabling

1.2 SUMMARY

A. This Section includes general cabling requirements for contractors installing structured data or voice cabling within their scope of work.

B. The cabling infrastructure shall be implemented as a data solution compliant with EIA/TIA standards under T568B-2.1. Fiber optic, security, and audiovisual infrastructure shall be implemented compliant with applicable standards.

C. Extent of the cabling systems work is indicated by the drawings and schedules, and is hereby defined to include, but not by of limitation, the provisions of:

1. Horizontal cables to the telecommunication rooms.
2. All termination blocks, outlets/jacks, patch panels, patch cords, etc.
3. Termination, cross connect, and patching.

D. Data cables shall be routed so as not to exceed 90 meters in length. Notify the Technology Designer before bid period question deadline, established at the pre-bid meeting, should any changes in bid documents be required to conform to this limitation. After entering Contract, Contractor shall provide Technology Designer-approved solution to meet the 90-meter requirement without additional expense to the Owner.

E. Color Coding:

1. The following chart describes the cable type/color for the primary structured cabling systems defined in this spec section.

System	Cable Type	Distribution Cable	Patch Cable (Station)	Patch Cable (Closet)	Jack Color
Data	CAT 6	Blue	Black	Blue	Orange
Analog	CAT 6	Grey	N/A	Grey	Grey
Wireless	CAT 6A	Yellow	N/A	Orange	Yellow
Security	CAT 6	Green	N/A	Green	Green
Audiovisual	CAT 6	Black	Black	Black	Black

F. Patching:

1. This Contractor is responsible for patching to all switches. Switches will be provided, by others, equal to the number of data ports. Provide **Category 6** patch cables. Quantity shall match the total number of data cables installed.

2. Patch cables shall be the minimum lengths necessary to patch one-for-one while utilizing the wire management. Technology Designer to approve patching method before installation.

3. Do NOT patch unused patch panel ports.

4. Patch cables shall NOT have boots

5. Patch cable manufacturer shall be consistent with the patch panel and jack manufacturer.

G. Contractor shall provide and install horizontal cable tray in each telecommunication room. Unless noted otherwise, cable tray will start at the edge of the room where incoming cables are fed, provide cable support for all racks, and be secured to the walls.

1.3 DEFINITIONS

A. ER: Equipment Room

B. MC: Main Cross-connect [Applies to references to MDF]

C. TR: Telecommunication Rooms [Applies to references to IDF]

D. PoE: Power over Ethernet

1.4 SUBMITTALS

A. Prior to ordering, confirm colors of horizontal cables, patch cables, and jacks.

B. Product Data: For each type of product indicated, provide a product data sheet in both hard-copy and electronic (PDF) formats. Data sheets indicating multiple products must have the applicable product highlighted or marked.

1. Cable
2. Faceplates
3. Terminations (Patch panels, jacks, etc.)
4. Patch cables (Identify lengths, colors, and quantities)

C. Samples:

1. Faceplate with proposed labeling format.

D. Qualification Data:

1. Include written confirmation from the manufacturer that the bidder is a certified installer for the cable plant solution.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Contractor must be certified by the manufacturer of the solution being installed.

B. Layout Responsibility: Preparation of Shop Drawings by an RCDD.

C. Installation Supervision: Installation and testing shall be performed by BICSI Registered Installers or manufacturer certified installers, with a consistent supervisor who shall always be present when work of this section is performed.

D. Comply with EIA/TIA 568B-2.1, EIA/TIA 569, and EIA/TIA 606.

1.6 COORDINATION

A. Coordinate cables for door entry, video surveillance, wireless infrastructure, etc. with the contractor who will be installing the equipment for termination location and method.

1.7 WARRANTY

A. Contractor is also to provide terms of any additional warranties as a manufacturer's standard. Special warranty specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.

B. The cable plant shall be covered by the manufacturer's warranty for a minimum of fifteen (15) years (e.g. Panduit Certification Plus System Warranty, Hubbell Premise Wiring Mission Critical Warranty and System Performance Guarantee, etc.).

PART 2 - PRODUCTS

2.1 SYSTEM REQUIREMENTS

A. Coordinate the features of materials and equipment so they form an integrated system complying with TIA/EIA-568-B. Match components and interconnections for optimum future performance.

B. One manufacturer must be used for all termination jacks, patch panels, and patch cables.

C. Contractor is to use plenum rated cable and cabling accessories throughout this project.

D. All Category 6A cables will be UL limited power (LP) rated.

2.2 MANUFACTURERS

A. The following are acceptable manufacturers for general equipment within this section, unless noted otherwise for any product. Any deviations must be approved in writing by the Technology Designer before installation.

1. Voice and Data Cable
   a. Berk-Tek
   b. Belden
   c. Commscope
   d. General
   e. Liberty Wire & Cable
   f. Lucent
   g. Mohawk
   h. Superior Essex
   i. Approved Equal
2. Patch Panels, Faceplates, Station Terminations, Jacks, other Accessories
   a. Hubbell
   b. Panduit
   c. Approved Equal

2.3 DATA CABLE AND TERMINATIONS

A. Cable Standards:

1. Cabling shall be contiguous, plenum rated **Category 6/6A**, four-pair UTP cable compliant with EIA/TIA 568B-2.1 standards.
2. Cable shall be solid copper.
3. Cabling shall be certified as a complete system with other components required herein to achieve manufacturers cabling system extended warranty.

B. Termination Standards:

1. Terminations shall be **Category 6/6A** compliant modular, T568B RJ-45 jacks.
2. Video surveillance, wireless access point, or other equipment terminations shall be modular T568B RJ-45 jacks in a plenum-rated biscuit box located in the nearest accessible ceiling or junction box to the end device. Alternatively contractor can use a modular plug terminated link (i.e. direct connect) that meets the ANSI/TIA-568-C.2 clause 6.3 requirements. If a modular plug terminated link (MPTL) is used, testing must be performed with the appropriate channel adapter.

2.4 INDOOR/OUTDOOR DATA STATION CABLING

A. Cable Standards:

1. Cable is to be continuous, Category 6/6A (6A for wireless) compliant UTP cable rated for indoor and outdoor installations between two environmentally protected points, including underground pathways.
2. Use in areas with thermal or chemical exposure.
3. Plenum-rated required when cabling indoors extend beyond 50’ from the building entry location.
4. Cable shall have an UV-resistant sheath and a core of solid-copper conductors, dual insulated resistant to chemical, moisture, and thermal exposure.
5. Cabling shall be certified as a complete system with other components required herein to achieve manufacturer’s cabling system extended warranty.

B. Manufacturer:

1. Hitachi Cable Drybit Indoor-Outdoor Cable
2. Super Essex with FEP Jacket CMP Indoor/Outdoor

3. Approved equivalent

C. Termination standards:

1. Contractor shall install lightning protectors in telecommunication room for each data/voice cable.
2. Terminate at station location in “biscuit box” or as recommended by station equipment manufacturer.

2.5 PATCH PANEL DISTRIBUTION FRAME TERMINATIONS

A. Standards:

1. Patch panels must be Category 6/6A, 19”, 48-port patch panels with T568B terminations.
2. Provide patch panels for all cables installed plus eight (8) open ports in each telecommunication room for future use.
3. Patch panels shall have a rear strain relief bar to organize cables and maintain appropriate bend radius.
4. Data cables shall be terminated sequentially. If terminated on the patch panels, cables installed for building systems (fire alarm phone line, security phone line, pay phones, etc.) shall be terminated together in the last patch panel positions and its use labeled on the patch panel.

2.6 FACEPLATES AND MODULE FRAMES

A. Faceplates shall be sized to accommodate the raceway, back box, or floorbox for each location with adequate modules for the required jacks.

B. All faceplates shall be Decora style stainless steel. Utilize smooth metal 302/304 stainless steel for all faceplates. Blank plates shall be sized to fit box without Decora cutout.

1. Exception: Plastic module frames shall be used where necessary to match installation of other contractors.

C. Faceplate labels shall be secured to the faceplate (loose or removable labels on the screw covers are not permanent and not acceptable).

2.7 CABLE TRAY

A. General Requirements:

1. Contractor may utilize cable tray or ladder rack.
2. Cable tray shall have a black finish to match cabinets within each telecommunication room.

B. Size:

1. Cable tray shall be sized so that there is no more than 30% fill at the completion of the project.
2. Provide 12” wide minimum in intermediate telecommunication rooms.
3. Provide 18” wide minimum in the main telecommunication room.

C. Cable tray supports shall be adequately sized to accommodate a minimum of 5 times the weight of the maximum cable fill and tray plus 300 lbs. and as per the manufacturer's recommendations.

2.8 PATCH CABLES

A. Provide Category 6 8-conductor patch cables for use within telecommunication rooms. Provide one for every data cable installed throughout the project. Patch cables shall be the minimum lengths necessary to patch while utilizing the wire management. Technology Designer to approve patching method. Refer to the cable color chart.

B. In addition to the patch cables to be used in the telecommunication rooms, provide Category 6 8-conductor patch cables for the owner's use at the station end in the following lengths and colors. Provide one for every data cable installed throughout the project.

Min. Length	Color	Quantity
6 ft	blue	40%
15 ft	**black**	40%
20 ft	blue	20%

C. Patch cable manufacturer shall be consistent with the patch panel and jack manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. It is the Contractor's responsibility to review the site work, architectural, structural, mechanical, and electrical drawings, specifications, and field conditions, for any details that may impact the installation or provisioning of the system.

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

3.2 INSTALLATION

A. Review all closet layouts with Technology Designer prior to installation.

B. With cables being visible in spots, the Owner has said they will not accept installations that do not meet their expectations for a neat installation. Where possible in open ceiling areas with exposed ceilings, contractors are to conceal cables in trusses, use J-hooks where necessary, etc.

C. Contractor shall be familiar and install in accordance with all applicable codes and standards, including FCC, NEC (NFPA 70), EIA/TIA 568, 569 and 606, BICSI (Telecommunications Distribution Methods Manual, current edition), federal, state, and local building/fire codes.

D. Contractor shall limit cable bundles for cable runs, cables in telecommunication rooms, and penetrations to:

1. Cat 5e 52 cables
2. Cat 6 64 cables
3. Cat 6A 74 cables

E. Contractor to provide additional cabling coiled above ceiling at both the workstation locations and in telecommunication rooms. The additional lengths of cable shall be included in distance calculations. Cable routing within the telecommunication closet is to be approved by the Owner's Representative before beginning termination.

F. At station locations, terminate all 8 conductors on all jacks, regardless of data or telephone use.

G. Ensure all cables within cable trays are arranged to avoid individual cables supporting the weight of the cable bundle. Cable trays shall have appropriate bend radii for cable and fiber. Provide elbows, supports, and ties to assist in offloading the weight of the cable and adequately support the tray.

H. Service loops for Cat 6A cables are to be installed in an S-configuration and not a circular loop.

3.3 IDENTIFICATION

A. In addition to requirements in this Article, comply with TIA/EIA-606-A.

B. Each termination module shall be labeled with a white, wrap-around self-adhesive label. Use Panduit MINI-COM® Module Port Identification Self-Adhesive Labels, or equivalent.

C. Each label shall identify the telecommunication room, patch panel and patch panel port. For example: 1-A-34 would refer TR-1, patch panel A, port 34.

D. Data cable patch panels shall be labeled sequentially with letter designations A, B, C, etc.

E. Patch panel ports used for mounted devices (wireless access points, surveillance cameras, displays, etc.) will be labeled with the device name (e.g. AP-09 for access point 9, CAM-07 for surveillance camera 7, etc.).

F. In addition to the faceplate label, each cable is to be labeled behind the faceplate and patch panel with a machine generated wrap-around self-adhesive label that matches the port label on the patch panel and faceplate.

G. Each rack is to be labeled with the IDF/MDF designation (e.g. IDF-1, IDF-2) utilizing permanent adhesive labels. Labels shall be at least 2" high and should be located in the lower right-hand corner of the backboard.

3.4 FIELD QUALITY CONTROL

A. The installations must be tested and certified as compliant for Category 6/6A Gigabit connectivity. The installation is to be tested to the current EIA/TIA TSB Channel Performance Testing Standard, or equivalent as approved by the Technology Designer. For workstation locations without a patch cable, use a 10' cable at for testing purposes.

1. Cables are to be tested with a Fluke Versiv Cable Certifier, or equivalent by Agilent or Wavetek, using the correct software version and adapter for the cable installation or as required for manufacturers warranty program.
2. Cables are to be tested consistently with the tester in the telecommunication room, and the injector at the workstation termination locations.
3. Testing will be performed after faceplates have been secured to the raceway/wall/floorbox.

B. Document for each pair as well as the worst margin the following test results:

1. Cable identification (Building and Circuit ID)
2. Test date
3. Cable length (ft.)
4. Wiremap
5. Delay (ns)
6. Skew (ns)
7. Resistance (Ohms)
8. Attenuation
9. NEXT
10. ELFEXT
11. Return Loss
12. PSNEXT
13. PSELFEXT

C. Any cables that do not meet the minimum performance criteria established by the standards or manufacturer shall be corrected or replaced at no additional cost to the Owner.

3.5 DOCUMENTATION

A. As-Built Documentation:

1. Include scaled drawings reflecting the final installation, including final location of all telecommunication rooms, equipment, cable paths, outlets, etc.
2. Drawings shall include all cable routing, outlet locations, and outlet labels.
3. Provide pictures of all cabinets where equipment, patch panel, and labeling is visible.
4. Drawings shall be created in AutoCAD or Revit format. Handwritten drawings shall be accepted for draft or working copies only.

B. Cable Testing

1. Cable test results are to be provided in hard copy format as well as a PDF organized by building and telecommunication room.

C. Warranty

1. Provide certificate of manufacturer’s extended warranty for the structured cabling system.

END OF SECTION 27 1500

SECTION 27 4116 – CLASSROOM AV SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

B. Specification Sections:

1. 27 0000 – General Technology Requirements
2. 27 1000 – General Cabling Requirements

1.2 SUMMARY

A. This Section includes general requirements for:

1. Interactive displays. Contractor to provide all equipment, materials, mounts, cabling, etc. for complete systems.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated, provide the manufacturer's product data sheet in electronic (PDF) format including dimensions and data on features, performance, electrical characteristics, ratings, and finishes. Data sheets indicating multiple products must have the applicable product highlighted or marked.

1. Interactive flat panel display.
2. Cable and connectors.
3. Mounts.

B. Samples

1. Provide a sample end-to-end classroom HDMI/USB solution including patch cables, faceplates, and connectors for the Owner to test with their equipment.

1.4 QUALITY ASSURANCE

A. Clevertouch display must be provided by an authorized Clevertouch reseller, and the lead installer must be a Clevertouch Certified Engineer or Installer.

B. AV schematics, plans, details, etc. are for conceptual purposes only. Final design to be provided by contractor and approved by Technology Designer. Notify the Technology Designer before bid period question deadline established at the pre-bid meeting should any changes in the bid documents be required to meet the design concept. Once bids have been received, contractor will be responsible for providing a solution approved by the Technology Designer for meeting the design concept.

C. All AV cabling shall be professional grade and sized appropriately for each installation. If signal degradation or image issues occur as the result of cable or adapter selection/installation, it will be replaced at no additional cost to the owner.

D. All AV connectors shall be professional grade. If signal degradation or image issues occurs or as the result of connector selection/termination, it will be replaced and re-terminated at no additional cost to the owner.

E. Contractor is responsible for providing any signal amplification and transmission necessary to ensure a completely functional and professional installation whether or not such items are specifically mentioned in the plans or specifications.

F. Contractor is responsible for all patch cables required to ensure a completely functional and professional, turn-key solution.

PART 2 - PRODUCTS

2.1 INTERACTIVE FLAT PANEL DISPLAY

A. General Requirements:

1. Model: 75” Clevertouch Impact 2 unless size is noted differently on drawings
2. Warranty: Minimum 5 years
3. MDM: Minimum 5 years license (Radix or Manufacturer’s equivalent)
4. Connectivity: HDMI and USB to the teacher’s computer
5. Accessories: Five (5) spare of each accessory that come with each display (e.g. stylus, eraser, etc.)
   Include a cleaning cloth with each display
6. The unit will be mounted to facilitate cleaning and maintenance

B. In addition to the remaining specifications, contract, and manufacturer’s requirements Contractor is responsible for the following:

1. Mount the display and ancillary equipment to facilitate cleaning and maintenance while concealing cabling and equipment that are mounted behind the display.
2. Provide appropriate wall bracing where needed.
3. Use black cable wrap to conceal any visible cables either from the front or side of the display.
4. Provide 10’ audiovisual patch cables for each display unless noted otherwise on the drawings. Provide black mesh cable wrap for AV cables and integrate data cable or other cables provided by others into the cable wrap.
5. Where shown on drawings provide proper over the board bracket and wire management to properly secure and support the unit and associated installation.
6. Contractor to work with Owner to create a master display with customized display settings, district-standard apps, user settings, etc. Contractor to then setup all boards similarly.
7. All displays are to be installed with sources connected consistently. For example, if the instructor’s computer is connected to HDMI 1 in the prototype rooms then HDMI 1 is to be used for the remaining instructor’s computer connections.
8. Contractor will ensure display is on the network, named according to the district standard, enrolled in the management solution, with the latest or approved software version installed on each display.

9. Contractor is to connect display to the instructor's computer and ensure both video and USB are functioning correctly.
10. After reviewing standard classroom accessories the Owner and Technology Designer, Contractor should anticipate gathering, organizing, and delivering some accessories to the Owner in a central location, while leaving other accessories secured to the display.
11. At the completion of each room installation, Contractor is to provide photos of each installation including:
    a. Display with the Android module shown on the display
    b. Display connected to the instructor's computer, with the room number written using the display interactivity
    c. Photo of the inputs showing consistent input usage
    d. Photo of the side of the display showing the mount and cable management.

C. Software:

1. Built-in screen mirroring from Chrome, iOS, Mac OS, Windows, and Android.
2. Minimum 5 years MDM license (Radix or Manufacturer's equivalent)
3. Management software that includes as a minimum:
    a. Maintain and inventory of equipment by location, name, serial number, and software version. Group displays by building.
    b. Change device settings remotely
    c. Remotely shut down or restart individual displays or groups of displays
    d. Install apps
    e. Remotely update Android and device firmware
4. Standard software included with the equipment purchase.
5. For any software requiring licensing, include 5 years of licensing as part of base bid allowing the software to be used by all staff and students.

D. Installation Height:

1. Install so the bottom of the display screen at it's lowest position (for height adjustable mounts) is 23" aff.

E. Base Bid Manufacturers:

1. Clevertouch Impact 2

Manufacturer Contact Info:
Jack Willson, VP Clevertouch USA
jack.willson@clevertouch.com

2.2 HEIGHT ADJUSTABLE WALL MOUNT

A. General Requirements

1. Provide ability for users to raise and lower the display manually without any tools.
2. Include any accessories, extension arms, etc. required for the display.
3. Vertical shift: Minimum 15.5" with ability to remain secure in any vertical position
4. Load capacity: Rated for the weight of the display, ancillary AV equipment, plus 50 lbs.
5. Motorized: No
6. Contractor is to adjust for ease of operation, and for leveling the display.

B. Acceptable Manufacturers

1. Display manufacturer
2. Balance Box

3. Chief Fusion Dynamic
4. Peerles

2.3 MOBILE FLAT PANEL DISPLAY CART

A. General Requirements

1. Screen Size Compatibility: 65” – 86”
2. Weight Capacity: Weight of the display plus 100 lbs.
3. Color: Black power coat finish
4. Mounting Pattern Compatibility: match interactive display
5. Orientation: Landscape
6. Height Adjustable: No
7. Locking casters: Yes (minimum 2 locking)
8. Center of Display to Floor/Table Range: 50 – 70”
9. Computer Shelf: No
10. Power Strip: Provide electrical outlet strip with cord wrap
11. Cord Management: Provide cord wrap for HDMI and USB cables
12. Contractor to place fluorescent tape on the top of the cart legs.

B. Manufacturers

1. Peerless SR598
2. Copernicus
3. Approved equivalent

2.4 HDMI EXTENDERS

A. Two options are given below. Contractor can submit the solution they are comfortable supporting throughout the warranty period.

B. Whichever option is selected, Contractor must provide a sample end-to-end solution including patch cables, faceplates, and connectors for the Owner to test with their equipment.

2.5 HDMI/USB EXTENDER (Option 1)

A. General Requirements

1. Provide HDMI and USB extenders to connect the interactive flat panel display to the instructor’s computer.
2. Format: Decora Wall-plate at teacher desk and a direct connection to the interactive display.
3. Cable: Active Optical HDMI cable
4. HDMI: HDBaseT 4K@60Hz 4:4:4
5. USB: as required for the connected equipment
6. Instructor faceplate will have one HDMI and one USB input

B. Manufacturers:

1. Kramer CP-AOCH/60
2. Approved equivalent

2.6 HDMI/USB EXTENDER (Option 2)

A. General Requirements

1. Provide HDMI and USB extenders to connect the interactive flat panel display to the instructor's computer.
2. Format: Decora Wall-plate at teacher desk with receiver mounted behind interactive display.
3. HDMI: HDBaseT 4K@60Hz. HDCP compliance
4. USB: USB 3.0 with connectors required for the connected equipment
5. Instructor faceplate will have one HDMI and one USB input
6. Contractor will use plenum, shielded, pre-terminated (not field terminated), **black** Category 6 cabling for the connection between transmitter and receiver unless the manufacturer recommends using a different cable (e.g. non-shielded cable or Cat 6A cable, etc.).
7. Terminate the cable in a biscuit box secured behind the display.
8. Contractor is to modify the existing raceway/outlet or supply a surface mounted back box where necessary for the installation.
9. Mount the receiver in a serviceable location behind the display, yet concealed from audience view. Where possible, locate on the side of the display furthest from the door. Utilize cable management or cable wrap to conceal the remaining cables.

B. Manufacturers:

1. Crestron
2. Extron
3. Hall Research
4. Kramer
5. Liberty

2.7 AV CABLES

A. HDMI cables and adapters are to be hi-speed HDMI cables meeting or exceeding the following:

1. Contractor is to test the cables with the Owner's equipment and must demonstrate a 4K image at 50Hz or higher.
2. Certified to pass complete EDID information
3. Throughput of at least 18 Gbps and designed for 4K@60 4:4:4.
4. Patch cables for user equipment are to be rated by manufacturer as "flexible".
5. Provide strain relief as necessary or as recommended by manufacturer for utilized cable distance.
6. Distances:
   a. For distances up to 25' use a 24AWG HDMI cable (patch cables <15' can be 26 AWG)
   b. For distances >25' use an active Cat 6 HDMI extender or active fiber HDMI cables.

B. Manufactures:

   a. Comprehensive AV/IT Series
   b. Crestron
   c. Extron
   d. Kramer

2.8 FACEPLATES AND MODULE FRAMES

A. Faceplates shall be sized to accommodate the raceway, back box, or floorbox for each location with adequate modules for the required jacks.

B. The following are general guidelines for faceplates:

1. For recessed boxes and surface-mounted faceplates, data faceplates shall be stainless steel with module frames or decora inserts. A/V faceplates may be plastic if necessary to provide the required A/V inserts.
2. Where single-channel surface-mounted raceway and boxes are used, faceplates shall match the raceway color.
3. Where dual-channel surface-mounted raceway is used (e.g. Wiremold V4000), faceplate shall match the faceplates used in the existing installation.
4. Plastic faceplates are to be used where necessary to coordinate and match modular furniture systems.
5. Blank faceplates shall be stainless steel.
6. Blank inserts for dual-channel raceway shall match the faceplate type and color.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Review mounting locations before installation. Coordinate locations with the electrical, mechanical, and architectural contractors and mitigate conflicts with other devices and boards.

B. Coordinate mounting height/locations with existing conditions and mount to avoid covering existing devices or devices to be installed during construction.

C. Contractor shall notify Technology Designer of any conflicts before installation.

3.2 MATERIAL HANDLING

A. Contractor shall have a representative onsite to receive delivery of Owner-furnished equipment and verify equipment quantities. Any quantity deviations or items damaged on delivery shall be noted to the Owner in writing immediately following delivery.

B. Contractor shall sign for all equipment that will be installed under their contract and shall be responsible for the equipment until the complete room systems are substantially complete and transferred to the Owner. Contractor will be responsible for coordinating replacement equipment for any items non-functioning upon delivery, and will replace any equipment missing or damaged during installation.

C. Contractor will be responsible for storing equipment until the equipment can be installed. Owner may be able to provide space in a central location for a portion of the Contractor’s equipment. Contractor is responsible for transporting the equipment between the storage space and the individual buildings.

D. Contractor is responsible for any equipment stored on premise. The Owner shall not be responsible for theft or damage to any equipment prior to Owner's acceptance of equipment after it is fully installed and operational.

E. Contractor is responsible to remove packing materials and general debris from the site. The Owner's trash cans and dumpsters are not to be use used except for minor debris cleanup. Contractor is responsible for arranging dumpster drop off and pickup if they choose to use a dumpster as opposed to removing the materials from the site. Any dumpster locations and delivery/pickup times are to be coordinated with the Owner to avoid conflicts with parking, activities, or student drop off / pick up times.

3.3 INSTALLATION

A. Contractor shall choose appropriate mounting method and materials for each location based on manufacturer's requirements, wall construction, building structure, etc.

B. Coordinate equipment location with electrical contractor. Location shown on drawings is approximate; contractor may shift slightly to avoid obstructions (lights, overhead mechanical, etc.) however location must accommodate the interactive display and marker boards.

C. Equipment that extends more than 4" from the wall will be mounted a minimum of 80" above finished floor unless reviewed and approved by Technology Designer or Owner.

D. Install all components according to manufacturer's guidelines. Provide raceway as required for the installation to conceal cables.

E. Provide wire management and cable wrap to manage and conceal cables between the wall and source. Submit cable wrap color for approval prior to installation.

F. Amplifiers or other electronics that have AC line voltage power requirements can not be mounted above the ceiling.

G. Install safety cable for all ceiling equipment supported by the building steel.

H. Contractor is to register all equipment on behalf of the Owner.

3.4 DEMONSTRATION / COMMISSIONING

A. Contractor will setup a prototype classroom with all of the cabling, equipment, and connectors found in a typical classroom. Contractor will demonstrate functionality to the Owner and Technology Designer prior to installing the remaining spaces.

1. The prototype classroom will be setup in time to allow the Owner to test additional equipment in the space.
2. If the construction schedule does not allow a prototype to be setup in a classroom, contractor will utilize all cabling, equipment, and connectors to setup a prototype of the connectivity in a separate space for approval of components. Contractor will still review a typical physical installation before completing all spaces.

3.5 AS-BUILT DOCUMENTATION

A. Provide spreadsheet by building identifying installed components for the interactive displays and extenders. Spreadsheet format to be approved by Technology Designer. Include:

1. Location (architectural room number and owner's room number)
2. Manufacturer and model name
3. Model number
4. Display size
5. Serial number (display and Android module)
6. IP address and MAC address for networkable equipment
7. Extender manufacturer and model
8. Other pertinent data for the specific equipment.

B. Provide complete manufacturer's installation, set-up and maintenance instructions.

C. Provide evidence that all equipment has been registered with the manufacturer on behalf of the owner.

END OF SECTION 27 4116

SECTION 27 5116 – PUBLIC ADDRESS SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

B. Specification Sections:

1. 27 0000 – General Technology Requirements
2. 27 1000 – General Cabling Requirements

1.2 OVERVIEW

A. Expand the existing Rauland TelecenterU public address system into the classroom addition. The existing equipment is located in the MDF. The contractor can use the owner's data network to extend into the classroom addition or pull cables between the MDF and the classroom addition.

B. Contractor will need to provide the Telecenter zone paging module(s) in the new IDF 4 to extend the existing paging system into the addition. Provide IP speakers or analog speakers with IP classroom modules with the associated cabling.

C. Contractor is to update the existing building documentation to include new paging zones and as-builts.

D. Program paging zone numbers to be consistent with the existing system nomenclature.

1.3 SUMMARY

A. PA system shall provide paging, emergency signal sounding, and time-event signals (bell system) to selectable zones (interior and exterior).

B. PA system shall allow for talkback from each classroom. Provide a preannounce tone over speakers before two-way communication is enabled.

C. Classrooms will have call buttons located near the teacher's desk.

D. PA system will have separate zones for the following areas. Speakers in support spaces can be part of the zone the support space is associated with (e.g. kitchen, servery, kitchen office, food storage areas, etc. can all be included in the cafeteria zone).

1. All Call (all interior speakers)
2. Emergency (all interior + exterior speakers)
3. All exterior speakers
4. Each Instructional Space (classrooms, etc.)
5. Cafeteria

1.4 DEFINITIONS

A. PA: Public Address

1.5 SUBMITTALS

A. Product Data: For each type of product indicated, provide a product data sheet in both hard-copy and electronic (PDF) formats. Data sheets indicating multiple products must have the applicable product highlighted or marked.

1. Speakers (ceiling, surface mount, horn, etc.)
2. Cable

B. Shop Drawings: For each drawing indicated, provide in hard-copy and electronic (PDF) formats.

1. Include a composite floorplan identifying speaker locations and zone assignments.

C. Qualification Data: Include written confirmation from the manufacturer that the Contractor is an authorized factory agent or distributor for the submitted products.

1.6 QUALITY ASSURANCE

A. PA system must be provided by an authorized Rauland Soundcom reseller, and installed by a Rauland Soundcom certified installer.

B. Comply with the requirements of NFPA 70.

C. The Contractor shall install in accordance with all applicable codes and standards, including federal, state, and local codes and authorities.

1.7 COORDINATION

A. Coordinate layout, rough-in requirements, and installation of the work of this section with the Owner's equipment, furniture, electrical, mechanical, architectural, and other technology trades.

PART 2 - PRODUCTS

2.1 SYSTEM REQUIREMENTS

A. The PA system equipment will be located in IDF 4, either in the IDF cabinet or wall-mount.

B. Provide a UPS to maintain 45-minutes of full system functionality in case of a power outage.

C. System shall be addressable to allow each speaker to be assigned to one or multiple zones.

D. Amplifiers shall be sized to accommodate all speaker locations defined in the plans and specifications. The system shall also allow for additional speakers to be added (allow for 20% growth).

E. Each input shall have individual volume controls. The unit shall have 1 master volume control.

F. Include programming software, if required.

G. Provide a preannounce tone over loudspeakers.

H. The Contractor is to use plenum rated cabling and accessories throughout the project. All cables shall be continuous and free from splices.

2.2 MANUFACTURERS

A. The following are acceptable manufacturers for general equipment within this section, unless noted otherwise for any product. Any deviations must be approved in writing by the Technology Designer before installation.

1. Rauland
2. Approved equivalent

2.3 SPEAKERS

A. Classroom and cafeteria speakers are to be talkback speakers.

B. Where possible, speakers shall be recessed-mounted in suspended ceiling tiles and protected with white grilles.

C. Ceiling PA speakers and grilles are to be the Rauland BAFKIT2X2L70V or Quam System 12 2x2 tile replacement speakers. Speakers are to be 8 Ohm and 15W.

D. Wall/open-ceiling PA speakers are to be Quam System 6VP or equivalent vandal resistant loudspeaker assemblies with durable white powder coat finish. Coordinate backboxes with the masonry and electrical contractors for a final flush-mount speaker.

E. Outdoor PA speakers are to be Quam System 36VPS or equivalent vandal resistant horn loudspeaker assemblies with durable stainless steel construction with white powder coat finish.

F. Any non-recessed speakers must match the surrounding architectural finishes. Speaker selection requires Technology Designer and Architect approval.

G. Appropriate mounting accessories (grilles, enclosures, baffles, etc.) shall be provided and installed with each speaker. Accessories shall be chosen to accommodate installation location.

H. All speakers to be equipped with appropriately sized transformers.

2.4 SPEAKER CABLING

A. Wiring shall be done per manufacturer's recommendation.

B. PA contractor is responsible for Cat 6 drops associated with the PA system. Refer to section 271500 for structured cabling specifications.

C. All terminal connections to be on barrier strips.

D. All cables to be labeled by room.

E. All speaker cabling is to be shielded and plenum rated.

F. Contractor to install conduit between speakers / backboxes where cabling is not concealed above accessible ceiling.

2.5 IP SPEAKERS

A. In lieu of analog speakers, IP speakers can be used in each space and tied into the TelecenterU.

2.6 CALL BUTTONS

A. Provide Quam CB13 or equivalent rocker call switch for each location indicated on the drawings.

B. Call buttons are to be stamped as “CALL”

PART 3 - EXECUTION

3.1 EXAMINATION

A. It is the Contractor’s responsibility to review the site work, architectural, structural, mechanical, and electrical drawings, specifications, and field conditions, for any details that may impact the installation or provisioning of the system.

B. Provide all cabling, equipment, and devices to ensure the system will properly function. Any issues with the systems, design, or installation must be brought to the attention of the Technology Designer before the bid is submitted.

C. Examine pathway elements intended for cabling to verify proposed routes of pathways. Check raceways, cable trays, and other elements for compliance with space allocations, clearances, installation tolerances, hazards to cable installation, and other conditions affecting installation. Verify that cabling can be installed complying with manufacturer requirements.

D. Verify that penetrations of rated fire walls are made using products labeled for type of wall penetrated.

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

3.2 INSTALLATION

A. The Contractor shall provide all miscellaneous items and accessories required to make the system operational whether or not such items are specifically mentioned in the plans and specifications.

B. The Contractor shall protect equipment and components during installation and clean all equipment before Owner acceptance using methods and materials recommended by the manufacturer.

C. The Contractor shall be familiar with the site and the rooms to ensure a proper installation. The final installation methods are left to the discretion of the contractor in accordance with this specification, within standards of generally accepted workmanship, and in accordance with manufacturer's recommended installation practices.

D. Contractor shall review zone speaker assignments, zone numbering scheme, and tone generator designations with the Owner and Technology Designer before beginning installation. Configure according to Owner requirements.

1. Zone assignments will be consistent for similar spaces across buildings. For example, each building is to have the same assignment for all-call, emergency zones, gymnasiums, cafeterias, etc.

E. After balancing the system, Contractor shall mark all components with variable sound levels indicating the levels recommended.

F. Splice cable only in accessible junction boxes or at terminal block units. Make cable shields continuous at splices and connect speaker circuit shield to equipment ground only at amplifier.

G. Leave 24" excess cable at each termination at microphone, volume pad, speaker, or other system outlet. Leave 6 feet of excess cable at each termination at the system cabinet. Service loop to be arranged and secured.

3.3 IDENTIFICATION

A. Cable runs shall be machine labeled within 1" of each termination. All cabling is to be tagged in a consistent manner, approved by the Technology Designer.

B. Zone paging modules, tone generators, etc. shall be labeled to designate their configuration.

3.4 FIELD QUALITY CONTROL

A. Measure and record sound power levels (dB SPL) in all areas (rooms, center of each corridor, near outdoor speakers).

B. Document call and talkback functionality performs properly in all rooms.

1. Verify correct speakers assigned to each paging zones
2. Talk back
3. Emergency tones

3.5 DEMONSTRATION

A. Contractor must test system to make sure all call, zoning, talkback, and lock down drills work properly prior to demonstration. District personnel must be present for an all call and lock down drill test.

B. Demonstrate all system functions (timed events, emergency tones, telephone and clock interfaces, etc.) to Technology Designer.

C. System training to be scheduled at Owner's convenience. Contractor to provide site-specific documentation on the basic operation, programming, bell schedules (standard and holidays), and troubleshooting of the system. Contractor to record training sessions.

3.6 SYSTEM ADJUSTMENTS

A. After initial setup, contractor may be required to make additional site visits within the first year of operation (as set forth from date of substantial completion) to adjust speaker volumes for individual speakers or zones.

3.7 DOCUMENTATION

A. As-Built Documentation:

1. Include composite drawing for each building indicating paging zones, paging zone numbers, and paging instructions.
2. Provide test results log of all systems and zones with date and time of test, the db reading, and who performed the test.
3. Include scaled drawings reflecting all changes between the bid documents and the final installation including cable routing, location of all equipment, speakers, remote volume controls, etc.
4. Drawings for systems showing location and cabinet/enclosure layout. Include all components identifying component manufacturer and model, serial numbers, label, and connections.
5. Schematic drawing indicating equipment models, interconnections, naming, serial numbers, and MAC addresses for IP-based components. Include interconnections to other systems.
6. Spreadsheet indicating the sound level recorded in each area and the test date.
7. Spreadsheet indicating call and talkback functionality has been tested in each room.

END OF SECTION 27 5100

SECTION 27 5300 – POE CLOCK SYSTEM

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.

B. Specification Sections:

1. 27 0000 – General Technology Requirements
2. 27 1000 – General Cabling Requirements
3. 27 1500 – Data Horizontal Cabling
4. 27 5100 – Public Address System

1.2 SUMMARY

A. This Section includes the following related to the wireless clock system:

1. Master Clock System
2. POE Analog Clocks

B. The existing Pattengill Elementary uses a National Time Signal MC100 Master Clock

C. The clock system shall continually synchronize clocks throughout the facility, and integrate with the public address system for time synchronization.

D. Related work provided by others:

1. Public address systems or other systems that will use the clock system for time synchronization.

E. Reference standards

1. Federal Communications Division (FCC)
   Part 15 - Code of Federal Regulations.
2. National Fire Protection Association (NFPA).
   NFPA 70E-[2012], Standard for Electrical safety in the Workplace.

1.3 DEFINITIONS

A. PA: Public Address System

B. POE: Power over Ethernet

1.4 SUBMITTALS

A. Product Data: For each type of product indicated, provide a product data sheet in both hard-copy and electronic (PDF) formats. Data sheets indicating multiple products must have the applicable product highlighted or marked.

1. Hallway Digital Clock
2. Classroom Analog Clock

1.5 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who is an authorized representative of the equipment manufacturer, for both installation and supervision of the installation of the system.

B. Equipment and components furnished shall be of manufacturer's latest model.

C. Regulatory Requirements
1. Comply with NFPA 70
2. Solution shall not require an FCC license:
3. All components shall comply with Part 90 of FCC rules as follows:
    a. This device may not cause harmful interference, and
    b. This device must accept interference received, including interference that may cause undesired operation.
4. System shall be installed in compliance with local and state authorities having jurisdiction.

1.6 COORDINATION

A. Coordinate layout and installation of the work of this section with the Owner's equipment, furniture, electrical, mechanical, architectural, and other technology trades.

1.7 WARRANTY

A. The contractor warrants the system to be free of defects of workmanship or products and will inspect and repair the system during the warranty period at no additional cost to the Owner. Contractor agrees to correct system deficiencies and replace components that fail in materials or workmanship including deficiencies arising when used according to the manufacturer or Contractor's written instructions. No warranty or terms therein shall limit or be interpreted to limit remedies as provided by law

B. The warranty period shall be five (5) years.

PART 2 - PRODUCTS

2.1 SYSTEM REQUIREMENTS

A. Clock system shall synchronize clocks throughout the facility, and shall be capable of clock readouts in multiple time zones where desired. Clocks shall receive a sync signal at a maximum of every 4 hours.

B. The system shall synchronize all clocks to each other. The system shall utilize Internet-based time sync to provide accurate time. Clocks shall automatically adjust for Daylight Savings Time.

C. System is to have web-based administration.

D. Communication between components is to be in the Power over Ethernet (POE) over the Owner's network.

E. Clocks shall be synchronized so that clock accuracy shall not exceed plus or minus 1 second.

F. The system shall include an internal clock reference so that failure of the network or master clock signal shall not cause the clocks to fail in indicating time.

G. The system shall include a "fail-safe" design so that failure of any component shall not cause failure of the system. Upon restoration of power or repair of failed component, the system shall resume normal operation without the need to reset the system or any component thereof.

H. System to have diagnostic feature allowing users to view when clock is not receiving the signal.

I. Provide contact closures and all labor and materials to synchronize time across the following systems: PA system, bell system.

2.2 MANUFACTURERS

A. The following are acceptable manufacturers for general equipment within this section, unless noted otherwise for any product. Other systems using wireless technology in an unlicensed frequency range will not be accepted. Any substitutions must be included in the bid as a voluntary alternate and if accepted approved in writing by the technology designer and Owner before installation.

1. Primex Wireless
2. National Time
3. Sapling
4. Approved equivalent

2.3 MASTER CLOCK

A. Description: SNTP/NTP-based Master Clock.

1. Provide and configure PoE cloud management system to remotely manage system device settings and monitor system devices.
2. Configure identified user accounts and configure to notify the systems administrator of any devices outages.
3. Change all initial passwords to conform with the Owner's password policy.
4. Coordinate network requirements with owner's IT department.
5. Receive (S)NTP time signal via Ethernet with multiple backup addresses.
6. Automatic bi-annual Daylight Savings Time changes.
7. System shall utilize web-based programming and administration.

2.4 POE DIGITAL CLOCK

A. Description: Digital clocks shall be double-sided wall or ceiling mounted as appropriate to the location.

1. POE IEEE 802.af power using Category 6 cabling.
2. Automatically adjust for Daylight Saving Time.
3. Provide double-sided clocks where shown on the drawings.
4. Operate under DHCP or non-DHCP environments
5. If system stops transmitting valid time signals due to network failure, the clocks will continue to function as accurate clock until a valid time signal is decoded (assuming POE still works to provide power to the clock)
6. Typical Format: 4 digit red display

2.5 ANALOG CLOCK

A. Description: Analog clocks shall be wall mounted and POE powered.

1. Polycarbonate lens
2. POE IEEE 802.af power using Category 6 cabling.
3. Automatically adjust for Daylight Saving Time.
4. Clocks shall have a tamper proof/theft resistant clock lock mounting.
5. Format: 12 hour
6. Face shall be white with black hour and minute hands and red seconds hand.
7. Sizes:
   a. 16 inch diameter: Gymnasium, natatorium, cafeteria.
   b. 12-1/2 inch diameter: Remaining locations unless noted otherwise on drawings.

PART 3 - EXECUTION

3.1 EXAMINATION

A. It is the Contractor's responsibility to review the site work, architectural, structural, mechanical, and electrical drawings, specifications, and field conditions, for any details that may impact the installation or provisioning of the system.

B. Prior to installation, a site survey must be performed to determine proper clock placement. Any issues with the systems, design, or installation must be brought to the attention of the Technology Designer before the bid is submitted.

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

3.2 INSTALLATION

A. Clock locations shall be in the rooms indicated on the drawings. The locations identify the general location only; final location shall accommodate conditions in each room. Clocks shall not be installed until painting and other finish work in each room is complete.

B. The Contractor shall install the system according to the manufacturer's sequence and guidelines and in accordance with NFPA 70E.

C. The Contractor shall provide all miscellaneous items and accessories required to make the system operational whether or not such items are specifically mentioned in the plans and specifications.

D. The Contractor shall protect equipment and components during installation until final acceptance of the project, and clean all equipment before Owner acceptance using methods and materials recommended by the manufacturer. Remove temporary labels from clock face (labels on the backs of clocks to remain).

E. At completion of installation and prior to final acceptance, turn on the equipment; ensure that all equipment is operating properly, and that all clocks are functioning. Prior to final acceptance, inspect each clock, adjust as required, and replace parts which are found defective.

F. Contractor is responsible for the initial configuration of the system including setting the initial annual schedule and events.

3.3 FIELD QUALITY CONTROL

A. All devices must be tested at their operational location under normal operational conditions to assure reception of signal.

3.4 DELIVERY STORAGE AND HANDLING

A. Deliver all components to the site in the manufacturer's original packaging. Packaging shall contain manufacturer's name and address, product identification number, and other related information. Contractor to dispose of all packaging.

3.5 DEMONSTRATION

A. The Contractor shall demonstrate for the Technology Designer and Owner that the system operates under manufacturer guidelines under both normal operational conditions and during the loss of network connectivity.

B. The Contractor shall train the Owner on the operation of the system including user administration, clock configuration, modifications to the clock settings (brightness, etc.), clock configuration, configuring alerts, reporting, clock mounting, and removing a mounted clock.

3.6 DOCUMENTATION

A. Document initial user and clock settings.

B. Manufacturer's Instructions: Provide complete installation, set-up and maintenance instructions.

END OF SECTION 27 5300

SECTION 28 1300 – ACCESS CONTROL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

B. Specification Sections:

1. 08 7111 – Door Hardware
2. 27 0000 – General Technology Requirements
3. 27 1000 – General Cabling Requirements

1.2 SUMMARY

A. This Section includes the following major components related to the security system:

1. Regulating access through entry doors
2. Controllers
3. Readers
4. Electric strike

B. The intent is to expand the existing Pattengill Elementary Continental Access System into the classroom addition.

C. Card readers for new doors will be integrated into the door hardware or specified in the door hardware schedule and specifications. Refer to those documents for more information.

1. Note: the scope includes adding a card reader and electric strike to the existing building for student entry. This contractor is to provide that equipment.

D. Install new control panel/controller in the new IDF. Wire each door and bus entry card reader to the location of the access control door panel/controller. The door hardware will be specified with a whip for this contractor to tie into.

E. Contractor will be required to coordinate access permissions with the owner, and apply the required individuals credential information to the new doors. The contractor will also coordinate multiple time schedules (standard school day, early release, holiday, etc.) with the owner and apply time schedules as required to each respective opening.

F. Contractor is to wire and interconnect the card readers, electrified hardware, door operators, and handicap buttons for daily use, after hours use, lockdown events, etc.

G. Integrate with the video intercoms located at the building and office entrances, and classroom pod entrances.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. The following are acceptable manufacturers for general equipment within this section, unless noted otherwise for any product. Any substitutions must be demonstrated to the Owner and Technology Designer for approval in writing before installation.

1. Continental Access

2.2 CONTROL PANEL

A. Provide Continental Accelaterm system sized for all doors, door contacts, etc. indicated on the drawings.

B. Integrate with Owner's existing Pattengill Elementary CICP2800 Accelaterm system.

2.3 CARD READERS

A. Provide HID iCLASS SE series multi-technology readers

2.4 ELECTRIC STRIKES (Where door hardware is not provided by Other)

A. Standard Electric Strikes: Heavy duty, cylindrical and mortise lock electric strikes conforming to ANSI/BHMA A156.31, Grade 1, and UL listed for both Burglary Resistance and for use on fire rated door assemblies. Stainless steel construction with dual interlocking plunger design tested to exceed 3000 lbs. of static strength and 350 ft-lbs. of dynamic strength. Strikes tested for a minimum 1 million operating cycles. Provide strikes with 12 or 24 VDC capability and supplied standard as fail-secure unless otherwise specified. Provide latchbolt and latchbolt strike monitoring indicating both the position of the latchbolt and locked condition of the strike where specified.

1. Manufacturers:

a. HES (HS).
b. Von Duprin (VD).

B. Surface Mounted Rim Electric Strikes: Surface mounted rim exit device electric strikes conforming to ANSI/BHMA A156.31, Grade 1, and UL Listed for both Burglary Resistance and for use on fire rated door assemblies. Construction includes internally mounted solenoid with two heavy-duty, stainless steel locking mechanisms operating independently to provide tamper resistance. Strikes tested for a minimum of 500,000 operating cycles. Provide strikes with 12 or 24 VDC capability supplied standard as fail-secure unless otherwise specified. Option available for latchbolt and latchbolt strike monitoring indicating both the position of the latchbolt and locked condition of the strike. Strike requires no cutting to the jamb prior to installation.

1. Manufacturers:

a. HES (HS) - 9500/9600 Series.(Surface Mount)
b. HES (HS) – 1006 Series Complete Pac (Cut-in)

C. Provide electric strikes with in-line power controller and surge suppressor by the same manufacturer as the strike with the combined products having a five year warranty.

2.5 DOOR CONTACT

A. General Requirements:

1. Provide door contacts for all doors without door contacts integrated into the door hardware in the locations shown on the drawings.
2. Provide wiring and electronics to integrate with the Continental access control system.
3. Contractor will program contact and create events for forced entry.
4. Contractor will program and create events for held open status over three (3) minutes.

B. Manufacturer:

1. Interlogix – 1078C-G
2. Approved equivalent

2.6 MOTION REQUEST TO EXIT DEVICE

A. General Requirements:

1. Contractor shall install, configure, and program motion sensor to shunt door contact(s) on normal exit

B. Manufacturer:

1. Honeywell – IS310WH
2. Approved equivalent

2.7 POWER SUPPLY

A. Manufacturer:

1. Altronix Power Supply (ACMCB)
   a. Provide two (2) 12V 5ah Batteries
2. Approved Equivalent

PART 3 - EXECUTION

3.1 EXAMINATION

A. It is the Contractor's responsibility to review the site work, architectural, structural, mechanical, and electrical drawings, specifications, and field conditions, for any details that may impact the installation or provisioning of the system.

B. Prior to installation, a site survey must be performed to determine equipment placement. Any issues with the systems, design, or installation must be brought to the attention of the Technology Designer and Construction Manager before the bid is submitted.

C. Examine pathway elements intended for cables. Check raceways, cable trays, and other elements for compliance with space allocations, installation tolerances, hazards to cable installation, and other conditions affecting installation.

D. Notify the Construction Manager of any conditions that would adversely affect installation or subsequent use.

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

3.2 PREPARATION

A. Comply with recommendations in SIA CP-01.

B. Review project plan with Technology Designer and Owner to clarify Owner requirements before installation. Create detailed project planning and publish documents for review and approval.

1. Complete system diagnostics and operation verification.
2. Prepare a specific plan for system testing, startup, and demonstration.
3. Develop acceptance test concept and, on approval, develop specifics of the test.

C. The Contractor shall install and configure the system according to the manufacturer's sequence and guidelines as well as generally accepted standard practices.

D. Contractor will provide floorplans/maps in the system software showing the location of doors on the access control system. Maps will include visual notifications based on created events.

E. The Contractor shall provide all miscellaneous items and accessories required to make the system operational whether or not such items are specifically mentioned in the plans and specifications.

F. The Contractor shall protect equipment and components during installation until final acceptance of the project, and clean all equipment before Owner acceptance using methods and materials recommended by the manufacturer.

G. All security devices (proximity readers, keypads, etc.) shall be installed according to ADA requirements.

H. Contractor will integrate with ADA operators to automatically fire and open the door without any further action than presenting a credential at the respective reader. Verify with owner whether this will be configured globally or on an individual user level. Provide any relays or miscellaneous equipment and labor required to successfully implement this feature.

3.3 FIELD QUALITY CONTROL

A. Perform the following field tests and inspections and prepare test reports:

1. Operational Test: After installation of cables and connectors, demonstrate product capability and compliance with requirements. Test each signal path for end-to-end performance from each end of all pairs installed. Remove temporary connections when tests have been satisfactorily completed.

3.4 TRAINING

A. Perform training on any updates in software and any modifications to the software.

1. Contractor to perform two (2) 2-hour training sessions for administrators of the system.

3.5 DOCUMENTATION

A. As-Built Documentation: In addition to the requirements listed in section 27 0000 or 28 0000, include the following:

1. Composite floorplan drawing of each building indicating controlled access location, reader type and system identification, and descriptive title.

3.6 WARRANTY

A. The following warranties shall be provided by the awarded contractor at no additional cost to the Owner.

1. Include a three (3) year complete warranty, including product maintenance/software updates. The awarded contractor will be required to replace any defective product at no additional cost, including labor. The warranty shall cover defects in equipment, workmanship, materials, or system configuration.

B. Final payment shall not relieve the awarded contractor of these obligations.

END OF SECTION 28 1300

SECTION 28 1350 – ENTRY VIDEO INTERCOM

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.

B. Specification Sections:

1. 27 0000 - General Technology Requirements
2. 27 1000 - General Cabling Requirements

1.2 SUMMARY

A. This Section includes the following major components related to the security system:

1. IP Entry Intercom
2. Master Station / Answering Device

B. Related work provided by others:

1. Phone System
2. Access Control System
3. Client Computers

C. The awarded contractor will be required to procure and install building signage at each entrance with an entry intercom.

D. The intent of this project is to install a new video entry system at each building. The general requirements include:

1. New “turnkey” entry system.
2. High quality images enabling the receptionist to clearly identify individuals.
3. Allow the receptionist to respond to the visitor, reply with instructions, and unlock the door for entry.

1.3 DEFINITIONS

A. FBO: Furnished By Owner
B. FCC: Federal Communication Commission
C. FF: Fixed Focus
D. IR: Infrared
E. LAN: Local Area Network
F. PoE: Power over Ethernet, IEEE 802.3af standard
G. PoE+: Power over Ethernet, IEEE 802.3at standard
H. TR: Telecommunication Room
I. UPS: Uninterruptible Power Supply
J. UTP: Unshielded Twisted Pair
K. VLAN: Virtual Local Area Network

L. VMS: Video Management System

1.4 SUBMITTALS

A. Product Data: For each type of product indicated, provide a product data sheet in both hard-copy and electronic (PDF) formats. Data sheets indicating multiple products must have the applicable product highlighted or marked.

1. Entry Intercom
2. Master Station

1.5 QUALITY ASSURANCE

A. Contractor must provide evidence that all installation staff have attended manufacturer training.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

C. Comply with NECA 1.

D. Comply with NFPA 70.

1.6 PROJECT CONDITIONS

A. Environmental Conditions: For outdoor locations or locations in a hazardous environment the intercom must meet the following environmental conditions without mechanical or electrical damage or degradation of operating capability:

1. Exterior Environment: System components installed in locations exposed to weather shall be rated for continuous operation in ambient temperatures of minus 30 to plus 122 F dry bulb and 20 to 90 percent relative humidity, condensing. Rate for continuous operation when exposed to rain as specified in NEMA 250, winds up to 85 mph and snow cover up to 24 inches thick.
2. Hazardous Environment: System components located in areas where fire or explosion hazards may exist because of flammable gases or vapors, flammable liquids, combustible dust, or ignitable fibers shall be rated, listed, and installed according to NFPA 70.

1.7 COORDINATION

A. A separate low-voltage cabling contractor will install new Category 6 cabling to the accessible ceiling near new entry intercom locations. This contractor will coordinate with the cabling contractor regarding the installation and final terminations of the new data cabling. This contractor is responsible for coordinating the intercom cabling locations with the data cabling contractor; for making any penetrations between the accessible ceiling and final intercom location, and for the patch cable to connect from the accessible ceiling to the intercom location.

B. Coordinate layout and installation of the work of this section with the Owner's equipment, furniture, electrical, mechanical, architectural, and other technology trades.

C. Coordinate layout and installation of equipment with existing conditions, door operators, ADA operators, access control system, etc.

D. Coordinate requirements and installation with the Owner's technical staff regarding firewall, proxy server, network address translation (NAT), Quality of Service (QoS), IP addressing, etc.

E. Coordinate with the Owner for configuration to integrate with the existing ShoreTel phone system.

F. The awarded contractor will work with the Owner to evaluate and devise a proper VLAN quality of service (QoS) strategy. These strategies will be deployed during this Project. Deployment of the applicable VLANs and QoS settings will configured/deployed by an Owner's representative.

PART 2 - PRODUCTS

2.1 DOOR STATION CAMERA INTERCOMS

A. IP Intercom Specifications

1. General Requirements:

a.	IP Telephone:	Hands free IP SIP 2.0 speakerphone with echo cancellation
b.	Power Source:	PoE (802.3af or 802.3at)
c.	Integrated Camera:	1280x960 minimum Onvif camera
d.	Call Buttons:	One Call button must have integrated braille or the Contractor must install a braille label under/adjacent to the call button. Provide sample for Owner's approval.
e.	Visual Notifications:	Light/pictogram to indicate when receptionist is speaking to visitor Light/pictogram when door is unlocked
f.	Receptionist Interface:	Support web-based, physical answering unit, and IP telephone.
g.	Management Interface:	Web-based
h.	VMS Integration:	Yes
i.	Access Control Integration:	2 independent outputs to support remote door control using DTMF codes
j.	Access Control Reader:	No
k.	Warranty:	3 years

2. Accessories:

a. Provide appropriate mount back box for each location to mount intercom for best visibility by receptionist for where typical user would stand, or for the existing conditions (e.g. surface mount box, angled bracket, etc.).

3. Cabling:

a. Existing intercoms have a network cable installed or it will be installed by others. This contractor to extend as needed to new intercom location using a longer patch cable if no service loop is available.

b. Install an 18/2 communication cable between each new intercom location and the associated door controller. Contractor to survey buildings with project team and Owner to review door controller locations.

c. Provide conduit for any exposed cabling.

4. Installation:

a. Configure software on receptionist computer to view entry camera image and allow for door release.
b. Configure intercom to call the receptionist's master station / answering unit.
c. Configure intercom as SIP phone to call the receptionist, other phones, or a hunt group and integrate with existing access door controller to release door with key sequence from existing IP phones.
d. Include all mounting hardware, installation, and configuration.
e. Installation must meet ADA requirements.
f. Integrate with handicap door controllers.
g. Provide angled bracket where necessary for the camera to aim at the visitor while the visitor is standing in front of the entry door.
h. Install the answering unit at the receptionist desk.

5. Quantity of Call Buttons on Each Intercom

a. Main Building 1
b. Modular Building 2

6. Color

a. Nickel

7. Manufacturer

a. 2N IP Solo 1-button locations
b. 2N IP Verso 2.0 1-button locations
c. 2N IP Verso 2.0 Multi-button locations (provide 5-button module)
d. Approved equivalent

2.2 VIDEO MASTER STATION / ANSWERING UNIT

A. In addition to the master station, provide software/licensing to allow the receptionist computer to view the video feed and configure as a SIP phone station and program the intercom to call the receptionist phone or hunt group.

B. General Requirements

1. IP Telephone: Hands free IP SIP 2.0 speakerphone
2. Power Source: PoE (802.3af)
3. 7" Touchscreen
4. LAN: Ethernet 10/100BaseT, RJ-45
5. WiFi: No
6. Power Adapter: Yes
7. Mount Type: Desk

C. Cabling

1. Provide patch cable to the desk Cat 6 cable. Identify patch panel and switch port and coordinate port configuration with the Owner.

D. Installation

1. Configure with entry intercom to view the live camera feed, provide 2-way audio communication with users, and unlock the entry door.

E. Manufacturer

1. 2N Indoor View
2. Approved equivalent

PART 3 - EXECUTION

3.1 EXAMINATION

A. It is the Contractor's responsibility to review the site work, architectural, structural, mechanical, and electrical drawings, specifications, and field conditions, for any details that may impact the installation or provisioning of the system.

B. The Contractor shall meet and work with the Owner's staff and Technology Designer to coordinate the system operation, camera locations, camera focal areas, and integration.

C. Prior to installation, a site survey must be performed to determine equipment placement.

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

3.2 INSTALLATION

A. The Contractor shall install and configure the system according to the manufacturer's sequence and guidelines as well as generally accepted standard practices.

B. The Contractor shall provide all miscellaneous items and accessories required to make the system operational whether or not such items are specifically mentioned in the plans and specifications.

C. The Contractor shall protect equipment and components during installation until final acceptance of the project, and clean all equipment before Owner acceptance using methods and materials recommended by the manufacturer.

D. Pre-Installation

1. Contractor to coordinate rough in requirements with the architectural and electrical contractors.
2. Contractor to review intercom naming conventions with Owner.

E. Contractor to provide turn-key installation. See installation information in each Product section above.

3.3 DEMONSTRATION

A. Demonstrate methods of determining optimum alignment and adjustment of components and settings for system controls.

B. Develop site specific training modules and materials for the following:

1. Configuration of the intercom
2. Answering an intercom call
3. Initiating intercom discussion with visitor
4. Releasing the door

C. The Contractor's trainer will supply system documentation and training aids customized to this installation. Documentation shall be tailored for system administrators and typical users.

1. Include training for the IT staff on the administration of the system.
2. Include training for the office staff after installation and testing. Training will need to be coordinated with the office staff and may not occur at the time of installation.

3.4 SYSTEM ADJUSTMENTS

A. After initial setup and use, contractor is to include one trip to each building to review usage with building administrators and to adjust intercom's viewing angle, etc.

3.5 DOCUMENTATION

A. Document configuration settings for the entry intercom and master station.

B. Provide a spreadsheet for all equipment to include:

1. Manufacturer, model number, and serial number
2. Device name and IP address
3. IDF and patch panel port connected to

C. Letter or tabloid sized composite floorplan drawing of each building indicating intercom locations, door controller locations, telecommunication closet location, and cable pathways.

D. Warranty information including contact information and expiration dates.

E. All documentation is to be delivered in electronic format.

3.6 WARRANTY

A. Include a three (3) year complete warranty, including product maintenance/software updates. The awarded contractor will be required to replace any defective product at no additional cost, including labor. The warranty shall cover defects in equipment, workmanship, materials, or system configuration.

END OF SECTION 28 1350

SECTION 28 1600 – INTRUSION DETECTION

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.

B. Specification Sections:

1. 27 0000 – General Technology Requirements
2. 27 1000 – General Cabling Requirements
3. 28 1300 – Access Control
4. 28 2300 – Video Surveillance

1.2 SUMMARY

A. Expand the existing Pattengill Elementary School intrusion detection system into the modular classroom addition.

B. This Section includes the following major components related to the security system:

1. Control Panels
2. Infrared/Motion Sensors
3. Glass Break Sensors

C. This Section includes the following:

1. Intrusion detection with hard-wired, modular, microprocessor-based controls, intrusion sensors and detection devices, and communication links to perform monitoring, alarm, and control functions.
2. Responsibility for integrating electronic and electrical systems and equipment.

D. Related work provided by others:

1. Electrical system
2. Public address system
3. Phone system

1.3 DEFINITIONS

A. LCD: Liquid-crystal display.

B. LED: Light-emitting diode.

C. PIR: Passive infrared.

D. RFI: Radio-frequency interference.

E. UPS: Uninterruptible power supply.

F. Partition: A space or area for which an intrusion must be detected and uniquely identified, the sensor or group of sensors assigned to perform the detection, and any interface equipment between sensors and communication link to central-station control unit.

G. Zone: A specific sensor (door contact, motion sensor, etc.) within a Partition.

H. Standard-Intruder Movement: Any movement, such as walking, running, crawling, rolling, or jumping, of an intruder in a protected zone.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated, provide a product data sheet in both hard-copy and electronic (PDF) formats including dimensions and data on features, performance, electrical characteristics, ratings, and finishes. Data sheets indicating multiple products must have the applicable product highlighted or marked.

1. Control Panels
2. Infrared/Motion Sensors
3. Glass Break Sensors

1.5 QUALITY ASSURANCE

A. Installer Qualifications:

1. An employer of workers, at least one of whom is a technician certified by the National Burglar & Fire Alarm Association.
2. Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.

B. Comply with NFPA 70.

1.6 COORDINATION

A. Coordinate layout and installation of the work of this section with the Owner's equipment, furniture, electrical, mechanical, architectural, and other technology trades.

B. The Contractor will coordinate network communication requirements with the owner.

C. The Contractor will coordinate testing with the Owner and monitoring company. The district’s current monitoring company is EPS Security 800.966.9199.

PART 2 - PRODUCTS

2.1 SYSTEM REQUIREMENTS

A. Integrate with the Continental Access control system.

B. Provide the most current release of software and patches at the time of implementation.

2.2 SYSTEM COMPONENT REQUIREMENTS

A. Surge Protection: Protect components from voltage surges originating external to equipment housing and entering through power, communication, signal, control, or sensing leads according to manufacturer and regulatory requirements. Include surge protection for external wiring of each conductor entry connection to components.

B. Addressable Devices: Transmitter and receivers shall communicate unique device identification and status reports to central-station control unit.

2.3 KEYPAD

A. Keypad and Display Module: Arranged for entering and executing commands for system-status changes and for displaying system-status and command-related data.

B. Manufacturers:

1. Honeywell
2. Approved Equivalent

2.4 PIR SENSORS

A. Description: Sensors detect intrusion by monitoring infrared wavelengths emitted from a human body within their protected zone and by being insensitive to general thermal variations.

1. Wall-Mounting Unit Maximum Detection Range: 125 percent of indicated distance for individual units and not less than 50 feet (15 m). Provide adjustable coverage pattern as indicated on the drawings.
2. Ceiling-Mounting Unit Spot-Detection Pattern: Full 360-degree conical not less than 70ft diameter.
    a. Coverage Information
        1) Coverage is 360° x 21 m (70 ft) diameter when the detector is mounted between 3.7 m and 7.6 m (12 ft to 25 ft) high.
        2) Coverage is 15 m (50 ft) diameter when the detector is mounted at 3 m (10 ft) high.
        3) Coverage is 12 m (40 ft) when the detector is mounted at 2.4 m (8 ft) high.
        4) The pattern consists of 69 zones in 21 barriers. Each barrier is 11 m (35 ft) long and 1.5 m (5 ft) wide at 11 m (35 ft). The barriers are grouped into three groups of seven barriers each. Each group has vertical adjustment for customized coverage.
    b. Mounting Considerations
        1) A height range of 3 m to 7.6 m (8 ft to 25 ft) is recommended. The detectors can be mounted directly to the ceiling or to a standard 10.2 cm (4 in.) octagonal electrical box. Coverage is adjustable by ±10° horizontally and +2° to -18° vertically

B. Device Performance:

1. Sensitivity: Adjustable pattern coverage to detect a change in temperature of 2 deg F (1deg C) or less, and standard-intruder movement within sensor's detection patterns at any speed between 0.3 to 7.5 fps (0.09 to 2.3 m/s) across 2 adjacent segments of detector's field of view.

2. Test Indicator: LED test indicator that is not visible during normal operation. When visible, indicator shall light when sensor detects an intruder. Locate test enabling switch under sensor housing cover.
3. Remote Test: When initiated by central-station control unit, start a test sequence for each detector element that simulates standard-intruder movement within sensor's detection patterns, causing an alarm.

2.5 GLASS BREAK SENSORS

A. Provide wired glass break sensors for exterior windows shown on the drawings and integrate into intrusion detection system. Configure system to notify central station of any glass breakages.

B. Sensors are to detect both impact and shattering frequencies with a range of 30’ minimum.

C. Wireless solutions can be proposed as a voluntary alternate.

D. Manufacturers:

1. Honeywell FG730 series
2. NAPCO
3. Approved equivalent

PART 3 - EXECUTION

3.1 EXAMINATION

A. It is the Contractor’s responsibility to review the site work, architectural, structural, mechanical, and electrical drawings, specifications, and field conditions, for any details that may impact the installation or provisioning of the system.

B. Prior to installation, a site survey must be performed to determine equipment placement. Any issues with the systems, design, or installation must be brought to the attention of the Technology Designer.

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

D. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of intrusion detection.

1. Examine roughing-in for embedded and built-in anchors to verify actual locations of intrusion detection connections before intrusion detection installation.
2. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of intrusion detection.

E. Inspect built-in and cast-in anchor installations, before installing intrusion detection, to verify that anchor installations comply with requirements. Prepare inspection reports.

1. Remove and replace anchors where inspections indicate that they do not comply with requirements. Reinspect after repairs or replacements are made.

2. Perform additional inspections to determine compliance of replaced or additional anchor installations. Prepare inspection reports.

F. For material whose orientation is critical for its performance as a ballistic barrier, verify installation orientation.

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

3.2 INSTALLATION

A. The Contractor shall install and configure the system according to the manufacturer's sequence and guidelines as well as generally accepted standard practices.

B. The Contractor shall provide all miscellaneous items and accessories required to make the system operational whether or not such items are specifically mentioned in the plans and specifications.

C. The Contractor shall protect equipment and components during installation until final acceptance of the project, and clean all equipment before Owner acceptance using methods and materials recommended by the manufacturer.

D. Install power supplies and other auxiliary components for detection devices at controllers, unless otherwise indicated or required by manufacturer. Do not install such items near devices they serve.

3.3 FIELD QUALITY CONTROL

A. Pretesting: After installation, align, adjust, and balance system and perform complete pretesting to determine compliance of system with manufacturer guidelines and requirements in the Contract Documents.

B. Perform the following field tests and inspections and prepare reports:

1. Inspection: Verify that units and controls are properly labeled and interconnecting wires and terminals are identified.
2. Operational Tests: Schedule tests after pretesting has been successfully completed. Test all modes of system operation and intrusion detection at each detection device. Test for detection of intrusion and for false alarms in each protected zone. Test for false alarms by simulating activities outside indicated detection patterns.

C. Tag all equipment, stations, and other components for which tests have been satisfactorily completed.

3.4 DOCUMENTATION

A. As-Built Documentation: In addition to the requirements listed in section 27 0000, include the following:

1. Provide a letter-size composite floorplan indicating partitions, sensor locations and door contacts with their designated labels. In addition to copies included in the as-built submission, provide one copy to each building office.

2. Provide a letter-size composite floorplan indicating partitions, sensor locations and door contacts with their designated labels to each building office stored in or on the outside of the control panel.

3. Provide an electronic copy composite floorplan indicating partitions, sensor locations and door contacts with their designated labels. In addition to copies included in the as-built submission, provide one copy to each building office.

4. Provide an AutoCAD or Revit drawing showing equipment types, equipment locations, cable routing, and zone designations. Provide as PDF and in native format.

END OF SECTION 28 1600

SECTION 28 2300 – VIDEO SURVEILLANCE

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.

B. Specification Sections:

1. 27 0000 – General Technology Requirements
2. 27 1000 – General Cabling Requirements
3. 27 1500 – Data and Voice Horizontal Cabling

1.2 SUMMARY

A. This Section includes the following major components related to the security system:

1. Servers and Storage
2. Video Management System (VMS)
3. Surveillance Cameras

B. Related work provided by others:

1. Electrical System
2. Network Equipment

C. Existing Network Infrastructure:

1. All buildings are connected via a leased internet connection to the district's data center located at the Hill Center. Most buildings have a 10GB connection.
2. The network is primarily based off Aruba 2920 series PoE+ switches. Contractor will need to provide power injectors for any cameras requiring more power.

D. Existing Video Surveillance System

1. The district has an existing Milestone Professional Plus video surveillance system that this contractor will expand.
   a. SLC: M01-C05-222-01-6C4D5F
   b. Current Care Expiration: 06/30/27
   c. New camera licenses are to co-term with this date
2. Each building currently has it's own local server(s) with the management server located in the data center at the Hill Center; but they will likely consolidate all servers to the Hill Center before this project finishes.

E. New Video Surveillance System Summary

1. The Contractor is responsible for providing, installing, patching, wire managing, labeling, configuration, and interconnecting video surveillance equipment as required to provide a complete turn-key video surveillance system.

2. Coordinate with the Owner's designee to create an IP scheme, and coordinate IP addressing and camera naming on the system.
3. Configure all analytics according to the Owner's needs.
4. Provide all required end user and administrative training.

1.3 DEFINITIONS

A. B/W: Black & White
B. DAS: Direct-Attached Storage
C. DVR: Digital Video Recorder
D. FBO: Furnished By Owner
E. FCC: Federal Communication Commission
F. FF: Fixed Focus
G. IR: Infrared
H. ISM: Information Security Management
I. LAN: Local Area Network
J. MPEG: Moving Picture Experts Group
K. NAS: Network Attached Storage
L. NAT: Network Address Translation
M. NTP: Network Time Protocol
N. NTSC: National Television System Committee
O. NVR: Network Video Recorder
P. PD: Powered Device
Q. PoE: Power over Ethernet, IEEE 802.3af standard
R. PoE+: Power over Ethernet, IEEE 802.3at standard
S. PSE: Power Source Equipment
T. PTZ: Pan/Tilt/Zoom
U. PDU: Power Distribution Unit
V. QoS: Quality of Service
W. RF: Radio Frequency
X. SAN: Storage Area Network
Y. TR: Telecommunication Room
Z. UPS: Uninterruptible Power Supply
AA. UTP: Unshielded Twisted Pair
BB. VLAN: Virtual Local Area Network
CC. VMS: Video Management System
DD. WAN: Wide Area Network

1.4 GENERAL REQUIREMENTS

A. The VMS shall offer centralized management of all devices, servers and users, and offer a rule-based system driven by schedules and events.

B. The intent of this project is to expand the existing video surveillance system at the buildings and locations identified in the drawings. The general requirements include:

1. High quality images enabling the owner to clearly identify individuals.
2. Minimum of 31 days of video storage on all cameras.
3. Designated staff members will be able to view the IP surveillance system from their networked workstations. In addition, the awarded contractor will be required to setup and configure the VMS so that staff members will be able to view both individual cameras and the created "shared" views via an iOS and Android device within the District and from outside the District. The awarded contractor will be required to setup the server(s) so that "shared" views will be accessible outside the District. Furthermore, the awarded

contractor will work in conjunction with the Owner's technical staff in setting up any firewall rules to accommodate the inbound and outbound network traffic.

4. Cameras must capture color images in normal light and black & white images in low light.
5. As applicable, the contractor will include any required separate power supplies and cabling for the heater/blower utilized by exterior cameras. Place these power supplies in telecommunication closets unless noted otherwise or agreed upon in writing during the pre-install walkthrough.

1.5 SUBMITTALS

A. Product Data: For each type of product indicated, provide a product data sheet in both hard-copy and electronic (PDF) formats. Data sheets indicating multiple products must have the applicable product highlighted or marked.

1. Video Management Software
2. Surveillance Cameras (including applicable camera mounts and housings)

B. Shop Drawings: Detail assemblies of standard components that are custom assembled for specific application on this Project.

1.6 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Comply with NECA 1.

C. Comply with NFPA 70.

D. Electronic data exchange between video surveillance system with an access control system shall comply with SIA TVAC.

1.7 PROJECT CONDITIONS

A. Environmental Conditions: Products must withstand the following environmental conditions without mechanical or electrical damage or degradation of operating capability:

1. Exterior Environment: System components installed in locations exposed to weather shall be rated for continuous operation in ambient temperatures of minus 30 to plus 122 F dry bulb and 20 to 90 percent relative humidity, condensing. Rate for continuous operation when exposed to rain as specified in NEMA 250, winds up to 85 mph and snow cover up to 24 inches thick.
2. Hazardous Environment: System components located in areas where fire or explosion hazards may exist because of flammable gases or vapors, flammable liquids, combustible dust, or ignitable fibers shall be rated, listed, and installed according to NFPA 70.
3. Interior Harsh/Humid Environments: System components located in interior areas where humidity levels may be high, unconditioned spaces, or there may be higher levels of chemicals in the air (i.e. natatoriums) shall be rated, listed, and installed to prevent damage to all system components including but not limited to cameras, mounts, cabling, etc. All items shall be warrantied against such damage.

1.8 COORDINATION

A. Coordinate layout and installation of the work of this section with the Owner's equipment, furniture, electrical, mechanical, architectural, and other technology trades.

B. Coordinate layout and installation of surveillance or display equipment and suspension system components with other construction that penetrates ceilings or walls or is supported by them, including light fixtures, HVAC equipment, fire-suppression-system components, and partition assemblies.

C. Coordinate installation of roof curbs, equipment supports, and roof penetrations.

D. Coordinate requirements and installation with the Owner's technical staff regarding firewall, proxy server, network address translation (NAT), network time protocol (NTP), Quality of Service (QoS), IP addressing, etc.

E. The awarded contractor will work with the Owner to evaluate and devise a proper VLAN quality of service (QoS) strategy. These strategies will be deployed during this Project. Deployment of the applicable VLANs and QoS settings will configured/deployed by an Owner's representative.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. After the bid opening the Owner will select the bidders whose proposals they feel best serve the district. Selection will be based on cost, functionality, installer references, etc. in determination of the most responsive bidder.

B. The following are acceptable VMS manufacturers for general equipment within this section, unless noted otherwise for any product.

1. Milestone Systems Professional Plus
2. Approved Equivalent

C. The following are acceptable camera manufacturers for general equipment within this section, unless noted otherwise for any product.

1. Axis Communications [Basis of Design]
2. Hanwha
3. Approved Equivalent

D. Any substitutions must be demonstrated to the Owner and Technology Designer for approval in writing before installation.

2.2 SYSTEM REQUIREMENTS

A. Provide the most current release of software and patches at the time of implementation. Include costs of all software updates throughout the warranty period. At the end of the warranty period the Owner will be on the latest release of the software.

B. Protect signal cables and connected components against transient-voltage surges by suppressors and absorbers designed specifically for the purpose.

C. Surge Protection: Protect components from voltage surges originating external to equipment housing and entering through power, communication, signal, control, or sensing leads.

1. Surveillance contractor will provide and install all exterior cameras with surge protection at the camera end.

2.3 VIDEO MANAGEMENT SYSTEM (VMS)

A. Alarms Support

1. The Contractor is to configure the system to send alerts to the system administrator for events such as:
   a. Camera block fully or partially (active tampering)
   b. If the surveillance camera image becomes blurred because of the camera being out of focus
   c. Loss of network connectivity
   d. Server hardware or storage issues

B. Maps

1. The Contractor will implement VMS mapping where digital maps are used to represent the physical location of cameras and other devices throughout the surveillance system.
2. Maps shall have hyperlinks to create a hierarchy of interlinked maps.

2.4 SERVER / STORAGE

1. Existing servers will be used. Contractor to provide requirements after contract award.
2. Contractor will be responsible for configuration changes and camera configuration in the existing system.

2.5 SURVEILLANCE CAMERAS

A. Basis of Design Cameras: Provide cameras meeting the specifications of the following cameras as a minimum.

1.	2MP	Axis P3265-LV/LVE
2.	5MP	Axis P3267-LV/LVE
3.	5MP Dual-Head Camera	Axis P4707-PLVE
4.	12MP Fisheye 360	Axis M34318-PLVE
5.	15MP Multisensor (4 Independent)	Axis P3719-PLE
6.	360 Multisensor	Axis P3727-PLE
7.	180 Panoramic Multisensor	Axis P3827-PVE

B. General Camera Requirements: Dome camera (unless noted otherwise), assembled and tested as a manufacturer unit, containing dome assembly, camera, zoom lens, receiver/driver.

1. Comply with UL 639.
2. Compression: H.264, H.265 or Motion JPEG
3. Cameras shall produce usable images in low-light conditions to 1 lux (color) and .2 lux (B&W)

4. Cameras should capture color images in normal light and black & white images in low light.
5. Selectable modes for backlight compensation or normal lighting.
6. Camera bases to be cast aluminum with polycarbonate housings.
7. Provide and install adequate power supplies and cabling for camera requiring power beyond POE+
8. Unless noted otherwise, all cameras should be equipped with a varifocal lens.
9. Camera Management Application/Tool
    a. The camera manufacturer must offer a management application/tool to manage their cameras.
    b. The camera management application/tool will allow for the following features:
        1) Discovering of new devices (cameras)
        2) Providing unit status
        3) Device configuration
        4) Device management
        5) Firmware upgrades
        6) Cameras will be allowed to be tagged or grouped by physical location/building

C. General Lens Requirements: Optical-quality coated optics, designed specifically for video surveillance applications, and matched to specified camera. Provide color-corrected lenses with color cameras.

1. Auto-Iris Lens: Electrically controlled iris with circuit set to maintain a constant video level in varying lighting conditions.
2. Fixed Lenses: With calibrated focus ring.
3. Zoom Lenses: Motorized, remote-controlled units, rated as "quiet operating." Features include the following:

    a. Electrical Leads: Filtered to minimize video signal interference.
    b. Motor Speed: Variable.
    c. Lens shall be available with preset positioning capability to recall the position of specific scenes.

D. Exterior Camera Requirements: Provide the appropriate mount for each installation type. Multi-lens camera.
1. Multi-lens cameras shown on the building exterior must include a corner mount, attachment accessories, and flexible outdoor conduit as necessary to complete the installation.
2. Multi-lens cameras shown mid-way on an exterior wall must include the required mount to provide horizontal installation to optimize the use of the cameras lens capabilities.
3. Single-lens cameras on the building exterior must include accessory sunshield or utilize a 90 degree mount to provide appropriate shielding from direct sunlight, weather, and UV exposure.

E. General Requirements

1. Day/Night IR capability
2. Minimum resolution is identified on the drawings.
3. Wide Dynamic Range (WDR)
4. Vandal-resistant housing
5. H.264 and H.265 compression
6. Onvif compliant
7. Remote focus and zoom for all lenses.
8. Bandwidth reduction enabled.
9. Multi-sensor models shall require a single IP address and license unless otherwise noted.

2.6 CAMERA-SUPPORTING EQUIPMENT

A. General Requirements:

1. Alignment Provisions: Camera mounting allows for easy camera aiming and permits removal and reinstallation of camera-lens unit without disturbing camera alignment.
2. Rated for load in excess of the total weight supported times a minimum safety factor of two.
3. Outdoor Units: Rated for a wind load of 100 mph (160 km/h).
4. Camera Viewing Window: Polycarbonate lens aligned with camera lens.

B. Mounting Brackets for Fixed Cameras: Type matched to the items supported and mounting conditions. Include manual pan-and-tilt adjustment.

C. Protective Housings for Fixed and Movable Exterior Cameras:

1. Steel or vandal resistant polycarbonate dome, dustproof exterior enclosures with internal camera mounting and connection provisions that are matched to camera/lens combination and mounting and installation arrangement of camera to be housed.
2. Include built-in thermostat-activated heater and blower units. Units shall be automatically controlled so the environmental limits of the camera equipment are not exceeded.
3. Housing and mounting bracket shall be factory finished using manufacturer's standard finishing process suitable for the installed environment.

PART 3 - EXECUTION

3.1 EXAMINATION

A. It is the Contractor's responsibility to review the site work, architectural, structural, mechanical, and electrical drawings, specifications, and field conditions, for any details that may impact the installation or provisioning of the system.

B. The Contractor shall meet and work with the Owner's staff and Technology Designer to coordinate the system operation, camera locations, camera focal areas, and integration.

C. Prior to installation, perform a site survey to determine equipment placement. Any issues with the systems, design, or installation must be brought to the attention of the Technology Designer before the bid is submitted.

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

3.2 INSTALLATION

A. Install and configure the system according to the manufacturer's sequence and guidelines as well as generally accepted standard practices.

B. The Contractor shall provide all miscellaneous items and accessories required to make the system operational whether or not such items are specifically mentioned in the plans and specifications.

C. The Contractor shall protect equipment and components during installation until final acceptance of the project, and clean all equipment before Owner acceptance using methods and materials recommended by the manufacturer.

D. Surveillance Cameras

1. The contractor shall carefully follow instructions in documentation provided by the manufacturer to insure all steps have been taken to provide a reliable, easy-to-operate system.
2. All equipment shall be tested and configured in accordance with instructions provided by the manufacturer prior to installation to provide the maximum field of view and security.
3. All firmware found in the products shall be the latest and most up-to-date provided by the manufacturer, or of a version as specified by the provider of the video management system. If in the event that a newer firmware revision is released by the manufacturer, during the project but prior to "final" acceptance, the awarded contractor will be required to deploy the latest firmware to the components/products (i.e. surveillance cameras).
4. All equipment requiring users to log on using a password shall be configured with user/site-specific password(s). No system/product default passwords shall be allowed.
5. The awarded contractor will be responsible for configuring each surveillance camera with a name chosen by the Owner along with its applicable configuration settings. The naming convention of the surveillance cameras will be discussed in the design meetings.
6. Review all exterior cameras with the owner and configure motion masking where the following conditions occur in the view:
    a. Tree branches and leaves
    b. Unwanted street traffic
    c. Activity on neighboring private properties
7. Review all cameras with the owner and create privacy masking on computer screens and other areas deemed necessary.
8. Contractor shall configure pre/post event triggers for 10 seconds on all cameras.

E. Interior Surveillance Cameras

1. When utilizing lay-in ceilings, the contractor is to install a security cable between each camera and the building structure or ceiling tile bridge so the camera is supported independent of the ceiling tile.
2. Install so the structured data cabling system is not visible after the surveillance camera has been securely mounted.
3. Some locations will require the surveillance camera to be mounted on a wall. In this case, the awarded contractor shall utilize Wiremold® V700® or equivalent metal raceway.
4. The Wiremold® V700® metal raceway shall consist of the raceway, appropriate fittings (i.e. mounting clips and straps, bushings, etc.) and device boxes for a complete installation.
5. Due to the width of the interior hallways and stairwells, the field of view/camera image may have to be rotated so that the optimal field of view is deployed. The awarded contractor should account for the necessary time to account for this task.

F. Exterior Surveillance Cameras

1. External mounts shall be sealed to prevent any water or environmental condition from entering the surveillance camera.
2. The structured data cabling system may not be visible at any time after the surveillance camera has been securely mounted.
3. During the initial walkthrough, the awarded contractor will review the proposed mounting locations and determine the optimal height of each surveillance camera. The height of each surveillance camera shall provide that camera with the best quality of picture.
4. All exterior cameras are to be installed with surge protectors at the camera end.

G. Video Management System

1. Servers must be configured and fully installed before any internal or external cameras are mounted. Cameras are to be integrated and brought online as they are installed.
2. The awarded contractor shall meet with the Owner and Technology Designer, prior to installation, to discuss all aspects of the VMS and its storage component(s) (including recording, storage, archiving, retention, etc.)
3. The awarded contractor will be required to configure each of the surveillance cameras' properties (i.e. resolution, frame rate, sensitivity to motion, etc.) within the VMS.
4. Each server or storage component must be labeled with the applicable component name and IP address.
5. All firmware, including device packs, found in the VMS equipment and software shall be the latest and most-up-to-date provided by the manufacturer, or of a version as specified by the provider of the VMS.
6. All equipment requiring users to log on using a password shall be configured with user accounts from Microsoft® Active Directory. No system/product default passwords shall be allowed. In addition, the service accounts and system administrator shall utilize different passwords. As a direct result, if the system administrator password is modified, the various services will not be affected.
7. All permission levels, as directed by the Owner, will be configured by the awarded contractor. In addition, the awarded contractor will be required to link the Microsoft® Active Directory user groups within the VMS.
8. Each building will have its' own folder within the directory of buildings. The awarded contractor will be required to create all of the various folders. The names of the folders will be discussed within the initial design meetings. In addition, the awarded contractor will be required to create all default views within each building. All network cameras must be included in at least one default view. The default views must not contain a high number of cameras where the view slows down the various workstations or laptops. As a rule, eight (8) network cameras is the greatest number of cameras per view.
9. The awarded contractor will be required to implement the interactive mapping function of the VMS to enable users with the ability to preview a camera by "mousing over" a camera icon. In addition, all the exterior doors are labeled with number for life safety purposes. The contractor will include the door numbers on the mapping software. The number on each door will be provided by the Owner. Real-time updates of system components shall be displayed directly on the map. All building maps/images will be provided by an Owner's representative, except district level maps that will be created using satellite imagery by the contractor.
    a. Create a hierarchy of interlinked maps, starting from a broad view of the district, hyperlink to each site view for exterior cameras.
        1) Contractor to create an overview of the district utilizing satellite imagery with target hyperlinks at each precise building location.
    b. Create multi-layer hyperlinks at each site.
        1) Hyperlink from each site's exterior view to an interior view of each level of the building.
        2) Each level of the building will have its own hyperlinked map. Create an on-screen button to hyperlink between levels.
10. All interior and exterior cameras are labeled with a number for life safety and troubleshooting purposes. The surveillance contractor will work with the owner on a labeling scheme. Surveillance Contractor will label all cameras prior to installation. These numbers will be required to be transferred to the interactive mapping function. All labels must be rated for external conditions. Any labels that fall off during the warranty period are to be replaced at no cost to the Owner. The awarded contractor will be required to create a rule, within the VMS solution, that will notify the District administrators that a surveillance camera has lost its network connection. This particular rule must be applied to all surveillance cameras.

11. The “camera tampering” alert shall also be enabled within each network camera. In addition, the VMS must recognize the condition and alert the Owner if this condition is met. The contractor is to configure the alerts based on the Owner’s preference.
12. The VMS shall direct all cameras to obtain their time from a District specified NTP (Network Time Protocol) server. If the Owner doesn’t have an existing NTP server, the contractor shall configure the NTP on one of the security servers or through a third party.
13. Load balance each building’s cameras across multiple servers. If a server fails, the entire building will not suffer due to a camera outage.
14. Load balance all servers to prevent video loss due to over buffering (exceeding the processing limits of any single server).

H. Camera Management Application/Tool

1. Contractor to discover all network cameras and import them into the management application.
2. Each building will have its own folder. Within each building folder, each installed model will have its own folder.
3. Populate each camera within the appropriate folder to allow for simpler future camera management.

3.3 FIELD QUALITY CONTROL

A. Pretesting: Align and adjust system and pretest components, wiring, and functions to verify that they comply with specified requirements. Conduct tests at varying lighting levels, including day and night scenes as applicable. Prepare video surveillance equipment for acceptance and operational testing as follows:

1. Verify operation of auto-iris lenses.
2. Work with Owner and to set all varifocal lenses.
3. Set and name all preset positions; consult Owner's personnel.
4. Set sensitivity of motion detection.
5. Connect and verify responses to alarms.
6. Verify operation of control-station equipment.

3.4 SYSTEM ADJUSTMENTS

A. Before customer sign off takes a place, a walkthrough with the awarded contractor, building administration, IT Director and Technology Consultant will take place to approve field of views and focus of all surveillance cameras. The awarded contractor will have at least a total of three (3) personnel onsite to make changes during walkthrough for approval. One (1) staff member viewing the cameras and two (2) staff members making any necessary adjustments.

B. Six (6) months after initial setup and substantial completion, Contractor is to include one trip to each building to review VMS usage with building administrators and to adjust any individual camera’s viewing angle, etc.

3.5 DOCUMENTATION

A. As-Built Documentation:
1. All of the items below must be included in a three-ring binder that will be presented to the Owner during the “close out” meeting. The following items are to be a minimum:
   a. Awarded Contractor’s Contact Information

b. Contractor's Guarantee/Warranty
c. VMS Licensing Information
d. Operations & Maintenance Manuals/CDs
e. Spreadsheet with the following for each server and camera
    1) Equipment manufacturer and model
    2) Serial Number
    3) MAC address
    4) IP address (if static IP addresses are used)
    5) Installed location (building and location description)
    6) Data cable number, closet location
    7) Network port information

2. A set of drawings showing locations of all equipment locations and approximate cable paths.
3. Documentation (including contact information) on the equipment warranties, warranty expiration, manufacturer and Contractor technical support number, and applicable software assurance(s)
4. Manufacturer specification/cut sheets for the systems and equipment installed.
5. Installation and programming manuals for all hardware and software components.

3.6 WARRANTY

A. Contractor is to register all equipment in the Owner's name, not the Contractor's. All manufacturer warranty and support must be available to the Owner directly and not required to channel through the Contractor, distributor, or other entity.

B. The Contractor warrants the system to be free of defects of workmanship or products and will inspect and repair the system within twenty-four (24) hours during the warranty period at no additional cost to the Owner. The Contractor shall respond on site within four (4) hours notice, and without cost to the Owner, during this warranty period. Contractor agrees to correct system deficiencies and replace components that fail in materials or workmanship including deficiencies arising when used according to the manufacturer or Contractor's written instructions. No warranty or terms therein shall limit or be interpreted to limit remedies as provided by law.

C. Warranty Duration

1. All equipment will be provided with a five (5) year hardware and software warranty unless noted otherwise.

D. Contractor will be responsible for servicing any new servers during the warranty period. Contractor will be responsible to coordinate camera replacement and shipping, though the Owner can physically install warranty cameras.

E. Bidders are to extend the same hardware and software warranty duration for their entire proposed base bid and alternate solution(s) whether the item is to comply with the base bid or whether it is a value-added benefit of the solution not specifically requested in the specifications but provided as part of the proposed solution.

F. The warranty shall include phone support and software assurance including patches, updates and version upgrades for both major and minor releases throughout the warranty period.

G. The Owner shall not be responsible for additional charges during the equipment warranty period. Labor, service charges, trip charges, etc. to configure and install equipment during the warranty period shall be included in the contractor's warranty.

H. Contractor is to provide documentation for all manufacturer's warranties including the operating conditions required for the warranty.

I. Contractor is also to provide terms of any additional warranties as a manufacturer's standard. Special warranty specified shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.

END OF SECTION 28 2300

SECTION 28 4600
FIRE DETECTION AND ALARM

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Fire alarm system design and installation, including all components, wiring, and conduit.

B. Transmitters for communication with supervising station.

C. Circuits from protected premises to supervising station, including conduit.

D. Replacement and removal of existing fire alarm system components, wiring, and conduit indicated.

E. Maintenance of fire alarm system under contract for specified warranty period.

1.2 RELATED REQUIREMENTS

A. Division 01 - General Requirements: Project adminstrative and procedural requirements.

B. Division 02 - Existing Conditions: Demolition, cleaning and disposal requirements, cutting and patching requirements, and repairs.

C. Division 07 - Thermal and Moisture Protection: Materials and methods for work to be performed by this installer.

D. Division 08 - Openings: Door hardware, coiling fire doors and smoke and/or fire curtains to be released by fire alarm system.

E. Division 14 - Conveying Equipment: Elevator systems monitored and controlled by fire alarm system and sensors and interlocks by fire alarm system.

F. Section 21 1300 - Fire-Suppression Sprinkler Systems: Supervisory, alarm, and actuating devices installed in sprinkler system.

G. Section 23 3300 - Air Duct Accessories: Smoke dampers and Smoke detectors monitored and controlled by fire alarm system.

H. Section 26 0005 - Basic Electrical Requirements.

I. Section 26 0533.13 - Conduit for Electrical Systems.

J. Section 26 0533.16 - Boxes for Electrical Systems.

K. Section 26 0553 - Identification for Electrical Systems.

1.3 REFERENCE STANDARDS

A. 36 CFR 1191 - Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines; current edition.

B. ADA Standards - 2010 ADA Standards for Accessible Design; 2010.

C. IEEE C62.41.2 - IEEE Recommended Practice on Characterization of Surges in Low-Voltage (1000 V and less) AC Power Circuits; 2002 (Corrigendum 2012).

D. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

E. NFPA 72 - National Fire Alarm and Signaling Code; Most Recent Edition Cited by Referring Code or Reference Standard.

F. NFPA 101 - Life Safety Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

G. UL 268 - Standard for Smoke Detectors for Fire Alarm Systems; Current Edition, Including All Revisions.

1.4 SUBMITTALS

A. Contractor shall provide submittals for equipment listed herein. Refer to Division 01 for submittal procedures.

B. Evidence of designer qualifications.

C. Design Documents: Submit all information required for plan review and permitting by authorities having jurisdiction, including but not limited to floor plans, riser diagrams, and description of operation:

1. Copy (if any) of list of data required by authority having jurisdiction.

2. NFPA 72 "Record of Completion", filled out to the extent known at the time.

3. Clear and concise description of operation, with input/output matrix similar to that shown in NFPA 72 Appendix A-7-5-2.2(9), and complete listing of software required.

4. System zone boundaries and interfaces to fire safety systems.

5. Location of all components, circuits, and raceways; mark components with identifiers used in control unit programming.

6. Circuit layouts; number, size, and type of raceways and conductors; conduit fill calculations; spare capacity calculations; notification appliance circuit voltage drop calculations.

7. List of all devices on each signaling line circuit, with spare capacity indicated.

8. Manufacturer's detailed data sheet for each component, including wiring diagrams, installation instructions, and circuit length limitations.

9. Description of power supplies; if secondary power is by battery include calculations demonstrating adequate battery power.

10. Certification by either the manufacturer of the control unit or by the manufacturer of each other component that the components are compatible with the control unit.

11. Certification by the manufacturer of the control unit that the system design complies with Contract Documents.

12. Certification by Contractor that the system design complies with Contract Documents.

D. Evidence of installer qualifications.

E. Evidence of instructor qualifications; training lesson plan outline.

F. Evidence of maintenance contractor qualifications, if different from installer.

G. Inspection and Test Reports:

1. Submit inspection and test plan prior to closeout demonstration.

2. Submit documentation of satisfactory inspections and tests.

3. Submit NFPA 72 "Inspection and Test Form," filled out.

H. Operating and Maintenance Data: Revise and resubmit until acceptable; have one set available during closeout demonstration:

1. Complete set of specified design documents, as approved by authority having jurisdiction.

2. Additional printed set of project record documents and closeout documents, bound or filed in same manuals.

3. Contact information for firm that will be providing contract maintenance and trouble call-back service.

4. List of recommended spare parts, tools, and instruments for testing.

5. Replacement parts list with current prices, and source of supply.

6. Detailed troubleshooting guide and large scale input/output matrix.

7. Preventive maintenance, inspection, and testing schedule complying with NFPA 72; provide printed copy and computer format acceptable to Owner.

8. Detailed but easy to read explanation of procedures to be taken by non-technical administrative personnel in the event of system trouble, when routine testing is being conducted, for fire drills, and when entering into contracts for remodeling.

I. Project Record Documents: Have one set available during closeout demonstration:

1. Complete set of floor plans showing actual installed locations of components, conduit, and zones.

2. "As installed" wiring and schematic diagrams, with final terminal identifications.

3. "As programmed" operating sequences, including control events by device, updated input/output chart, and voice messages by event.

J. Closeout Documents:

1. Certification by manufacturer that the system has been installed in compliance with manufacturer's installation requirements, is complete, and is in satisfactory operating condition.

2. NFPA 72 "Record of Completion", filled out completely and signed by installer and authorized representative of authority having jurisdiction.

1.5 QUALITY ASSURANCE

A. Designer Qualifications: NICET Level III or IV (3 or 4) certified fire alarm technician or registered fire protection engineer, employed by fire alarm control panel manufacturer, Contractor, or installer , with experience designing fire alarm systems in the jurisdictional area of the authorities having jurisdiction.

B. Installer Qualifications: Firm with minimum 3 years documented experience installing fire alarm systems of the specified type and providing contract maintenance service as a regular part of their business.

1. Authorized representative of control unit manufacturer; submit manufacturer's certification that installer is authorized; include name and title of manufacturer's representative making certification.

2. Installer Personnel: At least 2 years of experience installing fire alarm systems.

3. Supervisor: NICET level III or IV (3 or 4) certified fire alarm technician; furnish name and address.

C. Maintenance Contractor Qualifications: Same entity as installer or different entity with specified qualifications.

D. Instructor Qualifications: Experienced in technical instruction, understanding fire alarm theory, and able to provide the required training; trained by fire alarm control unit manufacturer.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Fire Alarm Control Units and Accessories:

1. National Time & Signal: www.natsco.net.

2. Provide control units made by the same manufacturer.

B. Initiating Devices and Notification Appliances:

1. Same manufacturer as control units.

2. Provide initiating devices and notification appliances made by the same manufacturer, where possible.

2.2 FIRE ALARM SYSTEM

A. Fire Alarm System: Provide a new automatic fire detection and alarm system:

1. Provide all components necessary, regardless of whether shown in Contract Documents or not.

2. Protected Premises: Entire building shown on drawings.

3. Comply with the following; where requirements conflict, order of precedence of requirements is as listed:

a. ADA Standards.

b. The requirements of the local authority having jurisdiction .

c. Applicable local codes.

d. Contract Documents (drawings and specifications).

e. NFPA 72; where the word "should" is used consider that provision mandatory; where conflicts between requirements require deviation from NFPA 72, identify deviations clearly on design documents.

4. Evacuation Alarm: Multiple smoke zones; allow for evacuation notification of any individual zone or combination of zones, in addition to general evacuation of entire premises.

5. Voice Notification: Provide emergency voice/alarm communications with multichannel capability; digital.

6. General Evacuation Zones: Each smoke zone is considered a general evacuation zone unless otherwise indicated, with alarm notification in all zones on the same floor, on the floor above, and the floor below.

7. Program notification zones and voice messages as directed by Owner.

8. Fire Command Center: Location indicated on drawings.

9. Fire Alarm Control Unit: New, located at supervising station.

B. Supervising Stations and Fire Department Connections:

1. Public Fire Department Notification: By on-premises supervising station.

2. On-Premises Supervising Station: Existing proprietary station operated by Owner, located at main building.

3. Means of Transmission to On-Premises Supervising Station: Directly connected noncoded system.

C. Circuits:

1. Initiating Device Circuits (IDC): Class B, Style A.

2. Signaling Line Circuits (SLC) Within Single Building: Class B, Style 0.5.

3. Notification Appliance Circuits (NAC): Class B, Style W.

D. Spare Capacity:

1. Fire Alarm Control Units: Capable of handling all circuits utilized to capacity without requiring additional components other than plug-in control modules.

E. Power Sources:

1. Primary: Dedicated branch circuits of the facility power distribution system.

2. Secondary: Storage batteries.

3. Capacity: Sufficient to operate entire system for period specified by NFPA 72.

4. Each Computer System: Provide uninterruptible power supply (UPS).

2.3 FIRE SAFETY SYSTEMS INTERFACES

A. Supervision: Provide supervisory signals in accordance with NFPA 72 for the following:

1. Sprinkler water control valves.

2. Dry-pipe sprinkler system pressure.

3. Dry-pipe sprinkler valve room low temperature.

B. Alarm: Provide alarm initiation in accordance with NFPA 72 for the following:

1. Sprinkler water flow.

C. Lighting Control

1. Connection between fire alarm systems and lighting control systems.

    a. Upon activation of fire alarm system, lighting control system shall provide full illumination to all emergency fixtures along path of egress for 90 minutes, or until alarm is reset.

D. HVAC:

1. Duct Smoke Detectors: Close dampers indicated; shut down air handlers indicated.

2. Control Modules: Shut down air handlers indicated.

E. Sound and Entertainment Systems:

1. Turn off Sound and Entertainment Systems upon activation from Fire Alarm controller.

F. Doors:

1. Smoke Barrier Door Magnetic Holders: Release upon activation of smoke detectors in smoke zone on either side of door, upon alarm from manual pull station on same floor, and upon sprinkler activation on same floor. Refer to Section 08 7100.

2. Electromagnetic Door Locks on Egress Doors: Unlock upon activation of any alarm initiating device or suppression system in smoke zone that doors serve as egress from. Refer to Division 08.

2.4 COMPONENTS

A. General:

1. Provide flush mounted units where installed in finish areas; in unfinished areas, surface mounted unit are acceptable.

2. Provide legible, permanent labels for each control device, using identification used in operation and maintenance data.

B. Fire Alarm Control Units: Analog, addressable type; listed, classified, and labeled as suitable for the purpose intended.

C. Master Control Unit: as specified in Basis of Design.

D. Remote Annunciators: locate per plans.

E. Initiating Devices:

1. Addressable Systems:

    a. Addressable Devices: Individually identifiable by addressable fire alarm control unit.

b. Provide suitable addressable interface modules as indicated or as required for connection to conventional (non-addressable) devices and other components that provide a dry closure output.

c. Connect all dwelling unit initiating devices back to Fire Alarm Control Panel. Provide supervisory signal to Supervising Station.

F. Circuit Conductors: Copper or optical fiber; provide 200 feet extra; color code and label.

G. Surge Protection: In accordance with IEEE C62.41.2 category B combination waveform and NFPA 70; except for optical fiber conductors.

H. Locks and Keys: Deliver keys to Owner.

I. Instruction Charts: Printed instruction chart for operators, showing steps to be taken when a signal is received (normal, alarm, supervisory, and trouble); easily readable from normal operator's station.

1. Frame: Stainless steel or aluminum with polycarbonate or glass cover.

2. Provide one for each control unit where operations are to be performed.

3. Obtain approval of Owner prior to mounting; mount in location acceptable to Owner.

4. Provide extra copy with operation and maintenance data submittal.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install in accordance with applicable codes, NFPA 72, NFPA 70, and Contract Documents.

B. Conceal all wiring, conduit, boxes, and supports where installed in finished areas.

C. Obtain Owner's approval of locations of devices, before installation.

D. Install instruction cards and labels.

3.2 INSPECTION AND TESTING FOR COMPLETION

A. Notify Owner 7 days prior to beginning completion inspections and tests.

B. Notify authorities having jurisdiction and comply with their requirements for scheduling inspections and tests and for observation by their personnel.

C. Provide the services of the installer's supervisor or person with equivalent qualifications to supervise inspection and testing, correction, and adjustments.

D. Prepare for testing by ensuring that all work is complete and correct; perform preliminary tests as required.

E. Provide all tools, software, and supplies required to accomplish inspection and testing.

F. Perform inspection and testing in accordance with NFPA 72 and requirements of local authorities; document each inspection and test.

G. Correct defective work, adjust for proper operation, and retest until entire system complies with Contract Documents.

3.3 OWNER PERSONNEL INSTRUCTION

A. Provide the following instruction to designated Owner personnel:

1. Hands-On Instruction: On-site, using operational system.

2. Classroom Instruction: Owner furnished classroom, on-site or at other local facility.

B. Administrative: One-hour session(s) covering issues necessary for non-technical administrative staff; classroom:

1. Initial Training: 1 session pre-closeout.

C. Basic Operation: One-hour sessions for attendant personnel, security officers, and engineering staff; combination of classroom and hands-on:

1. Initial Training: 1 session pre-closeout.

D. Furnish the services of instructors and teaching aids; have copies of operation and maintenance data available during instruction.

3.4 CLOSEOUT

A. Closeout Demonstration: Demonstrate proper operation of all functions to Owner.

1. Be prepared to conduct any of the required tests.

2. Have at least one copy of operation and maintenance data, preliminary copy of project record drawings, input/output matrix, and operator instruction chart(s) available during demonstration.

3. Have authorized technical representative of control unit manufacturer present during demonstration.

4. Demonstration may be combined with inspection and testing required by authority having jurisdiction; notify authority having jurisdiction in time to schedule demonstration.

5. Repeat demonstration until successful.

3.5 MAINTENANCE

A. See Division 01 for additional requirements relating to maintenance service.

B. Perform routine inspection, testing, and preventive maintenance required by NFPA 72, including:

1. Maintenance of fire safety interface and supervisory devices connected to fire alarm system.

2. Repairs required, unless due to improper use, accidents, or negligence beyond the control of the maintenance contractor.

3. Record keeping required by NFPA 72 and authorities having jurisdiction.

C. Provide trouble call-back service upon notification by Owner:

1. Provide on-site response within 2 hours of notification.

2. Include allowance for call-back service during normal working hours at no extra cost to Owner.

3. Owner will pay for call-back service outside of normal working hours on an hourly basis, based on actual time spent at site and not including travel time; include hourly rate and definition of normal working hours in maintenance contract.

D. Provide a complete description of preventive maintenance, systematic examination, adjustment, cleaning, inspection, and testing, with a detailed schedule.

E. Maintain a log at each fire alarm control unit, listing the date and time of each inspection and call-back visit, the condition of the system, nature of the trouble, correction performed, and parts replaced. Submit duplicate of each log entry to Owner's representative upon completion of site visit.

F. Comply with Owner's requirements for access to facility and security.

PATTENGILL MODULAR CLASSROOM BUILDING
LANSING SCHOOL DISTRICT

CONSTRUCTION DOCUMENTS BP#3
04.19.2024

DIRECTORY

CLIENT:
LANSING SCHOOL DISTRICT
519 WEST KALAMAZOO ST
LANSING, MI
P. (517) 755-1000

ARCHITECT & CIVIL ENGINEER:
KINGSCOTT ASSOCIATES INC.
259 E MICHIGAN AVE, SUITE 308
KALAMAZOO, MI 49007
TEL. (800) 632-7815

CONSTRUCTION MANAGER:
THE CHRISTMAN COMPANY
209 N. CAPITOL AVENUE
LANSING, MI 48933
P. (517) 482-1488

STRUCTURAL ENGINEER:
ROBERT DARVAS ASSOCIATES
442 S MAIN ST
ANN ARBOR, MI 48104
P. (734) 761-8713

MEP ENGINEER:
SES ENGINEERING
4000 WEST 11 MILE ROAD
BERKLEY, MI 48072
(248) 399-1900

TECHNOLOGY:
BARTON MALOW
26500 AMERICAN DR
SOUTHFIELD, MI 48034
(248) 436-5000

SHEET INDEX:

KINGSCOTT
KALAMAZOO | CHELSEA | GRAND RAPIDS | ROYAL OAK

PATTENGILL MODULAR CLASSROOM BUILDING
LANSING SCHOOL DISTRICT
815 North Fairview Avenue, Lansing, MI

Lansing School District

ISSUANCES	DATE
CONSTRUCTION DOCUMENTS BP03	04.19.2024

KEY PLAN

JOB NO. 2616.05

N

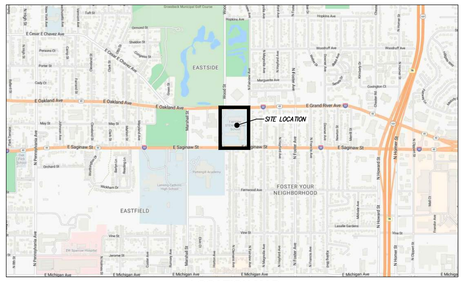
SHEET TITLE
TITLE SHEET

SHEET NO.
G0.1

SITE CONSTRUCTION PLANS

PATTENGILL MODULAR CLASSROOM BUILDING

815 N FAIRVIEW AVENUE, LANSING, MICHIGAN



LOCATION MAP

DEVELOPMENT TEAM

CIVIL ENGINEER
SPALDING DeDECKER
905 SOUTH BOULEVARD EAST
ROCHESTER HILLS, MICHIGAN 48307
CONTACT: CRAIG GENGLER
EMAIL: CGENGLER@SDA-ENG.COM
PHONE (248) 844-5400

ARCHITECT
KINGSCOTT
259 E. MICHIGAN AVENUE, SUITE 308
KALAMAZOO, MICHIGAN 49007
CONTACT: SAMI SZESZULSKI
EMAIL: SSZESZULSKI@KINGSCOTT.COM
PHONE: (800) 632-7815

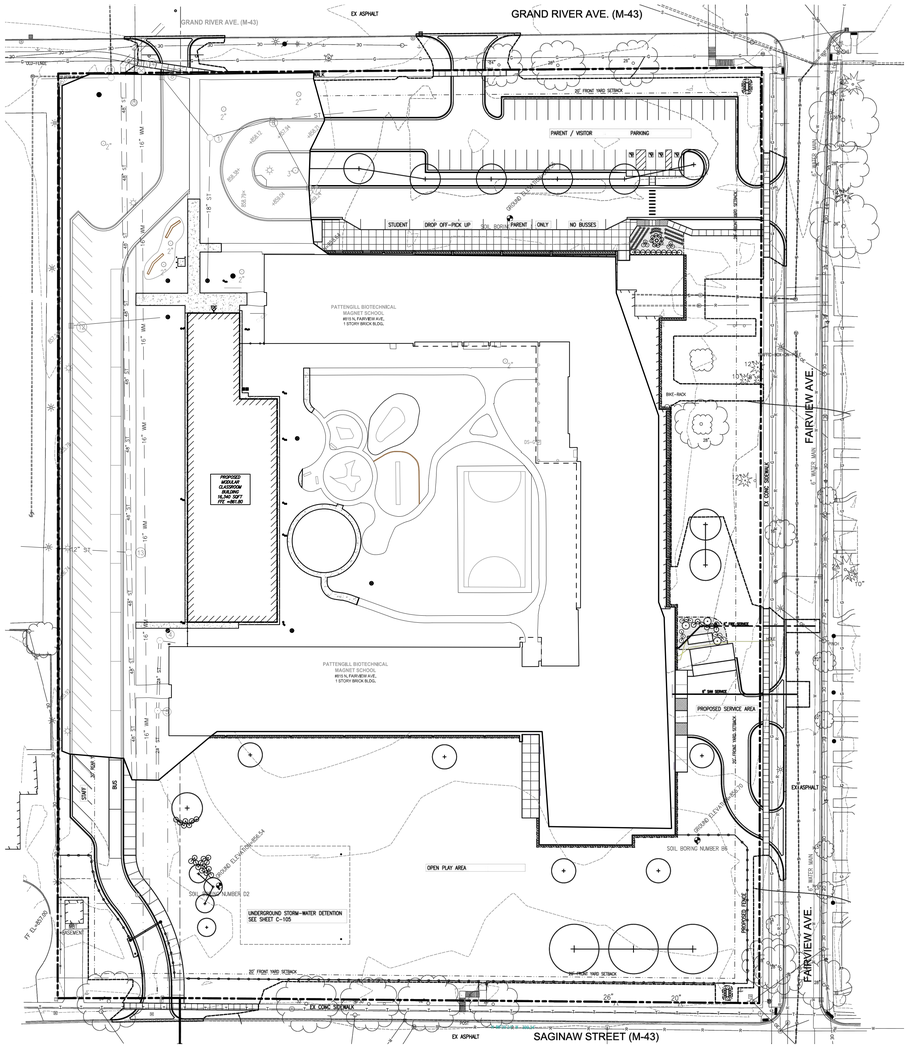
OWNER
LANSING SCHOOL DISTRICT
519 W. KALAMAZOO STREET
LANSING, MI 48933
517-755-1000

GOVERNING AGENCIES

PLANNING
CITY OF LANSING
DEPARTMENT OF ECONOMIC DEVELOPMENT & PLANNING
316 N. CAPITOL AVE.
LANSING, MI 48933
CONTACT SUSAN STACHOWIAK
PHONE 517-483-4085

ENGINEERING
CITY OF LANSING
PUBLIC SERVICE DEPARTMENT - ENGINEERING
124 W. MICHIGAN AVE.
LANSING, MI 48933
CONTACT DANIEL DANKE
PHONE 517-483-4461

LANSING BOARD OF WATER & LIGHT
PO BOX 13007
LANSING, MI 48901
CONTACT JANET MCNEW
PHONE 517-702-6693



GRAPHIC SCALE
0 25 50 100
(IN FEET)
1 inch = 50 ft.

SHEET INDEX

PROJECT NARRATIVE

A NEW 16,340 SF CLASSROOM ADDITION IS PROPOSED ON THE WEST SIDE OF PATTENGILL ELEMENTARY SCHOOL. THE PROJECT SCOPE WILL INCLUDE EARTHWORK, RE-ROUTING EXISTING STORM SEWER, STORMWATER MANAGEMENT IMPROVEMENTS, AND NEW WATER AND SEWER CONNECTIONS.

WETLANDS

THERE ARE NO EXISTING WETLANDS ON-SITE.

FLOODPLAIN NOTE

PER THE FEDERAL EMERGENCY MANAGEMENT AGENCY (FEMA) FLOOD MAP (MAP NO. 26065C0132D, DATED AUGUST 16, 2011), THE SITE DOES NOT LIE WITHIN A FLOOD HAZARD AREA.

KINGSCOTT
KALAMAZOO | CHELSEA | GRAND RAPIDS | ROYAL OAK

Pattengill Elementary School
MODULAR CLASSROOM BUILDING
Lansing School District

Lansing School District

REVISIONS/REVIEW	DATE
Early Site Work	3.5.2024
Addendum #1	3.20.2024
Addendum #2	3.26.2024
Issued for Permits	4.15.2024
Construction Documents BP03	4.19.2024

KEY PLAN

NORTH

JOB NO. **NP24011**

SHEET TITLE
COVER

SHEET NO.
C0.0

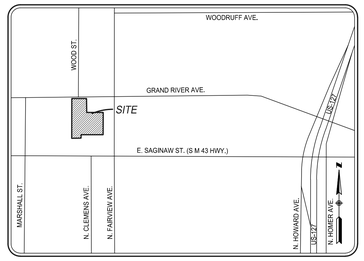
BP01 -FOR REFERENCE

LEGEND

- MANHOLE
- CATCH BASIN
- C.O. SEWER CLEAN OUT
- GAS METER
- GAS SHUT OFF VALVE
- VALVE BOX
- GATE VALVE & WELL
- WATER SHUT OFF VALVE
- FIRE HYDRANT
- SPRINKLER VALVE BOX
- LAWN SPRINKLER HEAD
- UNVERIFIED MAPPED OBJECT
- ELECTRIC RISER OR METER
- TELEPHONE RISER
- CABLE TV RISER
- AIR CONDITION UNIT
- UTILITY POLE
- UTILITY POLE W/ LAMP EXTENSION (ARROW INDICATES DIRECTION OF ARM)
- LIGHT POLE
- LIGHT POLE WITH LAMP EXTENSION
- TRAFFIC SIGNAL
- POLE W/ TRAFFIC SIGNAL (OVER ROAD)
- GUY WIRE
- GROUND LEVEL / DECORATIVE LIGHTING
- FLAG POLE
- METAL OR CONC. POST
- MAILBOX
- SIGN
- WATER FOUNTAIN
- PARKING METER
- BILLBOARD OR LARGE SIGN
- BASKETBALL HOOP
- BOULDER
- STATUE OR SCULPTURE
- BENCH — BENCH
- BIKE RACK — BIKE RACK
- PICNIC TABLE
- SOCCER GOAL — SOCCER GOAL
- STUMP
- DS-S — DOWNSPOUT INTO STORM DRAIN
- DS-G — DOWNSPOUT TO GROUND
- CONIFEROUS TREE
- DECIDUOUS TREE
- DECIDUOUS SHRUB
- CONIFEROUS SHRUB
- SECTION CORNER
- SDA#10 — TRAVERSE POINT
- 1 — STRUCTURE NUMBER
- 100 — SDA POINT No.
- 850.00 — SPOT ELEVATION

TC	TOP OF CURB ELEVATION
GU	GUTTER ELEVATION
TP	TOP OF PAVEMENT ELEVATION
EM	EDGE OF METAL ELEVATION
TW	TOP OF WALK ELEVATION
T/WALL	TOP OF WALL ELEVATION
B/WALL	BOTTOM OF WALL ELEVATION
GR	GROUND ELEVATION
UG	UNDERGROUND
FO	FIBER OPTIC
CONC	CONCRETE
ASPH	ASPHALT
FF	FINISH FLOOR ELEVATION
DL	DOOR LEDGE ELEVATION
F.I.	FOUND IRON
F.I.P.	FOUND IRON PIPE
MON	FOUND MONUMENT
F.P.K.	FOUND P.K. NAIL
S.I.	SET IRON W/SDA CAP
S.P.K.	SET P.K. NAIL
S.P.K./TAG	SET P.K. NAIL W/SDA TAG
MAG/TAG	SET MAGNETIC NAIL W/SDA TAG
M	MEASURED
R	RECORD
C	CALCULATED
INV.	INVERT ELEVATION
CMP	CORRUGATED METAL PIPE

- G — GAS
- SN — SANITARY SEWER (SAN)
- ST — STORM SEWER (STM)
- WM — WATERMAIN (WM)
- OH — OVERHEAD WIRE
- CS — COMBINED SEWER
- STE — STEAM LINE
- O — OIL LINE
- F — UG FIBER (COMM.)
- E — UG ELECTRIC (ELEC.)
- T — UG PHONE (PH)
- C — UG CABLE (CBL)
- CHAIN LINK FENCE (CL)
- WOOD FENCE
- WOVEN WIRE FENCE (WW)
- GUARD RAIL
- EDGE OF BRUSH/WOODS
- CENTERLINE OF DITCH
- CULVERT
- 650 — MAJOR CONTOUR
- 651 — MINOR CONTOUR
- BOUNDARY LINES
- ROW LINES
- SECTION LINES
- PROPERTY LINES
- ASPHALT
- CONCRETE
- GRAVEL/ DIRT/ MULCH
- BRICK / PAVERS
- WATER
- WATER W/ VEGETATION



LOCATION MAP
NOT TO SCALE

BENCHMARK DESCRIPTIONS

DATUM: GPS-DERIVED NAVD'88

SITE BM#100	SET BENCH TIE IN SOUTH FACE OF UTILITY POLE, LOCATED ON THE SOUTH SIDE OF GRAND RIVER AVE. AND ±30' WEST OF WOOD STREET. ELEV.=858.18
SITE BM#101	ARROW ON HYDRANT, LOCATED ON THE SOUTH SIDE OF GRAND RIVER AVE. AND ±125' EAST OF WOOD STREET. ELEV.=860.63
SITE BM#102	CHISELED "+" ON NORTH SIDE OF CONCRETE LIGHT POLE BASE., LOCATED ±70' WEST AND ±140' SOUTH OF THE NORTHWEST BUILDING CORNER OF PATTENGILL BIOTECHNICAL MAGNET SCHOOL. ELEV.=863.13
SITE BM#103	CHISELED "+" ON EAST SIDE OF CONCRETE LIGHT POLE BASE, LOCATED ±140' NORTH AND ±5' EAST OF THE SOUTHWEST BUILDING CORNER OF PATTENGILL BIOTECHNICAL MAGNET SCHOOL. ELEV.=863.60

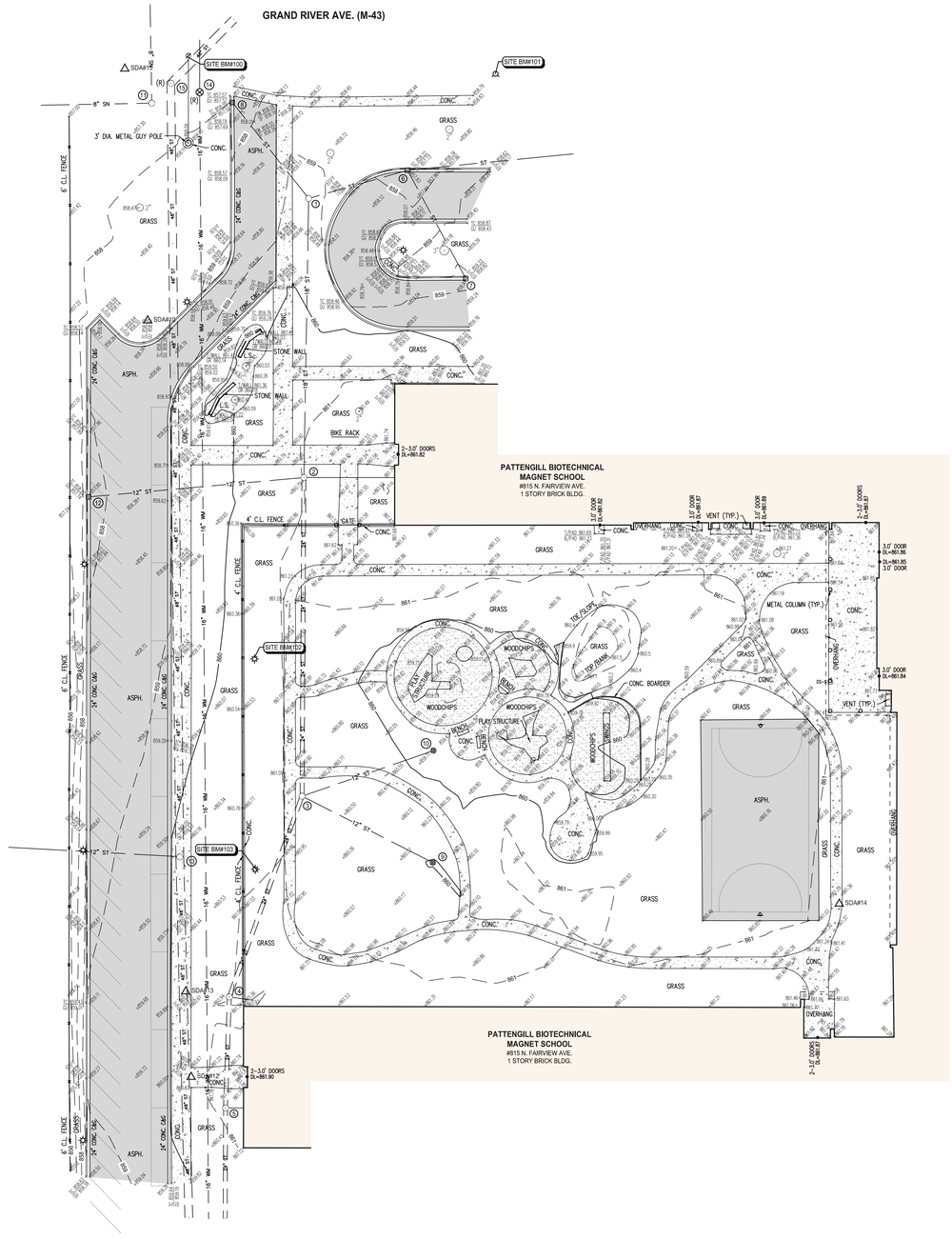
SURVEYOR'S COMMENTS

1. THIS TOPOGRAPHICAL MAP IS BASED UPON A FIELD SURVEY PERFORMED BY SPALDING DEDECKER DURING FEBRUARY OF 2024.
2. THIS SURVEY HAS BEEN PREPARED WITHOUT THE BENEFIT OF A CURRENT TITLE SEARCH THAT WOULD IDENTIFY ANY RECORDED EASEMENTS THAT ENCUMBER THIS PROPERTY. THEREFORE, THIS PROPERTY MAY BE SUBJECT TO EASEMENTS, RIGHT-OF-WAY TAKINGS AND RESTRICTIVE COVENANTS THAT ARE NOT SHOWN.
3. THE BASIS OF BEARINGS IS THE STATE PLANE GRID.
4. THE COORDINATE SYSTEM FOR THIS SURVEY IS THE STATE PLANE COORDINATE SYSTEM, MICHIGAN SOUTH ZONE (2113), BASED ON NAD83 (NSRS2011). UNITS ARE INTERNATIONAL FEET. COORDINATES WERE ESTABLISHED USING A DATA LINK TO THE MDOT CONTINUOUSLY OPERATING REFERENCE STATIONS (CORS).
5. THE VERTICAL DATUM OF THIS SURVEY IS BASED UPON THE NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD'88) AS ESTABLISHED WITH RTK GPS MEASUREMENTS USING A DATA LINK TO THE MDOT CONTINUOUSLY OPERATING REFERENCE STATIONS (CORS).

STRUCTURE TABLE

THE STRUCTURE TABLE ON THIS DRAWING IDENTIFIES THE AS-SURVEYED UNDERGROUND UTILITY MANHOLES THAT WERE FIELD MEASURED USING REASONABLE AND TRADITIONAL SURVEYING PRACTICES. PIPE SIZES, DIRECTIONS AND ELEVATIONS ARE INDICATED BY A COMBINATION OF FIELD EVIDENCE AND AVAILABLE RECORD INFORMATION. UNDERGROUND UTILITY PIPE SIZES AND CONNECTIONS ARE MANY TIMES AMBIGUOUS. SOME STRUCTURES MAY HAVE PIPES WITH UNKNOWN CONNECTIONS, SUMPS AND / OR PIPES THAT ARE FILLED WITH DEBRIS. IT WILL BE UP TO THE DESIGN ENGINEER TO LOOK AT THE PRESENTED SURVEY RESULTS AND DECIDE IF FURTHER INVESTIGATION BY OTHER METHODS SUCH AS VACUUM CLEAN OUT, UNDERGROUND RADAR, SMOKE TESTING AND PHYSICAL EXCAVATION IS REQUIRED AS AN ADDITIONAL SERVICE.

#	TYPE	RIM	SIZE	MTRL	INVERT	DIRECTION	CONNECT
1	**STORM MANHOLE**	859.31	12"	CPP	852.46	NW	8
			15"	CPP	853.26	ENE	6
			18"	CPP	852.31	SOUTH	2
	TOP / WATER	852.31					
2	**STORM MANHOLE**	861.02	6"	PVC	855.97	EAST	BLDG
			12"	CPP	852.82	WEST	12
			18"	CPP	851.92	NORTH	1
			24"	CPP	851.72	SOUTH	3
3	**STORM MANHOLE**	860.81	12"	CPP	854.31	NE	10
			12"	CPP	854.11	SE	9
			24"	CPP	851.46	NORTH	2
			24"	CPP	851.41	SSW	4
4	**STORM MANHOLE**	860.93	6"	PVC	854.63	ESE	BLDG
			24"	CPP	851.03	NNE	3
			24"	CPP	851.03	SOUTH	5
5	**STORM MANHOLE**	861.25	10"	PVC	852.75	EAST	BLDG
			24"	CPP	850.95	NORTH	4
			24"	CPP	850.95	SOUTH	
6	**SQUARE CATCH BASIN**	857.76	12"	CPP	853.36	EAST	
			12"	CPP	853.26	SE	7
			15"	CPP	853.16	WSW	1
7	**SQUARE CATCH BASIN**	858.86	12"	CPP	853.46	NW	6
8	**SQUARE CATCH BASIN**	857.59	12"	CPP	853.25	SE	1
9	**BEE-HIVE CATCH BASIN**	859.98	12"	CPP	855.28	NW	3
10	**BEE-HIVE CATCH BASIN**	859.30	12"	CPP	855.10	SW	3
11	**SANITARY MANHOLE**	857.29	8"	PVC	844.34	WEST	
			8"	PVC	844.29	NORTH	
12	**SQUARE CATCH BASIN**	857.75	12"	CPP	853.70	EAST	2
13	**STORM MANHOLE**	860.13	12"	PVC	845.53	WEST	
	COULD NOT OPEN		48"	RCP	834.68	NORTH	15
			48"	RCP	834.68	SOUTH	
14	**GATE VALVE & WELL**	N/A					
	SHOWN PER RECORD						
	NOT FIELD LOCATED						
15	**STORM MANHOLE**	N/A	48"	RCP	N/A	NNE (REC)	
	SHOWN PER RECORD		48"	RCP	N/A	SOUTH	13 (REC)
	NOT FIELD LOCATED						



KINGSCOTT
KALAMAZOO | CHELSEA | GRAND RAPIDS | ROYAL OAK

Pattengill Elementary School
MODULAR CLASSROOM BUILDING
Lansing School District

Lansing School District

REVISIONS/REVIEW	DATE
Early Site Work	3.5.2024
Addendum #1	3.20.2024
Addendum #2	3.26.2024
Issued for Permits	4.15.2024
Construction Documents BP03	4.19.2024

KEY PLAN

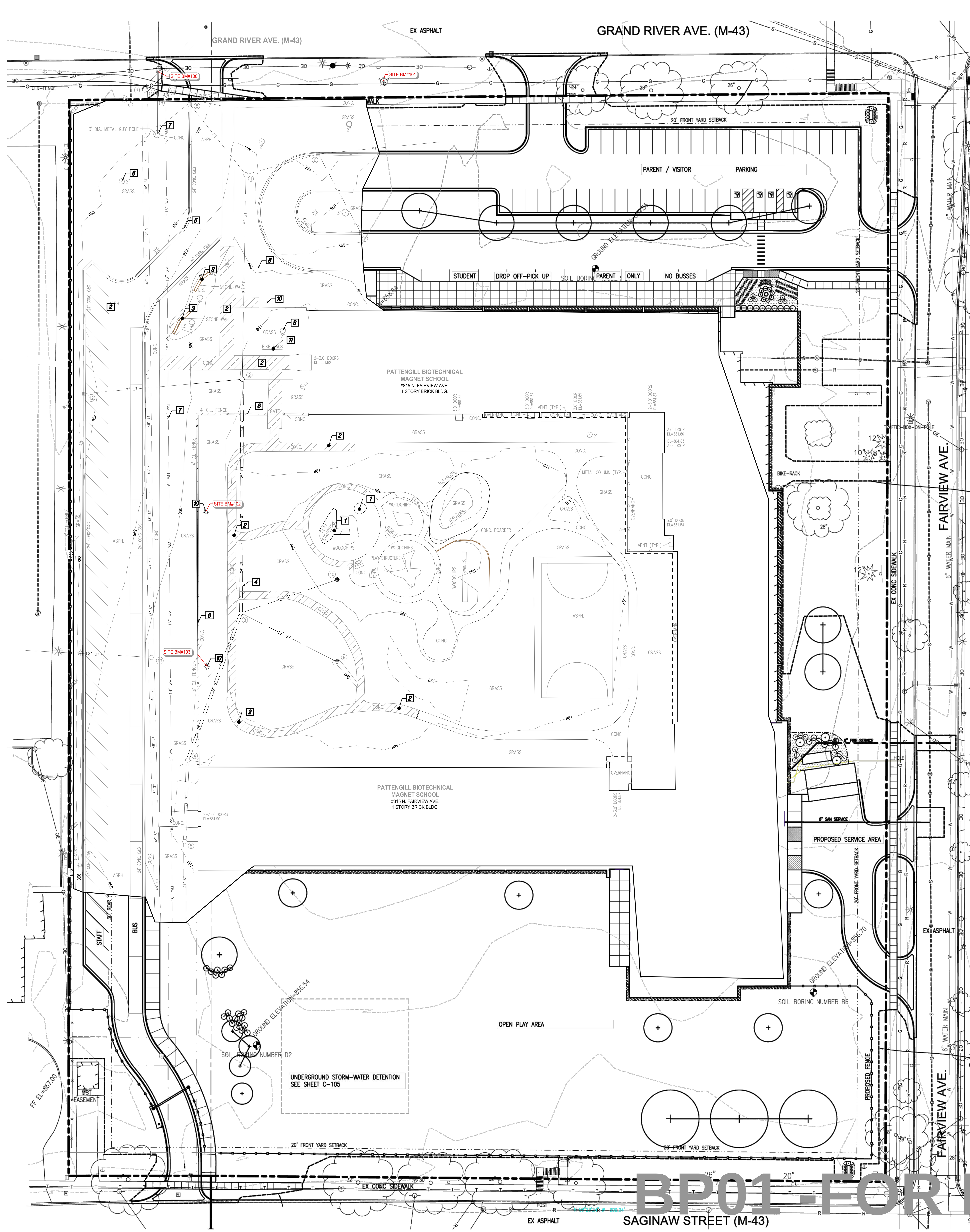
JOB NO. NP24011

NORTH

SHEET TITLE
Topographical Survey

SHEET NO.
C1.0

BP01 -FOR REFERENCE



GRAPHIC SCALE

0 15 30 60

(IN FEET)
1 inch = 30 ft.

DEMOLITION NOTES

1. SALVAGE EXISTING PLAYGROUND EQUIPMENT. RELOCATE EQUIPMENT AT DIRECTION OF OWNER.
2. REMOVE CONCRETE PAVEMENT TO FULL DEPTH. SAWCUT FULL DEPTH TO NEAREST JOINT WHERE NEW PAVEMENT WILL BE PLACED ADJACENT TO EXISTING PAVEMENT.
3. SALVAGE EXISTING LANDSCAPED STONE WALL. RELOCATE AT DIRECTION OF OWNER.
4. REMOVE EXISTING UTILITY UNLESS OTHERWISE NOTED TO BE ABANDONED. BACKFILL WITH CLASS II FILL AND COMPACT TO 95% MAXIMUM DENSITY. INSTALL WATERTIGHT BULKHEADS AT STRUCTURES WHERE EXISTING PIPE IS TO BE REMOVED. INSTALL WATER TIGHT CAP AT CUT PIPE ENDS.
5. PROTECT EXISTING CONCRETE CURB AND GUTTER TO REMAIN.
6. REMOVE EXISTING CHAIN LINK FENCE, INCLUDING ALL GATES, POSTS, AND FOOTINGS.
7. PROTECT EXISTING UTILITIES AND UTILITY STRUCTURES TO REMAIN.
8. PROTECT EXISTING TREES AND LANDSCAPING TO REMAIN DURING CONSTRUCTION. SEE TREE PROTECTION DETAIL THIS SHEET.
9. REMOVE EXISTING TREE (INCLUDING STUMPS AND ROOTS).
10. REMOVE LIGHT POLE AND BASE. COORDINATE WITH ELECTRICAL PLANS.
11. PROTECT BICYCLE RACKS. IF REMOVAL IS REQUIRED FOR UTILITY CONSTRUCTION SALVAGE AND REPLACE IN THE SAME LOCATION AS EXISTING.

EXISTING SIGNAGE AND MAILBOXES WITHIN THE CLEARING LIMITS ARE TO BE REMOVED AND SALVAGED. STAGE IN ON SITE LOCATION AS SPECIFIED BY OWNER.

ALL DEPRESSIONS CREATED BY DEMOLITION PROCEDURES SHALL BE BACKFILLED WITH CLASS II FILL MATERIAL, IN 8" LIFTS COMPACTED TO 95% OF MAXIMUM UNIT WEIGHT, UP TO PROPOSED SUBGRADE.

CONTRACTOR IS RESPONSIBLE FOR DOING AN EARTHWORK CALCULATION FOR CUT AND FILL REQUIREMENTS, AND IS RESPONSIBLE FOR INCLUDING IMPORT AND EXPORT OF MATERIALS IN THEIR BID. ALL EXCESS MATERIAL (INCLUDING TOPSOIL, CLEAN FILL, AND WASTE MATERIAL) SHALL BE REMOVED FROM THE SITE.

EXISTING SUPPORTED SLABS AT BUILDING ENTRY/DOORS TO REMAIN, UNLESS OTHERWISE DIRECTED. CONTRACTOR TO VERIFY LIMITS OF EXISTING SUPPORTED SLAB AND REMOVE ADJACENT WALKS AS SHOWN ON PLANS.

CONTRACTOR TO PROTECT EXISTING WALKS, PAVEMENT, CURBS, GUTTERS, WALLS, FENCES, GATES, LANDSCAPING AND TREES TO REMAIN DURING CONSTRUCTION.

SURVEY NOTES

1. TOPOGRAPHIC AND/OR BOUNDARY SURVEY, INCLUDING PROPERTY LINES, LEGAL DESCRIPTION,EXISTING UTILITIES, SITE TOPOGRAPHY WITH SPOT ELEVATIONS, OUTSTANDING PHYSICAL FEATURES AND EXISTING STRUCTURE LOCATIONS WERE PROVIDED BY THE SELLER/OWNER.
2. SPALDING DEDECKER ASSOCIATES, INC. WILL NOT BE HELD RESPONSIBLE FOR THE ACCURACY OF THE SURVEY OR DESIGN OMISSIONS RESULTING FROM SURVEY INACCURACIES.
3. THE CONTRACTOR IS RESPONSIBLE FOR CONFIRMING ALL INFORMATION SHOWN ON THIS SURVEY AND NOTIFYING THE ENGINEER IMMEDIATELY OF ANY DISCREPANCIES.
4. CONTRACTOR SHALL UTILIZE A PRIVATE UTILITY LOCATOR TO STAKE PUBLIC AND PRIVATE UTILITY LOCATIONS PRIOR TO START OF CONSTRUCTION. IT IS THE CONTRACTORS RESPONSIBILITY, AT NO COST TO THE PROJECT, TO REPAIR OR REPLACE ANY DAMAGE CAUSED TO EXISTING UTILITIES.
5. CONTRACTOR SHALL CONTACT MISS DIG (811) THREE WORKING DAYS PRIOR TO THE START OF CONSTRUCTION FOR STAKING OF UTILITIES.

KINGSCOTT
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Pattengill Elementary School
MODULAR CLASSROOM BUILDING
Lansing School District

Lansing School District

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Early Site Work	3.5.2024
Addendum #1	3.20.2024
Addendum #2	3.26.2024
Issued for Permits	4.15.2024
Construction Documents BP03	4.19.2024

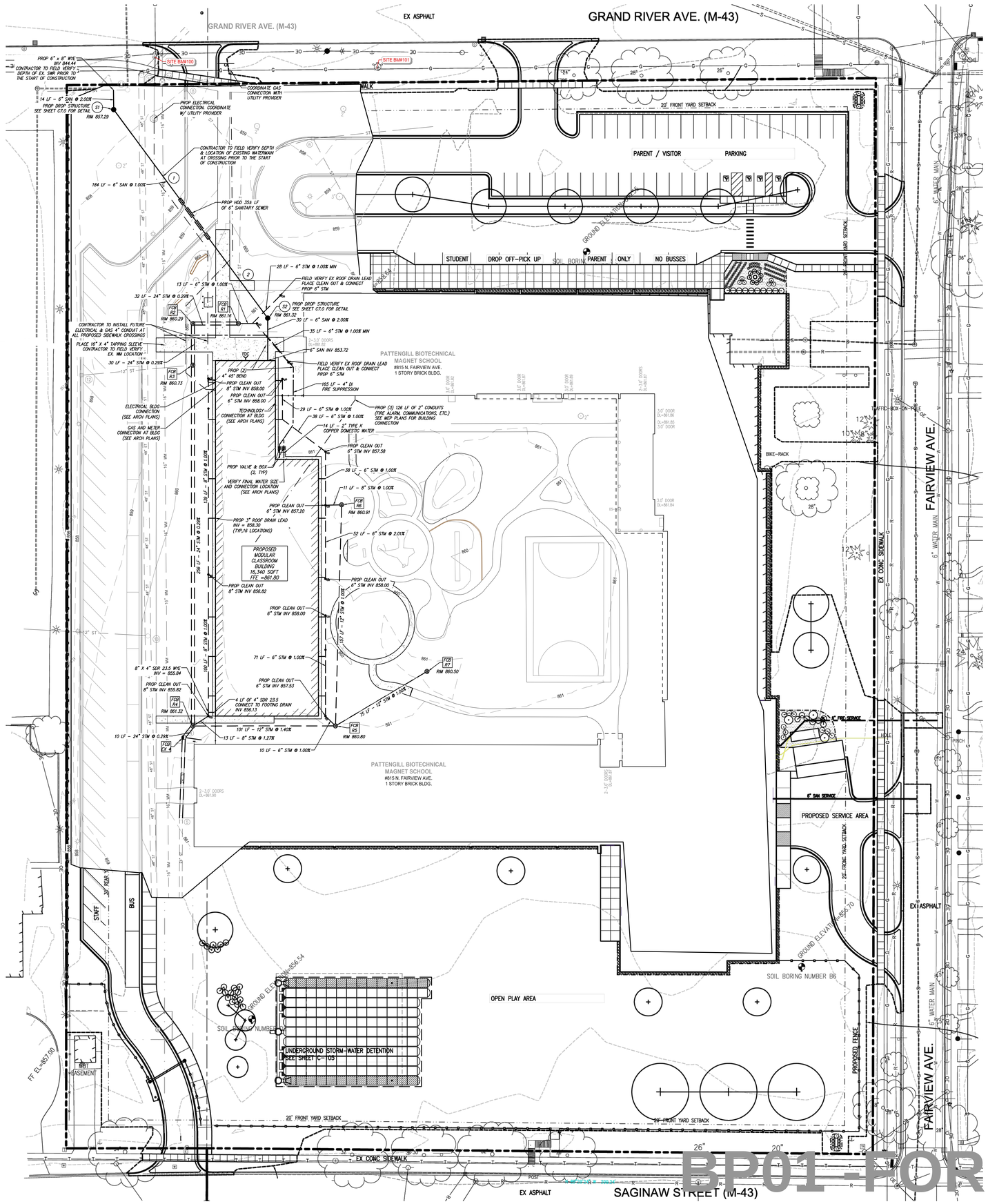
KEY PLAN

JOB NO. **NP24011**

NORTH

SHEET TITLE
Existing Conditions & Demolition Plan

SHEET NO.
C2.0



GRAPHIC SCALE
0 15 30 60
(IN FEET)
1 inch = 30 ft.

LEGEND

- PROPOSED WATERMAIN
- PROPOSED SANITARY
- PROPOSED STORM SEWER
- PROPOSED GAS MAIN
- PROPOSED ELECTRIC
- PROPOSED HYDRANT
- PROPOSED GATE VALVE & WELL (GVW)
- PROPOSED TAPPING SLEEVE, VALVE & WELL (TSVW)
- PROPOSED SAN MANHOLE (SAN)
- PROPOSED STORM MANHOLE (MH)
- PROPOSED CATCH BASIN (CB)
- PROPOSED INLET (INL)
- PROPOSED END SECTION (ES)
- PROPOSED FIELD CATCH BASIN (FCB) W/RECEIVE COVER OR STANDPIPE (SP) W/ BAR GRATE COVER
- STANDARD BITUMINOUS PAVEMENT
- HEAVY-DUTY BITUMINOUS PAVEMENT
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- CONCRETE PAVEMENT
- CONCRETE SIDEWALK
- MILL PAVEMENT
- UTILITY CROSSING (SEE DATA TABLE)
- STORM SEWER STRUCTURE: CB 2 — STRUCT. TYPE, STRUCT. NO.
- SANITARY SEWER STRUCTURE: 20
- WATERMAIN STRUCTURE: 10 / XXX — STRUCT. NO., STRUCT. TYPE

UTILITY NOTES

1. STORM SEWER 12" AND LARGER SHALL BE HDPE UNLESS OTHERWISE NOTED ON THE PLAN.
2. STORM SEWER 6" AND SMALLER SHALL BE PVC SDR 23.5. STORM SEWER GREATER THAN 6" THROUGH 10" SHALL BE PVC SDR 26.
3. SANITARY SEWER SHALL LEADS SHALL BE SOLID WALL, PVC, SDR 23.5.
4. WATER MAIN SHALL BE CLASS 52 DUCTILE IRON. WATER MAINS SHALL BE LEAKAGE AND PRESSURE TESTED IN ACCORDANCE WITH AWWA STANDARD C600. WATER MAINS SHALL BE DISINFECTED IN ACCORDANCE WITH AWWA STANDARD C651 PRIOR TO BEING PUT INTO SERVICE.
5. ALL UTILITY TRENCHES THAT FALL WITHIN A 1–ON–1 INFLUENCE OF PAVEMENT AREAS SHALL BE BACKFILLED WITH CLASS 2 SAND AND COMPACTED TO 95% OF MAXIMUM DENSITY.
6. ALL WATER MAIN SHALL BE BURIED WITH 6' OF COVER FROM PROPOSED GRADES. USE 22.5° BENDS TO LOWER WATER MAIN WHERE NOTED AT UTILITY CROSSING.
7. WHERE HYDRANTS ARE INDICATED ON THE PLAN, COMPLETE HYDRANT ASSEMBLIES ARE REQUIRED, INCLUDING SHUT–OFF VALVE AND BOX (REFER TO THE STANDARD DETAIL SHEET FOR DETAILED REQUIREMENTS) THE ELEVATION OF THE VALVE BOX SHALL BE EQUAL TO THE FINISH GRADE (FG) ELEVATION OF THE HYDRANT UNLESS OTHERWISE NOTED.
8. ALL UTILITIES SHALL BE INSTALLED IN ACCORDANCE WITH THE STANDARDS AND SPECIFICATIONS OF THE CITY OF LANSING.
9. ALL UTILITIES SHALL BE INSTALLED ON CLASS "B" BEDDING OR BETTER.
10. ALL HYDRANTS MUST BE AT LEAST 5' FROM THE BACK OF CURB OR EDGE OF PAVEMENT.
11. ALL UTILITIES SHALL BE PLACED AT LEAST 10' FROM OTHER UTILITIES, SIGNIFICANT TREES, AND FIXED STRUCTURES.
12. UNLESS OTHERWISE NOTED, ALL STORM SEWER STRUCTURES SHALL BE 4' DIAMETER (INLETS SHALL BE 2' DIAMETER). CONTRACTOR IS RESPONSIBLE FOR VERIFYING STRUCTURES SIZES IN RELATION TO PIPE SIZES AND ANGLES AND PRICING THEIR BID ACCORDINGLY. UNLESS OTHERWISE INDICATED ON THE STANDARD DETAIL SHEETS CASTINGS SHALL BE:
PINK CATCH BASINS – EJIW 5105 – "M1" (FRAMES WITH CURB BOXES WILL NOT BE ALLOWED)
YARD CATCH BASINS – EJIW 1040 – "02"
MANHOLES – EJIW 1040 – "A"
13. WHERE THESE PLANS DIFFER FROM THE STANDARD DETAILS OR STANDARD SPECIFICATIONS OF THE CITY OF LANSING, THE CITY REQUIREMENTS SHALL GOVERN.

DOWNSPOUT NOTES

1. ALL DOWNSPOUT 6" LEADS TO BE AT 1.0% (UNLESS NOTED OTHERWISE)
2. EXTEND ALL DOWNSPOUT LEADS TO 12" ABOVE GRADE & STUB FOR DOWNSPOUT CONNECTION (CONFIRM EXACT LOCATION W/THE ARCH. PLAN)
3. ALL INVERT ELEVATIONS SHOWN FOR BLDG. ROOF LEADS ARE AT 5' FROM THE LOCATION OF THE DOWNSPOUT. THE SITE CONTRACTOR IS REQUIRED TO EXTEND THE LEADS TO THE DOWNSPOUT LOCATION AND STUB THE LEAD AT 12" ABOVE PROPOSED GROUND. THE MECHANICAL CONTRACTOR WILL MAKE THE FINAL CONNECTION WITH THE APPROPRIATE FITTINGS. COORDINATE EXACT DOWNSPOUT LOCATION WITH ARCH. PLANS.

RIM ADJUSTMENT NOTE:

REMOVE EXISTING CASTING, COVER AND ADJUSTMENT MATERIALS FROM DRAINAGE STRUCTURE. SALVAGE CASTING AND COVER FOR REINSTALLATION AND PROVIDE NEW ADJUSTMENT BRICK/BLOCK/RINGS. REINSTALL ACCORDING TO STANDARD DETAILS (IF INCLUDED). PROTECT EXISTING UTILITY STRUCTURE TO REMAIN.

SANITARY STRUCTURE SCHEDULE

STR. NO.	TYPE	RIM ELEV.	INV. SIZE	INV. DIR.	INVERT	IN/OUT
S1	4' DIA MANHOLE	857.29	6" 6" 6"	N SE SE	844.72' 848.45' 844.86'	Out In In
S2	4' DIA MANHOLE	861.32	6" 6" 6"	NW S S	850.28' 853.12' 850.55'	Out In In

STORM STRUCTURE SCHEDULE

STR. NO.	TYPE	RIM ELEV.	INV. SIZE	INV. DIR.	INVERT	IN/OUT
EX 4	4' DIA FIELD CATCH BASIN	860.98	24" 6" 24"	NE E S	851.03' 854.63' 851.03'	In Out Out
R1	4' DIA FIELD CATCH BASIN	861.16	24" 6" 24"	W E N	851.99' 855.26' 851.99'	Out In In
R2	4' DIA FIELD CATCH BASIN	860.29	24" 24"	E S	851.90' 851.90'	In Out
R3	4' DIA FIELD CATCH BASIN	860.73	24" 24" 12"	S N W	851.81' 851.81' 853.07'	Out In In
R4	4' DIA FIELD CATCH BASIN	861.32	24" 24" 12" 8"	N SW E NE	851.06' 851.06' 853.86' 855.44'	In Out In In
R5	4' DIA FIELD CATCH BASIN	860.80	12" 12" 6" 12"	N W NW NE	855.27' 855.27' 857.19' 855.47'	In Out In In
R6	4' DIA FIELD CATCH BASIN	860.91	12" 8"	S W	856.84' 856.84'	Out In
R7	4' DIA FIELD CATCH BASIN	860.50	12"	SW	856.22'	Out

CROSSING DETAIL

1 PR SANITARY / EX WATERMAIN	2 PR SANITARY / EX STORM SEWER
EX 16" WTMN @ P 852.45	EX 18" STM @ P 852.00
PR 6" SAN T/P 849.69	PR 6" SAN T/P 850.45
CLEARANCE 2.76'	CLEARANCE 1.55'
NOTIFY ENGINEER IF CONFLICT OCCURS	NOTIFY ENGINEER IF CONFLICT OCCURS

KINGSCOTT
KALAMAZOO | CHELSEA | GRAND RAPIDS | ROYAL OAK

Pattengill Elementary School MODULAR CLASSROOM BUILDING

Lansing School District

Lansing School District

REVISIONS/REVIEW	DATE
Early Site Work	3.5.2024
Addendum #1	3.20.2024
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Issued for Permits	4.15.2024
Construction Documents BP03	4.19.2024

KEY PLAN

NORTH

JOB NO. **NP24011**

SHEET TITLE
Utility Plan

SHEET NO.
C4.0

Project: Pattengill Elementary School

Chamber Model -	MC-3500	
Units -	Imperial	
Number of Chambers -	145	
Number of End Caps -	22	
Voids in the stone (porosity) -	40	%
Base of Stone Elevation -	849.25	ft
Amount of Stone Above Chambers -	12	in
Amount of Stone Below Chambers -	9	in
Area of system -	8074	sf Min. Area - 7545 sf min. area

StormTech MC-3500 Cumulative Storage Volumes

Height of System (inches)	Incremental Single Chamber (cubic feet)	Incremental Single End Cap (cubic feet)	Incremental Chambers (cubic feet)	Incremental End Cap (cubic feet)	Incremental Stone (cubic feet)	Incremental Ch, EC and Stone (cubic feet)	Cumulative System (cubic feet)	Elevation (feet)
66	0.00	0.00	0.00	0.00	269.12	269.12	27524.94	854.75
65	0.00	0.00	0.00	0.00	269.12	269.12	27255.82	854.67
64	0.00	0.00	0.00	0.00	269.12	269.12	26986.70	854.58
63	0.00	0.00	0.00	0.00	269.12	269.12	26717.57	854.50
62	0.00	0.00	0.00	0.00	269.12	269.12	26448.45	854.42
61	0.00	0.00	0.00	0.00	269.12	269.12	26179.33	854.33
60	0.00	0.00	0.00	0.00	269.12	269.12	25910.20	854.25
59	0.00	0.00	0.00	0.00	269.12	269.12	25641.08	854.17
58	0.00	0.00	0.00	0.00	269.12	269.12	25371.96	854.08
57	0.00	0.00	0.00	0.00	269.12	269.12	25102.84	854.00
56	0.00	0.00	0.00	0.00	269.12	269.12	24833.71	853.92
55	0.00	0.00	0.00	0.00	269.12	269.12	24564.59	853.83
54	0.06	0.00	8.42	0.00	265.75	274.18	24295.47	853.75
53	0.19	0.02	28.14	0.53	257.65	286.33	24021.29	853.67
52	0.29	0.04	42.62	0.83	251.74	295.19	23734.96	853.58
51	0.40	0.05	58.53	1.13	245.26	304.92	23439.77	853.50
50	0.69	0.07	99.64	1.49	228.67	329.80	23134.85	853.42
49	1.03	0.09	149.10	1.94	208.71	359.75	22805.05	853.33
48	1.25	0.11	181.18	2.36	195.71	379.25	22445.30	853.25
47	1.42	0.13	206.22	2.78	185.52	394.52	22066.05	853.17
46	1.57	0.14	228.10	3.18	176.61	407.89	21671.53	853.08
45	1.71	0.16	247.54	3.58	168.68	419.79	21263.64	853.00
44	1.83	0.18	265.13	4.00	161.47	430.60	20843.84	852.92
43	1.94	0.20	280.98	4.41	154.97	440.36	20413.24	852.83
42	2.04	0.22	295.92	4.80	148.83	449.56	19972.89	852.75
41	2.13	0.23	309.53	5.17	143.24	457.94	19523.33	852.67
40	2.22	0.25	322.51	5.51	137.91	465.94	19065.39	852.58
39	2.31	0.27	334.48	5.84	132.99	473.32	18599.45	852.50
38	2.38	0.28	345.79	6.16	128.34	480.29	18126.13	852.42
37	2.46	0.29	356.57	6.47	123.91	486.94	17645.84	852.33
36	2.53	0.31	366.58	6.77	119.78	493.14	17158.89	852.25
35	2.59	0.32	376.09	7.07	115.86	499.02	16665.76	852.17
34	2.66	0.33	385.13	7.36	112.13	504.61	16166.74	852.08
33	2.72	0.35	393.69	7.63	108.59	509.92	15662.12	852.00
32	2.77	0.36	401.84	7.92	105.22	514.98	15152.21	851.92
31	2.82	0.37	409.57	8.19	102.02	519.78	14637.23	851.83
30	2.88	0.38	416.94	8.45	98.96	524.36	14117.45	851.75
29	2.92	0.40	424.00	8.71	96.04	528.75	13593.09	851.67
28	2.97	0.41	430.63	8.97	93.28	532.88	13064.34	851.58
27	3.01	0.42	436.81	9.21	90.72	536.73	12531.45	851.50
26	3.05	0.43	442.72	9.45	88.25	540.43	11994.72	851.42
25	3.09	0.44	448.67	9.69	85.78	544.14	11454.29	851.33
24	3.13	0.45	453.93	9.92	83.58	547.43	10910.15	851.25
23	3.17	0.46	459.02	10.14	81.46	550.62	10362.72	851.17
22	3.20	0.47	463.92	10.35	79.41	553.69	9812.10	851.08
21	3.23	0.48	468.51	10.56	77.49	556.57	9258.41	851.00
20	3.26	0.49	472.90	10.76	75.66	559.32	8701.85	850.92
19	3.29	0.50	477.09	10.96	73.91	561.95	8142.52	850.83
18	3.32	0.51	481.10	11.14	72.22	564.47	7580.57	850.75
17	3.34	0.51	484.90	11.32	70.64	566.85	7016.10	850.67
16	3.37	0.52	488.45	11.49	69.15	569.09	6449.25	850.58
15	3.39	0.53	491.91	11.65	67.70	571.26	5880.17	850.50
14	3.41	0.54	495.11	11.80	66.36	573.27	5308.90	850.42
13	3.44	0.54	498.37	11.95	65.00	575.31	4735.63	850.33
12	3.46	0.55	501.37	12.09	63.74	577.20	4160.32	850.25
11	3.48	0.56	504.41	12.21	62.47	579.10	3583.12	850.17
10	3.51	0.59	508.24	13.09	60.59	581.92	3004.03	850.08
9	0.00	0.00	0.00	0.00	269.12	269.12	2422.11	850.00
8	0.00	0.00	0.00	0.00	269.12	269.12	2152.98	849.92
7	0.00	0.00	0.00	0.00	269.12	269.12	1883.86	849.83
6	0.00	0.00	0.00	0.00	269.12	269.12	1614.74	849.75
5	0.00	0.00	0.00	0.00	269.12	269.12	1345.62	849.67
4	0.00	0.00	0.00	0.00	269.12	269.12	1076.49	849.58
3	0.00	0.00	0.00	0.00	269.12	269.12	807.37	849.50
2	0.00	0.00	0.00	0.00	269.12	269.12	538.25	849.42
1	0.00	0.00	0.00	0.00	269.12	269.12	269.12	849.33

STORM WATER MANAGEMENT CALCULATIONS

SCS Curve Number

1) Existing area contributing runoff (A) = 0.43 acres

Surface	Area (sf)	CN	A x CN
Building	0	98.00	0.00
Pavement	0	98.00	0.00
Water Surface	0	100.00	0.00
Open Space NRCS Soil Group C/D	18,740	77.00	1,442,980.00
	18,740		1,442,980.00

Weighted SCS Curve Number (CN) = (∑A x CN) / ∑A = **77.00**

2) Developed area contributing runoff (A) = 0.43 acres

Surface	Area (sf)	CN	A x CN
Building	16,340	98.00	1,601,320
Pavement	2,400	98.00	235,200.00
Water Surface	0	100.00	0.00
Open Space NRCS Soil Group C/D	0	77.00	0.00
	18,740		1,836,520.00

Weighted SCS Curve Number (CN) = (∑A x CN) / ∑A = **98.00**

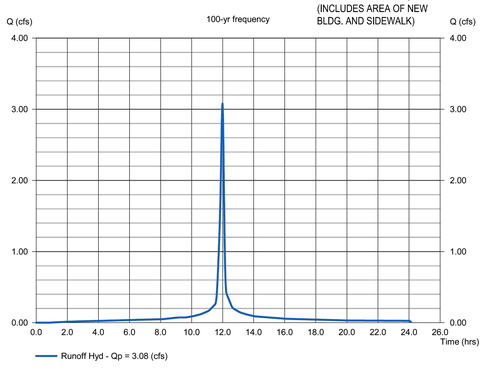
Hydrology Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Wednesday, Feb 21 2024

<Name>

Hydrograph type	= SCS	Peak discharge (cfs)	= 3.079
Storm frequency (yrs)	= 100	Time interval (min)	= 1
Drainage area (ac)	= 0.430	Curve number (CN)	= 98
Basin Slope (%)	= n/a	Hydraulic length (ft)	= n/a
Tc method	= User	Time of conc. (min)	= 10
Total precip. (in)	= 5.50	Storm Distribution	= Type II
Storm duration (hrs)	= 24	Shape factor	= 484

Hydrograph Volume = 8,214 (cuft); 0.189 (acft)



PROPOSED CONDITIONS 100 YR - 24 HR HYDROGRAPH

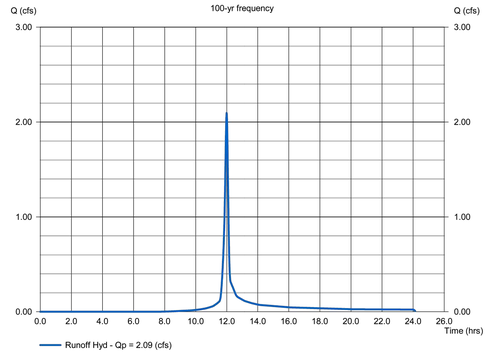
Hydrology Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Wednesday, Feb 21 2024

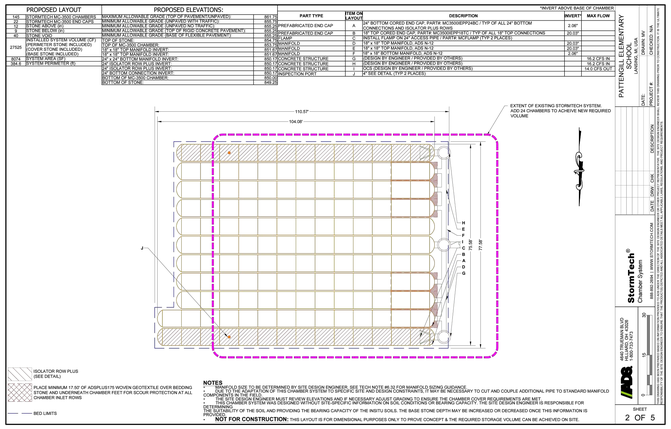
<Name>

Hydrograph type	= SCS	Peak discharge (cfs)	= 2.095
Storm frequency (yrs)	= 100	Time interval (min)	= 1
Drainage area (ac)	= 0.430	Curve number (CN)	= 77
Basin Slope (%)	= n/a	Hydraulic length (ft)	= n/a
Tc method	= User	Time of conc. (min)	= 10
Total precip. (in)	= 5.50	Storm Distribution	= Type II
Storm duration (hrs)	= 24	Shape factor	= 484

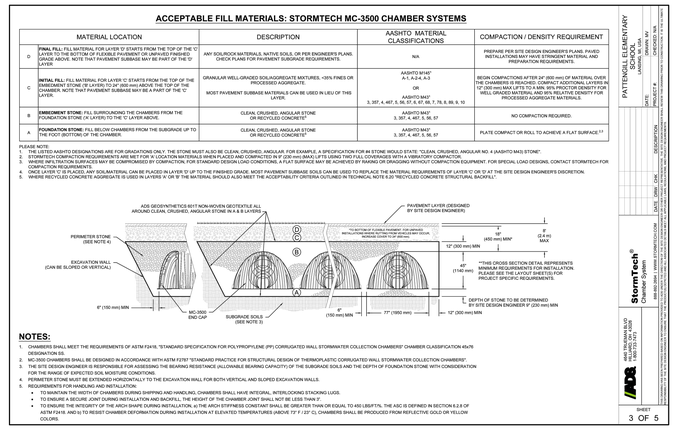
Hydrograph Volume = 4,755 (cuft); 0.109 (acft)

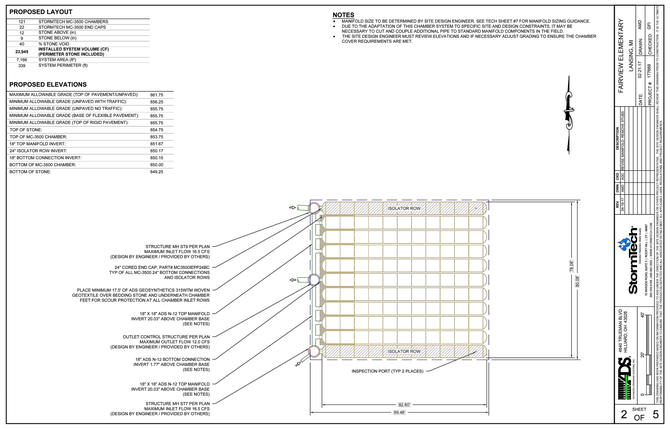


EXISTING CONDITIONS 100 YR - 24 HR HYDROGRAPH



PROPOSED STORMTECH UNDERGROUND DETENTION SYSTEM THE WITH ADDITION OF 3,459 CF OF STORAGE





EXISTING STORMTECH UNDERGROUND DETENTION SYSTEM

KINGSCOTT
KALAMAZOO | CHELSEA | GRAND RAPIDS | ROYAL OAK

Pattengill Elementary School
MODULAR CLASSROOM BUILDING
Lansing School District

Lansing School District

REVISIONS/REVIEW	DATE
Early Site Work	3.5.2024
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Construction Documents BP03	4.19.2024

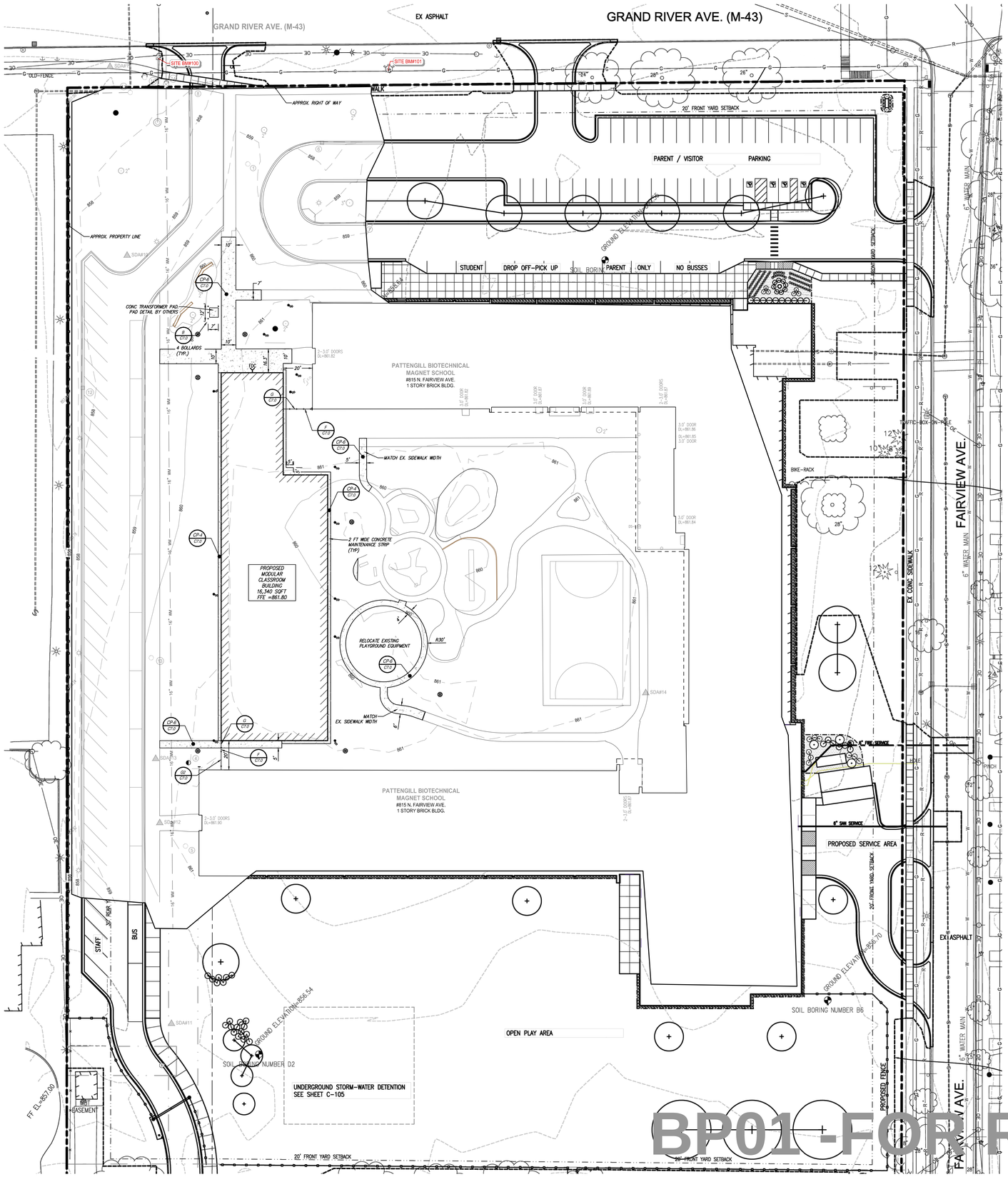
KEY PLAN

JOB NO. **NP24011**

NORTH

SHEET TITLE
Stormwater Management Details

SHEET NO.
C5.0



GRAPHIC SCALE

0 15 30 60

(IN FEET)

1 inch = 30 ft.

LEGEND

- PROPOSED WATERMAIN
- PROPOSED SANITARY
- PROPOSED STORM SEWER
- PROPOSED GAS MAIN
- PROPOSED ELECTRIC
- PROPOSED HYDRANT
- PROPOSED GATE VALVE & WELL (GVW)
- PROPOSED TAPPING SLEEVE, VALVE & WELL (TSVW)
- PROPOSED SAN MANHOLE (SAN)
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- DEEP-STRENGTH BITUMINOUS PAVEMENT
- CONCRETE PAVEMENT
- CONCRETE SIDEWALK
- MILL PAVEMENT
- UTILITY CROSSING (SEE DATA TABLE)
- STORM SEWER STRUCTURE: CB 2 — STRUCT. TYPE, STRUCT. NO.
- SANITARY SEWER STRUCTURE: 20
- WATERMAIN STRUCTURE: 10 XXX — STRUCT. NO., STRUCT. TYPE

PAVING CONSTRUCTION NOTES

1. EARTHWORK AND PAVEMENT CONSTRUCTION SHALL BE PERFORMED IN ACCORDANCE WITH THE CURRENT MDOT STANDARD SPECIFICATIONS FOR CONSTRUCTION UNLESS OTHERWISE NOTED IN THE FOLLOWING ITEMS.
2. REMOVE ANY EXISTING TOPSOIL, VEGETATION, TREES AND OTHER DELETERIOUS MATERIALS TO EXPOSE THE SUBGRADE SOIL. TREE ROOTS SHALL BE COMPLETELY REMOVED.
3. EXCAVATE TO THE DEPTH OF THE FINAL SUBGRADE ELEVATION TO ALLOW FOR GRADE CHANGES AND THE PLACEMENT OF THE RECOMMENDED PAVEMENT SYSTEM.
4. THE TOP 12 INCHES OF THE EXPOSED SUBGRADE SHALL BE COMPACTED TO A DENSITY NO LESS THAN 95 PERCENT OF THE MAXIMUM DENSITY AS DETERMINED BY THE MODIFIED PROCTOR (ASTM D 1557-91).
5. THE FINAL SUBGRADE SHALL BE THOROUGHLY PROOFROLLED UNDER THE OBSERVATION OF A GEOTECHNICAL/PAVEMENT ENGINEER. LOOSE OR YIELDING AREAS WHICH CANNOT BE MECHANICALLY STABILIZED SHALL BE REMOVED AND REPLACED WITH ENGINEERED FILL OR AS DICTATED BY FIELD CONDITIONS.
6. THE AGGREGATE BASE SHALL BE COMPACTED TO A DENSITY NO LESS THAN 95 PERCENT OF THE MAXIMUM DENSITY AS DETERMINED BY THE MODIFIED PROCTOR (ASTM D 1557-91). THE BASE SHALL EXTEND A MINIMUM OF 1 FOOT BEYOND THE PAVED EDGE.
7. ALL BITUMINOUS MATERIAL SHALL BE COMPACTED TO A DENSITY NO LESS THAN 97 PERCENT OF THE MAXIMUM DENSITY AS DETERMINED BY THE MARSHALL METHOD.
8. CONTRACTOR SHALL PROTECT EXISTING CURB, GUTTER, SIDEWALK, WALLS, FENCES AND ALL OTHER EXISTING SITE FEATURES NOT INDICATED FOR REMOVAL OR REHABILITATION.
9. PLACE EXPANSION JOINTS WHERE NEW CONCRETE PAVEMENT OR WALKS ABUT BUILDING WALLS (PROPOSED OR EXISTING), COLUMN WALLS OR BASES, CONCRETE FOUNDATIONS OR BASES, CURBS, OR EXISTING CONCRETE PAVEMENT. PLACE JOINT SEALANT ON ALL EXPANSION JOINTS.
10. CONTRACTOR TO CONSTRUCT CONTRACTION AND EXPANSION JOINTS IN ALL NEW CONCRETE PAVEMENT. CONTRACTION JOINTS SHALL BE TOOLED WHERE SIDEWALK WIDTH IS 8' OR LESS, AND SHALL BE SPACED EQUAL TO THE WIDTH OF THE PAVEMENT (I.E. 8' SPACING FOR 8' WIDE WALK), BUT NOT MORE THAN 10' APART. PLACE EXPANSION JOINTS WITH JOINT SEALANT AT MAXIMUM 50' SPACING. CONTRACTOR SHALL GENERALLY MATCH THE JOINT PATTERNS FOR CONCRETE PAVEMENT WHEN SHOWN ON THE PLANS.
11. WHERE THESE PLANS DIFFER FROM THE STANDARD DETAILS OR STANDARD SPECIFICATIONS OF THE CITY OF LANSING, THE CITY REQUIREMENTS SHALL GOVERN.
12. CONCRETE PAVEMENT SHALL MEET THE REQUIREMENTS FOR MDOT GRADE 4000 CONCRETE PER THE CURRENT MDOT STANDARD SPECIFICATIONS FOR CONSTRUCTION.

KINGSCOTT
KALAMAZOO | CHELSEA | GRAND RAPIDS | ROYAL OAK

Pattengill Elementary School
MODULAR CLASSROOM BUILDING
Lansing School District

Lansing School District

REVISIONS/REVIEW	DATE
Early Site Work	3.5.2024
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Construction Documents BP03	4.19.2024

KEY PLAN

JOB NO. **NP24011**

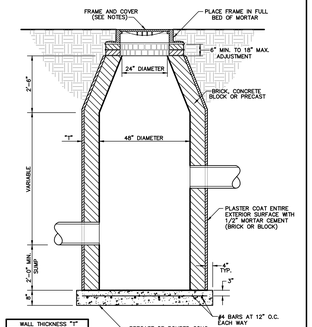
NORTH

SHEET TITLE
Site Layout Plan

SHEET NO.
C6.0

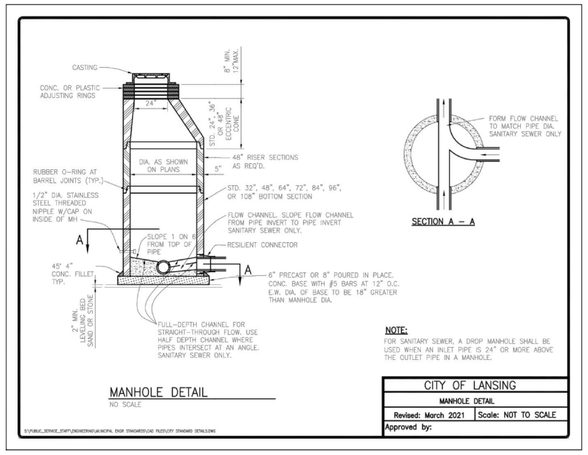
SPECIAL CATCH BASIN NOTES:

1. STEPS SHALL BE PLACED IN ALL 48" DIAMETER STRUCTURES MORE THAN 4' DEEP.



WALL THICKNESS "T"		
DEPTH	BRICK	PRECAST OR BLOCK
0'-10'	8"	6"
10'-18'	12"	8"

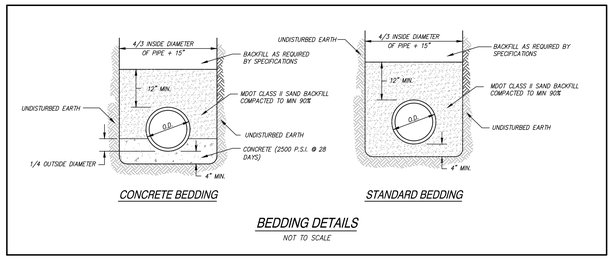
STORM SEWER CATCH BASIN/MANHOLE
NO SCALE



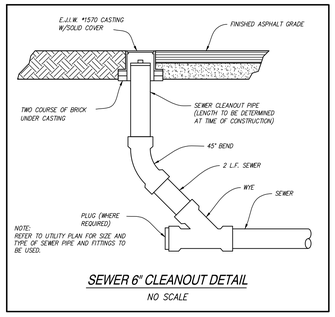
MANHOLE DETAIL
NO SCALE

NOTE:
FOR SANITARY SEWER, A DROP MANHOLE SHALL BE USED WHEN AN INLET PIPE IS 24" OR MORE ABOVE THE OUTLET PIPE IN A MANHOLE.

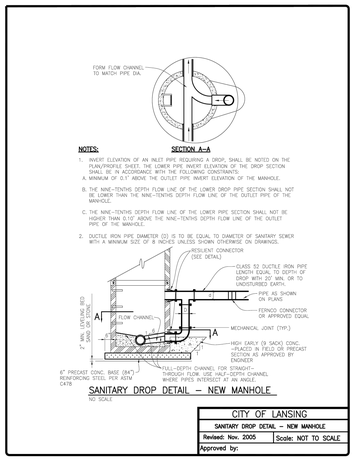
CITY OF LANSING	
MANHOLE DETAIL	
Revised: March 2021	Scale: NOT TO SCALE
Approved by:	



BEDDING DETAILS
NOT TO SCALE



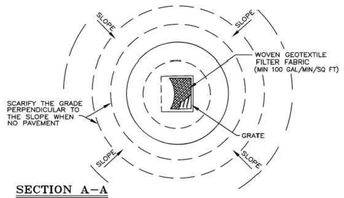
SEWER 6" CLEANOUT DETAIL
NO SCALE

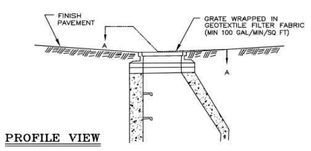


CITY OF LANSING	
SANITARY DROP DETAIL – NEW MANHOLE	
Revised: Nov. 2005	Scale: NOT TO SCALE
Approved by:	

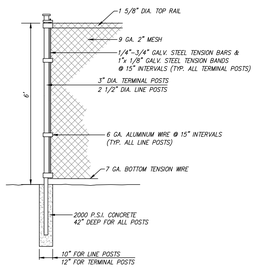
LOW POINT INLET FILTER (SI–2)

ALTERNATIVE INLET FILTER MUST BE USED IN AREAS THAT MAY BECOME A SAFETY HAZARD DUE TO FLOODING OR FREEZING.



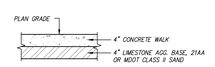


PROFILE VIEW

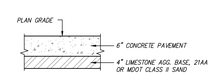


NOTE:
TERMINAL POSTS INCLUDE END, COVER, ANGLE, INTERSECTION AND INTERMEDIATE BRACED POSTS.

DETAIL F C7.0
6' CHAIN LINK FENCE



DETAIL CP-1 C7.0
4" CONCRETE WALK



DETAIL CP-2 C7.0
6" CONCRETE WALK

COMMERCIAL GRADE HINGE 3 HINGES ON 9' OR HIGHER

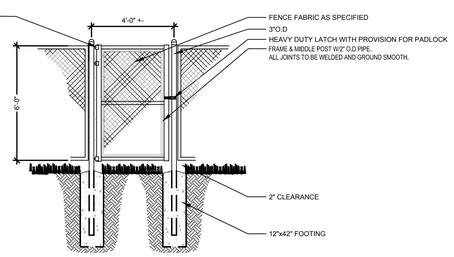
CHAIN LINK FENCE

FABRIC SHALL BE #9 GAUGE, CHAIN LINK OPEN HEARTH STEEL WIRE, HOT-DIPPED GALVANIZED AFTER WEAVING WITH MINIMUM COATING OF 2.0 OUNCE OF ZINC PER SQUARE FOOT OR ALUMINUM COATING WITH .40 OUNCES PER SQUARE FOOT, WOVEN IN 2" DIAMOND MESH.

CONCRETE FOR SETTING POSTS SHALL BE PORTLAND CEMENT COMPLYING WITH ASTM C-150, AGGREGATES COMPLYING WITH ASTM C-33, AND CLEAN WATER. MIX MATERIALS TO OBTAIN CONCRETE WITH A MINIMUM 28-DAY COMPRESSIVE STRENGTH OF 3,000 PSI.

STRETCHER BAR BANDS, TIE WIRES, HOG RINGS, COUPLINGS, NUTS, STRETCHER BARS, BOLTS AND MISCELLANEOUS FASTENING DEVICES SHALL BE GALVANIZED PER MANUFACTURER'S STANDARD FOR HEAVY CONSTRUCTION FENCE.

INSPECTION OF THE FABRIC WILL BE DONE BY OWNER OR OWNER'S AUTHORIZED REPRESENTATIVE AFTER INSTALLATION. ALL BARBS AND ICICLES WILL BE REMOVED BY THE CONTRACTOR TO THE SATISFACTION OF THE OWNER.



DETAIL G C7.0
4' CHAIN LINK FENCE GATE

COMMERCIAL GRADE HINGE 3 HINGES ON 9' OR HIGHER

CHAIN LINK FENCE

FABRIC SHALL BE #9 GAUGE, CHAIN LINK OPEN HEARTH STEEL WIRE, HOT-DIPPED GALVANIZED AFTER WEAVING WITH MINIMUM COATING OF 2.0 OUNCE OF ZINC PER SQUARE FOOT OR ALUMINUM COATING WITH .40 OUNCES PER SQUARE FOOT, WOVEN IN 2" DIAMOND MESH.

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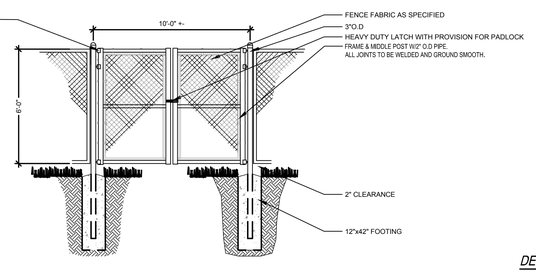
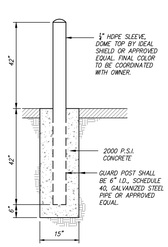


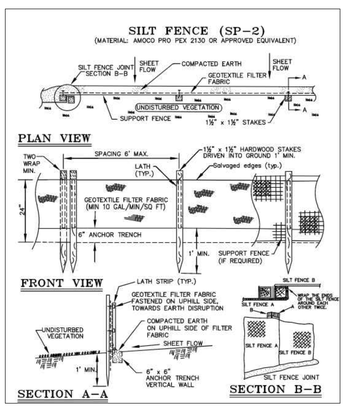
DETAIL G2 C7.0
10' CHAIN LINK FENCE VEHICLE GATE



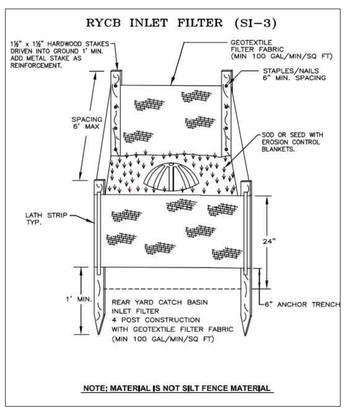
DETAIL B C7.0
BOLLARD DE

SILT FENCE (SP–2)

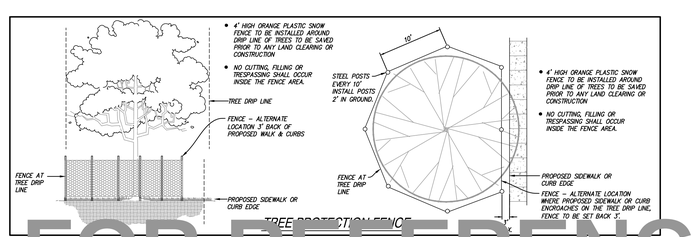
(MATERIAL: AMOCO PRO PEX 2130 OR APPROVED EQUIVALENT)



RYCB INLET FILTER (SI–3)



NOTE: MATERIAL IS NOT SILT FENCE MATERIAL



KINGSCOTT
KALAMAZOO | CHELSEA | GRAND RAPIDS | ROYAL OAK

Pattengill Elementary School MODULAR CLASSROOM BUILDING

Lansing School District

Lansing School District

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Issued for Permits	4.15.2024
Construction Documents BP03	4.19.2024

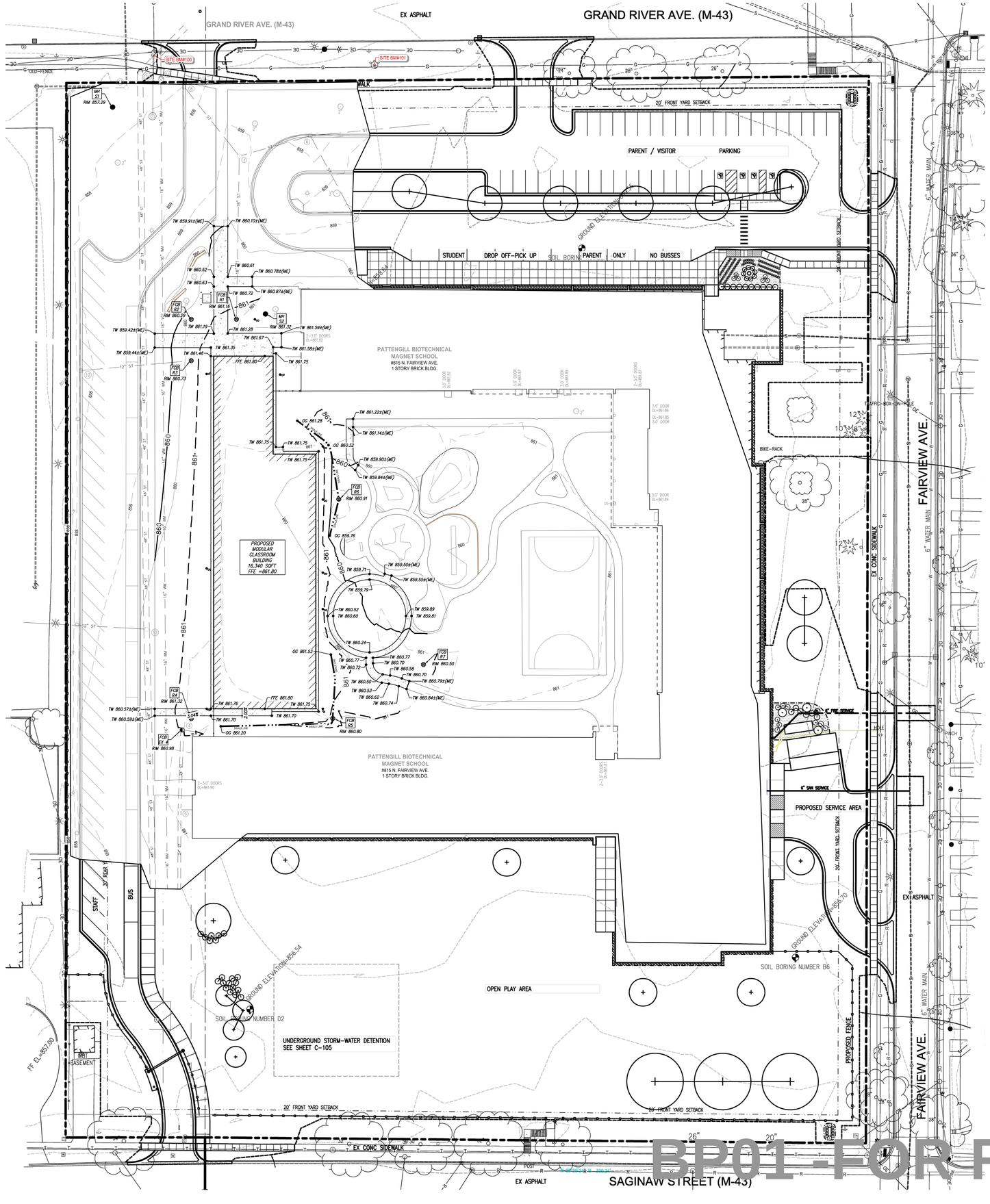
KEY PLAN

JOB NO. NP24011

NORTH

SHEET TITLE
Details

SHEET NO.
C7.0



GRAPHIC SCALE
0 15 30 60
(IN FEET)
1 inch = 30 ft.

GRADING LEGEND

	EXISTING ELEVATION	• TP 000.00	TOP OF PAVEMENT ELEVATION
TC 000.00	PROPOSED TOP OF CURB ELEVATION	• TW 000.00	TOP OF WALK ELEVATION
G 000.00	PROPOSED GUTTER ELEVATION	• FG 000.00	FINISH GRADE ELEVATION
• OG 000.00	OUTSIDE GRADE ELEVATION	• T/WALL 000.00	TOP OF WALL ELEVATION
11.50	EXISTING CONTOURS	• ME 000.00	MATCH EXISTING ELEVATION
11.21			FLOW ARROW
1130	PROPOSED CONTOURS		

GRADING NOTES

1. CONTRACTOR TO PLACE ALL NEW PAVEMENT TO THE GRADES INDICATED, OR MATCH ORIGINAL GRADES IF NEW GRADES ARE NOT SHOWN. CONTRACTOR SHALL CONFIRM MINIMUM 1% PAVEMENT SLOPES ARE ATTAINED IN ALL AREAS.
2. PROPOSED GRADES MAY BE BASED ON AN INTERPOLATION OF DATA SHOWN ON THE TOPOGRAPHIC SURVEY. THIS INTERPOLATED DATA IS APPROXIMATE AND COULD DIFFER SLIGHTLY BASED ON THE ACCURACY OF THE SURVEY. CONTRACTOR SHALL CONFIRM THAT THE PROPOSED GRADES SHOWN ON THIS PLAN WILL NOT CREATE A STANDING WATER CONDITION (I.E. A LOW SPOT OR PAVEMENT SLOPES LESS THAN 1%) OR AN UNSAFE CONDITION WITH SLOPES IN EXCESS OF 5%. CONTRACTOR SHALL NOTIFY ENGINEER IMMEDIATELY IF THEY BELIEVE THAT ONE OF THESE SITUATIONS WILL OCCUR BASED ON THE PROPOSED GRADES.
3. ALL PAVEMENT PLACED WITHIN BARRIER FREE PARKING AREAS (STALLS AND ACCESS AISLES) SHALL HAVE A MAXIMUM SLOPE OF 2% IN ANY DIRECTION, INCLUDING MEASURED DIAGONALLY ACROSS THE AREAS. CONTRACTOR SHALL ADJUST SLOPES AS NECESSARY TO PROVIDE ADA COMPLIANT SLOPES AS WELL AS PROVIDING RE-GRADED TRANSITION SLOPES OUTSIDE OF THE BARRIER FREE PARKING AREAS. CONTRACTOR SHALL NOTIFY ENGINEER IMMEDIATELY IF TRANSITION ZONES WILL EXCEED MAXIMUM 5% SLOPES. CONTRACTOR SHALL MAINTAIN POSITIVE DRAINAGE PATTERNS WITH ALL NECESSARY PAVEMENT RE-GRADING.
4. ALL BARRIER FREE RAMPS AND ADA ACCESSIBLE ROUTES SHALL BE CONSTRUCTED IN ACCORDANCE WITH THE CURRENT VERSION OF MDOT DETAIL R-28 "SIDEWALK RAMP AND DETECTABLE WARNING DETAILS".
5. CONTRACTOR IS RESPONSIBLE FOR CONTROLLING STORM WATER RUNOFF DURING CONSTRUCTION OPERATIONS. OF PARTICULAR CONCERN WILL BE THE TIME PERIOD AFTER THE SITE HAS BEEN STRIPPED AND NOT YET RESTORED, BUILT UPON, OR PAVED. CONTRACTOR MUST INSTALL OR CONSTRUCT APPROPRIATE TEMPORARY MEASURES TO PROTECT ADJACENT PROPERTIES.

KINGSCOTT
KALAMAZOO | CHELSEA | GRAND RAPIDS | ROYAL OAK

Pattengill Elementary School
MODULAR CLASSROOM BUILDING
Lansing School District

Lansing School District

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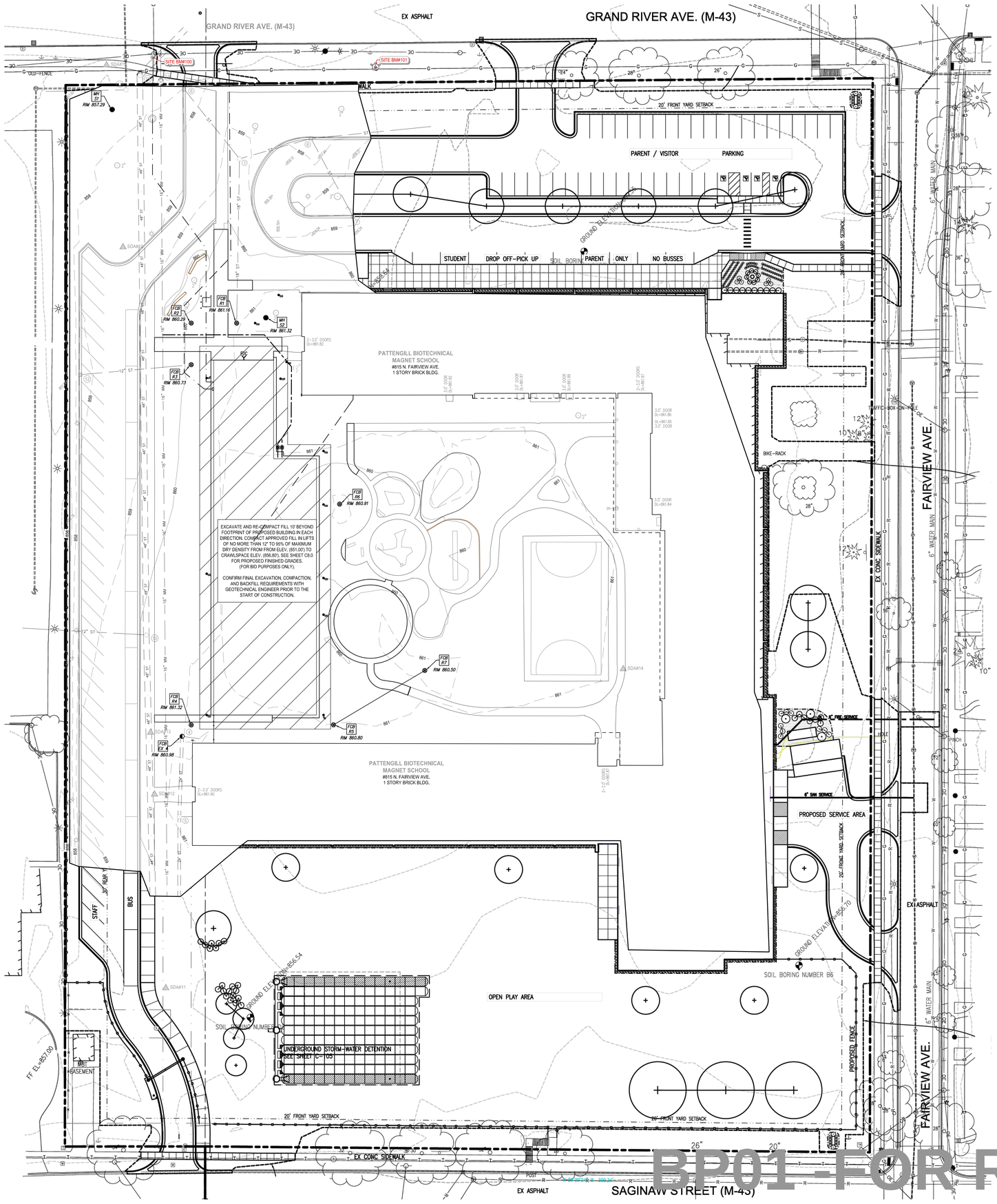
KEY PLAN

JOB NO. NP24011

NORTH

SHEET TITLE
Grading Plan

SHEET NO.
C8.0



GRAPHIC SCALE
0 15 30 60
(IN FEET)
1 inch = 30 ft.

LEGEND
GROUND IMPROVEMENTS

KINGSCOTT
KALAMAZOO | CHELSEA | GRAND RAPIDS | ROYAL OAK

Pattengill Elementary School
MODULAR CLASSROOM BUILDING
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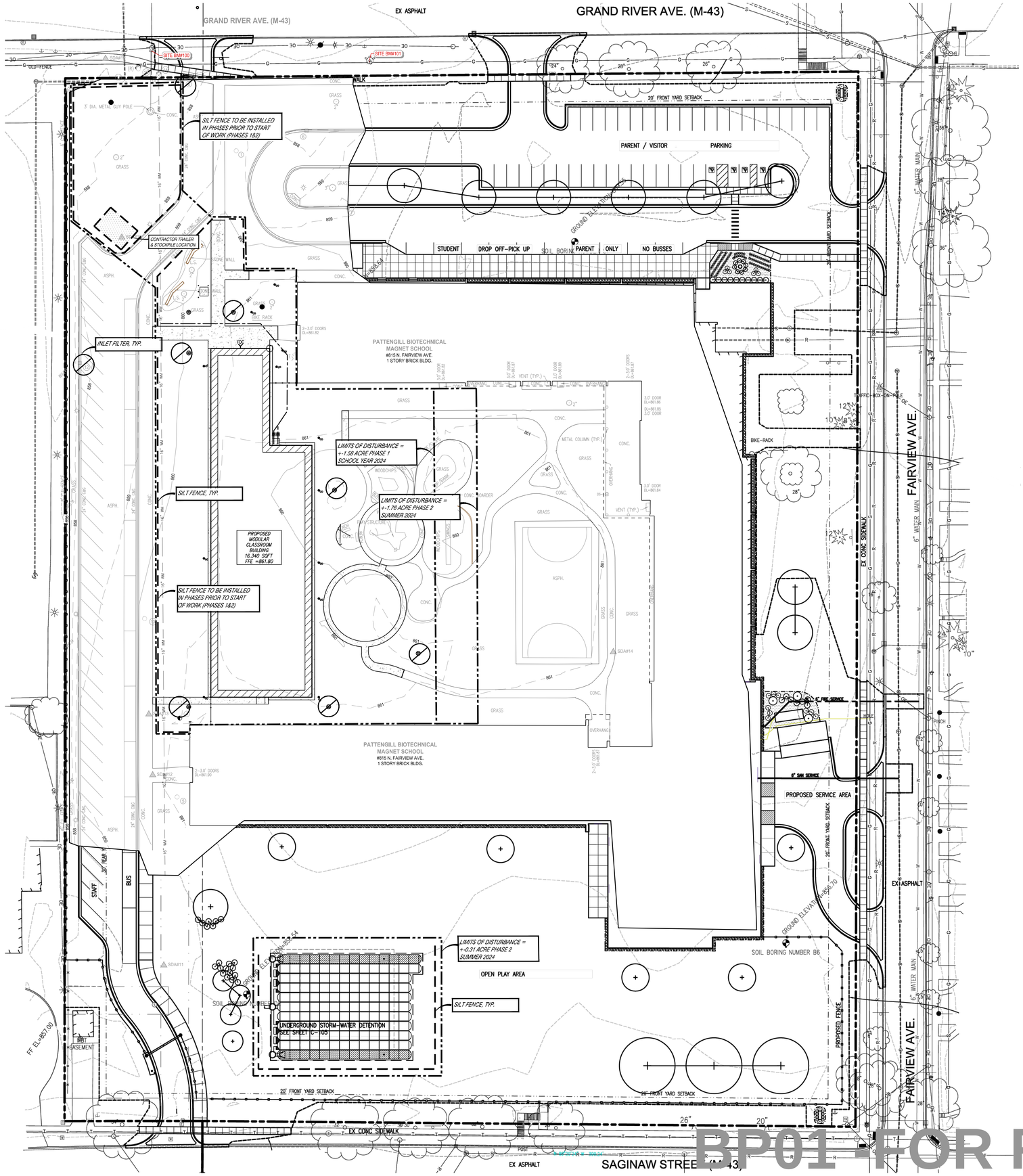
KEY PLAN

JOB NO. NP24011

NORTH

SHEET TITLE
GROUND IMPROVEMENTS

SHEET NO.
C8.1



GRAPHIC SCALE
0 15 30 60
(IN FEET)
1 inch = 30 ft.

GRADING LEGEND

	EXISTING ELEVATION	• TP 000.00	TOP OF PAVEMENT ELEVATION
• TC 000.00	PROPOSED TOP OF CURB ELEVATION	• TW 000.00	TOP OF WALK ELEVATION
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11.50	EXISTING CONTOURS	• ME 000.00	MATCH EXISTING ELEVATION
11.50	PROPOSED CONTOURS		FLOW ARROW

SOIL EROSION CONTROL DEVICES

- INLET SEDIMENT TRAP
- SILT FENCE
- LIMITS OF DISTURBANCE

RESTORATION NOTE

RESTORE ALL NON-PAVED AREAS WITH 3" OF CLEAN TOPSOIL AND SEED MIX (30% KENTUCKY BLUEGRASS, 30% PERENNIAL RYEGRASS, 50% CREEPING RED FESCUE). PLACE MULCH IN ALL SEEDED AREAS. ON SLOPES IN EXCESS OF 10 HORIZONTAL TO 1 VERTICAL PLACE NORTH AMERICAN GREEN DS150 MULCH BLANKET IMMEDIATELY AFTER SEEDING. USE METAL STAPLES PER MANUFACTURERS RECOMMENDATIONS TO HOLD MATTING IN PLACE.

GRADING NOTES

1. CONTRACTOR TO PLACE ALL NEW PAVEMENT TO THE GRADES INDICATED, OR MATCH ORIGINAL GRADES IF NEW GRADES ARE NOT SHOWN. CONTRACTOR SHALL CONFIRM MINIMUM 1% PAVEMENT SLOPES ARE ATTAINED IN ALL AREAS.
2. PROPOSED GRADES MAY BE BASED ON AN INTERPOLATION OF DATA SHOWN ON THE TOPOGRAPHIC SURVEY. THIS INTERPOLATED DATA IS APPROXIMATE AND COULD DIFFER SLIGHTLY BASED ON THE ACCURACY OF THE SURVEY. CONTRACTOR SHALL CONFIRM THAT THE PROPOSED GRADES SHOWN ON THIS PLAN WILL NOT CREATE A STANDING WATER CONDITION (I.E. A LOW SPOT OR PAVEMENT SLOPES LESS THAN 1%) OR AN UNSAFE CONDITION WITH SLOPES IN EXCESS OF 5%. CONTRACTOR SHALL NOTIFY ENGINEER IMMEDIATELY IF THEY BELIEVE THAT ONE OF THESE SITUATIONS WILL OCCUR BASED ON THE PROPOSED GRADES.
3. ALL PAVEMENT PLACED WITHIN BARRIER FREE PARKING AREAS (STALLS AND ACCESS AISLES) SHALL HAVE A MAXIMUM SLOPE OF 2% IN ANY DIRECTION, INCLUDING MEASURED DIAGONALLY ACROSS THE AREAS. CONTRACTOR SHALL ADJUST SLOPES AS NECESSARY TO PROVIDE ADA COMPLIANT SLOPES AS WELL AS PROVIDING RE-GRADED TRANSITION SLOPES OUTSIDE OF THE BARRIER FREE PARKING AREAS. CONTRACTOR SHALL NOTIFY ENGINEER IMMEDIATELY IF TRANSITION ZONES WILL EXCEED MAXIMUM 5% SLOPES. CONTRACTOR SHALL MAINTAIN POSITIVE DRAINAGE PATTERNS WITH ALL NECESSARY PAVEMENT RE-GRADING.
4. ALL BARRIER FREE RAMPS AND ADA ACCESSIBLE ROUTES SHALL BE CONSTRUCTED IN ACCORDANCE WITH THE CURRENT VERSION OF MDOT DETAIL R-28 "SIDEWALK RAMP AND DETECTABLE WARNING DETAILS".
5. CONTRACTOR IS RESPONSIBLE FOR CONTROLLING STORM WATER RUNOFF DURING CONSTRUCTION OPERATIONS. OF PARTICULAR CONCERN WILL BE THE TIME PERIOD AFTER THE SITE HAS BEEN STRIPPED AND NOT YET RESTORED, BUILT UPON, OR PAVED. CONTRACTOR MUST INSTALL OR CONSTRUCT APPROPRIATE TEMPORARY MEASURES TO PROTECT ADJACENT PROPERTIES.

SOIL EROSION/SEDIMENTATION CONTROL NOTES

1. ALL EROSION AND SEDIMENT CONTROL WORK SHALL CONFORM TO THE STANDARDS AND SPECIFICATIONS OF THE CITY OF LANSING.
2. DAILY INSPECTIONS SHALL BE MADE BY THE CONTRACTOR TO DETERMINE EFFECTIVENESS OF EROSION AND SEDIMENTATION CONTROL DEVICES, AND ANY NECESSARY REPAIRS SHALL BE PERFORMED WITHOUT DELAY.
3. EROSION AND ANY SEDIMENT FROM WORK ON THIS SITE SHALL BE CONTAINED ON THE SITE AND NOT ALLOWED TO COLLECT ON ANY OFF-SITE AREAS OR IN WATER WAYS. WATERWAYS INCLUDE BOTH NATURAL AND MANMADE OPEN DITCHES, STREAMS, STORM DRAINS, LAKES AND PONDS.
4. EROSION AND SEDIMENT CONTROL DEVICES ARE TO BE PLACED PRIOR TO, OR AS THE FIRST STEP IN CONSTRUCTION. SEDIMENT CONTROL PRACTICES WILL BE APPLIED AS A PERIMETER DEFENSE AGAINST ANY TRANSPORTING OF SILT OFF THE SITE.
5. CONTRACTOR SHALL APPLY TEMPORARY EROSION AND SEDIMENTATION CONTROL DEVICES AS REQUIRED AND AS DIRECTED ON THESE PLANS. HE SHALL REMOVE TEMPORARY DEVICES AS SOON AS PERMANENT STABILIZATION OF SLOPES, DITCHES, AND OTHER EARTH CHANGES HAVE BEEN ACCOMPLISHED AND APPROVED BY THE CITY.
6. DEBRIS FROM PROJECT WILL BE LEFT ON THE SITE BY DELIVERY OR CONSTRUCTION VEHICLES THROUGH THE USE OF CLEAN STONE EXITS. SHOULD THE STONE BECOME LESS EFFECTIVE IT WILL BE REPLACED. ALL CONSTRUCTION TRAFFIC WILL USE THE CLEAN STONE EXIT.
7. DUST CONTROL WILL BE EXERCISED AT ALL TIMES WITHIN THE PROJECT BY THE CONTRACTORS. SPRINKLING TANK TRUCKS WILL BE AVAILABLE AT ALL TIMES TO BE USED ON HAUL ROUTES OR OTHER PLACES WHERE DUST BECOMES A PROBLEM.
8. IMMEDIATELY AFTER SEEDING, MULCH ALL SEEDED AREAS WITH UNWEATHERED SMALL GRAIN STRAW OR HAY. SPREAD UNIFORMLY AT A RATE OF 1 1/2 TO 2 TONS PER ACRE OR 0.10 POUNDS PER SQUARE FEET. ANCHOR MULCH WITH DISC TYPE MULCH ANCHORING TOOL.
9. ALL MUD, DIRT, AND DEBRIS TRACKED ONTO EXISTING ROADS FROM THIS SITE SHALL BE PROMPTLY REMOVED BY THE CONTRACTOR OR BUILDER. ALL MUD, DIRT, AND DEBRIS TRACKED OR SPILLED ONTO PAVED SURFACES WITHIN THIS SITE SHALL BE PROMPTLY REMOVED BY THE CONTRACTOR.
10. PERMANENT SOIL EROSION CONTROL DEVICES FOR ALL SLOPES, CHANNELS, DITCHES OR ANY DISTURBED LAND AREA SHALL BE COMPLETED WITHIN 15 CALENDAR DAYS AFTER FINAL GRADING OR FINAL EARTH CHANGES HAVE BEEN COMPLETED. WHEN IT IS NOT POSSIBLE TO PERMANENTLY STABILIZE A DISTURBED AREA AFTER AN EARTH CHANGE HAS BEEN COMPLETED OR WHERE SIGNIFICANT EARTH CHANGE ACTIVITY CEASES, TEMPORARY SOIL EROSION CONTROL DEVICES SHALL BE IMPLEMENTED WITHIN 30 CALENDAR DAYS. ALL TEMPORARY SOIL EROSION CONTROL DEVICES SHALL BE MAINTAINED UNTIL PERMANENT SOIL EROSION DEVICES ARE IMPLEMENTED AND/OR ESTABLISHED. ALL PERMANENT SOIL EROSION CONTROL DEVICES WILL BE IMPLEMENTED AND ESTABLISHED BEFORE A CERTIFICATE OF COMPLIANCE IS ISSUED.
11. ALL CONTRACTORS ARE TO KEEP EXCAVATED MATERIAL ON SITE. PARTICULAR CARE SHOULD BE TAKEN WHEN WORKING ALONG THE PERIMETER OF THE SITE. IN NO EVENT SHALL THE WORK AREA EXTEND BEYOND THE LIMITS INDICATED ON THE PLANS.
12. THE SOIL EROSION CONTROLS WILL BE MAINTAINED WEEKLY AND AFTER EVERY STORM EVENT BY THE CONTRACTOR.
13. DISTANCE TO NEAREST LAKE, STREAM, OR DRAIN: 800 FT NW, UNNAMED BASIN.

SOIL EROSION/SEDIMENTATION CONTROL CONSTRUCTION SEQUENCE

1. INSTALL INLET FILTERS, AND SILT FENCE AROUND DEFINED PERIMETER AS SHOWN.
2. COMPLETE SITE DEMOLITION ACTIVITIES INCLUDING PAVEMENT REMOVAL AND DISPOSAL, CLEAR, GRUB AND STRIP TOPSOIL IN AREAS OF EARTH DISRUPTION.
3. COMPLETE ROUGH GRADING LAND BALANCING OPERATIONS.
4. INSTALL PROPOSED UNDERGROUND UTILITIES AND PLACE INLET FILTERS IN NEW STORM STRUCTURES WHERE INDICATED. REPLACED INLET FILTERS WITHIN AFFECTED EXISTING STRUCTURES AS NECESSARY.
5. PERFORM FINE GRADING, PAVING OPERATIONS, AND FIELD.
6. COMPLETE LANDSCAPING ACTIVITIES INCLUDING LAWN RESTORATION.
7. EROSION CONTROL MEASURES ARE NOT TO BE REMOVED UNTIL THE CITY AND/OR COUNTY GRANTS ITS APPROVAL. INLET FILTERS SHALL BE PERIODICALLY INSPECTED AND CLEANED/REPLACED AS NECESSARY.

ALL EROSION CONTROL MEASURES SHALL BE INSTALLED APPROXIMATELY ACCORDING TO THE FOLLOWING SEQUENCE OF CONSTRUCTION.

PROJECT COMMENCEMENT ON OR ABOUT MAY 2024.

SCHEDULE

A.	INSTALL SILT FENCE, AND INLET FILTERS IN EXISTING STRUCTURES.	1-2 DAYS
B.	STRIP AND STOCKPILE TOPSOIL, SITE DEMOLITION, AND ROUGH GRADE SITE.	2-3 WEEKS
C.	INSTALL PROPOSED UTILITIES AND NEW STRUCTURES.	2-3 WEEKS
D.	INSTALL INLET FILTERS IN DRAINAGE STRUCTURES	1-2 DAYS
E.	BUILDING ADDITION CONSTRUCTION.	2 MONTHS
F.	FINE GRADE SITE, PAVE, INSTALL LANDSCAPING AND ESTABLISH VEGETATION.	2-3 WEEKS
G.	CLEAN PAVEMENTS, WALKS, CULVERTS, AND WATERCOURSES OF ALL ACCUMULATED SEDIMENT IN CONJUNCTION WITH REMOVAL ALL TEMPORARY DEVICES.	1-2 WEEKS

PROJECT COMPLETION ON OR ABOUT NOVEMBER 2024.

KINGSCOTT
KALAMAZOO | CHELSEA | GRAND RAPIDS | ROYAL OAK

Pattengill Elementary School MODULAR CLASSROOM BUILDING

Lansing School District

Lansing School District

REVISIONS/REVIEW	DATE
Early Site Work	3.5.2024
Addendum #1	3.20.2024
Addendum #2	3.26.2024
Issued for Permits	4.15.2024
Construction Documents BP03	4.19.2024

KEY PLAN

NORTH

JOB NO. **NP24011**

SHEET TITLE
Soil Erosion and Sedimentation Control Plan

SHEET NO.
C9.0

STRUCTURAL NOTES

GENERAL

1. THESE NOTES ARE TO BE READ IN CONJUNCTION WITH THE DRAWINGS AND THE WRITTEN SPECIFICATIONS. IN THE EVENT OF CONFLICT BETWEEN THE INFORMATION ON THE WRITTEN SPECIFICATIONS, THE DRAWINGS, AND THESE NOTES, THE MORE STRINGENT REQUIREMENTS SHALL GOVERN.

2. THE CONTRACT STRUCTURAL DRAWINGS AND SPECIFICATIONS REPRESENT THE COMPLETED STRUCTURE. IT IS THE CONTRACTOR'S RESPONSIBILITY TO PROVIDE ADEQUATE SHORING AND BRACING DURING CONSTRUCTION TO ACCOUNT FOR ALL FORCES, INCLUDING BUT NOT LIMITED TO: GRAVITY, WIND, EARTH PRESSURE, AND UNBALANCED FORCES DUE TO CONSTRUCTION SEQUENCE. THE CONTRACTOR SHALL BE SOLELY RESPONSIBLE FOR ALL CONSTRUCTION MEANS, METHODS, PROCEDURES, TECHNIQUES, SEQUENCES, AND JOB SAFETY.

3. THE CONTRACTOR SHALL ENSURE THAT ALL CONSTRUCTION METHODS WILL NOT CAUSE DAMAGE TO ADJACENT BUILDINGS, UTILITIES, OR OTHER PROPERTIES.

4. THE CONTRACTOR IS RESPONSIBLE FOR COORDINATION OF THE STRUCTURAL WORK WITH THE ARCHITECTURAL, MECHANICAL, ELECTRICAL, AND PLUMBING WORK, AS WELL AS ANY OTHER APPLICABLE TRADES. NOTIFY THE ARCHITECT/ENGINEER OF ANY DISCREPANCIES AND/OR INTERFERENCES IMMEDIATELY.

5. CONTRACTOR SHALL VERIFY ALL DIMENSIONS AND EXISTING CONDITIONS BEFORE BEGINNING WORK. CONTRACTOR SHALL TAKE FIELD MEASUREMENTS AND BE RESPONSIBLE FOR SAME.

6. IN CASES OF CONFLICT BETWEEN DRAWINGS AND/OR SPECIFICATIONS AND OTHER DISCIPLINES OR EXISTING CONDITIONS, THE CONTRACTOR SHALL NOTIFY THE ARCHITECT/ENGINEER AND OBTAIN CLARIFICATION PRIOR TO BIDDING AND/OR PROCEEDING WITH THE WORK.

7. THE CONTRACTOR SHALL VERIFY ALL OPENING SIZES AND LOCATIONS WITH OTHER DISCIPLINES. THE DRAWINGS DO NOT SHOW ALL OPENINGS REQUIRED. ADDITIONAL OPENINGS, BLOCKOUTS, AND SLEEVES MAY BE REQUIRED BY OTHER DISCIPLINES. OPENINGS REQUIRED BUT NOT SHOWN ON STRUCTURAL DRAWINGS MUST BE APPROVED BY THE STRUCTURAL ENGINEER OF RECORD.

8. APPLY DETAILS, SECTIONS, AND NOTES ON THE DRAWINGS WHERE CONDITIONS ARE SIMILAR TO THOSE INDICATED BY DETAIL, DETAIL TITLE, OR NOTE.

9. DO NOT SCALE DRAWINGS. ONLY USE DIMENSIONS INDICATED ON THE DRAWINGS.

10. ISOMETRIC VIEWS, IF INCLUDED, ARE TO GIVE A GENERAL SENSE OF THE STRUCTURE AND MASSING. THEY DO NOT SUPERSEDE THE STRUCTURAL DRAWINGS AND ARE PROVIDED AS SUPPLEMENTAL INFORMATION ONLY. THE STRUCTURE SHALL BE PROVIDED PER THE STRUCTURAL DRAWINGS, DETAILS, NOTES, AND SPECIFICATIONS.

11. CENTERLINES OF FOUNDATIONS COINCIDE WITH COLUMN LOCATIONS, UNLESS NOTED OTHERWISE.

12. THE CONTRACTOR SHALL OBTAIN COPIES OF THE LATEST CONTRACT DOCUMENTS INCLUDING ALL BULLETINS AND ADDENDA, AND SHALL PROVIDE THE RELEVANT PORTIONS TO ALL SUBCONTRACTORS AND SUPPLIERS PRIOR TO SUBMITTAL OF SHOP DRAWINGS, FABRICATION, AND ERECTION OF STRUCTURAL MEMBERS.

13. STRUCTURAL ENGINEER OF RECORD'S ACCEPTANCE MUST BE SECURED FOR ALL STRUCTURAL SUBSTITUTIONS.

14. NO STRUCTURAL MEMBER SHALL BE CUT, NOTCHED, OR OTHERWISE REDUCED IN STRENGTH UNLESS SPECIFICALLY SHOWN ON THE STRUCTURAL DRAWINGS OR APPROVED IN WRITING BY THE STRUCTURAL ENGINEER OF RECORD.

15. THE GENERAL CONTRACTOR IS TO PROVIDE AN APPROPRIATE NUMBER OF COPIES OF ONE COMPLETE COORDINATED DRAWING SET SHOWING ALL SLEEVES, CONDUITS, BOXOUTS, DUCT OPENINGS, ETC. AS REQUIRED FOR ALL TRADES FOR THE STRUCTURAL ENGINEER OF RECORD'S APPROVAL. THIS SHALL BE DONE A MINIMUM OF TWO WEEKS PRIOR TO CONSTRUCTING AFFECTED SLABS, BEAMS, WALLS, COLUMNS, OR FOOTINGS.

16. SUPPORT DETAILS FOR ARCHITECTURAL, MECHANICAL, ELECTRICAL, AND PLUMBING EQUIPMENT IS BASED UPON AVAILABLE INFORMATION OF MANUFACTURER. CONTRACTOR SHALL COORDINATE REQUIREMENTS OF ACTUAL EQUIPMENT SUPPLIED WITH DETAILS AND SHALL PROVIDE ANY ADDITIONAL FRAMING REQUIRED.

17. PERIODIC SITE OBSERVATION VISITS MAY BE PROVIDED BY THE ARCHITECT/ENGINEER. THE SOLE PURPOSE OF THESE OBSERVATIONS IS TO REVIEW THE GENERAL CONFORMANCE OF THE CONSTRUCTION WITH THE CONTRACT DOCUMENTS. THESE LIMITED OBSERVATIONS SHOULD NOT BE CONSIDERED AS CONTINUOUS OR EXHAUSTIVE INVESTIGATIONS TO VERIFY THAT ALL CONSTRUCTION IS IN COMPLIANCE WITH THE CONTRACT DOCUMENTS.

REFERENCED CODES AND STANDARDS

1. PERFORM ALL CONSTRUCTION IN CONFORMANCE WITH THE LATEST EDITIONS OF THE BUILDING AND DESIGN CODES REFERENCED WITHIN THESE DOCUMENTS. THE CONTRACT DOCUMENTS REFER TO THE FOLLOWING CODES AND STANDARDS, LATEST EDITIONS AS REFERENCED IN THE CURRENT BUILDING CODE IN THE STATE OF THE PROJECT, UNLESS NOTED OTHERWISE:
   - 2015 MICHIGAN BUILDING CODE
   - ASCE 7, MINIMUM DESIGN LOADS FOR BUILDINGS AND OTHER STRUCTURES
   - ACI 301, SPECIFICATIONS FOR STRUCTURAL CONCRETE FOR BUILDINGS
   - ACI 318, BUILDING CODE REQUIREMENTS FOR STRUCTURAL CONCRETE
   - TMS 402/602, BUILDING CODE REQUIREMENTS AND SPECIFICATION FOR MASONRY STRUCTURES
   - HOT AND COLD WEATHER MASONRY CONSTRUCTION BY THE MASONRY INDUSTRY COUNCIL
   - AISC 303, CODE OF STANDARD PRACTICE FOR STEEL BUILDINGS AND BRIDGES
   - AISC 360, SPECIFICATION FOR STRUCTURAL STEEL BUILDINGS

DESIGN CRITERIA

1. GENERAL
   - CONCRETE DESIGN — LRFD
   - STEEL DESIGN — LRFD
   - RISK CATEGORY — III

2. DEAD LOADS (**PER UNIT MANUFACTURER**)
   - CORRIDOR — 10.0 PSF
   - CLASSROOMS — 10.0 PSF
   - ROOF — 10.0 PSF

3. LIVE LOADS (**PER UNIT MANUFACTURER**)
   - CORRIDOR — 100.0 PSF
   - CLASSROOMS — 50.0 PSF
   - ROOF — 30.0 PSF

4. SNOW LOADS (**NOT PROVIDED BY MANUFACTURER**)
   - GROUND SNOW LOAD (P_G) — 30.0 PSF
   - SNOW EXPOSURE FACTOR (C_E) — 0.9
   - SNOW IMPORTANCE FACTOR (I_S) — 1.1
   - THERMAL FACTOR (C_T) — 1.0
   - FLAT ROOF SNOW LOAD (P_F) — 21.0 PSF
   - MINIMUM SNOW LOAD (P_{MIN}) — 22.0 PSF

5. WIND LOADS (**NOT PROVIDED BY MANUFACTURER**)
   - BASIC WIND SPEED (V) — 115 MPH
   - EXPOSURE CATEGORY — B
   - (SEE WIND LOAD DIAGRAMS)

6. SEISMIC LOADS (**NOT PROVIDED BY MANUFACTURER**)
   - SEISMIC SITE CLASS — D
   - DESIGN SPECTRAL ACCELERATION (S_{DS}) — 0.098
   - DESIGN SPECTRAL ACCELERATION (S_{D1}) — 0.074
   - SEISMIC DESIGN CATEGORY — B
   - SEISMIC IMPORTANCE FACTOR (I_E) — 1.25
   - WOOD WALLS SHEATHED WITH WOOD PANELS (R) — 6.5
   - SEISMIC RESPONSE COEFFICIENT (C_S) — 0.018

- **PRE-MANUFACTURED UNIT SUPPLIER DECLINED TO PROVIDE REACTIONS ITEMIZED FOR EACH LOAD CASE (DEAD, LIVE, ROOF LIVE, SNOW, WIND (N-S, E-W, AND UPLIFT), AND SEISMIC (N-S, E-W, AND UPLIFT). ASSUMPTIONS WERE THEREFORE MADE TO DESIGN FOUNDATIONS. SUPPLIER TO PROVIDE FINAL ENGINEERED PLANS, SECTIONS, AND DETAILS, WITH CALCULATIONS, ALL SIGNED AND SEALED BY A PROFESSIONAL STRUCTURAL ENGINEER LICENSED IN THE STATE OF MICHIGAN AS A SEPARATE DELEGATED DESIGN PACKAGE FOR WHICH RDA TAKES NO RESPONSIBILITY FOR THE ADEQUACY OF ANY PRE-MANUFACTURED UNIT DESIGN OR CONSTRUCTION.**

SUBMITTALS

1. THE CONTRACTOR SHALL SUBMIT FOR ARCHITECT/ENGINEER REVIEW A SCHEDULE WHICH DETAILS THE ESTIMATED QUANTITY OF SUBMITTALS, AND THE DATE THEY WILL BE RECEIVED, AT LEAST TWENTY (20) WORKING DAYS PRIOR TO THE FIRST SUBMITTAL. THE SCHEDULE SHOULD ACCOUNT FOR AT LEAST TEN (10) WORKING DAYS OF REVIEW TIME BY THE ARCHITECT/ENGINEER FOR EACH SUBMITTAL.

2. SHOP DRAWINGS AND/OR DETAILS THAT ARE PREPARED FROM REPRODUCTIONS OF THE STRUCTURAL ENGINEER OF RECORD'S DESIGN DOCUMENTS, IN WHOLE OR IN PART, SHALL NOT BE USED AND WILL BE REJECTED.

3. THE ARCHITECT/ENGINEER MAY RETURN, WITHOUT COMMENT, SUBMITTALS WHICH THE CONTRACTOR HAS NOT STAMPED OR WHICH DO NOT MEET THE PROJECT REQUIREMENTS.

4. THE CONSTRUCTION, MANUFACTURE, AND/OR FABRICATION OF ANY ITEMS PRIOR TO THE ARCHITECT/ENGINEER REVIEW WILL BE ENTIRELY AT THE RISK OF THE CONTRACTOR.

5. ARCHITECT'S/ENGINEER'S REVIEW IS FOR GENERAL CONFORMANCE AND COMPLIANCE WITH THE DESIGN CONCEPT AND CONTRACT DOCUMENTS. ANY ACTION NOTED DOES NOT WAIVE ANY REQUIREMENT OF CONTRACT DOCUMENTS, COORDINATION OF TRADES, AND SATISFACTORY PERFORMANCE OF THEIR WORK WHICH ARE THE CONTRACTOR'S COMPLETE RESPONSIBILITY.

6. FOR COMPONENTS THAT REQUIRE A SPECIALTY ENGINEER, THE SUBMITTAL SHALL BE SEALED BY THE ENGINEER RESPONSIBLE FOR THE DESIGN. "SPECIALTY ENGINEER" IS DEFINED AS THE STRUCTURAL ENGINEER EMPLOYED BY THE SUPPLIER TO DESIGN PRODUCTS TO MEET THE SPECIFIC CRITERIA OUTLINED IN THE CONTRACT DOCUMENTS. SEALING OF THE SUBMITTAL IMPLIES THAT THE SPECIALTY ENGINEER HAS REVIEWED THE CONTRACT DOCUMENTS AND HAS, TO THE BEST OF THEIR KNOWLEDGE, INCORPORATED ALL OF THE SPECIAL DESIGN CRITERIA CONTAINED THEREIN.

7. ITEMS THAT REQUIRE SUBMITTAL FOR STRUCTURAL REVIEW ARE:
   - CONCRETE MIX DESIGNS
   - CONCRETE REINFORCING LAYOUT
   - MASONRY UNIT STRENGTHS
   - MORTAR/GROUT MIX DESIGNS
   - MASONRY REINFORCING LAYOUT
   - ANCHOR RODS
   - STRUCTURAL STEEL
   - PRE-FABRICATED BUILDING LOADS

SAW CUTTING EXISTING CONCRETE AND/OR MASONRY

1. SAW CUTTING OF NEW OPENINGS IN EXISTING CONCRETE AND/OR MASONRY WALLS SHALL BE DONE WITHOUT OVERCUTTING BEYOND THE BOUNDARIES OF THE INTENDED OPENING. ANY STRUCTURAL REPAIRS REQUIRED BY THE STRUCTURAL ENGINEER OF RECORD AS A RESULT OF OVERCUTTING BEYOND THE BOUNDARIES OF AN OPENING SHALL BE PAID FOR BY THE SAW CUTTING CONTRACTOR. SEE DRAWINGS FOR ADDITIONAL INFORMATION.

FOUNDATIONS

1. FOUNDATION CONSTRUCTION SHALL BE IN ACCORDANCE WITH THE SOIL REPORT BY SOIL AND MATERIALS ENGINEER, 2663 EATON RAPIDS ROAD, LANSING, MICHIGAN DATED MARCH 5, 2024 (SME JOB NO. 095629.00). THE CONTRACTOR SHALL OBTAIN A COPY OF THE SOIL REPORT AND BECOME FAMILIAR WITH THE REQUIREMENTS AND RECOMMENDATIONS THEREIN.

2. A REPRESENTATIVE OF THE GEOTECHNICAL ENGINEER SHALL BE RETAINED BY THE CONTRACTOR TO VERIFY FOUNDATION INSTALLATION AND CONSTRUCTION IS IN CONFORMANCE WITH THE RECOMMENDATIONS OUTLINED IN THE GEOTECHNICAL INVESTIGATION REPORT.

3. ALL FOOTINGS SHALL BEAR ON UNDISTURBED SOIL, HAVING A MINIMUM SAFE BEARING CAPACITY OF 3,000 PSF.

4. CONTRACTOR SHALL NOTIFY THE GEOTECHNICAL ENGINEER WHEN EXCAVATIONS ARE COMPLETED SO THAT CONDITIONS MAY BE INSPECTED PRIOR TO PLACEMENT OF ANY FILL, REINFORCING, OR CONCRETE. NOTIFY ARCHITECT/ENGINEER OF ANY VARIATION FROM THE ANTICIPATED BEARING CAPACITY FOR APPROPRIATE REDESIGN OR LOWERING OF FOOTING.

5. THE BOTTOMS OF ALL FOOTINGS SHALL BE MINIMUM 3'-6" BELOW FINISHED GRADE. IF SUCH ADDITIONAL FOOTING DEPTH WILL CAUSE UNDERMINING OF ADJACENT EXISTING FOOTINGS OR STRUCTURES, PROVIDE SHORING, BRACING, OR UNDERPINNING AS REQUIRED, OR LEAVE FOOTING ELEVATION AS DESIGNED AND PROVIDE CONTINUED PROTECTION AND HEAT TO PREVENT FORMATION OF FROST BELOW FOOTING AND ADJACENT TO FOOTING.

6. EDGES OF FOOTINGS SHALL NOT BE PLACED AT A GREATER THAN 1 VERTICAL TO 2 HORIZONTAL SLOPE WITH RESPECT TO ANY ADJACENT FOOTING OR EXCAVATION, UNLESS UNDERPINNING OR SHORING AND BRACING OF EXISTING FOOTING OR EXCAVATION IS PROVIDED. UNDERPINNING SHALL BE DONE SO AS NOT TO CAUSE SETTLEMENTS OF EXISTING STRUCTURE AND SHALL BE SUCH THAT COMPLETE CONTACT IS ACHIEVED BETWEEN NEW UNDERPINNING AND EXISTING CONCRETE.

7. DO NOT BACKFILL AGAINST BASEMENT WALLS UNTIL CONCRETE HAS ATTAINED 100 PERCENT OF ITS DESIGN STRENGTH. DO NOT PLACE BACKFILL AGAINST FOUNDATION WALLS UNTIL BASEMENT SLAB ON GRADE AND FIRST FLOOR STRUCTURE ARE IN PLACE. SHORE AND BRACE WALLS AS REQUIRED IF BACKFILLING OPERATIONS ARE TO BE CARRIED OUT PRIOR TO PLACEMENT OF BASEMENT SLAB AND/OR FLOOR STRUCTURE.

8. NO FOUNDATIONS OR SLABS SHALL BE PLACED ON OR AGAINST SUB-GRADE CONTAINING WATER, FROST, OR ICE. CONTRACTOR SHALL FURNISH ALL REQUIRED DE-WATERING EQUIPMENT TO MAINTAIN A DRY EXCAVATION UNTIL BACKFILL IS COMPLETE.

9. CONTRACTOR SHALL BE RESPONSIBLE TO ADEQUATELY PROTECT EXCAVATIONS AND SUB-GRADES OF COMPLETED NON-FROST PROTECTED FOUNDATIONS AND SLABS FROM DAMAGE DUE TO FREEZING CONDITIONS UNTIL THE FULL BUILDING ENCLOSURE IS COMPLETED AND HEATED.

10. SLABS ON GRADE SHALL REST ON GRANULAR FILL PER GEOTECHNICAL REPORT. ALL BACKFILL WITHIN BUILDING LINES SHALL BE ENGINEERED GRANULAR FILL PLACED UNDER THE FULL-TIME SUPERVISION OF A SOIL ENGINEER AND SHALL BE COMPACTED TO ACHIEVE 95% MODIFIED PROCTOR DENSITY (AS DEFINED BY ASTM D1557 MODIFIED PROCTOR TEST). FILL SHALL BE PLACED IN 9" MAXIMUM LIFTS.

11. THE CONTRACTOR SHALL SAFEGUARD AND PROTECT ALL EXCAVATIONS, ADJACENT STRUCTURES, PAVEMENTS, AND UTILITIES. DO NOT REMOVE SHORING, SUCH AS SHEET PILING, IF IT WILL CAUSE SETTLEMENT OR DAMAGE TO EXISTING OR NEW STRUCTURES, PAVEMENT, AND/OR UTILITIES.

12. MAXIMUM LENGTH OF FOUNDATION WALL PLACED IN ONE OPERATION SHALL NOT EXCEED 60 FEET.

13. THE FOUNDATION CONTRACTOR SHALL REFER TO MECHANICAL AND ELECTRICAL DRAWINGS FOR ALL LOCATIONS OF TRENCHES, PITS, CONDUITS, ETC. NOT SHOWN ON THE STRUCTURAL DRAWINGS.

CONCRETE

1. ALL CONCRETE SHALL BE MADE WITH PORTLAND CEMENT AND STONE AGGREGATE, WITH MIXES DESIGNED TO MEET 28-DAY MINIMUM COMPRESSIVE STRENGTHS IN VARIOUS ELEMENTS OF THE STRUCTURE AS FOLLOWS, UNLESS NOTED OTHERWISE:

ELEMENT	F'C	TYPE	MAX. AGG.	MAX. W/C	MAX. SLUMP
FOOTINGS	3,000	I/II	1 1/2"	0.49	4" (+/- 1")
WALLS	4,500	I/II	3/4"	0.46	4" (+/- 1")
SLABS ON GRADE	4,500	I/II	3/4"	0.46	4" (+/- 1")

2. ALL CONCRETE WORK SHALL CONFORM TO THE REQUIREMENTS OF THE AMERICAN CONCRETE INSTITUTE ACI 301, 318, AND SP-66 (315 INCLUDED AS A CHAPTER), LATEST EDITIONS.

3. PROVIDE NORMAL WEIGHT CONCRETE WITH CURED DENSITY OF 145 PCF AND AGGREGATE CONFORMING TO ASTM C33.

4. CONCRETE EXPOSED TO MOISTURE AND FREEZING-AND-THAWING CYCLES (WITH OR WITHOUT EXPOSURE TO DE-ICING CHEMICALS) SHALL BE AIR-ENTRAINED.

5. THE USE OF CALCIUM CHLORIDE AND/OR OTHER CHLORIDE CONTAINING AGENTS IS PROHIBITED. THE USE OF RECYCLED CONCRETE IS PROHIBITED. PLACEMENT WITHIN AND CONTACT BETWEEN ALUMINUM ITEMS AND CONCRETE IS PROHIBITED.

6. NO CONCRETE SHALL BE PLACED UNTIL CONCRETE DESIGN MIXES AND PREVIOUS TESTS HAVE BEEN SUBMITTED FOR EACH CLASS OF CONCRETE NOTED ABOVE AND HAVE BEEN APPROVED BY THE STRUCTURAL ENGINEER OF RECORD. CONCRETE PROPORTIONS SHALL BE BASED UPON FIELD EXPERIENCE AND/OR TRIAL BATCHES PER ACI 301 AND ACI 318. THE CONTROLLED CONCRETE TO BE USED SHALL CONFORM TO THE APPROVED DESIGN MIX. THE USE OF ANY ADDITIVES NOT PRESENT IN THE DESIGN MIX IS PROHIBITED. REPRESENTATIVE TEST CYLINDERS WILL BE TAKEN FROM THE CONCRETE PLACED EACH DAY IN ACCORDANCE WITH THE CONCRETE SPECIFICATIONS.

7. THE CONTRACTOR IS RESPONSIBLE FOR PROVIDING DRAWINGS FOR REVIEW OF ALL JOINTS IN THE CONCRETE WORK INCLUDING CONSTRUCTION, EXPANSION, CONTRACTION, AND MOVEMENT JOINTS. DRAWINGS SHALL BE SUBMITTED AT LEAST TWO WEEKS PRIOR TO EXPECTED START OF WORK. JOINT LOCATIONS SHALL COMPLY WITH RECOMMENDATIONS AND REQUIREMENTS DESCRIBED IN ACI 224, LATEST EDITION.

8. ALL CONCRETE STRUCTURAL MEMBERS SHALL BE PLACED FOR THEIR FULL DEPTHS IN ONE OPERATION. CONSTRUCTION JOINTS, SUCH AS DAY'S END PLACEMENT JOINTS, SHALL BE LOCATED IN THE MIDDLE THIRD OF THE SPAN AND BE ROUGHENED. REINFORCING TO RUN THROUGH THE JOINT, BULKHEAD, AND/OR KEY JOINTS. REMOVE LAITANCE PRIOR TO NEXT POUR.

9. CONTRACTOR SHALL CALCULATE AND INCLUDE ALL ADDITIONAL CONCRETE THAT MAY BE REQUIRED DURING PLACING DUE TO DEFLECTION OF STRUCTURE AND PROVIDE A LEVEL CONCRETE SURFACE. THICKNESS OF SLAB CALLED OUT ON DRAWINGS IS THE MINIMUM THICKNESS AND SHALL BE MEASURED AT COLUMNS.

10. ALL CONCRETE SHALL INCLUDE REINFORCEMENT. IF REINFORCEMENT IS NOT SPECIFICALLY INDICATED ON THE DRAWINGS, VERIFY WITH THE STRUCTURAL ENGINEER OF RECORD.

11. CONCRETE SHALL NOT BE PLACED UNTIL PREPARATIONS HAVE BEEN APPROVED BY THE TESTING AND INSPECTION AGENCY INCLUDING FORMWORK, REINFORCEMENT, EMBEDMENTS, AND ACCESSORIES.

CONCRETE REINFORCEMENT

1. REINFORCEMENT SHALL CONFORM TO THE FOLLOWING STANDARDS AND MATERIAL PROPERTIES.
   - DEFORMED BARS — ASTM A615, GRADE 60

2. UNLESS NOTED OTHERWISE, THE CONCRETE COVER FOR REINFORCEMENT IN CAST-IN-PLACE CONCRETE SHALL NOT BE LESS THAN THE FOLLOWING:
   - CAST AGAINST EARTH — 3"
   - EXPOSED TO EARTH/WEATHER — 2"
   - SLABS, WALLS, AND JOISTS — 3/4"

3. DETAIL REINFORCEMENT BASED ON THE PROJECT REQUIREMENTS, ACI 318, ACI 315R, AND THE ACI DETAILING MANUAL SP-066, LATEST EDITIONS.

4. WHERE A 90-DEGREE, 135-DEGREE, OR 180-DEGREE HOOK IS GRAPHICALLY INDICATED, PROVIDE CORRESPONDING ACI STANDARD HOOKS, UNLESS NOTED OTHERWISE.

5. DOWELS SHALL MATCH SIZE AND SPACING OF MAIN REINFORCEMENT, UNLESS NOTED OTHERWISE.

6. LAP WELDED WIRE REINFORCEMENT TWO PANEL SPACES. WIRE MESH SHALL BE SUPPORTED ON CHAIRS SO PROPER COVER IS MAINTAINED. DO NOT USE METHOD OF PULLING UP WITH A HOOK DURING CONCRETE POURING TO POSITION THE REINFORCING.

7. UNLESS NOTED OTHERWISE, TERMINATE BARS AT DISCONTINUOUS ENDS WITH STANDARD HOOKS.

CONCRETE MASONRY

1. LOAD BEARING AND BACKUP WALL CONCRETE MASONRY CONSTRUCTION SHALL CONFORM TO THE FOLLOWING MATERIAL STANDARDS:
   - CONCRETE BLOCK — ASTM C90, NORMAL WEIGHT, TYPE 1
   - MORTAR — ASTM C270, TYPE M OR S PORTLAND/LIME
   - GROUT — ASTM C476 (3,000 PSI AT 28-DAYS)
   - REINFORCEMENT — ASTM A615, GRADE 60, (MIN. 24" LAP)
   - JOINT REINFORCEMENT — ASTM A951, LADDER TYPE, (MIN 9-GAGE), GALV.

2. UNLESS NOTED OTHERWISE, THE MASONRY COVER FOR REINFORCEMENT SHALL NOT BE LESS THAN THE FOLLOWING:
   - MASONRY FACE EXPOSED TO WEATHER — 1 1/2"
   - MASONRY FACE NOT EXPOSED TO WEATHER — 1 1/2"
   - GALVANIZED WIRE JOINT REINFORCING — 3/4"

3. CONCRETE MASONRY ASSEMBLAGE SHALL DEVELOP 2,500 PSI COMPRESSIVE STRENGTH IN 28-DAYS, UNLESS NOTED OTHERWISE.

4. MORTAR FOR CONCRETE MASONRY SHALL BE TYPE M FOR ALL BELOW GRADE UNITS AND TYPE S AT ABOVE GRADE UNITS.

5. CALCIUM CHLORIDE SHALL NOT BE USED IN MORTAR OR GROUT.

6. LAY MASONRY IN RUNNING BOND, UNLESS NOTED OTHERWISE.

7. HOLLOW-UNIT MASONRY SHALL HAVE FACE SHELL BEDDING EXCEPT AT PIERS, COLUMNS, PILASTERS, THE COURSE IMMEDIATELY ABOVE FOUNDATIONS, AND WHERE CONTAINMENT OF GROUT OR LOOSE FILL INSULATION REQUIRES THAT WEB AND FACE SHELLS BE MORTARED. IN FULLY GROUTED OR UN-GROUTED MASONRY, ONLY THE FACE SHELLS NEED TO BE MORTARED.

8. PROVIDE A CONTINUOUS BOND BEAM WITH (2) #5 BARS CONTINUOUS IN THE TOP COURSE OF ALL BLOCK WALLS, AT LOCATIONS WHERE FRAMING MEMBERS ARE BOLTED TO FACE OF CMU WALLS, BELOW BEAM BEARINGS, AND AT LOCATIONS INDICATED ON THE DRAWINGS. BOND BEAMS SHALL HAVE CORNER BARS AROUND CORNERS AND AT WALL INTERSECTIONS.

9. FILL ALL VOIDS AND BLOCK CELLS LOCATED BELOW GRADE SOLIDLY WITH GROUT. GROUT SHALL BE VIBRATED AND RE-VIBRATED AFTER INITIAL WATER LOSS TO ENSURE COMPLETE FILLING OF CORES.

BRICK MASONRY

1. BRICK MASONRY CONSTRUCTION SHALL CONFORM TO THE LATEST EDITIONS OF THE FOLLOWING STANDARDS:
   - BUILDING CODE REQUIREMENTS AND SPECIFICATION FOR MASONRY STRUCTURES, TMS 402/602.
   - TECHNICAL NOTES ON BRICK CONSTRUCTION, TECHNICAL NOTES 1-48, BIA.
   - GUIDE SPECIFICATION FOR BRICK MASONRY, TECHNICAL NOTES 11A-E, BIA.
   - HOT AND COLD WEATHER MASONRY CONSTRUCTION BY THE MASONRY INDUSTRY COUNCIL.

2. BRICK UNITS FOR EXTERIOR USE AS A VENEER SHALL CONFORM TO ASTM C216 GRADE SW, WITH THE FOLLOWING EXCEPTIONS:
   - THE SATURATION COEFFICIENT (C/B) REQUIREMENT SHALL NOT BE WAIVED AS ALLOWED IN SECTIONS 5.1 AND 5.2 UNLESS ENGINEERING DATA AND FIELD RECORDS CAN BE PROVIDED WHICH DEMONSTRATES THE UNITS TO BE SUFFICIENTLY DURABLE AND RESISTANT TO FREEZE-THAW DETERIORATION.
   - INITIAL RATE OF ABSORPTION (IRA) SHALL NOT EXCEED 20 GRAMS PER MINUTE PER 30 SQUARE INCHES OF FACE AREA. FOR COLD WEATHER CONSTRUCTION, THE BRICKS SHALL HAVE A MINIMUM IRA OF 6 GRAMS PER MINUTE PER 30 SQUARE INCHES OF FACE AREA.

3. BRICK MANUFACTURER OR DISTRIBUTOR SHALL PROVIDE THE ARCHITECT WITH BRICK TEST DATA, CERTIFICATE OF COMPLIANCE WITH ASTM C216 GRADE SW, AND THE ABOVE NOTED EXCEPTIONS. BRICK UNITS SHALL NOT BE SHIPPED TO THE SITE UNTIL APPROVAL HAS BEEN RECEIVED FROM THE ARCHITECT.

4. MORTAR FOR BRICK MASONRY SHALL CONFORM TO ASTM C270. MORTAR SHALL BE TYPE M FOR ALL BELOW GRADE UNITS AND TYPE N ABOVE GRADE.

STRUCTURAL STEEL

1. STEEL MATERIALS SHALL CONFORM TO THE FOLLOWING MINIMUM REQUIREMENTS UNLESS NOTED OTHERWISE:
   - W-SHAPES — ASTM A992, MIN 50 KSI
   - HSS-SHAPES — ASTM A500, GRADE C, MIN 50 KSI
   - PIPES — ASTM A53, GRADE B, MIN 35 KSI
   - ALL OTHER — ASTM A36, MIN 36 KSI

2. CONNECTION MATERIAL SHALL CONFORM TO THE FOLLOWING MINIMUM REQUIREMENTS OR AS NEEDED FOR CONNECTION DESIGN:
   - ANGLES & PLATES — ASTM A36, MIN 36 KSI
   - WT-SHAPES — ASTM A992, MIN 50 KSI
   - BOLTS — ASTM F3125
   - NUTS — ASTM A563
   - WASHERS — ASTM F436
   - THREADED RODS — ASTM A36, MIN 36 KSI
   - ANCHOR RODS — ASTM F1554 WELDABLE, GRADE 55
   - WELD ELECTRODES — E70XX

3. ALL CONNECTIONS NOT SPECIFICALLY DETAILED, SHALL BE BEARING TYPE CONNECTIONS DESIGNED AND DETAILED BY THE FABRICATOR TO SUPPORT THE END REACTIONS NOTED ON THE DRAWINGS. SHEAR TAB CONNECTIONS ARE PERMISSIBLE FOR SECONDARY BEAMS, PRIMARY GIRDERS REQUIRE DOUBLE CLIP ANGLES, TYP.

4. SPLICES SHALL BE ALLOWED ONLY AT LOCATIONS SPECIFICALLY INDICATED ON THE STRUCTURAL DRAWINGS UNLESS APPROVED OTHERWISE BY THE STRUCTURAL ENGINEER OF RECORD.

5. DO NOT USE OVERSIZED OR SLOTTED HOLES FOR ANY CONNECTIONS UNLESS SPECIFICALLY INDICATED ON THE DRAWINGS OR APPROVED BY THE STRUCTURAL ENGINEER OF RECORD.

6. STEEL THAT MAY ACCUMULATE WATER SHALL HAVE DRAIN HOLES. ALL DRAIN PENETRATIONS THROUGH MAIN MEMBERS SHALL NOT EXCEED 1-INCH IN DIAMETER AND SHALL BE GROUND SMOOTH. THESE DRAINS MUST BE KEPT CLEAN AND OPEN.

7. SHOW ALL COPES, HOLES, OPENINGS, AND MODIFICATIONS REQUIRED IN STRUCTURAL STEEL MEMBERS FOR ERECTION OR THE WORK OF OTHER TRADES ON THE SHOP DRAWINGS.

8. ALL WELDING SHALL BE DONE BY CERTIFIED, LICENSED WELDERS AND SHALL BE IN CONFORMANCE WITH THE STRUCTURAL WELDING CODE OF THE AMERICAN WELDING SOCIETY ANSI/AWS D1.1, LATEST EDITION.

9. NO PENETRATIONS ARE PERMITTED THROUGH STRUCTURAL STEEL MEMBERS UNLESS INDICATED ON STRUCTURAL DRAWINGS OR APPROVED BY THE STRUCTURAL ENGINEER OF RECORD.

10. APPROVAL OF THE STRUCTURAL ENGINEER OF RECORD SHALL BE MANDATORY FOR THE USE OF CUTTING TORCH IN THE FIELD.

11. ALL GROUT UNDER STEEL PLATES SHALL BE NON-SHRINK "PRE-MIX" TYPE AND SHALL HAVE A MINIMUM COMPRESSIVE STRENGTH OF 5,000 PSI, TESTED IN ACCORDANCE WITH CONCRETE SPECIFICATIONS. USE NON-STAINING GROUT AT EXPOSED LOCATIONS.

12. THE STEEL FABRICATOR MAY SUBSTITUTE HEAVIER SECTIONS IN PLACE OF THE SECTIONS SHOWN ON THE DRAWINGS TO ACHIEVE ECONOMY OF REPETITION, FOR AVAILABILITY, OR TO TAKE ADVANTAGE OF ROLLING MILL PRODUCTION SCHEDULES SO LONG AS THE CHANGES ARE MADE KNOWN TO THE ARCHITECT AND STRUCTURAL ENGINEER, AND ARE ACCEPTABLE TO BOTH.

13. ALL STRUCTURAL STEEL SHALL BE PAINTED WITH ONE SHOP-APPLIED COAT OF RUST INHIBITING PRIMER AFTER SURFACE PREPARATION BY THE SOCIETY FOR PROTECTIVE COATINGS (SSPC) SP3 "POWER TOOL CLEANING", UNLESS NOTED OTHERWISE. DO NOT PAINT PORTIONS OF STEEL MEMBERS THAT ARE TO RECEIVE SPRAY-ON FIREPROOFING, NOR SURFACES TO RECEIVE WELDED SHEAR STUDS. STEEL STRUCTURE THAT IS PERMANENTLY EXPOSED TO THE EXTERIOR SHALL BE HOT DIP GALVANIZED ACCORDING TO ASTM A123.

14. FOR MISCELLANEOUS STEEL CONSTRUCTION NOT SHOWN ON STRUCTURAL DRAWINGS, SEE ARCHITECTURAL, MECHANICAL, AND ELECTRICAL DRAWINGS.

FIELD DRILLED ADHESIVE ANCHORS

1. BASIS OF DESIGN FOR FIELD DRILLED ADHESIVE ANCHORS AND REBAR IN CONCRETE SHALL BE HILTI HIT-HY 200 V3 AS MANUFACTURED BY HILTI, OR EQUIVALENT PRODUCT. BASIS OF DESIGN FOR FIELD DRILLED ADHESIVE ANCHORS AND REBAR IN MASONRY SHALL BE HILTI HIT-HY 270 AS MANUFACTURED BY HILTI, OR EQUIVALENT PRODUCT. FOR HOLLOW OR MULTI-WYTHE MASONRY, PROVIDE APPROPRIATELY SIZED SCREEN TUBE PER INSTALLATION INSTRUCTIONS. FOR SUBSTITUTION PURPOSES, SIGNED AND SEALED CALCULATIONS SHALL BE PROVIDED FOR REVIEW, INDICATING THE SUBSTITUTED ANCHOR MEETS THE CAPACITY REQUIREMENTS OF THE DETAILED ANCHOR.

2. ANCHOR CAPACITY IS DEPENDENT UPON SPACING BETWEEN ADJACENT ANCHORS AND PROXIMITY OF ANCHORS TO EDGE OF CONCRETE OR MASONRY. INSTALL ANCHORS IN ACCORDANCE WITH SPACING AND EDGE CLEARANCES INDICATED ON THE DRAWINGS.

3. USE ONLY CODE-APPROVED ANCHORS WITH VALID EVALUATION REPORT FOR USE IN THE BASE MATERIAL SHOWN ON THE CONSTRUCTION DOCUMENTS. SUBMIT EVALUATION REPORT TO STRUCTURAL ENGINEER OF RECORD AND SPECIAL INSPECTION AGENT FOR APPROVAL. DO NOT INSTALL ANCHORS UNTIL SUBMITTAL IS RETURNED "REVIEWED WITHOUT COMMENT."

4. ONLY ONE LENGTH ANCHOR SHALL BE PRESENT ON THE JOB SITE FOR A GIVEN ANCHOR DIAMETER, UNLESS OTHERWISE SPECIFIED ON THE DRAWINGS.

5. ALL FIELD INSTALLED ADHESIVE ANCHORS SHALL CONFORM TO AC-308. INSTALLER OF FIELD INSTALLED ADHESIVE ANCHORS SHALL BE TRAINED BY ANCHOR MANUFACTURER TO ENSURE PROPER INSTALLATION REQUIREMENTS SUCH AS HOLE CLEANING, HORIZONTAL AND OVERHEAD APPLICATIONS, EMBEDMENT DEPTHS GREATER THAN 10 INCHES, AND WATER FILLED HOLES.

6. ADHESIVE ANCHORS OF THE DIAMETER AND EMBEDMENT SHOWN ON THE DRAWINGS SHALL BE INSTALLED IN STRICT ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS UNDER THE CONTINUOUS SUPERVISION OF AN INDEPENDENT TESTING AGENCY. WHERE THE PROVISIONS OF THE ABOVE REFERENCED DOCUMENTS ARE IN CONFLICT, THE MOST RESTRICTIVE REQUIREMENT SHALL GOVERN. AT LOCATIONS WHERE ANCHORAGE IS NOT SPECIFIED, CONSULT STRUCTURAL ENGINEER OF RECORD.

7. CLEAN EXISTING CONCRETE SURFACE TO SOLID STRUCTURAL CONCRETE. GRIND SMOOTH FOR FULL STEEL CONTACT AND TO PREVENT GAPS BETWEEN STEEL AND CONCRETE. ALTERNATIVELY, PROVIDE NON-SHRINK GROUT IN ALL VOIDS BETWEEN STEEL AND BASE MATERIAL. FOREIGN MATERIAL SHALL NOT BE PLACED IN THE HOLES THAT RECEIVE ADHESIVE ANCHORS. ALL ABANDONED HOLES DRILLED IN CONCRETE SHALL BE COMPLETELY FILLED WITH STRUCTURAL GRADE EPOXY.

8. THE CONTRACTOR SHALL CREATE A TEMPLATE AT EACH ADHESIVE ANCHOR CONNECTION LOCATION **PRIOR** TO FABRICATING HOLES IN CONNECTING PLATES OR ROLLED SHAPES. TEMPLATES SHALL BE MADE BY FIRST LOCATING EXISTING REINFORCING STEEL USING NON-DESTRUCTIVE TESTING EQUIPMENT, AND THEN DRILLING ANCHOR HOLES SUCH THAT NO CONFLICT EXISTS WITH THE EXISTING REINFORCING. ANCHOR LOCATIONS IN THE FIELD MAY BE RELOCATED A MAXIMUM OF 1 1/2 INCHES FROM THE DIMENSIONS SHOWN ON THE DRAWINGS TO AVOID CONFLICTS WITH THE EXISTING REINFORCING STEEL. HOWEVER, DO NOT EXCEED MINIMUM ANCHOR SPACINGS OR EDGE DISTANCES PER MANUFACTURER'S REQUIREMENTS.

9. ADHESIVE ANCHORS SHALL BE INSTALLED PERPENDICULAR TO THE FACE OF THE SURFACE BEING DRILLED. THE MAXIMUM TOLERANCE FOR DEVIATION FROM PERPENDICULAR SHALL BE 6 DEGREES. ALL ADHESIVE ANCHORS INSTALLED OUTSIDE OF THE SPECIFIED TOLERANCE SHALL BE CONSIDERED UNACCEPTABLE. USE OF DIAMOND CORE BIT WITH ROUGHENING TOOL FOR ANCHOR HOLES REQUIRES APPROVAL FROM STRUCTURAL ENGINEER OF RECORD PRIOR TO DRILLING.

10. HOLES IN CONNECTION PLATES SHALL BE NO MORE THAN 3/16 INCH LARGER THAN THE ADHESIVE ANCHOR ROD DIAMETER. IF LARGER DIAMETER HOLES ARE USED FOR ERECTION PURPOSES, THE CONTRACTOR MUST PROVIDE PLATE WASHERS WITH HOLES NO MORE THAN 1/16 INCH LARGER THAN THE ANCHOR. PLATE WASHERS MUST BE WELDED TO THE CONNECTION PLATE TO TRANSFER THE LOAD. WELDING MUST TAKE PLACE AFTER HOLES ARE DRILLED, BUT PRIOR TO ADHESIVE INSTALLATION TO AVOID BURNING OR MELTING THE ADHESIVE.

FIELD DRILLED MECHANICAL ANCHORS

1. BASIS OF DESIGN FOR FIELD DRILLED MECHANICAL ANCHORS IN CONCRETE AND SOLID GROUTED MASONRY SHALL BE HILTI KWIK BOLT TZ2 ANCHORS AS MANUFACTURED BY HILTI, OR EQUIVALENT PRODUCT. FOR SUBSTITUTION PURPOSES, SIGNED AND SEALED CALCULATIONS SHALL BE PROVIDED FOR REVIEW, INDICATING THE SUBSTITUTED ANCHOR MEETS THE CAPACITY REQUIREMENTS OF THE DETAILED ANCHOR.

2. ANCHOR CAPACITY IS DEPENDENT UPON SPACING BETWEEN ADJACENT ANCHORS AND PROXIMITY OF ANCHORS TO EDGE OF CONCRETE OR MASONRY. INSTALL ANCHORS IN ACCORDANCE WITH SPACING AND EDGE CLEARANCES INDICATED ON THE DRAWINGS.

3. USE ONLY CODE-APPROVED ANCHORS WITH VALID EVALUATION REPORT FOR USE IN THE BASE MATERIAL SHOWN ON THE CONSTRUCTION DOCUMENTS. SUBMIT EVALUATION REPORT TO STRUCTURAL ENGINEER OF RECORD AND SPECIAL INSPECTION AGENT FOR APPROVAL. DO NOT INSTALL ANCHORS UNTIL SUBMITTAL IS RETURNED "REVIEWED WITHOUT COMMENT."

4. ONLY ONE LENGTH ANCHOR SHALL BE PRESENT ON THE JOB SITE FOR A GIVEN ANCHOR DIAMETER, UNLESS OTHERWISE SPECIFIED ON THE DRAWINGS.

5. ALL FIELD INSTALLED MECHANICAL ANCHORS SHALL CONFORM TO AC-193. INSTALLER OF FIELD INSTALLED MECHANICAL ANCHORS SHALL BE TRAINED BY ANCHOR MANUFACTURER TO ENSURE PROPER INSTALLATION REQUIREMENTS SUCH AS DRILLING METHODS, HOLE CLEANING, AND INSTALLATION TORQUE.

6. MECHANICAL ANCHORS OF THE DIAMETER AND EMBEDMENT SHOWN ON THE DRAWINGS SHALL BE INSTALLED IN STRICT ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS UNDER THE CONTINUOUS SUPERVISION OF AN INDEPENDENT TESTING AGENCY. WHERE THE PROVISIONS OF THE ABOVE REFERENCED DOCUMENTS ARE IN CONFLICT, THE MOST RESTRICTIVE REQUIREMENT SHALL GOVERN. AT LOCATIONS WHERE ANCHORAGE IS NOT SPECIFIED, CONSULT STRUCTURAL ENGINEER OF RECORD.

7. CLEAN EXISTING CONCRETE SURFACE TO SOLID STRUCTURAL CONCRETE. GRIND SMOOTH FOR FULL STEEL CONTACT AND TO PREVENT GAPS BETWEEN STEEL AND CONCRETE. ALTERNATIVELY, PROVIDE NON-SHRINK GROUT IN ALL VOIDS BETWEEN STEEL AND BASE MATERIAL. FOREIGN MATERIAL SHALL NOT BE PLACED IN THE HOLES THAT RECEIVE MECHANICAL ANCHORS. ALL ABANDONED HOLES DRILLED IN CONCRETE SHALL BE COMPLETELY FILLED WITH STRUCTURAL GRADE EPOXY.

8. THE CONTRACTOR SHALL CREATE A TEMPLATE AT EACH MECHANICAL ANCHOR CONNECTION LOCATION **PRIOR** TO FABRICATING HOLES IN CONNECTING PLATES OR ROLLED SHAPES. TEMPLATES SHALL BE MADE BY FIRST LOCATING EXISTING REINFORCING STEEL USING NON-DESTRUCTIVE TESTING EQUIPMENT, AND THEN DRILLING ANCHOR HOLES SUCH THAT NO CONFLICT EXISTS WITH THE EXISTING REINFORCING. ANCHOR LOCATIONS IN THE FIELD MAY BE RELOCATED A MAXIMUM OF 1 1/2 INCHES FROM THE DIMENSIONS SHOWN ON THE DRAWINGS TO AVOID CONFLICTS WITH THE EXISTING REINFORCING STEEL. HOWEVER, DO NOT EXCEED MINIMUM ANCHOR SPACINGS OR EDGE DISTANCES MANUFACTURER'S REQUIREMENTS.

9. MECHANICAL ANCHORS SHALL BE INSTALLED PERPENDICULAR TO THE FACE OF THE SURFACE BEING DRILLED. THE MAXIMUM TOLERANCE FOR DEVIATION FROM PERPENDICULAR SHALL BE 6 DEGREES. ALL MECHANICAL ANCHORS INSTALLED OUTSIDE OF THE SPECIFIED TOLERANCE SHALL BE CONSIDERED UNACCEPTABLE. USE OF DIAMOND CORE BIT WITH ROUGHENING TOOL FOR ANCHOR HOLES REQUIRES APPROVAL FROM STRUCTURAL ENGINEER OF RECORD PRIOR TO DRILLING.

10. HOLES IN CONNECTION PLATES SHALL BE NO MORE THAN 3/16 INCH LARGER THAN THE MECHANICAL ANCHOR ROD DIAMETER. IF LARGER DIAMETER HOLES ARE USED FOR ERECTION PURPOSES, THE CONTRACTOR MUST PROVIDE PLATE WASHERS WITH HOLES NO MORE THAN 1/16 INCH LARGER THAN THE ANCHOR. PLATE WASHERS MUST BE WELDED TO THE CONNECTION PLATE TO TRANSFER THE LOAD.

MASONRY CONSTRUCTION REQUIREMENTS PER TMS 602/ACI 530.1/ASCE 6

TMS 602 - TABLE 3 - MINIMUM VERIFICATION REQUIREMENTS

Minimum Verification	LVL 1	LVL 2	LVL 3
Prior to construction, verification of compliance of submittals	R	R	R
Prior to construction, verification of f'm and f'AAC, except where specifically exempted by the Code	NR	R	R
During construction, verification of Slump flow and Visual Stability Index (VSI) when self-consolidating grout is delivered to the project site	NR	R	R
During construction, verification of f'm and f'AAC for every 5,000 sq. ft.	NR	NR	R
During construction, verification of proportions of materials as delivered to the project site for premixed or preblended mortar, prestressing grout, and grout other than self-consolidating grout.	NR	NR	R

TMS 602 - TABLE 4 - MINIMUM SPECIAL INSPECTION REQUIREMENTS

Minimum Verification	LVL 1	LVL 2	LVL 3
As masonry construction begins, verify that the following are in compliance:			
Proportions of site-prepared mortar	NR	P	P
Grade, type, and size of reinforcement, connectors, anchor bolts	NR	P	P
Prior to grouting, verify that the following are in compliance:			
Grout space	NR	P	C
Placement of reinforcement, connectors, and anchor bolts	NR	P	C
Proportions of site-prepared grout	NR	P	P
Verify compliance of the following during construction:			
Materials and procedures with the approved submittals	NR	P	P
Placement of masonry units and mortar joint construction	NR	P	P
Size and location of structural members	NR	P	P
Type, size, and location of anchors, including other details of anchorage of masonry to structural members, frames, or other construction	NR	P	C
Welding of reinforcement	NR	C	C
Preparation, construction, and protection of masonry during cold weather (temperature below 40F) or hot weather (temperature above 90F)	NR	P	P
Observe preparation of grout specimens, mortar specimens, and/or prisms	NR	P	C

MICHIGAN BUILDING CODE 2015

TABLE 1705.3 - REQUIRED SPECIAL INSPECTION AND TESTS OF CONCRETE CONSTRUCTION

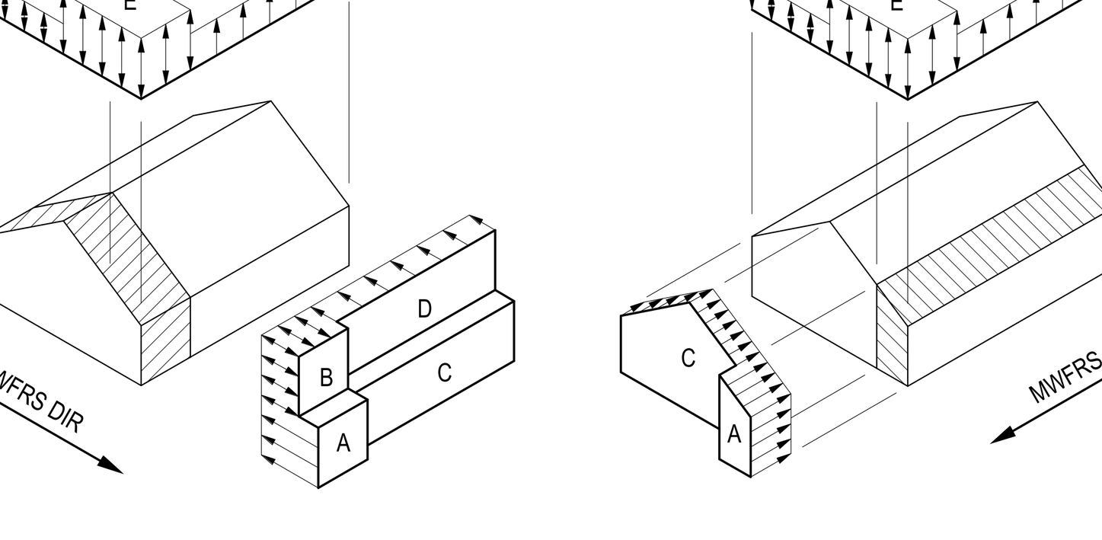
TYPE	CONTINUOUS	PERIODIC
Inspect reinforcement, including prestressing tendons, and verify placement.	--	X
Reinforcing bar welding:		
Verify weldability of reinforcing bars other than ASTM A706	--	X
Inspect single-pass fillet welds, maximum 5/16"	--	X
Inspect all other welds	X	--
Inspect anchors cast in concrete	--	X
Inspect anchors post-installed in hardened concrete members		
Adhesive anchors installed in horizontally or upwardly inclined orientations to resist sustained tension loads.	X	--
Mechanical anchors and adhesive anchors not defined above	--	X
Verify use of required design mix	--	X
Prior to concrete placement, fabricate specimens for strength tests, perform slump and air content tests, and determine the temperature of the concrete	X	--
Inspect concrete and shotcrete placement for proper application techniques	X	--
Verify maintenance of specified curing temperature and techniques	--	X
Verify in-situ concrete strength, prior to removal of shores from beams and structure slabs	--	X
Inspect formwork for shape, location, and dimensions of the concrete member being formed	--	X

TABLE 1705.6 - REQUIRED SPECIAL INSPECTIONS AND TESTS OF SOILS

TYPE	CONTINUOUS	PERIODIC
Verify materials below shallow foundations are adequate to achieve the design bearing capacity.	--	X
Verify excavations are extended to proper depth and have reached proper material.	--	X
Perform classification and testing of compacted fill materials	--	X
Verify use of proper materials, densities, and lift thicknesses during placement and compaction of compacted fill.	X	--
Prior to placement of compacted fill, observe subgrade and verify that the site has been prepared properly.	--	X

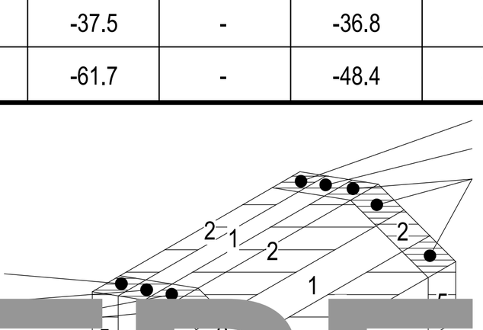
MAIN WIND FORCE RESISTING SYSTEM (psf)

HORIZONTAL PRESSURES				VERTICAL PRESSURES				OVERHANG PRESSURES	
A	B	C	D	E	F	G	H	Eoh	Goh
± 22.8	± 11.9	± 16.0	± 8.0	± 27.4	± 15.6	± 19.1	± 12.1	± 38.4	± 30.1



COMPONENTS AND CLADDING

ZONE	LOAD (psf) 10 SF		20 SF		50 SF		100 SF	
1	16.0	-25.9	16.0	-25.2	16.0	-24.4	16.0	-23.7
2	16.0	-43.5	16.0	-38.8	16.0	-32.7	16.0	-28.1
3	16.0	-65.4	16.0	-54.2	16.0	-39.3	16.0	-28.1
4	25.9	-28.1	24.7	-26.9	23.2	-25.4	22.0	-24.2
5	25.9	-34.7	24.7	-32.4	23.2	-29.3	22.0	-26.9
2 ROH	-	-37.5	-	-36.8	-	-35.9	-	-35.3
3 ROH	-	-61.7	-	-48.4	-	-30.9	-	-17.6



KINGSCOTT
KALAMAZOO | CHELSEA | GRAND RAPIDS | ROYAL OAK

PATTENGILL MODULAR CLASSROOM BUILDING

LANSING SCHOOL DISTRICT
815 North Fairview Avenue, Lansing, MI

Lansing School District

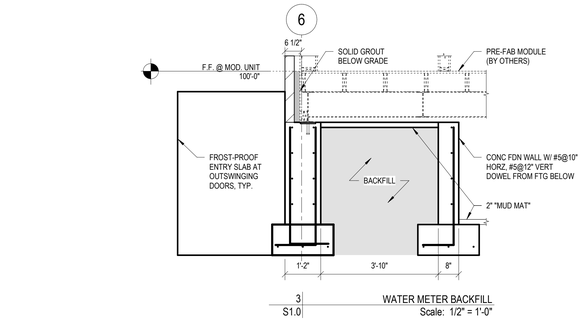
ISSUANCE	DATE
Early Foundation Work BP #2	03.22.2024
Addendum #2	04.11.2024
Construction Documents BP03	04.19.2024

STATE OF MICHIGAN
BRAD CUTTER
ENGINEER
No. 6201063383
LICENSED PROFESSIONAL ENGINEER

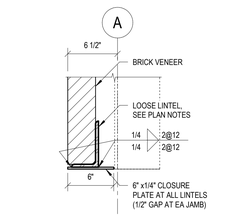
JOB NO. 24013

SHEET TITLE
STRUCTURAL NOTES AND SPECIAL INSPECTIONS

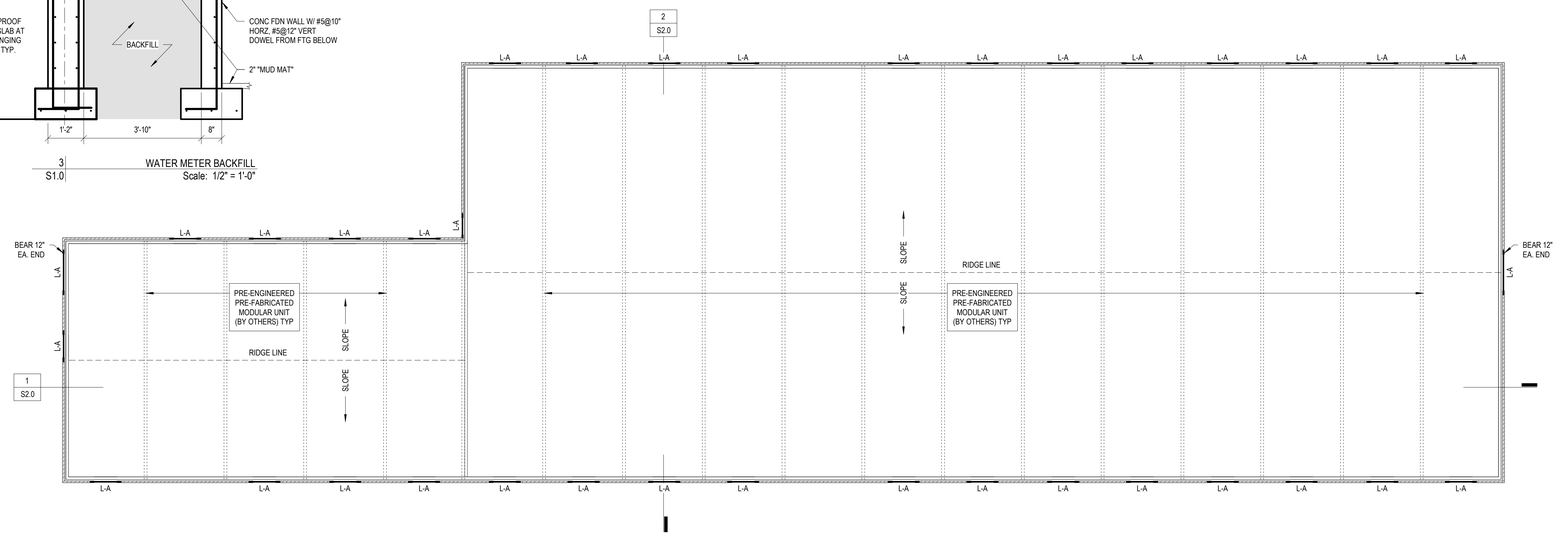
SHEET NO.
S0.1



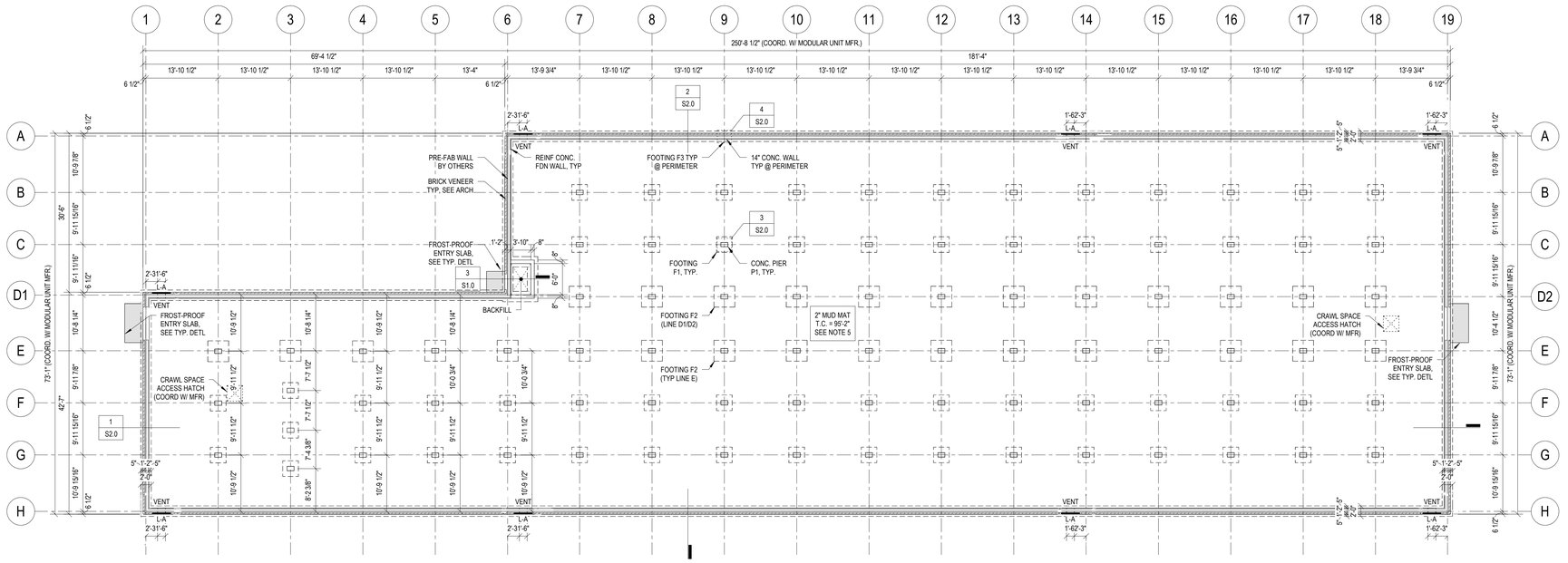
3 S1.0 WATER METER BACKFILL
Scale: 1/2" = 1'-0"



4 S1.0 TYPICAL LINTEL DETAIL
Scale: 1 1/2" = 1'-0"



2 S1.0 LINTEL FRAMING PLAN
Scale: 3/32" = 1'-0"



MARK	TYPE	TYPE	REINF
F1	CONC COL FTG	3'-0"x3'-0"x1'-0"	(4) #5 BOT, EACH WAY
F2	CONC COL FTG	4'-0"x4'-0"x1'-0"	(5) #5 BOT, EACH WAY
F3	CONC STRIP FTG	2'-0"x1'-0"	(3) #5 BOT, CONT.
P1	CONC PIER	10"x16"	(4) #6 VERT, DOWEL FROM FTG W/ #3 TIES, 3@3" OC TOP, BAL @12" OC
P2	CONC PIER	--	NOT USED

1 S1.0 FOUNDATION PLAN
Scale: 3/32" = 1'-0"

PLAN NOTES:

1. SEE SHEET S0.1 FOR STRUCTURAL NOTES AND TYPICAL DETAILS.
2. GENERAL CONTRACTOR SHALL FIELD VERIFY ALL DIMENSIONS AND EXISTING CONDITIONS PRIOR TO CONSTRUCTION.
3. VERIFY ALL DIMENSIONS WITH ARCHITECTURAL DRAWINGS AND MODULAR UNIT DRAWINGS.
4. ALL FOUNDATION CONDITIONS ARE TO BE INSPECTED AND APPROVED BY THE GEOTECHNICAL ENGINEER PRIOR TO REBAR AND CONCRETE PLACEMENT. MINIMUM ALLOWABLE BEARING PRESSURE = 3,000 PSF.
5. SLAB ON GRADE TO BE 2" THICK (MINIMUM) "MUD MAT".
6. PROVIDE BOND BREAKER BETWEEN SLAB & FOUNDATION ELEMENTS.
7. ALL MASONRY CORES AND VOIDS BELOW GRADE TO BE SOLID GROUTED
8. STEEL LINTEL AT OPENINGS IN BRICK VENEER TO BE L6 x3-1/2 x3/8" W/ 6" x1/4" BOT PL. (L-A). BEAR 8" EACH END.
9. ALL STEEL TO BE HOT-DIP GALVANIZED.
10. ALL FRAMING CLIPS, STRAPS, AND HANGERS TO BE SIMPSON STRONG-TIE OR APPROVED EQUAL, U.O.N.
11. ALL HANGERS, FASTENERS, NAILS, SCREWS, ETC. TO BE STAINLESS STEEL AT EXTERIOR CONDITIONS.

PRE-MANUFACTURED UNIT SUPPLIER DECLINED TO PROVIDE REACTIONS ITEMIZED FOR EACH LOAD CASE (DEAD, LIVE, ROOF LIVE, SNOW, WIND (N-S, E-W, AND UPLIFT), AND SEISMIC (N-S, E-W, AND UPLIFT), ASSUMPTIONS WERE THEREFORE MADE TO DESIGN FOUNDATIONS. SUPPLIER TO PROVIDE FINAL ENGINEERED PLANS, SECTIONS, AND DETAILS, WITH CALCULATIONS, ALL SIGNED AND SEALED BY A PROFESSIONAL STRUCTURAL ENGINEER LICENSED IN THE STATE OF MICHIGAN AS A SEPARATE DELEGATED DESIGN PACKAGE FOR WHICH RDA TAKES NO RESPONSIBILITY FOR THE ADEQUACY OF ANY PRE-MANUFACTURED UNIT DESIGN OR CONSTRUCTION.

KINGSCOTT
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PATTENGILL MODULAR CLASSROOM BUILDING

LANSING SCHOOL DISTRICT

815 North Fairview Avenue, Lansing, MI

Lansing School District

ISSUANCE	DATE
Early Foundation Work BP #2	03.22.2024
Addendum #2	04.11.2024
Construction Documents BP03	04.19.2024
BP02 - PR01	04.26.2024

KEY PLAN

N

JOB NO. 24013

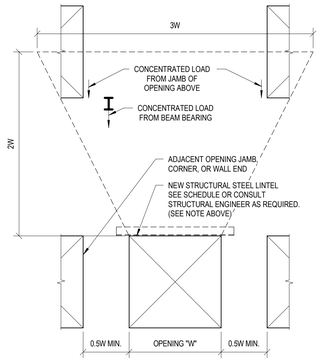
SHEET TITLE
FOUNDATION AND LINTEL FRAMING PLANS

SHEET NO.
S1.0

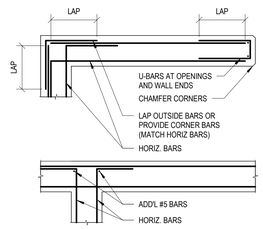
OPENING WIDTH "W"	SIZE OF LINTEL TO BE USED FOR EA. 4" OF WALL THICKNESS	MIN. BRG.
< 8"	NO LINTEL REQUIRED	--
8" TO 3'-0"	L3 1/2" x 3 1/2" x 1/4"	8"
3'-0" TO 3'-6"	L5" x 3 1/2" x 1/4" LLV	8"
3'-6" TO 5'-0"	L6" x 3 1/2" x 5/16" LLV	8"
5'-0" TO 6'-0"	L6" x 3 1/2" x 3/8" LLV	12"
> 6'-0"	CONSULT STRUCTURAL	

SELECT LINTEL FROM SCHEDULE ABOVE IF **BOTH** CONDITIONS BELOW ARE MET. IF EITHER CONDITION IS NOT MET, CONSULT THE PROJECT STRUCTURAL ENGINEER FOR LINTEL SIZE, BEARING, AND DETAIL UON

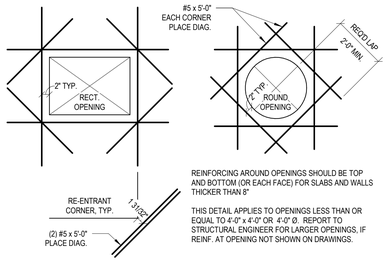
CONDITION A: NO CONCENTRATED LOADS FROM BEAM BEARING OR MASONRY JAMBS FALL WITHIN AN AREA 3W HORIZONTAL BY 2W VERTICAL
CONDITION B: THE DISTANCE TO THE CLOSEST ADJACENT OPENING, JAMB, CORNER, OR WALL END IS GREATER THAN 0.5W



12 S2.0 TYPICAL STEEL LINTEL SCHEDULE
Not to Scale



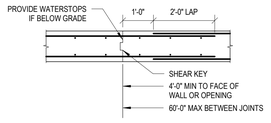
13 S2.0 TYPICAL WALL AND CORNER REINFORCING
Not to Scale



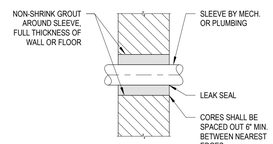
REINFORCING AROUND OPENINGS SHOULD BE TOP AND BOTTOM (OR EACH FACE) FOR SLABS AND WALLS THICKER THAN 8"

THIS DETAIL APPLIES TO OPENINGS LESS THAN OR EQUAL TO 4'-0" x 4'-0" OR 4'-0" Ø. REPORT TO STRUCTURAL ENGINEER FOR LARGER OPENINGS, IF REINF. AT OPENING NOT SHOWN ON DRAWINGS.

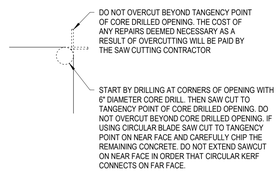
14 S2.0 REINFORCING AT CONCRETE OPENINGS
Scale: 3/4" = 1'-0"



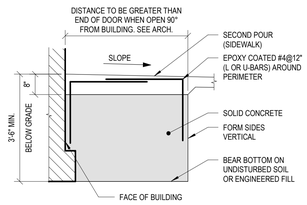
15 S2.0 WALL CONSTRUCTION JOINT
Scale: 1/2" = 1'-0"



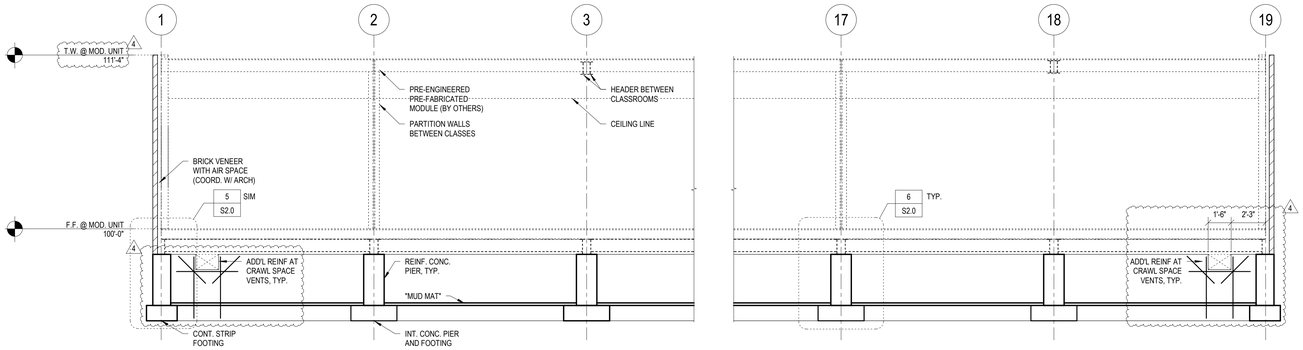
7 S2.0 CORING AND SLEEVING IN EXISTING CONCRETE
Not to Scale



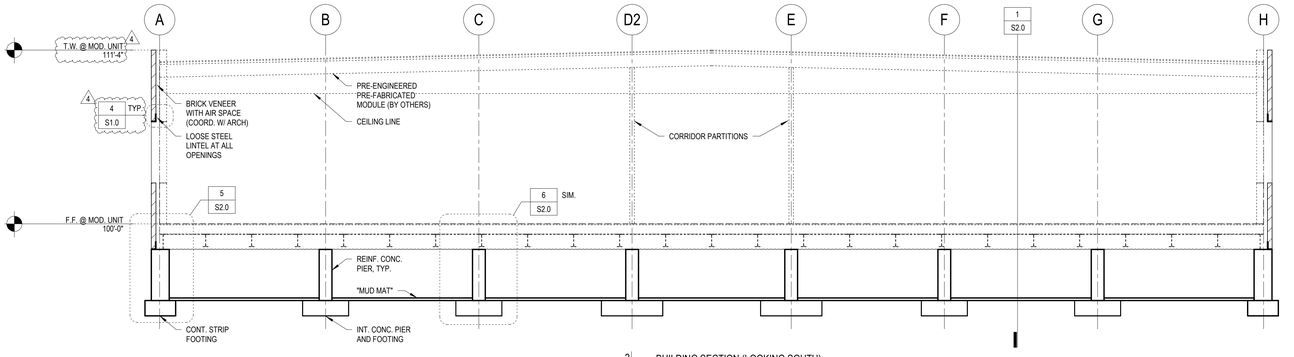
8 S2.0 NEW OPENINGS IN EXISTING CONCRETE
Not to Scale



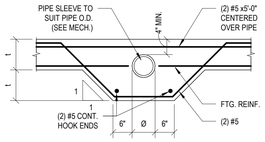
9 S2.0 FROST-PROOF ENTRY SLAB
Not to Scale



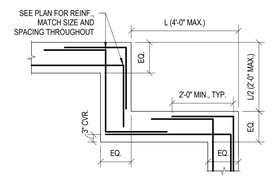
1 S2.0 BUILDING SECTION (LOOKING EAST)
Scale: 1/4" = 1'-0"



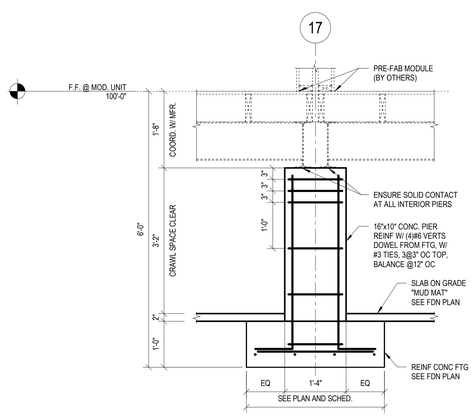
2 S2.0 BUILDING SECTION (LOOKING SOUTH)
Scale: 1/4" = 1'-0"



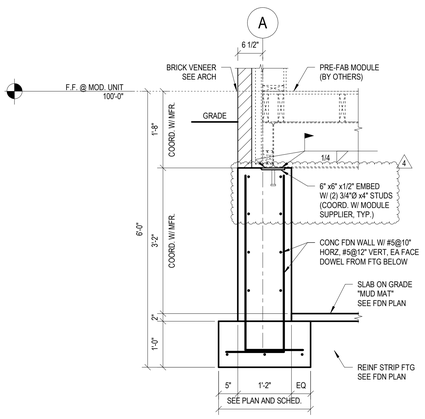
10 S2.0 PIPE THROUGH FOUNDATION
Not to Scale



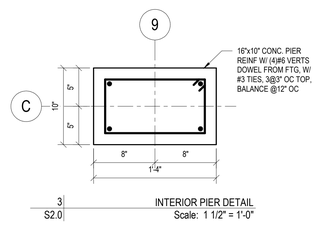
11 S2.0 STEPPED FOUNDATION DETAIL
Not to Scale



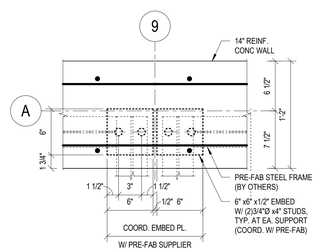
6 S2.0 FOUNDATION DETAIL AT INTERIOR PIER
Scale: 3/4" = 1'-0"



5 S2.0 FOUNDATION DETAIL AT EXTERIOR WALL
Scale: 3/4" = 1'-0"



3 S2.0 INTERIOR PIER DETAIL
Scale: 1 1/2" = 1'-0"



4 S2.0 EXTERIOR PIER DETAIL
Scale: 1 1/2" = 1'-0"

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PATTENGILL MODULAR CLASSROOM BUILDING

LANSING SCHOOL DISTRICT

815 North Fairview Avenue, Lansing, MI

Lansing School District

ISSUANCE	DATE
Early Foundation Work BP #2	03.22.2024
Addendum #2	04.11.2024
Construction Documents BP03	04.19.2024
BP02 - PR01	04.26.2024

JOB NO. 24013

SHEET TITLE
SECTIONS AND DETAILS

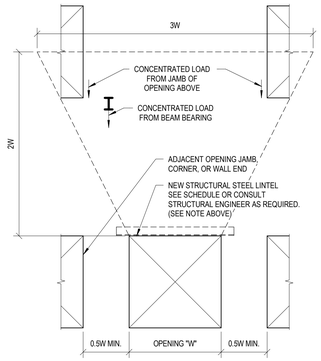
SHEET NO.
S2.0

BP02 -FOR REFERENCE

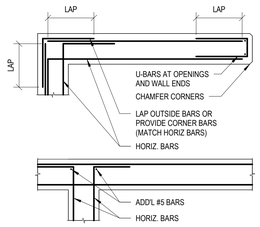
OPENING WIDTH "W"	SIZE OF LINTEL TO BE USED FOR EA. 4" OF WALL THICKNESS	MIN. BRG.
< 8"	NO LINTEL REQUIRED	--
8" TO 3'-0"	L3 1/2" x 3 1/2" x 1/4"	8"
3'-0" TO 3'-6"	L5" x 3 1/2" x 1/4" LLV	8"
3'-6" TO 5'-0"	L6" x 3 1/2" x 5/16" LLV	8"
5'-0" TO 6'-0"	L6" x 3 1/2" x 3/8" LLV	12"
> 6'-0"	CONSULT STRUCTURAL	

SELECT LINTEL FROM SCHEDULE ABOVE IF **BOTH** CONDITIONS BELOW ARE MET. IF EITHER CONDITION IS NOT MET, CONSULT THE PROJECT STRUCTURAL ENGINEER FOR LINTEL SIZE, BEARING, AND DETAIL UON

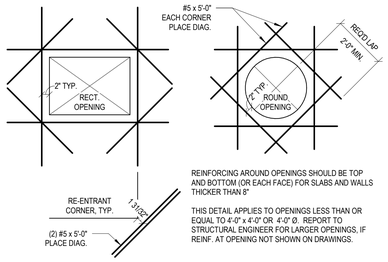
CONDITION A: NO CONCENTRATED LOADS FROM BEAM BEARING OR MASONRY JAMBS FALL WITHIN AN AREA 3W HORIZONTAL BY 2W VERTICAL
CONDITION B: THE DISTANCE TO THE CLOSEST ADJACENT OPENING, JAMB, CORNER, OR WALL END IS GREATER THAN 0.5W



12 S2.0 TYPICAL STEEL LINTEL SCHEDULE
Not to Scale



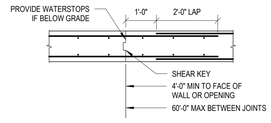
13 S2.0 TYPICAL WALL AND CORNER REINFORCING
Not to Scale



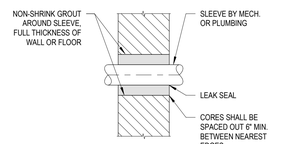
REINFORCING AROUND OPENINGS SHOULD BE TOP AND BOTTOM (OR EACH FACE) FOR SLABS AND WALLS THICKER THAN 8"

THIS DETAIL APPLIES TO OPENINGS LESS THAN OR EQUAL TO 4'-0" x 4'-0" OR 4'-0" Ø. REPORT TO STRUCTURAL ENGINEER FOR LARGER OPENINGS, IF REINF. AT OPENING NOT SHOWN ON DRAWINGS.

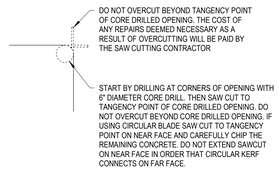
14 S2.0 REINFORCING AT CONCRETE OPENINGS
Scale: 3/4" = 1'-0"



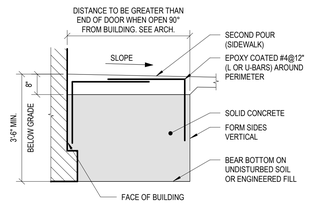
15 S2.0 WALL CONSTRUCTION JOINT
Scale: 1/2" = 1'-0"



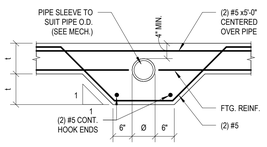
7 S2.0 CORING AND SLEEVING IN EXISTING CONCRETE
Not to Scale



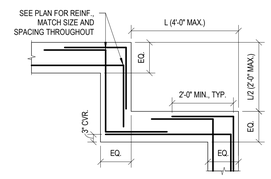
8 S2.0 NEW OPENINGS IN EXISTING CONCRETE
Not to Scale



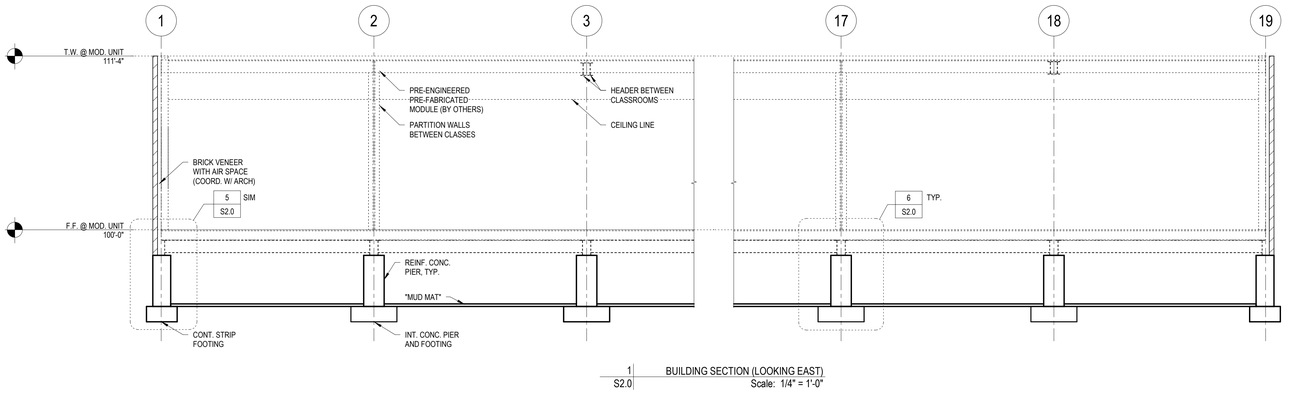
9 S2.0 FROST-PROOF ENTRY SLAB
Not to Scale



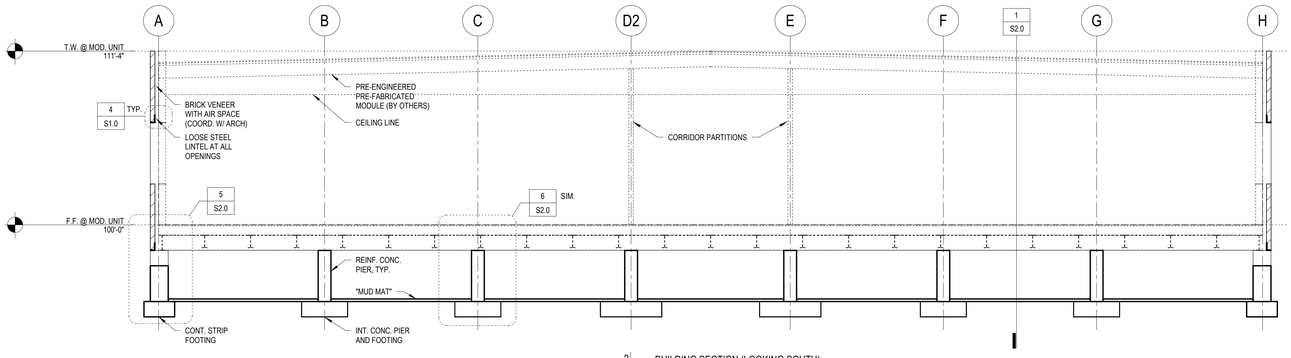
10 S2.0 PIPE THROUGH FOUNDATION
Not to Scale



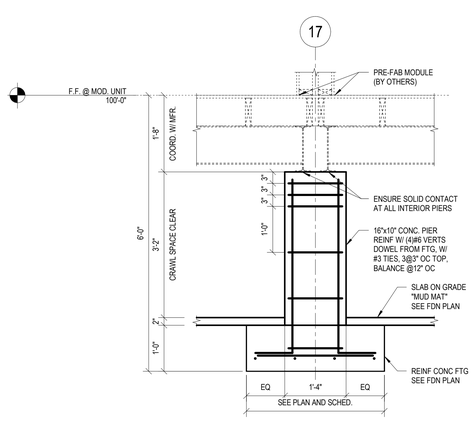
11 S2.0 STEPPED FOUNDATION DETAIL
Not to Scale



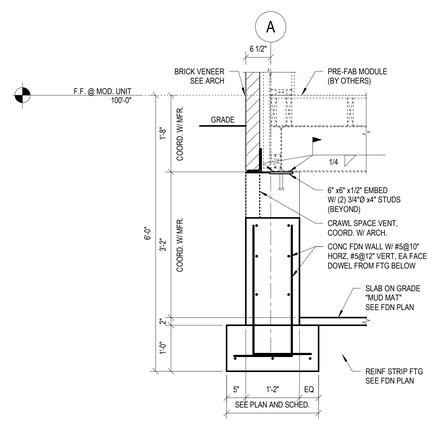
1 S2.0 BUILDING SECTION (LOOKING EAST)
Scale: 1/4" = 1'-0"



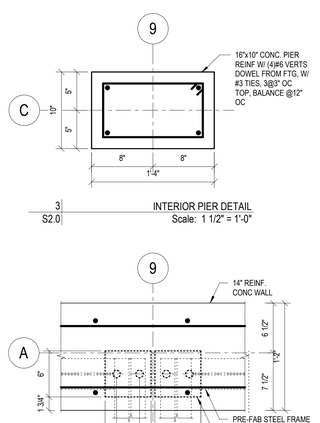
2 S2.0 BUILDING SECTION (LOOKING SOUTH)
Scale: 1/4" = 1'-0"



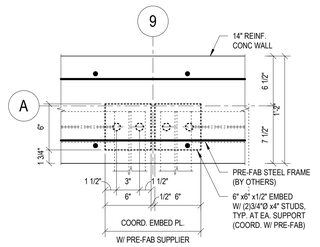
6 S2.0 FOUNDATION DETAIL AT INTERIOR PIER
Scale: 3/4" = 1'-0"



5 S2.0 FOUNDATION DETAIL AT EXTERIOR WALL
Scale: 3/4" = 1'-0"



3 S2.0 INTERIOR PIER DETAIL
Scale: 1 1/2" = 1'-0"



4 S2.0 EXTERIOR PIER DETAIL
Scale: 1 1/2" = 1'-0"

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PATTENGILL MODULAR CLASSROOM BUILDING

LANSING SCHOOL DISTRICT

815 North Fairview Avenue, Lansing, MI

Lansing School District

ISSUANCE	DATE
Early Foundation Work BP #2	03.22.2024
Addendum #2	04.11.2024
Construction Documents BP03	04.19.2024

JOB NO. 24013

SHEET TITLE
SECTIONS AND DETAILS

SHEET NO.
S2.0

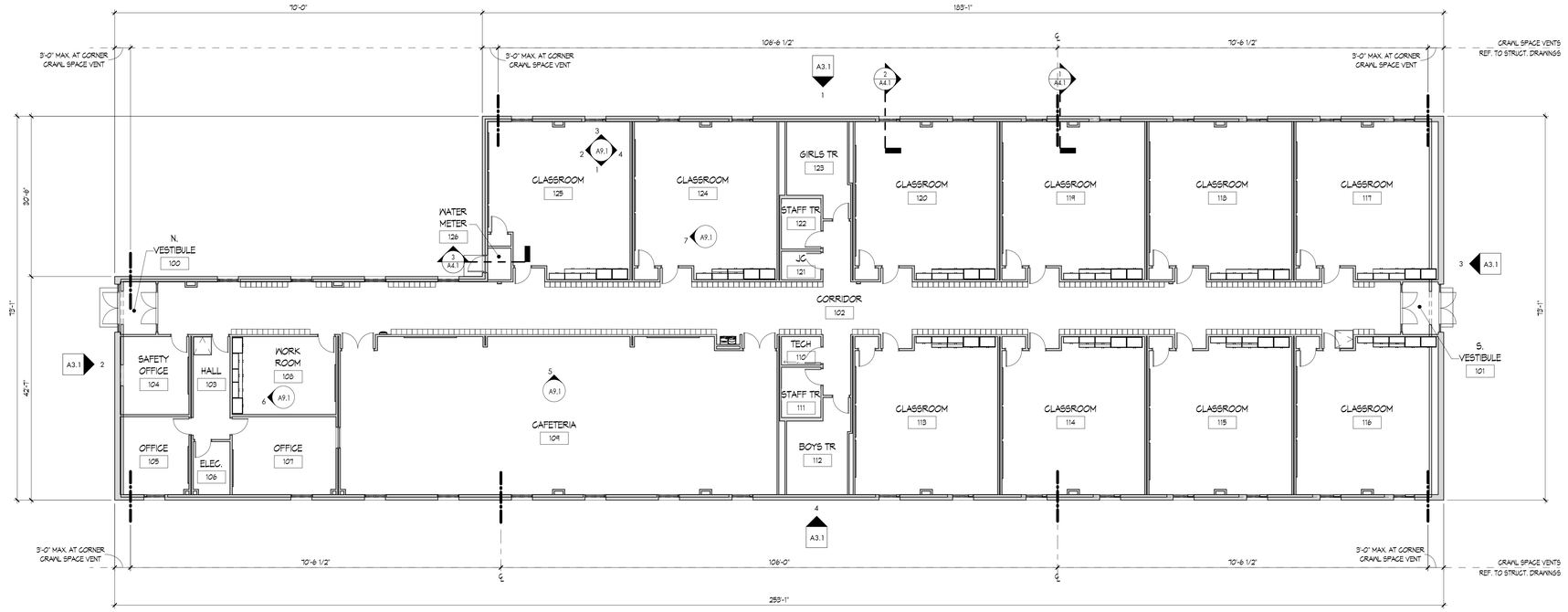
STATE OF MICHIGAN
BRAD CUTTER
ENGINEER
No. 6201063383
REGISTERED PROFESSIONAL ENGINEER

BP02 -FOR REFERENCE

COMPOSITE PLAN GENERAL NOTES

NAME
101 INDICATES CONSTRUCTION DOCUMENT ROOM NUMBERS.

REFER TO CODE COMPLIANCE SHEETS FOR BUILDING CODE REQUIREMENTS.



1 COMPOSITE FLOOR PLAN
3/32" = 1'-0"

PATTENGILL MODULAR CLASSROOM BUILDING

LANSING SCHOOL DISTRICT

815 North Fairview Avenue, Lansing, MI

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Lansing School District

ISSUANCES	DATE
CONSTRUCTION DOCUMENTS BP03	04.19.2024

KEY PLAN

N

JOB NO. 2616.05

SHEET TITLE
FIRST FLOOR COMPOSITE PLAN

SHEET NO.
A0.1

LAST PRINTED: 4/19/2024 7:03:28 AM
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CODE COMPLIANCE LEGEND

FE	FIRE EXTINGUISHER / FIRE EXTINGUISHER CABINET - PROVIDED BY MODULAR COMPANY
(arrow)	EXIT
NAME / XXX	ROOM NAME & ROOM NUMBER

GENERAL NOTES

1. CORRIDOR WALLS SHALL EXTEND TIGHT TO UNDERSIDE OF DECK TO RESIST THE PASSAGE OF SMOKE.

BUILDING CODE INFORMATION

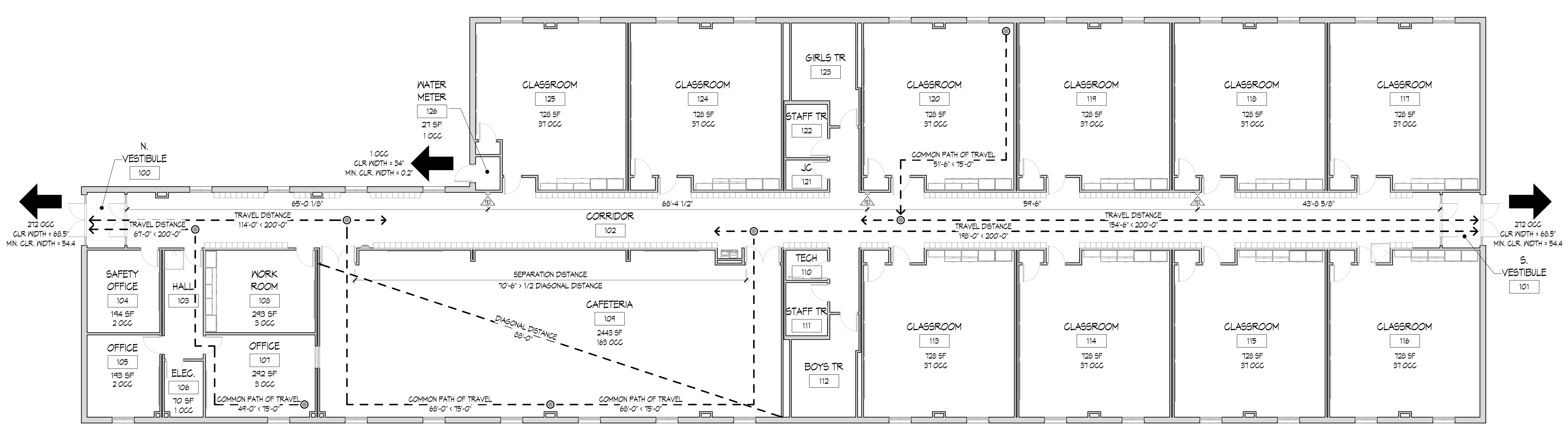
RULES AND CODED:	MICHIGAN BUILDING CODE 2015 2012 NFPA 101 LIFE SAFETY CODE.
BARRIER FREE DESIGN:	MICHIGAN BUILDING CODE 2015 CHAPTER 11
ENERGY CODE:	2015 MICHIGAN ENERGY CODE
PLUMBING CODE:	MICHIGAN PLUMBING CODE 2021
MECHANICAL CODE:	MICHIGAN MECHANICAL CODE 2021
ELECTRICAL CODE:	NATIONAL ELECTRICAL CODE 2023
OCCUPANCY:	E (EDUCATIONAL)
CONSTRUCTION TYPE:	VB
SPRINKLERED (Y/N):	SPRINKLERED

MEANS OF EGRESS REQUIREMENTS:

	ALLOWED
COMMON PATH (M.B.C. 1006.2.1):	75' - 0"
(NFPA 14.2.5.3):	75' - 0"
EXIT TRAVEL DIST. (M.B.C. 1017.2):	250'-0" (W/ FIRE SUPPRESSION)
(N.F.P.A. 14.2.6.2):	200'-0" (W/ FIRE SUPPRESSION)

ALLOWABLE HEIGHT / AREA: MBC TABLES 504.3, 504.4, 506.2	1 STORY, 50 FT / 18,500 S.F.
PROVIDED HEIGHT / AREA:	1 STORY, 11'-4" FT / 16,362 S.F.

BEARING WALLS (EXTERIOR, INTERIOR):	1 HR.
NONBEARING WALLS (EXTERIOR):	1 HR.
NONBEARING WALLS AND PARTITIONS (INTERIOR):	1 HR.
FLOOR CONSTRUCTION:	1 HR.
ROOF CONSTRUCTION AND ASSOCIATED MEMBERS:	1 HR.



1 FIRST FLOOR CODE COMPLIANCE PLAN
3/32" = 1'-0"

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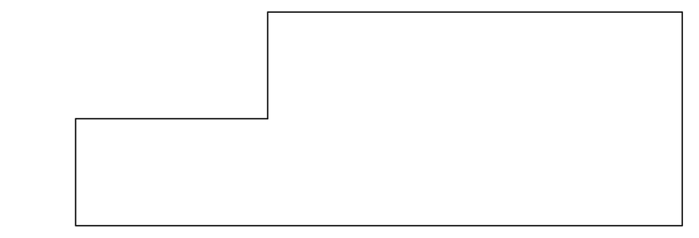
PATTENGILL MODULAR CLASSROOM BUILDING

LANSING SCHOOL DISTRICT
815 North Fairview Avenue, Lansing, MI

Lansing School District

ISSUANCES	DATE
CONSTRUCTION DOCUMENTS BP03	04.19.2024



KEY PLAN

N

JOB NO. 2616.05

SHEET TITLE
FIRST FLOOR CODE COMPLIANCE PLAN

SHEET NO.
A0.3

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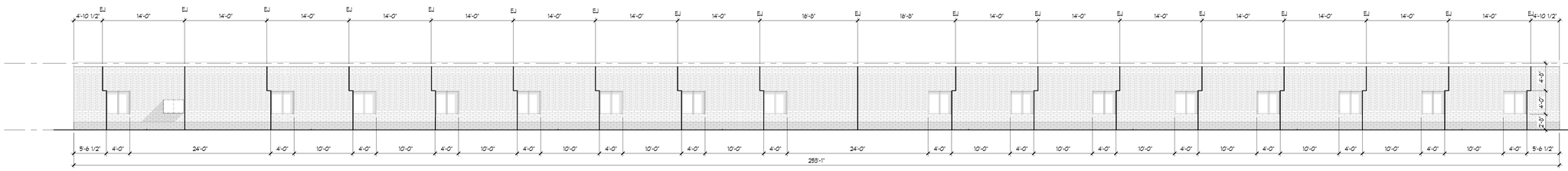

PATTENGILL MODULAR CLASSROOM BUILDING

LANSING SCHOOL DISTRICT

815 North Fairview Avenue, Lansing, MI

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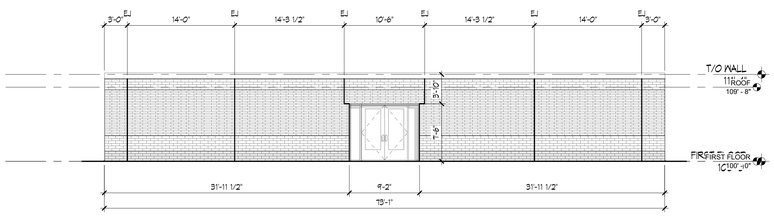
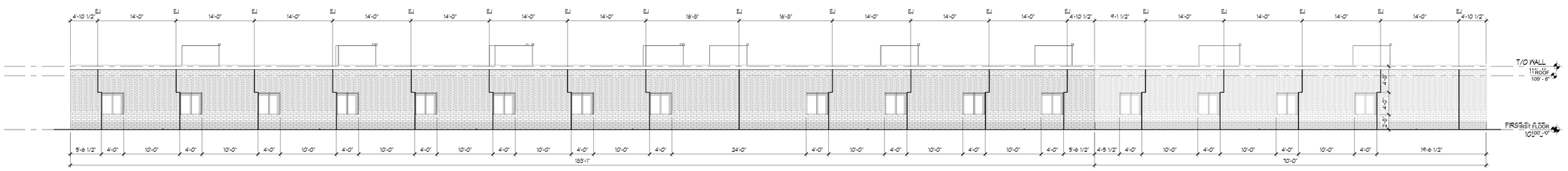
4 WEST ELEVATION

1/8" = 1'-0"



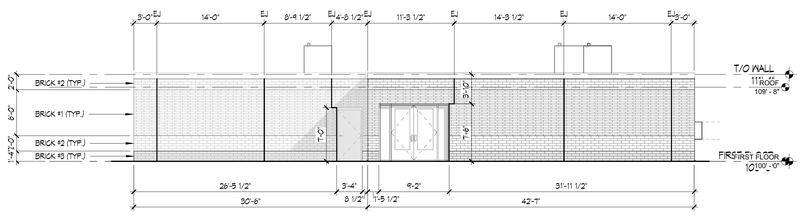
3 SOUTH ELEVATION

1/8" = 1'-0"



1 EAST ELEVATION

1/8" = 1'-0"



2 NORTH ELEVATION

1/8" = 1'-0"

Lansing School District

ISSUANCES	DATE
ADDENDUM 02	04.11.2024
CONSTRUCTION DOCUMENTS BP03	04.19.2024

KEY PLAN

N

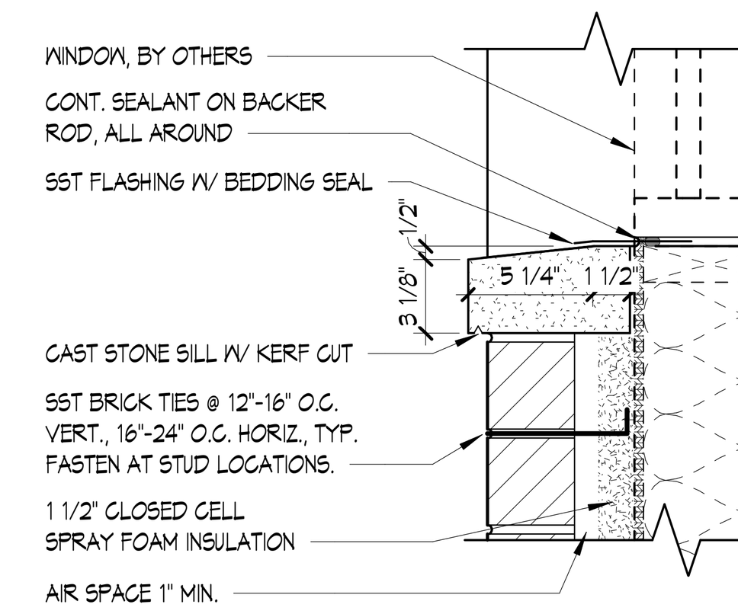
JOB NO. 2616.05

SHEET TITLE

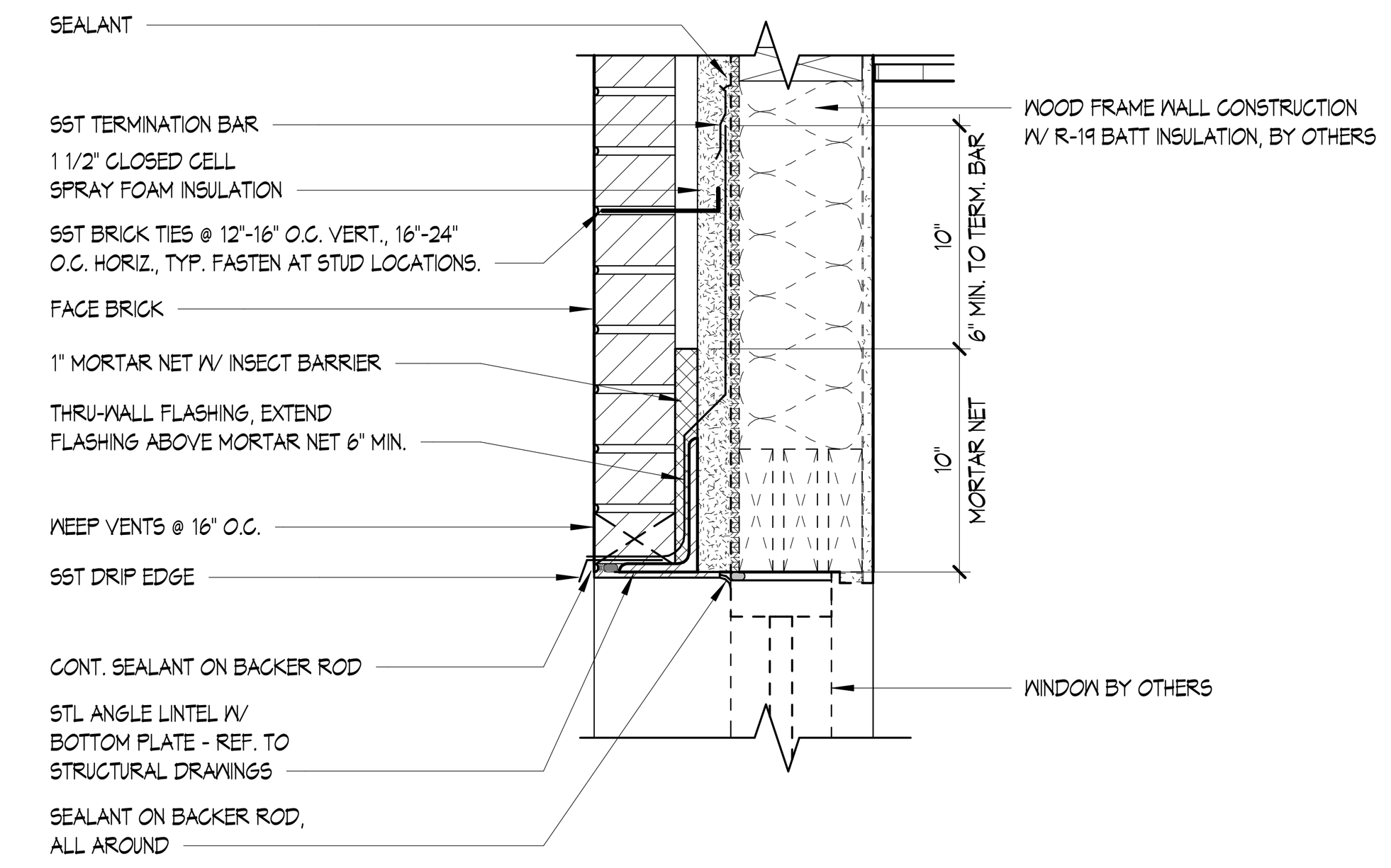
EXTERIOR ELEVATIONS

SHEET NO.

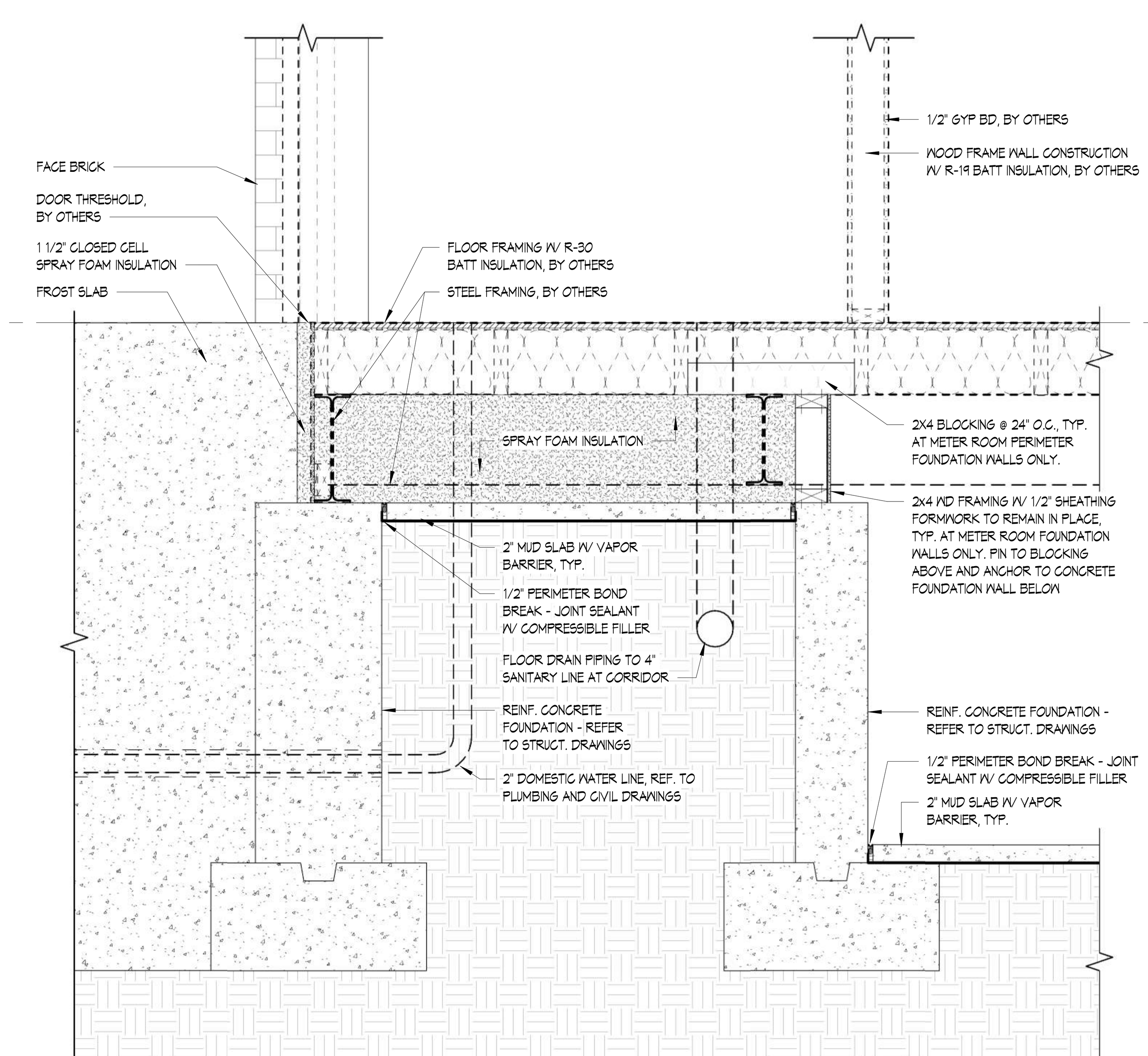
A3.1



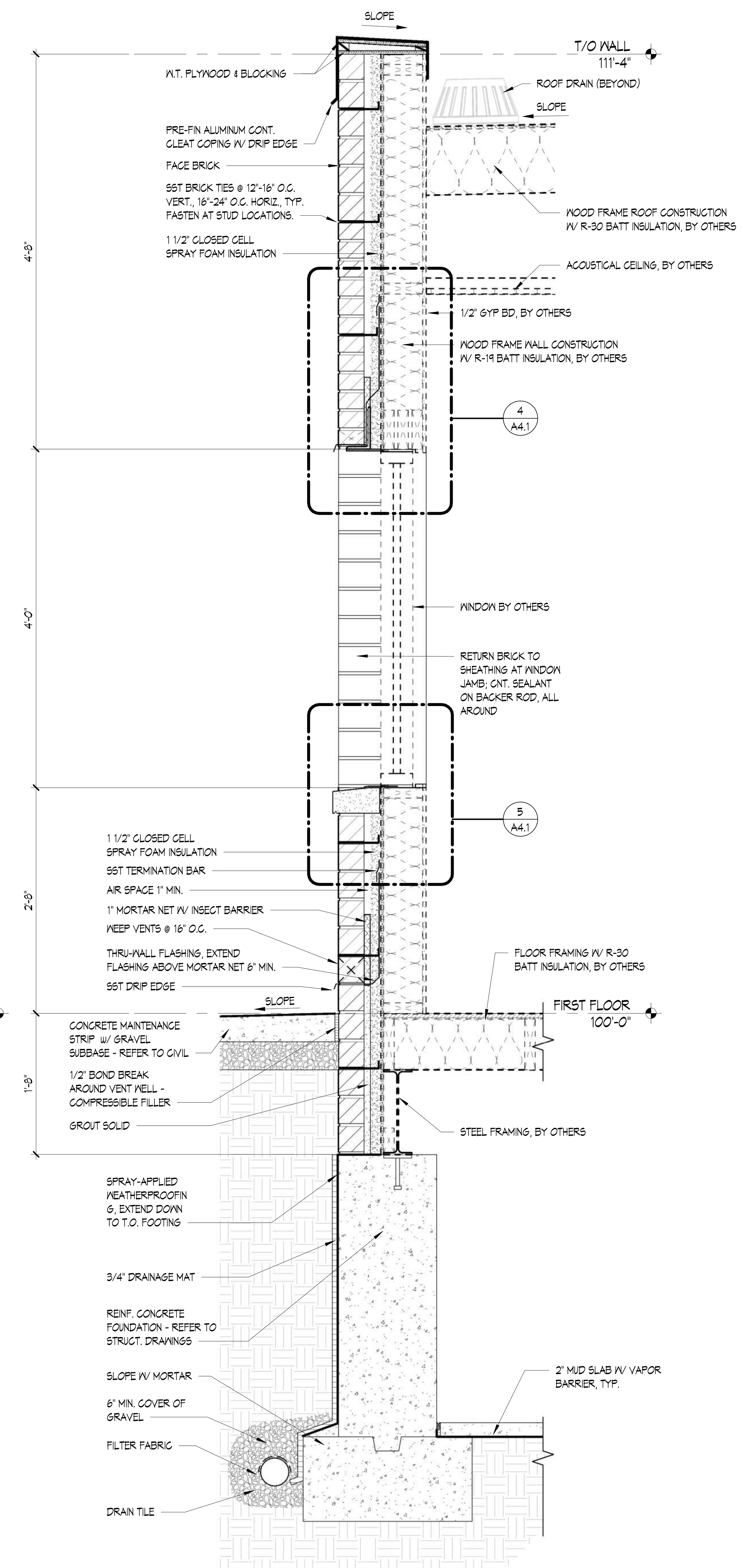
5 TYPICAL WINDOW SILL DETAIL
1 1/2" = 1'-0"



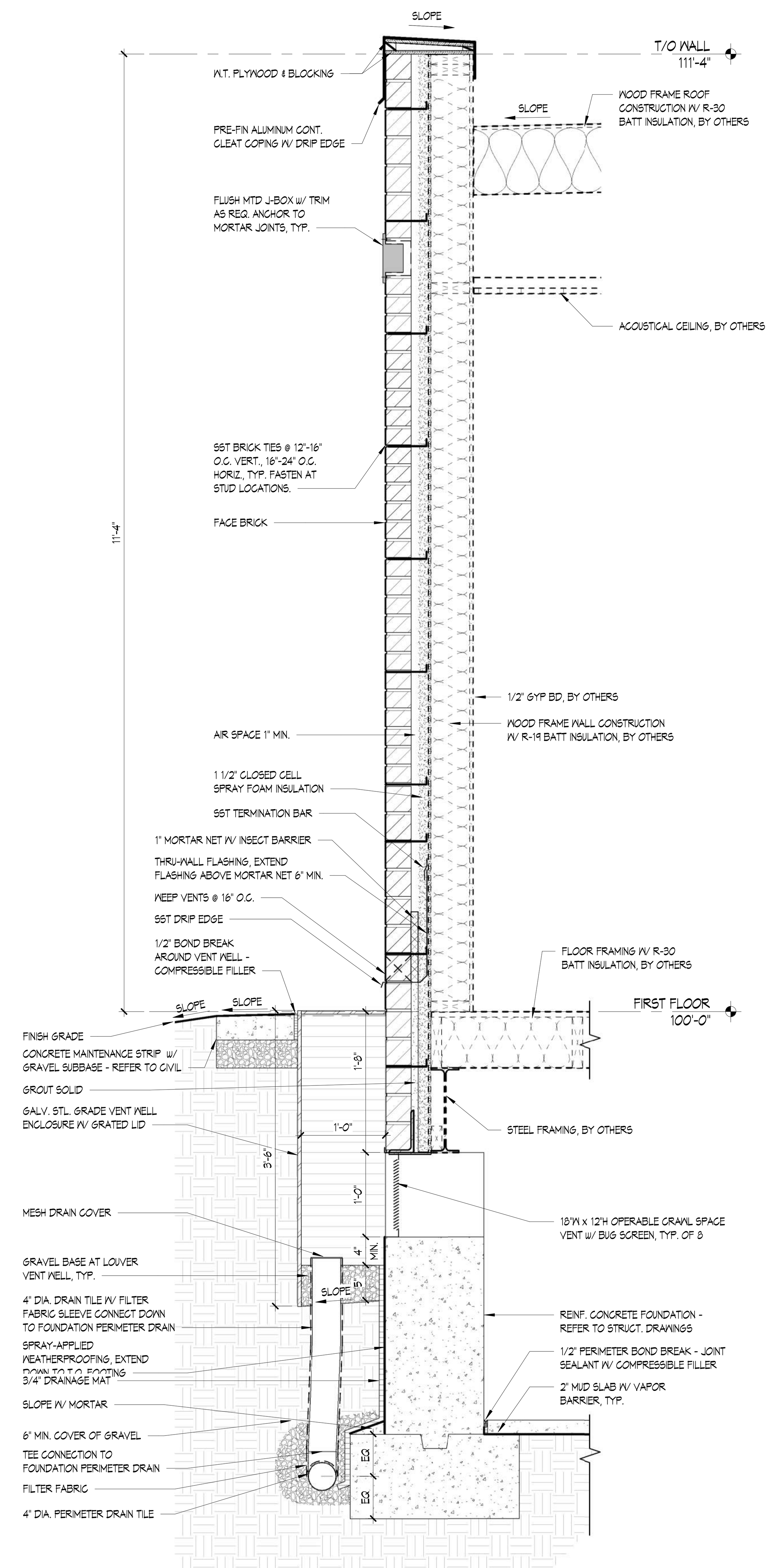
4 TYPICAL WINDOW HEAD DETAIL
1 1/2" = 1'-0"



3 SECTION @ METER ROOM CRAWL SPACE
1" = 1'-0"



2 TYPICAL WALL SECTION @ WINDOW
1" = 1'-0"



1 WALL SECTION @ CRAWL SPACE VENT
1" = 1'-0"

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PATTENGILL MODULAR CLASSROOM BUILDING

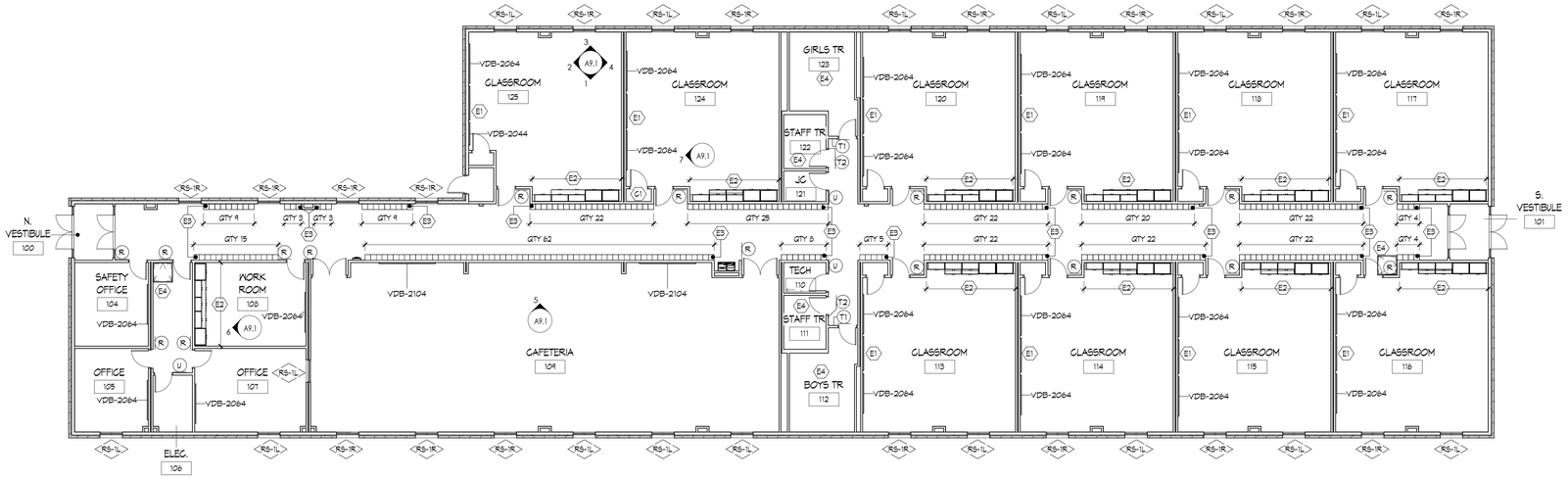
LANSING SCHOOL DISTRICT
815 North Fairview Avenue, Lansing, MI

Lansing School District

ISSUANCES	DATE
ADDENDUM 02	04.11.2024
CONSTRUCTION DOCUMENTS BP03	04.19.2024

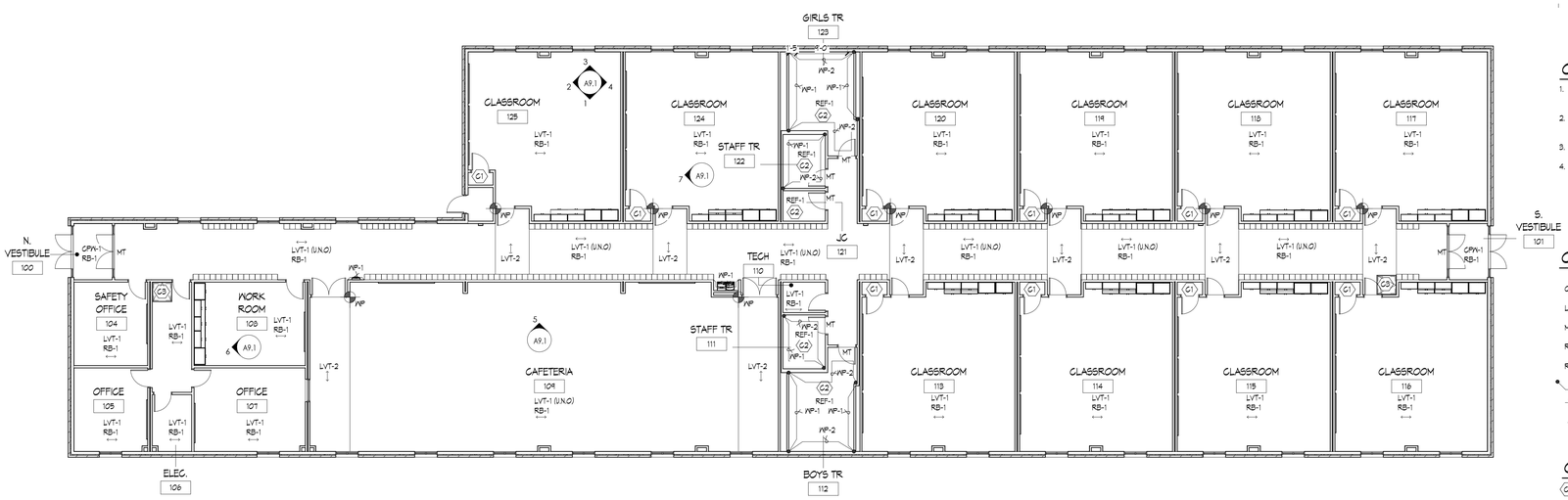
KEY PLAN

JOB NO. 2616.05
SHEET TITLE
WALL SECTIONS
SHEET NO.
A4.1



3 EQUIPMENT PLAN - UNIT 1100

3/32" = 1'-0"



1 COLOR LAYOUT PLAN - UNIT 1100

3/32" = 1'-0"

EQUIPMENT PLAN GENERAL NOTES

1. ALL VISUAL DISPLAY BOARD INSTALLATION LOCATIONS ARE TO BE FIELD VERIFIED PRIOR TO INSTALLATION
2. REFER TO SPECIFICATIONS FOR VISUAL DISPLAY BOARD FINISHES AND COLOR DESIGNATIONS.
3. REFER TO SPECIFICATION **SECTION 122413** FOR DETAILED INFORMATION ON WINDOW ROLLER SHADES.
4. REFER TO SPECIFICATION **SECTION 101423.16** FOR SIGNAGE DETAILS. PROVIDE BACK PANELS AT ALL SIGNAGE MOUNTED ON GLASS.
5. TRIM WALL PROTECTION AROUND POWER/DATA OUTLETS (TYP.)
6. REFER TO TECHNOLOGY DRAWINGS BY OTHERS TO COORDINATE VDB'S. INFORM ARCHITECT OF CONFLICTS.

EQUIPMENT PLAN LEGEND

VDB-_# = VISUAL DISPLAY BOARD, SPECIFICATION SECTION 101100

RS-XX = ROLLER SHADE, SPECIFICATION SECTION 122413

(X) = ROOM IDENTIFICATION PANEL SIGNAGE, SPECIFICATION SECTION 101423.16

EQUIPMENT PLAN KEYNOTES

E1 WALL MOUNTED INTERACTIVE TOUCH SCREEN, REFER TO TECHNOLOGY DRAWINGS.

E2 CASEWORK TO BE PROVIDED BY MODULAR COMPANY.

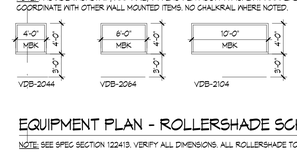
E3 METAL WARDROBE LOCKERS WITH SLOPED TOP. PROVIDE END PANELS AS NEEDED.

E4 3'-0" X 5'-0" FLOOR ACCESS HATCH - PROVIDED BY MODULAR COMPANY.

E4 TOILET PAPER DISPENSERS TO BE OWNER PROVIDED, CONTRACTOR INSTALLED.

EQUIPMENT PLAN - VDB SCHEDULE

NOTE: PROVIDE TACKSTRIP, MAP RAIL, & 1 FLAG PER ROOM TYPICAL AT MARKERBOARDS. COORDINATE WITH OTHER WALL MOUNTED ITEMS. NO CHALKRAIL WHERE NOTED.



EQUIPMENT PLAN - ROLLERSHADE SCHEDULE

NOTE: SEE SPEC SECTION 122413. VERIFY ALL DIMENSIONS. ALL ROLLERSHADE TO BE INSIDE MOUNT.

RS-1L	SINGLE ROLLER SHADE 40"W X 40"L	5% LIGHT FILTERING	LEFT SIDE MANUALLY OPERATED
RS-1R	SINGLE ROLLER SHADE 40"W X 40"L	5% LIGHT FILTERING	RIGHT SIDE MANUALLY OPERATED

COLOR LAYOUT PLAN GENERAL NOTES

1. PAINT NEW ANY CONDUIT / PENETRATIONS IN EXISTING SCHOOL CORRIDOR TO MATCH EXPOSED CEILINGS IN THAT AREA.
2. SEE REFLECTED CEILING PLANS FOR ACOUSTICAL CEILING TYPES. ACOUSTICAL CEILINGS PROVIDED BY MODULAR COMPANY.
3. FLOORING TRANSITIONS TO OCCUR IN LINE WITH THE CENTERLINE OF THE DOOR LEAF.
4. AT EXPOSED CEILING, PAINT MECHANICAL & STRUCTRUAL ELEMENTS TO MATCH COLOR INDICATED.

COLOR LAYOUT PLAN LEGEND

CPVT-# WALK OFF CARPET, SEE SPECIFICATION SECTION 096813

LVT-# LUXURY VINYL TILE, SEE SPECIFICATION SECTION 096519

MT BARRIER FREE METAL TRANSITION EQUAL TO SCHLUTER RENO-RAMP

RB-# RUBBER BASE, SEE SPECIFICATION SECTION 096513

REF-# RESINOUS EPOXY FLOORING- BY MODULAR COMPANY

PRODUCT EXTENTS WITH MATERIAL INDICATED

WP WORK POINT

MATERIAL INSTALL DIRECTION

WP-# FULL HEIGHT WALL PROTECTION - BY MODULAR COMPANY

COLOR LAYOUT PLAN KEYNOTES

C1 CONTINUE FINISHES FROM ADJACENT ROOM

C2 4" EPOXY RESINOUS BASE WITH SCHLUTER TRIM - BY MODULAR COMPANY

C3 PROVIDE METAL TRIM AROUND FLOOR TRAP DOOR.

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PATTENGILL MODULAR CLASSROOM BUILDING

LANSING SCHOOL DISTRICT

815 North Fairview Avenue, Lansing, MI

Lansing School District

ISSUANCES	DATE
CONSTRUCTION DOCUMENTS BP03	04.19.2024

KEY PLAN

N

JOB NO. 2616.05

SHEET TITLE

FIRST FLOOR EQUIPMENT & COLOR LAYOUT PLAN - UNIT 1100

SHEET NO.

A8.1

LAST PRINTED: 4/19/2024 7:04:47 AM
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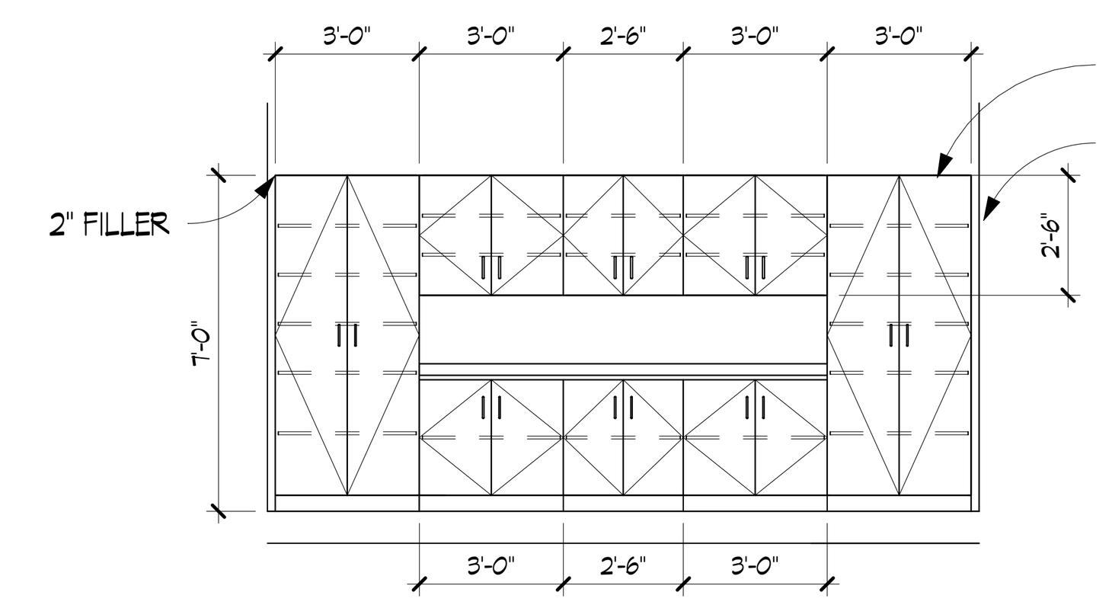
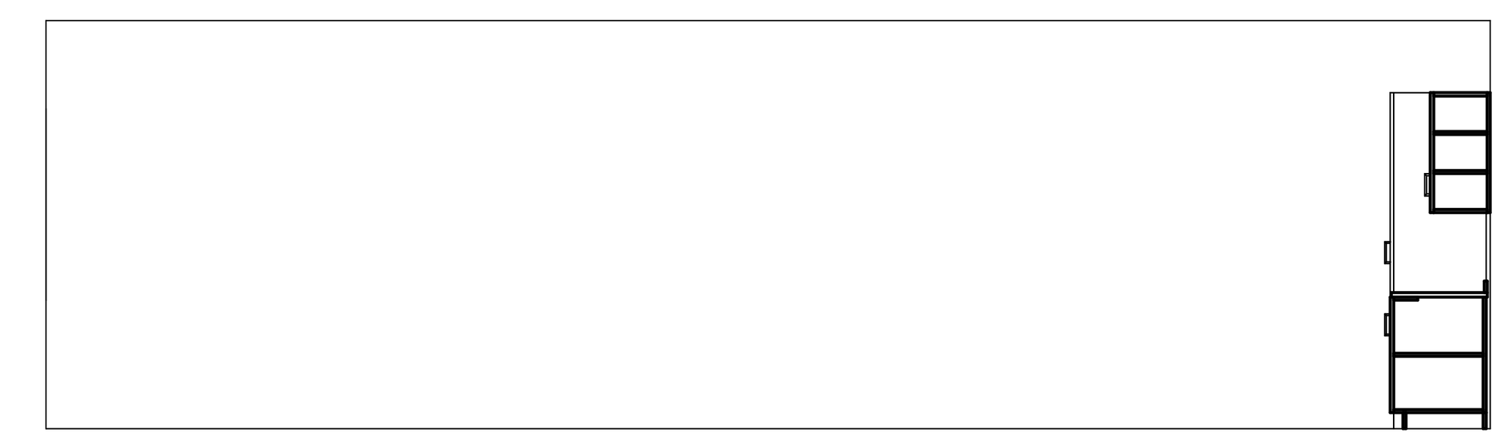
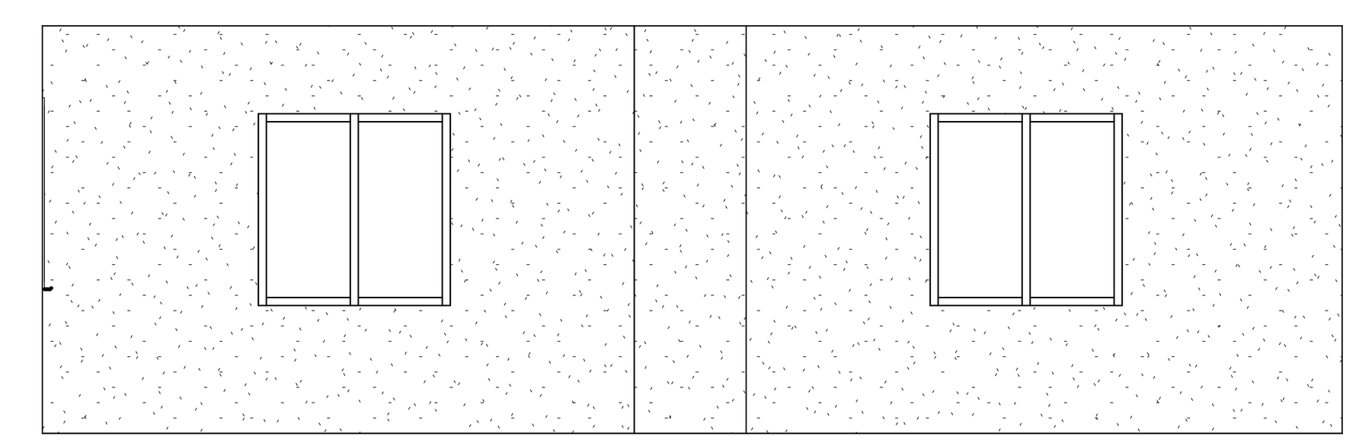
NOTE: CASEWORK TO BE PROVIDED BY OTHERS



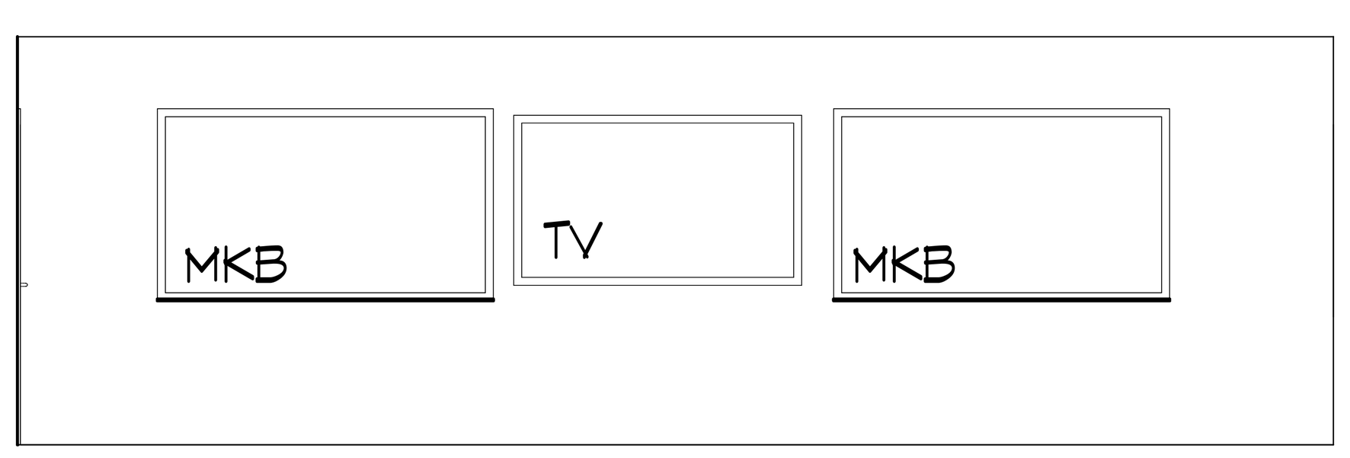
6 WORKROOM 108 - NORTH WALL
1/4" = 1'-0"



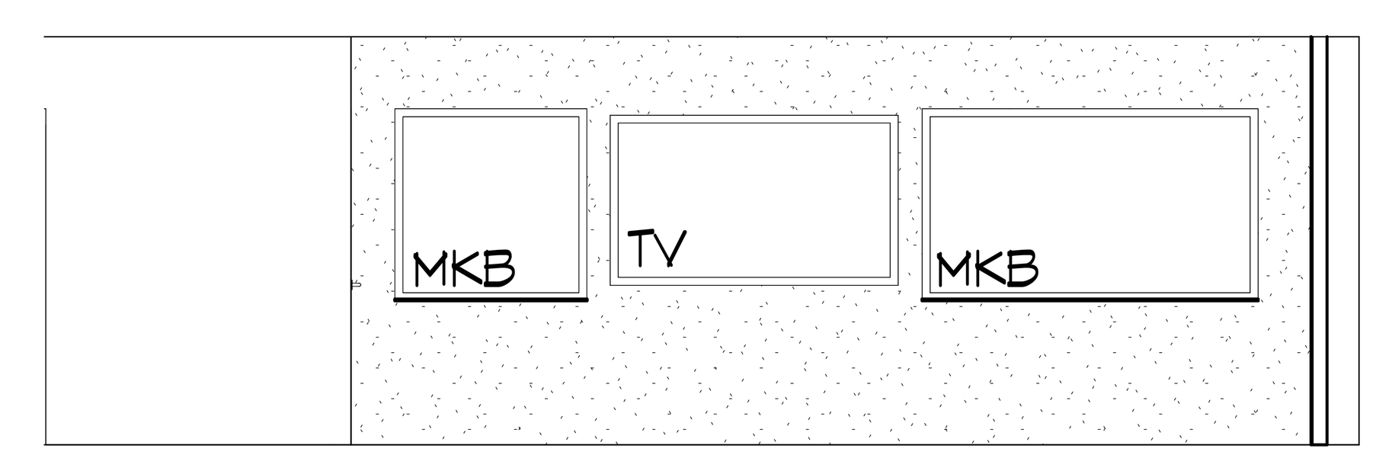
4 CLASSROOM - BACK WALL (TYP)
1/4" = 1'-0"



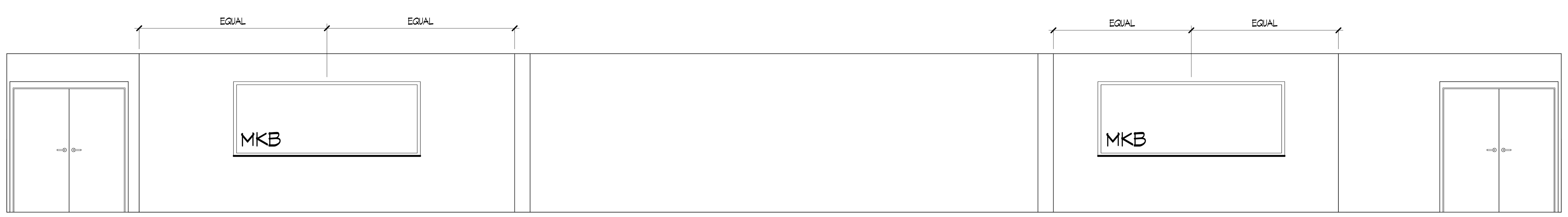
3 CLASSROOM - WINDOW WALL (TYP)
1/4" = 1'-0"



7 CLASSROOM - TEACHER WALL (TYP)
1/4" = 1'-0"

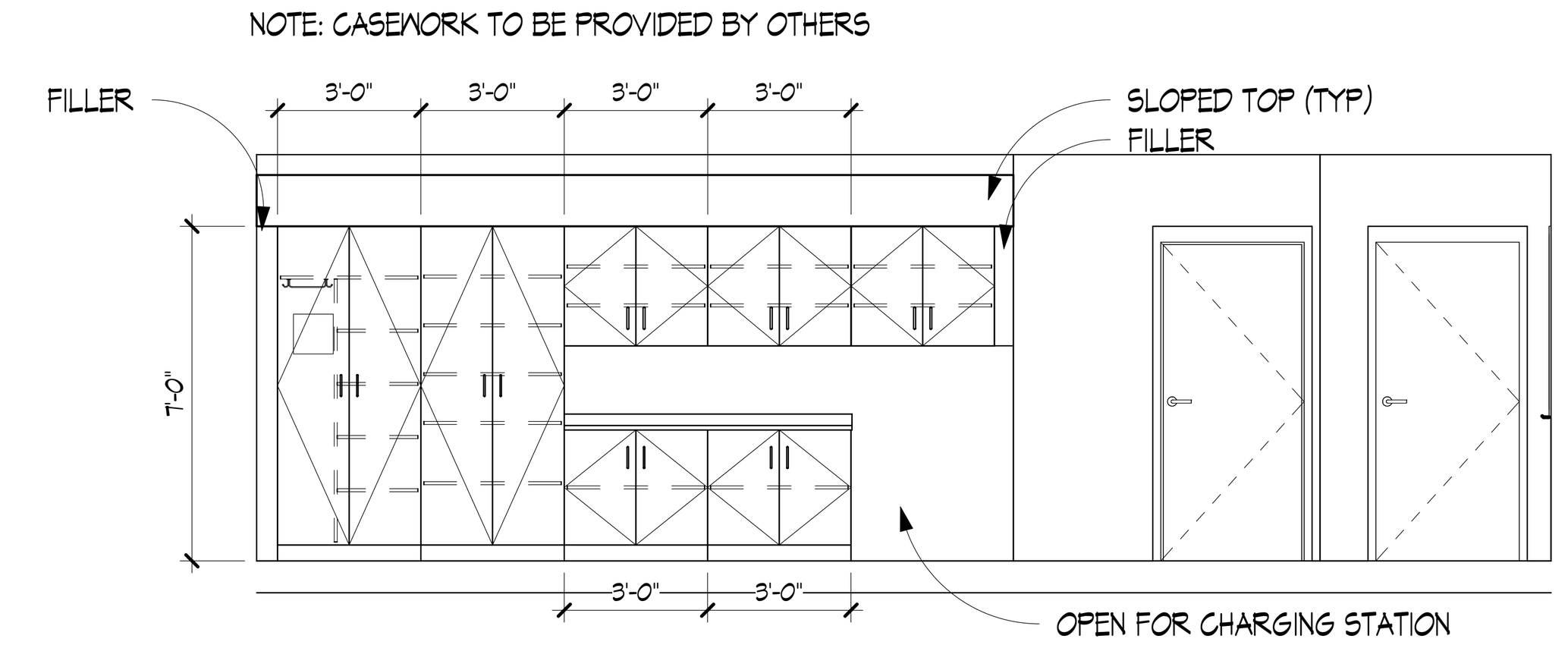


2 CLASSROOM 125 - TEACHER WALL
1/4" = 1'-0"



5 CAFETERIA - EAST WALL
1/4" = 1'-0"

NOTE: CASEWORK TO BE PROVIDED BY OTHERS



1 CLASSROOM - CASEWORK ELEVATION (TYP)
1/4" = 1'-0"

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PATTENGILL MODULAR CLASSROOM BUILDING

LANSING SCHOOL DISTRICT
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Lansing School District

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KEY PLAN

N

JOB NO. 2616.05

SHEET TITLE
INTERIOR ELEVATIONS

SHEET NO.
A9.1

MECHANICAL ABBREVIATIONS

ABBREV.	DESCRIPTION
AAV	AUTOMATIC AIR VENT / AIR ADMITTANCE VALVE
AD	ACCESS DOOR
AE	AIR EXTRACTOR
AFF	ABOVE FINISHED FLOOR
APD	AIR PRESSURE DROP
ASR	AUTOMATIC SPRINKLER RISER
BAS	BUILDING AUTOMATION SYSTEM
BFP	BACKFLOW PREVENTER
BHP	BRAKE HORSEPOWER
BMS	BUILDING MANAGEMENT SYSTEM
BOD	BOTTOM OF DUCT
BTU	BRITISH THERMAL UNIT
BTUH	BRITISH THERMAL UNITS PER HOUR
BWV	BACKWATER VALVE
CA	COMBUSTION AIR
CAP	CAPACITY
CAV	CONSTANT AIR VOLUME
CFH	CUBIC FEET PER HOUR
CFM	CUBIC FEET PER MINUTE
CIRC	CIRCULATING
CLG	COOLING
CO	CLEAN OUT
CONT	CONTINUATION OR CONTINUED
CONV	CONVECTOR
CUH	CABINET UNIT HEATER
CV	CONTROL VALVE
DB	DRY BULB TEMPERATURE
DEG	DEGREES
DDC	DIRECT DIGITAL CONTROL
DN	DOWN
DTC	DRAIN TILE CONNECTION
DWH	DOMESTIC WATER HEATER
(E)	EXISTING
EA/EXH	EXHAUST AIR
EAT	ENTERING AIR TEMPERATURE
EDB	ENTERING DRY BULB TEMPERATURE
EF	EXHAUST FAN
EJ	EXPANSION JOINT
EL	ELEVATION
ELECT	ELECTRICAL
EMS	ENERGY MANAGEMENT SYSTEM
ESP	EXTERNAL STATIC PRESSURE
EWB	ENTERING WET BULB TEMPERATURE
EWC	ELECTRIC WATER COOLER
°F	DEGREES FAHRENHEIT
FA	FACE AREA (COIL) / FREE AREA (LOUVER)
FC	FLEXIBLE CONNECTION
FD	FLOOR DRAIN
FDC	FIRE DEPARTMENT CONNECTION
FH	FIRE HYDRANT
FHC	FIRE HOSE CABINET
FHR	FIRE HOSE RACK
FHV	FIRE HOSE VALVE
FL	FLUE
FLA	FULL LOAD AMPS
FLR	FLOOR
FPM	FEET PER MINUTE
FFD	FUNNEL FLOOR DRAIN
FFE	FINISHED FLOOR ELEVATION
FS	FLOOR SINK
FT	FEET
FURN	FURNISHED
FV	FACE VELOCITY
FVC	FIRE VALVE CABINET
GAL	GALLON
GCO	GRADE CLEAN OUT
GPH	GALLONS PER HOUR
GPM	GALLONS PER MINUTE
HB	HOSE BIBB

MECHANICAL ABBREVIATIONS

ABBREV.	DESCRIPTION
HO	HUB OUTLET
HP	HORSEPOWER
HR	HOUR
HTG	HEATING
HYD	HYDRANT
HZ	HERTZ
ID	INSIDE DIAMETER
IE	INVERT ELEVATION
IN	INCHES
INST	INSTALLED
INV	INVERT
ISP	INTERNAL STATIC PRESSURE
IW	INDIRECT WASTE
KW	KILOWATT
LAT	LEAVING AIR TEMPERATURE
LAV	LAVATORY
LBS/HR	POUNDS PER HOUR
LDB	LEAVING DRY BULB TEMPERATURE
LRA	LOCKED ROTOR AMPS
LWB	LEAVING WET BULB TEMPERATURE
MAV	MANUAL AIR VENT
MAX	MAXIMUM
MBH	1000 BRITISH THERMAL UNITS PER HOUR
MCA	MINIMUM CIRCUIT AMPACITY
MECH	MECHANICAL
MFR	MANUFACTURER
MH	MANHOLE
MIN	MINIMUM
MISC	MISCELLANEOUS
MOD	MOTOR OPERATED DAMPER (AUTOMATIC)
MOP/MOCP	MAXIMUM OVER-CURRENT PROTECTION
N.C.	NOISE CRITERIA
NIC	NOT IN CONTRACT
NC	NORMALLY CLOSED
NO	NORMALLY OPEN
NOM	NOMINAL
OA	OUTSIDE AIR
OBD	OPPOSED BLADE DAMPER
OC	ON CENTER / CENTER TO CENTER
OD	OUTSIDE DIAMETER
OED	OPEN ENDED DUCT
ORS	OVERFLOW ROOF SUMP
OS&Y	OUTSIDE SCREW AND YOKE
PD	PRESSURE DROP (FEET OF WATER)
PRV	PRESSURE REDUCING VALVE
PSIA	POUNDS PER SQUARE INCH - ABSOLUTE
PSIG	POUNDS PER SQUARE INCH - GAUGE
PT	PRESSURE / TEMPERATURE PORT
RA	RETURN AIR
RH	RELATIVE HUMIDITY
REQD	REQUIRED
REL.A	RELIEF AIR
RPM	REVOLUTIONS PER MINUTE
RPZ	REDUCED PRESSURE ZONE
RS	ROOF SUMP
SA	SUPPLY AIR
SH	SHOWER
SP	STAIR PRESSURE
SP	STATIC PRESSURE
SqFt / SF	SQUARE FOOT/SQUARE FEET
SS	SERVICE SINK
TC	TEMPERATURE CONTROL
TCC	TEMPERATURE CONTROLS CONTRACTOR
T & P	TEMPERATURE AND PRESSURE
TSP	TOTAL STATIC PRESSURE
TYP	TYPICAL
UG	UNDERGROUND
UH	UNIT HEATER
UL	UNDERWRITERS LABORATORY

MECHANICAL ABBREVIATIONS

ABBREV.	DESCRIPTION
UNO	UNLESS NOTED OTHERWISE
UR	URINAL
VD	VOLUME DAMPER (MANUALLY ADJUSTABLE)
VTR	VENT THRU ROOF
W	WASTE
W&V	WASTE AND VENT
WB	WET BULB TEMPERATURE
WC	WATER CLOSET
WG	WATER GAUGE
WH	WALL HYDRANT
YCO	YARD CLEAN OUT

MECHANICAL PIPING SYMBOLS

ABBREV.	DESCRIPTION
	PIPE ELBOW UP
	PIPE ELBOW DOWN
	PIPE TEE DOWN
	DIRECTION OF FLOW
	UNION
	STRAINER
	CONCENTRIC REDUCER
	ECCENTRIC REDUCER
	EXPANSION JOINT
	FLEXIBLE CONNECTION
	PIPE ANCHOR
	PIPE GUIDE
	PIPE CAP OR PLUG
	ISOLATION VALVE
	CIRCULATING PUMP
	GLOBE VALVE
	BALL VALVE
	BUTTERFLY VALVE
	BACKWATER VALVE
	ANGLE VALVE
	CHECK VALVE (SWING)
	CHECK VALVE (SPRING)
	PLUG VALVE
	NEEDLE VALVE
	OUTSIDE SCREW AND YOKE VALVE (OS&Y)
	PRESSURE REGULATING VALVE
	SOLENOID VALVE
	CONTROL VALVE (2-WAY / 3-WAY)
	FAN
	AUTOMATIC GAS SHUT-OFF VALVE
CC	TRAP (PLAN VIEW)
	FLOOR DRAIN / FUNNEL FLOOR DRAIN (PLAN VIEW)
	FLOOR DRAIN / FUNNEL FLOOR DRAIN (ELEVATION)
	ROOF SUMP
CO	CLEAN OUT (IN FLOOR)
CO	CLEAN OUT (IN LINE)
WCO	CLEAN OUT (WALL)
BFP	BACKFLOW PREVENTER
M	WATER METER ASSEMBLY
	HOSE BIBB, WALL HYDRANT
	DIRECTION OF PIPE PITCH
	SPRINKLER HEAD (UPRIGHT)
	SPRINKLER HEAD (SIDEWALL)
FS	FLOW SWITCH
	SIAMESE CONNECTION (YARD)
	SIAMESE CONNECTION (WALL MOUNTED)
	FIRE HYDRANT
	FLOW MEASURING DEVICE
	BALANCING VALVE
	COMBINATION FLOW MEASURING AND BALANCING DEVICE
AAV	AUTOMATIC AIR VALVE
MAV	MANUAL AIR VALVE

MECHANICAL SYMBOLS

ABBREV.	DESCRIPTION
	RECTANGULAR TAKE-OFF (SINGLE LINE)
	RECTANGULAR TAKE-OFF (DOUBLE LINE)
	ROUND TAKE-OFF (SINGLE LINE)
	ROUND TAKE-OFF (DOUBLE LINE)
	SPIN-IN FITTING (WITH VOLUME DAMPER)
	ELBOW (WITH TURNING VANES)
	RADIUS RECTANGULAR ELBOW
	RADIUS ROUND ELBOW
	RECTANGULAR ELBOW UP
	ROUND ELBOW UP
	RECTANGULAR ELBOW DOWN
	ROUND ELBOW DOWN
	CONCENTRIC TRANSITION (DOUBLE LINE)
	CONCENTRIC TRANSITION (SINGLE LINE)
	ECCENTRIC TRANSITION (DOUBLE LINE)
	ECCENTRIC TRANSITION (SINGLE LINE)
R	INCLINED RISE IN DIRECTION OF AIR FLOW (DOUBLE LINE)
R	INCLINED RISE IN DIRECTION OF AIR FLOW (SINGLE LINE)
D	INCLINED DROP IN DIRECTION OF AIR FLOW (DOUBLE LINE)
D	INCLINED DROP IN DIRECTION OF AIR FLOW (SINGLE LINE)
	FLEXIBLE CONNECTION
	FLEXIBLE DUCT CONNECTION TO SUPPLY DIFFUSER
	SUPPLY DIFFUSER
	LINEAR SLOT DIFFUSER
	RETURN OR EXHAUST GRILLE
	TRANSFER GRILLE
	CROSS SECTION OF SUPPLY AIR DUCT
	CROSS SECTION OF EXHAUST OR RETURN AIR DUCT
EXISTING / NEW	FIRE DAMPER (HORIZONTAL)
EXISTING / NEW	FIRE DAMPER (VERTICAL)
EXISTING / NEW	SMOKE DAMPER
EXISTING / NEW	COMBINATION FIRE/SMOKE DAMPER (VERTICAL)
EXISTING / NEW	COMBINATION FIRE/SMOKE DAMPER (HORIZONTAL)
	VOLUME DAMPER (MANUALLY ADJUSTABLE)
M	MOTORIZED DAMPER
SD	SMOKE DETECTOR
CO2	CO2 SENSOR
T	THERMOSTAT OR TEMPERATURE SENSOR
H	HUMIDISTAT OR HUMIDITY SENSOR
	RETURN OR EXHAUST AIR FLOW / SUPPLY AIR FLOW

PIPING LEGEND

ABBREV.	DESCRIPTION
BCW	BOOSTED DOMESTIC COLD WATER PIPING
DI	DEIONIZED WATER PIPING
CW	DOMESTIC COLD WATER PIPING
NPCW	NON POTABLE COLD WATER PIPING
RO	REVERSE OSMOSIS WATER PIPING
SCW	SOFTENED COLD WATER
HW	DOMESTIC HOT WATER PIPING
HWR	DOMESTIC HOT WATER RECIRCULATION PIPING
NPHW	NON POTABLE HOT WATER PIPING
TW	TEMPERED WATER PIPING
F (DRY)	FIRE PROTECTION DRY PIPING
F	FIRE PROTECTION WET PIPING
F (PRE)	FIRE PROTECTION PRE-ACTION PIPING
CHWR	CHILLED WATER RETURN PIPING
CWR	CONDENSER WATER RETURN PIPING
GXHR	GEO HEAT EXCHANGE RETURN PIPING
HPLR	HEAT PUMP LOOP RETURN PIPING
HHWR	HEATING HOT WATER RETURN PIPING
HPC	HIGH PRESSURE CONDENSATE RETURN PIPING
LPC	LOW PRESSURE CONDENSATE RETURN PIPING
RHWR	RADIANT HEATING WATER RETURN PIPING
PCR	STEAM CONDENSATE PUMPED RETURN PIPING
CR	STEAM CONDENSATE RETURN PIPING
CHWS	CHILLED WATER SUPPLY PIPING
CA	COMPRESSED AIR PIPING
CWS	CONDENSER WATER SUPPLY PIPING
GXHS	GEO HEAT EXCHANGE SUPPLY PIPING
HPLS	HEAT PUMP LOOP SUPPLY PIPING
HHWS	HEATING HOT WATER SUPPLY PIPING
HPS	HIGH PRESSURE STEAM PIPING
LPS	LOW PRESSURE STEAM PIPING
G	NATURAL GAS PIPING
RHWS	RADIANT HEATING WATER SUPPLY PIPING
STM	STEAM PIPING
R	REFRIGERANT PIPING
RL	REFRIGERANT LIQUID PIPING
RS	REFRIGERANT SUCTION PIPING
AW	ACID WASTE PIPING
CD	CONDENSATE DRAIN PIPING
PCD	CONDENSATE DRAIN PUMPED PIPING
DT	DRAIN TILE
GW	GREASE WASTE PIPING
IW	INDUSTRIAL WASTE PIPING
RC	RAIN CONDUCTOR PIPING
ORC	RAIN CONDUCTOR OVERFLOW PIPING
SAN	SANITARY PIPING
PSAN	SANITARY PUMPED PIPING
ST	STORM PIPING
PST	STORM PUMPED PIPING
AV	ACID VENT PIPING
V	VENT PIPING
MV	MEDICAL VACUUM PIPING
VAC	VACUUM PIPING
WAGD	WASTE ANESTHESIA GAS DISPOSAL PIPING
CO2	CARBON DIOXIDE PIPING
H	HELIUM PIPING
IA	INSTRUMENT AIR PIPING
MA	MEDICAL AIR PIPING
N	NITROGEN PIPING
NO	NITROUS OXIDE PIPING
O2	OXYGEN PIPING
OTHER	OTHER PIPING

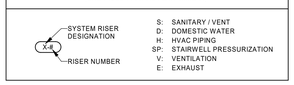
APPLICABLE CODES AND REGULATIONS

YEAR	CODE
2015	MICHIGAN BUILDING CODE
2021	MICHIGAN PLUMBING CODE
2021	MICHIGAN MECHANICAL CODE
2015	MICHIGAN UNIFORM ENERGY CODE
2015	INTERNATIONAL FIRE CODE
2021	INTERNATIONAL FUEL GAS CODE
2014	NFPA 96
2013	NFPA 13, NFPA 14, NFPA 20
2012	NFPA 101 WITH BFS AMENDMENTS
2009	ICC/ANSI ACCESSIBLE AND USABLE BUILDING & FACILITIES
-	AMERICANS WITH DISABILITIES ACT ACCESSIBILITIES GUIDELINE (ADA-AG)

DRAWING INDEX

DRAWING NOTATION

SYMBOL	DESCRIPTION
1	NEW WORK KEY NOTE NO. 1
1	DEMOLITION KEY NOTE NO. 1
EF-1	EQUIPMENT DESIGNATION, (IE: EXHAUST FAN NO. 1)
S-1 8ø 100-2	AIR TERMINAL TAG: IE: DIFFUSER TYPE = S-1 NECK SIZE = 8ø CFM = 100-(TYPICAL FOR 2) S = SUPPLY R = RETURN E = EXHAUST T = TRANSFER
	EXISTING DEVICES OR EQUIPMENT
	NEW OR MODIFIED DEVICES OR EQUIPMENT
	EXISTING SYSTEM COMPONENT TO BE REMOVED
	EXISTING PIPING UNDERGROUND
	NEW PIPING UNDERGROUND
	POINT OF NEW CONNECTION



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PATTENGILL MODULAR CLASSROOM BUILDING

LANSING SCHOOL DISTRICT

815 North Fairview Avenue, Lansing, MI

STATE OF MICHIGAN
STEVEN R. GUNTHER JR.
ENGINEER
No. 6201007419
LICENSED PROFESSIONAL ENGINEER
04/19/2024

Lansing School District

ISSUANCES	DATE
Construction Documents BP03	04.19.2024

JOB NO. 2616.05

SHEET TITLE
MECHANICAL GENERAL INFORMATION

SHEET NO.
M0.0

Strategic Energy Solutions®
4000 W. Eleven Mile Road Berkley, MI 48072
Phone 248.399.1900 Fax 248.399.1901
www.sesnet.com

SES Project # 23 0588 03

LAST PLOTTED: 04/19/2024 10:08:18 PM
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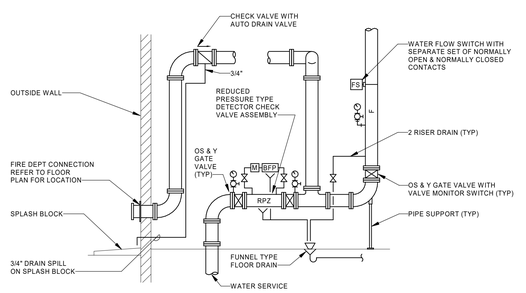
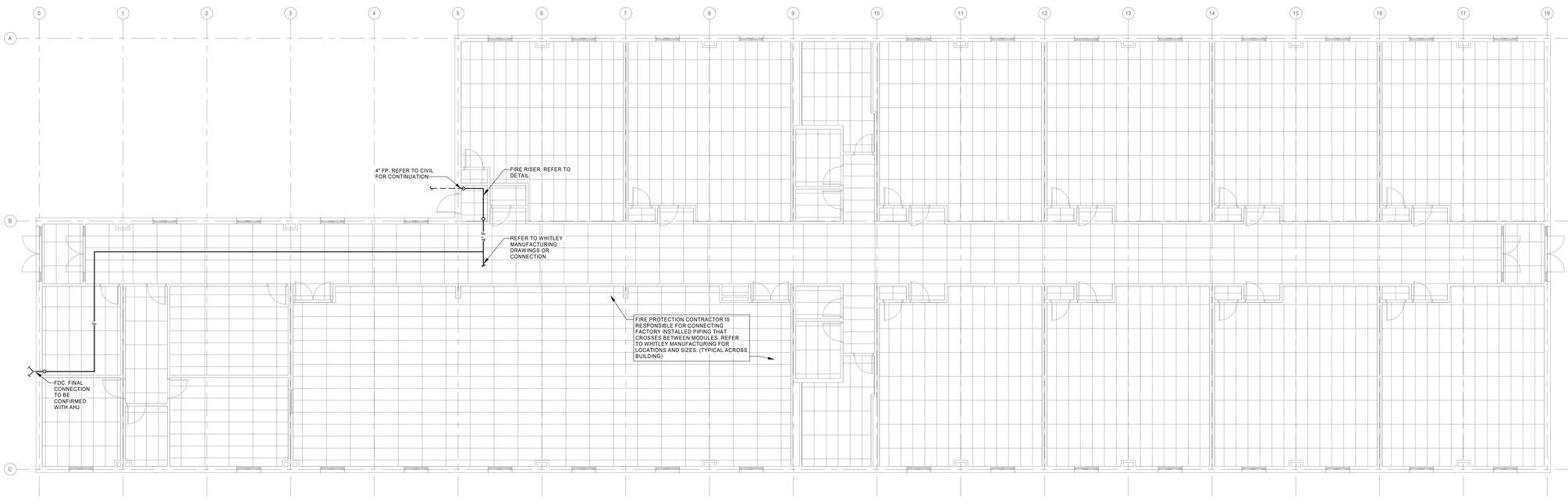
FIRE PROTECTION GENERAL NOTES

1. THESE DRAWINGS ARE DIAGRAMMATIC AND INDICATE THE GENERAL INTENT OF THE WORK. PROVIDE/REWORK FIRE PROTECTION SYSTEMS COMPLETE, PER APPLICABLE CODES, NFPA, OWNERS INSURER'S REQUIREMENTS AND REQUIREMENTS OF AUTHORITIES HAVING JURISDICTION INCLUDING ALL PIPING, OFFSETS, FITTINGS, DRAINS, VALVES, SPRINKLER HEADS, ETC. AS REQUIRED FOR A COMPLETE OPERABLE SYSTEM.
2. CONTRACTOR SHALL COORDINATE HIS WORK WITH THE WORK OF ALL OTHER TRADES. SPRINKLER PIPING SHALL NOT BE LOCATED BELOW MECHANICAL EQUIPMENT.
3. MINIMUM RUN-OUT PIPE SIZE TO SPRINKLER HEADS SHALL BE 1".
4. FIRE PROTECTION TRADES SHALL SUBMIT PLANS, FLOW AND PRESSURE TEST AND CALCULATIONS TO THE LOCAL FIRE MARSHAL AND TO THE BUILDING'S INSURING AGENCY FOR APPROVAL. CONTRACTOR SHALL THEN MAKE ALL NECESSARY CORRECTIONS AND RESUBMIT PLANS AND CALCULATIONS FOR RECORD TO THE ARCHITECT AS WELL AS THE FIRE MARSHAL.
5. CONTRACTOR SHALL PROVIDE ALL NECESSARY TESTS AND PAY FOR ALL FEES, PERMITS, INSPECTIONS, AND LICENSES, AS REQUIRED BY THE LOCAL AUTHORITY.



AUTOMATIC SPRINKLER RISER PIPING DIAGRAM
NO SCALE



FP1.0 - FIRST FLOOR FIRE PROTECTION PLAN
SCALE: 1/8" = 1'-0"

KINGSCOTT
KALAMAZOO | CHELSEA | GRAND RAPIDS | ROYAL OAK

PATTENGILL MODULAR CLASSROOM BUILDING

LANSING SCHOOL DISTRICT

815 North Fairview Avenue, Lansing, MI

STATE OF MICHIGAN
STEVEN K. GUNTHER, JR.
ENGINEER
No. 6201067419
REGISTERED PROFESSIONAL ENGINEER
04/19/2024

Lansing School District

ISSUANCES	DATE
Construction Documents BP03	04.19.2024

JOB NO. 2616.05

SHEET TITLE
FIRST FLOOR FIRE PROTECTION PLAN

SHEET NO.
FP1.1

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Strategic Energy Solutions®
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SES Project # 23 0588 03

PLUMBING FIXTURES/SPECIALTIES SCHEDULE

TAG	BARRIER FREE	ITEM	PIPE CONNECTION SIZES				MANUFACTURER & MODEL NO.	ACCESSORIES
			WASTE	VENT	CW	HW		
DN-1	-	DOWNSPOUT NOZZLE					MIFAB R1940	PROVIDE WITH HINGED STAINLESS STEEL PERFORATED COVER
FD-1	-	FLOOR DRAIN - MECHANICAL ROOM	4"				JR SMITH 2330Y	12" ROUND TOP WITH SEDIMENT BUCKET AND VANDAL PROOF CAST IRON ADA GRATE.

PLUMBING GENERAL NOTES

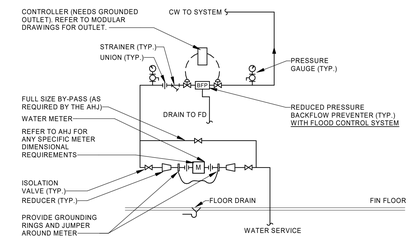
1. THESE DRAWINGS ARE DIAGRAMMATIC & INDICATE THE GENERAL EXTENT OF THE WORK. PROVIDE PLUMBING SYSTEMS COMPLETE AND PER APPLICABLE CODES INCLUDING REQUIRED COMPONENTS, OFFSETS REQUIRED TO AVOID THE STRUCTURE, ETC.
3. CONTRACTOR SHALL BE RESPONSIBLE FOR COMPLIANCE WITH THE STATE AND LOCAL COUNTY DEPARTMENT OF HEALTH CROSS CONTAMINATION CODE REQUIREMENTS.
4. VERIFY DEPTH, SIZE, LOCATION AND CONDITION OF ALL UTILITIES IN THE FIELD, INCLUDING POINTS OF CONNECTION, PRIOR TO STARTING ANY WORK. NOTIFY THE ARCHITECT/ENGINEER OF ANY INTERFERENCES OR DISCREPANCIES.
5. CONTRACTOR SHALL COORDINATE THE INSTALLATION OF PLUMBING AND PIPING WORK WITH THE WORK OF ALL OTHER TRADES, EXISTING SITE CONDITIONS, AND EQUIPMENT MANUFACTURER RECOMMENDATIONS. VERIFY ALL CLEARANCES PRIOR TO THE FABRICATION OF ANY NEW WORK.
6. PIPING SHALL BE ROUTED AS HIGH AS POSSIBLE AND SHALL MAINTAIN REQUIRED CLEARANCES OVER, AROUND AND IN FRONT OF ALL ELECTRICAL EQUIPMENT, PANELS, TRANSFORMERS, ETC. PIPING SHALL NOT INTERFERE WITH, OR BE INSTALLED IN A LOCATION THAT RESTRICTS ACCESS OR CLEARANCE TO ELECTRICAL OR MECHANICAL DEVICES. PROVIDE REQUIRED ACCESS AND CLEARANCE AROUND ALL EQUIPMENT PER MANUFACTURER'S RECOMMENDATIONS.
7. CONTRACTOR SHALL PROVIDE SUPPLEMENTARY STEEL AS REQUIRED FOR THE PROPER SUPPORT OF ALL PLUMBING SYSTEMS.
8. PROVIDE BRANCH LINE ISOLATION VALVES ON DOMESTIC PIPING TO EACH GROUP OF FIXTURES AND TOILET ROOMS.
9. PLUMBING VENT PIPING THRU THE ROOF SHALL BE LOCATED 10'-0" FROM ANY FRESH AIR INTAKE LOCATION AND A MINIMUM OF 18" CLEAR FROM THE INSIDE FACE OF PARAPET.
10. PROVIDE CODE REQUIRED CLEARANCE/ACCESS DOORS FOR VALVES/CLEANOUTS LOCATED IN WALLS OR ABOVE HARD CEILINGS. COORDINATE LOCATIONS WITH ARCHITECT. PROVIDE CLEANOUTS AT THE BASE OF ALL STACKS.
11. RUN ALL SANITARY AND STORM PIPING 2 1/2" OR LESS AT 1/4" PER FOOT AND 3" AND LARGER PIPING AT 1/8" PER FOOT MINIMUM UNLESS OTHERWISE NOTED. MINIMUM UNDERGROUND PIPE SIZE SHALL BE 3".
12. PROVIDE "INLINE" TRAP SEAL PROTECTION OR TRAP PRIMER ON ALL FLOOR DRAINS AND TRAPS SUBJECT TO EVAPORATION.
13. AT EACH CONNECTION OF GAS SUPPLY TO EQUIPMENT PROVIDE A UNION, SHUT-OFF VALVE, TEE WITH SEDIMENT TRAP & PRESSURE TEST PLUG, REGULATOR AND UNION. FOR MEDIUM PRESSURE REGULATORS, AN ADDITIONAL TEE WITH PRESSURE TEST PLUG SHALL BE INSTALLED NOT LESS THAN 10 PIPE DIAMETERS DOWNSTREAM. SEDIMENT TRAPS SHALL BE INSTALLED SUCH THAT THERE IS ROOM BELOW TO REMOVE THE CAP/PLUG AND CLEAN THE TRAP. WEATHERPROOF PAINT ALL EXTERIOR GAS PIPING.

PLUMBING KEYNOTES

P1 3" RC. REFER TO WHITLEY MANUFACTURING/MODULAR CONSTRUCTION DRAWINGS FOR CONNECTION.

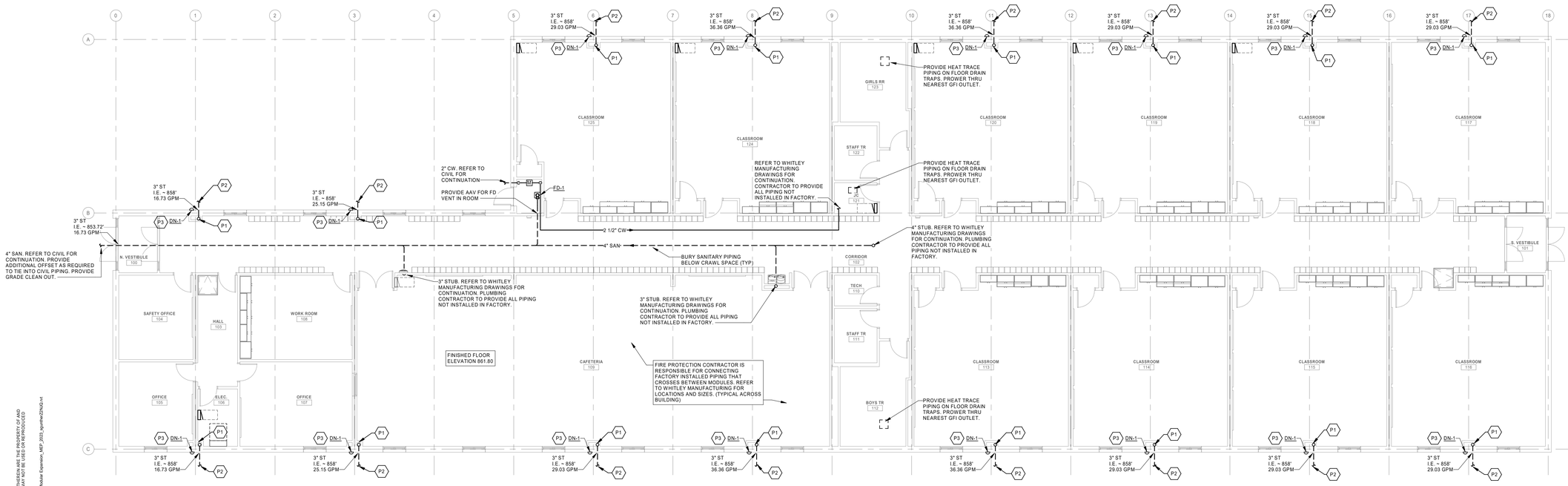
P2 3" STORM ROUTED 5' OUTSIDE BUILDING. REFER TO CIVIL FOR CONTINUATION. PROVIDE GRADE CLEAN OUT AT HEAT STORM LEAD LOCATION.

P3 MECHANICAL CONTRACTOR TO PROVIDE DOWNSPOUT. FIELD COORDINATE CONNECTION POINT AND CONNECT TO 3" VERTICAL ORC PIPING PROVIDED BY WHITLEY MANUFACTURING/MODULAR SUPPLIER.



NOTES:
1. WATER METER AND BACK FLOW PREVENTER SHALL BE SUPPORTED FROM THE FLOOR AND/OR WALL.

WATER METER WITH STACKED RPZ DETAIL
NO SCALE



FIRST FLOOR PLUMBING PLAN
SCALE: 1/8" = 1'-0"

PATTENGILL MODULAR CLASSROOM BUILDING

LANSING SCHOOL DISTRICT

815 North Fairview Avenue, Lansing, MI

KINGSCOTT
KALAMAZOO | CHELSEA | GRAND RAPIDS | ROYAL OAK

STATE OF MICHIGAN
STEVEN R. GUNTHER, JR.
ENGINEER
No. 6201067419
LICENSED PROFESSIONAL ENGINEER
04/19/2024

Lansing School District

ISSUANCES	DATE
Construction Documents BP03	04.19.2024

JOB NO. 2616.05

SHEET TITLE
FIRST FLOOR PLUMBING PLAN

SHEET NO.
P1.1

SES
Strategic Energy Solutions®
4000 W. Eleven Mile Road Berkley, MI 48072
Phone 248.399.1900 Fax 248.399.1901
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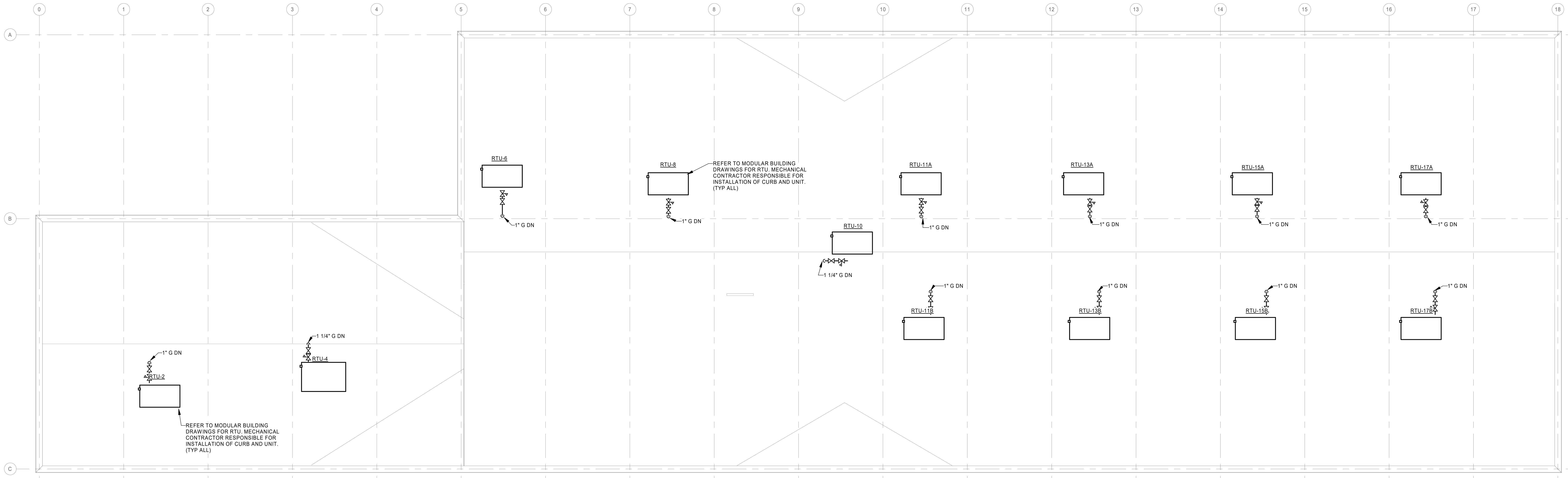
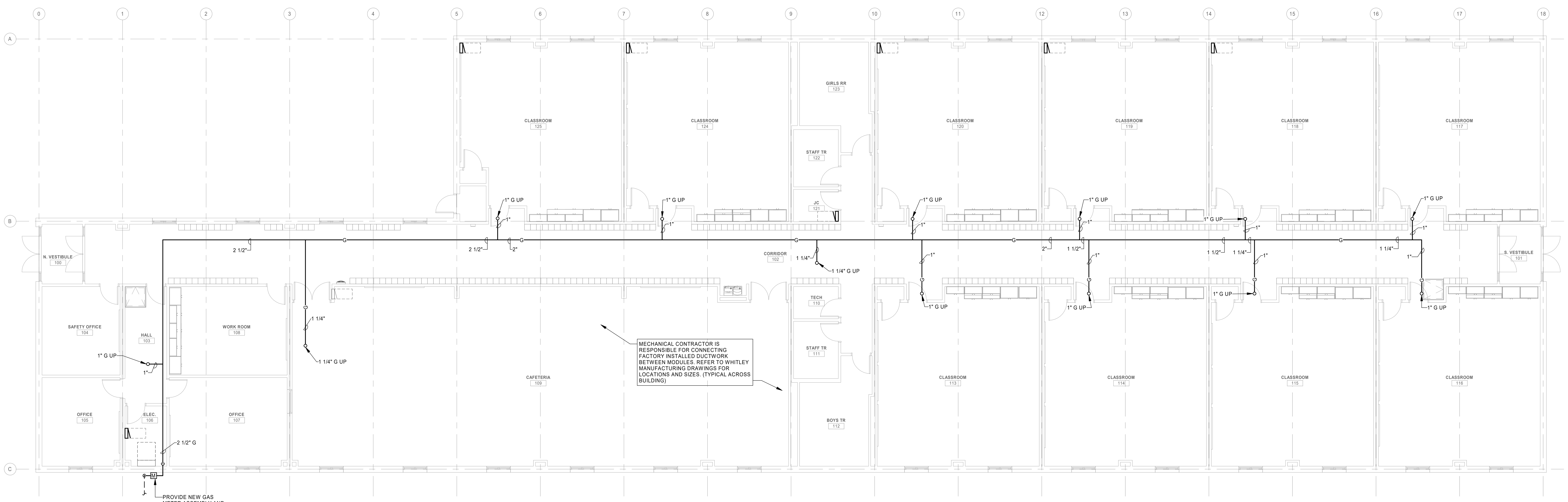
SES Project # 23 0588 03

HVAC GENERAL NOTES

1. THESE DRAWINGS ARE DIAGRAMMATIC AND INDICATE THE GENERAL EXTENT OF THE WORK. PROVIDE HVAC SYSTEMS COMPLETE PER SPECIFICATION, SMACNA STANDARDS, AND PER APPLICABLE CODES INCLUDING ALL NECESSARY OFFSETS, FITTINGS, SPECIAL RADIUS OR MITERED ELBOWS WHICH ARE REQUIRED DUE TO SPACE CONSTRAINTS OR STRUCTURAL CONDITIONS OR OTHER CONDITIONS.
2. CONTRACTOR SHALL COORDINATE THEIR WORK WITH THE WORK OF ALL OTHER TRADES. ALL DUCTWORK IS TO BE ROUTED AS HIGH AS POSSIBLE. PROVIDE ACCESS AROUND ALL NEW EQUIPMENT PER MANUFACTURER'S RECOMMENDATIONS. VERIFY ALL CLEARANCES PRIOR TO THE FABRICATION OF ANY WORK.
3. DUCTWORK/PIPING SHALL BE ROUTED AS HIGH AS POSSIBLE AND SHALL NOT BE LOCATED OVER ELECTRICAL EQUIPMENT/PANELS. PROVIDE REQUIRED CLEARANCE IN FRONT OF ELECTRICAL EQUIPMENT. DUCTWORK/PIPING SHALL NOT INTERFERE WITH ELECTRICAL EQUIPMENT CLEARANCE.
4. DUCTWORK/PIPING SHALL NOT BE INSTALLED IN A LOCATION THAT RESTRICTS THE ACCESS TO MECHANICAL DEVICES REQUIRING ACCESS.
5. THE CONTRACTOR SHALL PROVIDE ALL MISCELLANEOUS SUPPORTING STEEL, ETC. FOR THE PROPER INSTALLATION OF ALL MECHANICAL SYSTEMS.
6. COORDINATE FLOOR, WALL, ROOF PENETRATIONS, LOUVER SIZES, PAD LOCATIONS ETC. WITH ARCHITECTURAL TRADES. SEAL ALL PIPING AND DUCT PENETRATIONS.
7. FOR EQUIPMENT VALVING, COMPONENT, AND PIPING ARRANGEMENT, REFER TO PIPING DIAGRAMS AND DETAILS.
8. PROVIDE CODE REQUIRED CLEARANCE/ACCESS DOORS FOR DAMPERS, VALVES, AND CLEANOUTS LOCATED IN WALLS OR ABOVE HARD CEILINGS. COORDINATE LOCATIONS WITH ARCHITECT. REFER TO ARCHITECTURAL PLANS FOR CEILING TYPES.
9. CONNECTION TO EQUIPMENT SHALL BE VERIFIED WITH MANUFACTURER'S CERTIFIED DRAWINGS. TRANSITIONS TO ALL EQUIPMENT SHALL BE VERIFIED AND PROVIDED FOR EQUIPMENT FURNISHED.
10. ROOF MOUNTED EQUIPMENT REQUIRING SERVICE SHALL BE LOCATED A MINIMUM OF 10 FEET FROM ROOF EDGES. WHERE EQUIPMENT CAN'T BE LOCATED AWAY FROM ROOF EDGE AND GUARD RAILS ARE NOT PROVIDED, PROVIDE PERMANENT FALL ARREST ANCHORAGE CONNECTION DEVICE THAT COMPLIES WITH ANSI/ASSE Z 359.1.



ROOF MECHANICAL PLAN
SCALE: 1/8" = 1'-0"



FIRST FLOOR MECHANICAL PLAN
SCALE: 1/8" = 1'-0"

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PATTENGILL MODULAR CLASSROOM BUILDING

LANSING SCHOOL DISTRICT
815 North Fairview Avenue, Lansing, MI

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Lansing School District

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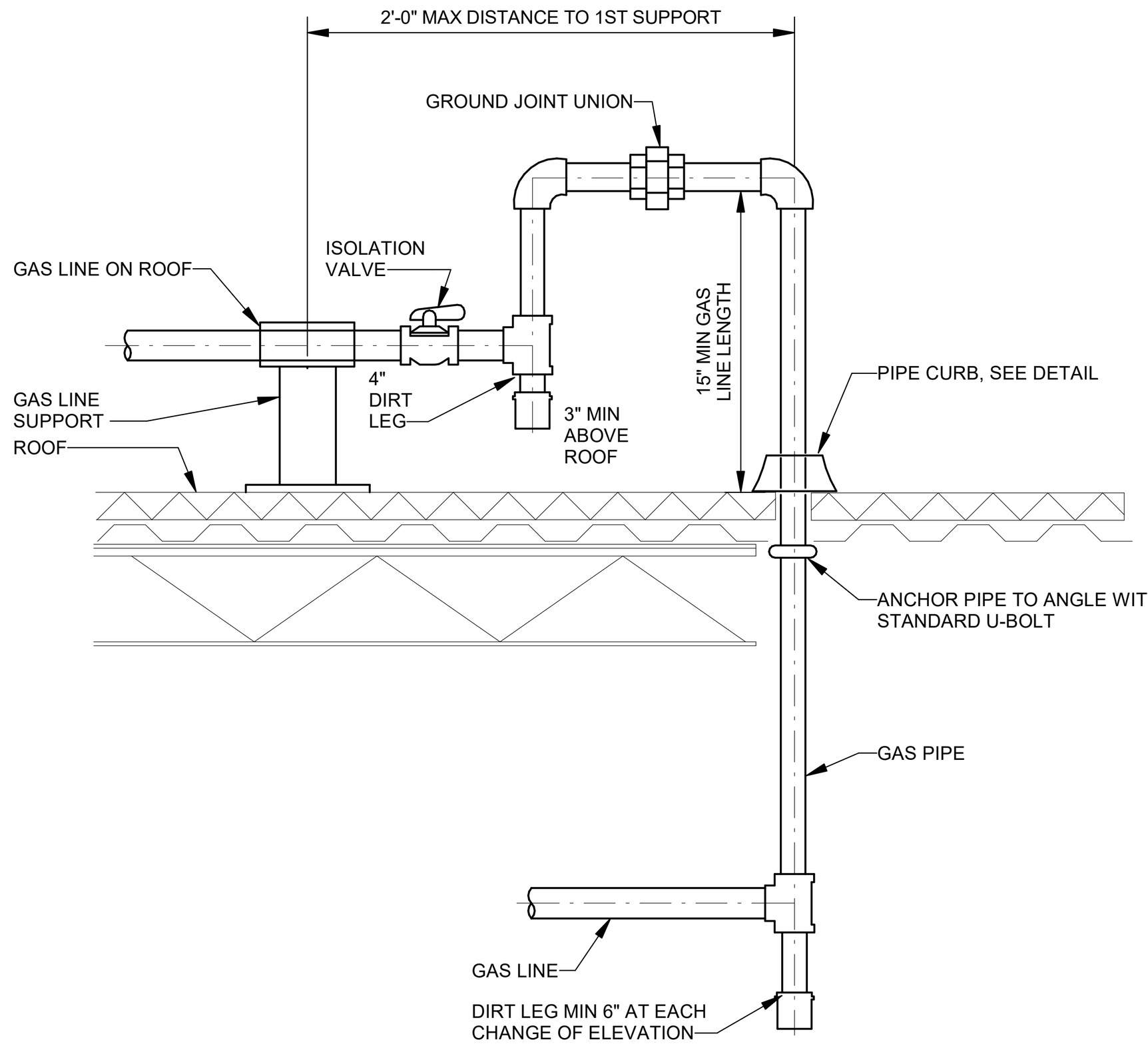
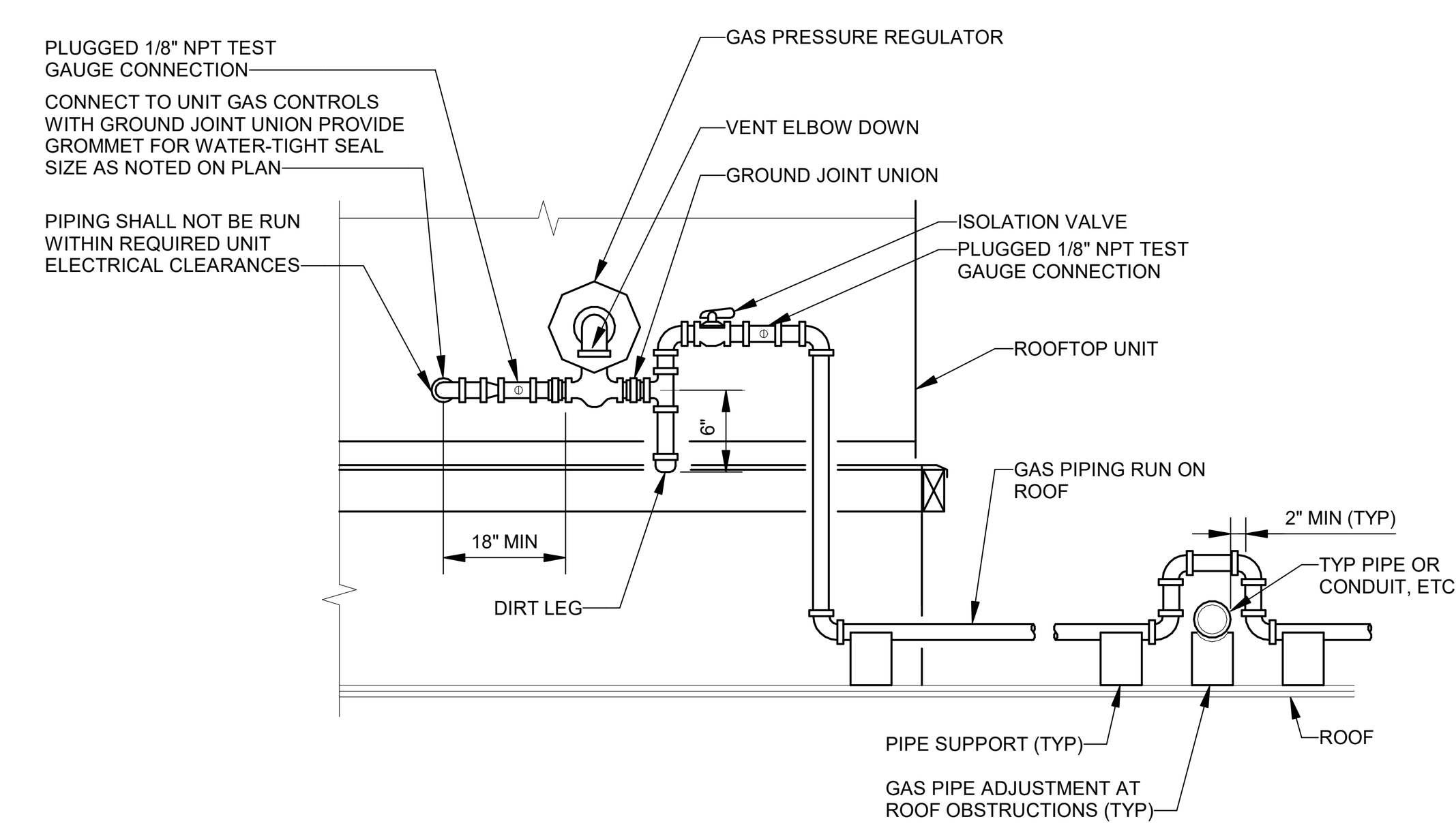
SHEET TITLE
FIRST FLOOR AND ROOF MECHANICAL PLANS

SHEET NO.
M1.1



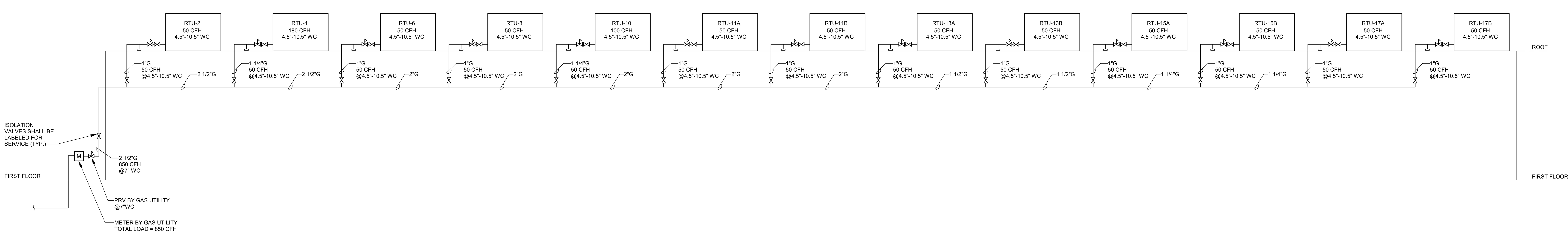
GAS PIPING THRU ROOF DETAIL
NO SCALE



GAS CONNECTION DETAIL - ROOFTOP UNIT
NO SCALE

GAS LOAD SUMMARY	
EQUIPMENT ID	CFH
RTU-2	50
RTU-4	180
RTU-6	50
RTU-8	50
RTU-10	100
RTU-11A	50
RTU-11B	50
RTU-13A	50
RTU-13B	50
RTU-15A	50
RTU-15B	50
RTU-17A	50
RTU-17B	50
TOTAL	830

NOTES:
1. CONTRACTOR TO COORDINATE GAS LOAD AND PRESSURE REQUIREMENTS WITH LOCAL UTILITY COMPANY.
2. CONTRACTOR SHALL VERIFY ALL EQUIPMENT CONNECTION REQUIREMENTS (SIZES, LOCATION, TYPES, ETC.) PRIOR TO COMMENCEMENT OF WORK.
3. 7" W.C. DELIVERY PRESSURE. DISTRIBUTION OF GAS PIPING IS SIZED FOR A MAXIMUM PRESSURE DROP, BASED ON A TOTAL DEVELOPED LENGTH OF 400 LINEAR FEET SCHEDULE 40 METALLIC PIPE TO FARTHEST EQUIPMENT.



NATURAL GAS RISER DIAGRAM
NO SCALE

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SHEET TITLE
MECHANICAL DETAILS

SHEET NO.
M5.0

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SES Project # 23 0588 03

COPPER FEEDER SCHEDULE

FEEDER (AMPS)	COND. SIZE	2 WIRE WITH GROUND	FEEDER (AMPS)	COND. SIZE	3 WIRE WITH GROUND	FEEDER (AMPS)	COND. SIZE	4 WIRE WITH GROUND
15S	12	2#12, 1#12 GND IN 3/4"C	15	12	3#12, 1#12 GND IN 3/4"C	15N	12	4#12, 1#12 GND IN 3/4"C
20S	12	2#12, 1#12 GND IN 3/4"C	20	12	3#12, 1#12 GND IN 3/4"C	20N	12	4#12, 1#12 GND IN 3/4"C
25S	10	2#10, 1#10 GND IN 3/4"C	25	10	3#10, 1#10 GND IN 3/4"C	25N	10	4#10, 1#10 GND IN 3/4"C
30S	10	2#10, 1#10 GND IN 3/4"C	30	10	3#10, 1#10 GND IN 3/4"C	30N	10	4#10, 1#10 GND IN 3/4"C
35S	8	2#8, 1#10 GND IN 3/4"C	35	8	3#8, 1#10 GND IN 3/4"C	35N	8	4#8, 1#10 GND IN 3/4"C
40S	8	2#8, 1#10 GND IN 3/4"C	40	8	3#8, 1#10 GND IN 3/4"C	40N	8	4#8, 1#10 GND IN 3/4"C
45S	6	2#6, 1#10 GND IN 3/4"C	45	6	3#6, 1#10 GND IN 3/4"C	45N	6	4#6, 1#10 GND IN 1"C
50S	6	2#6, 1#10 GND IN 3/4"C	50	6	3#6, 1#10 GND IN 3/4"C	50N	6	4#6, 1#10 GND IN 1"C
60S	4	2#4, 1#10 GND IN 1"C	60	4	3#4, 1#10 GND IN 1"C	60N	4	4#4, 1#10 GND IN 1 1/4"C
70S	4	2#4, 1#8 GND IN 1"C	70	4	3#4, 1#8 GND IN 1"C	70N	4	4#4, 1#8 GND IN 1 1/4"C
80S	3	2#3, 1#8 GND IN 1"C	80	3	3#3, 1#8 GND IN 1"C	80N	3	4#3, 1#8 GND IN 1 1/4"C
90S	2	2#2, 1#8 GND IN 1"C	90	2	3#2, 1#8 GND IN 1 1/4"C	90N	2	4#2, 1#8 GND IN 1 1/2"C
100S	1	2#1, 1#8 GND IN 1 1/4"C	100	1	3#1, 1#8 GND IN 1 1/4"C	100N	1	4#1, 1#8 GND IN 1 1/2"C
			110	2	3#2, 1#6 GND IN 1 1/4"C	110N	2	4#2, 1#6 GND IN 1 1/4"C
			125	1	3#1, 1#6 GND IN 1 1/4"C	125N	1	4#1, 1#6 GND IN 1 1/2"C
			150	1/0	3#1/0, 1#6 GND IN 1 1/2"C	150N	1/0	4#1/0, 1#6 GND IN 2"C
			175	2/0	3#2/0, 1#6 GND IN 1 1/2"C	175N	2/0	4#2/0, 1#6 GND IN 2"C
			200	3/0	3#3/0, 1#6 GND IN 2"C	200N	3/0	4#3/0, 1#6 GND IN 2"C
			225	4/0	3#4/0, 1#4 GND IN 2"C	225N	4/0	4#4/0, 1#4 GND IN 2 1/2"C
			250	250	3-250 KCMIL, 1#4 GND IN 2"C	250N	250	4-250 KCMIL, 1#4 GND IN 2 1/2"C
			300	350	3-350 KCMIL, 1#4 GND IN 2 1/2"C	300N	350	4-350 KCMIL, 1#4 GND IN 3"C
			350	500	3-500 KCMIL, 1#3 GND IN 3"C	350N	500	4-500 KCMIL, 1#3 GND IN 3 1/2"C
			400	600	3-600 KCMIL, 1#3 GND IN 3 1/2"C	400N	600	4-600 KCMIL, 1#3 GND IN 4"C
			450	2-4/0	(2) 3#4/0, 1#2 GND IN 2"C	450N	2-4/0	(2) 4#4/0, 1#2 GND IN 2 1/2"C
			500	2-250	(2) 3-250 KCMIL, 1#2 GND IN 2 1/2"C	500N	2-250	(2) 4-250 KCMIL, 1#2 GND IN 2 1/2"C
			600	2-350	(2) 3-350 KCMIL, 1#1 GND IN 2 1/2"C	600N	2-350	(2) 4-350 KCMIL, 1#1 GND IN 3"C
			700	2-500	(2) 3-500 KCMIL, 1#1/0 GND IN 3"C	700N	2-500	(2) 4-500 KCMIL, 1#1/0 GND IN 3 1/2"C
			800	2-600	(2) 3-600 KCMIL, 1#1/0 GND IN 3 1/2"C	800N	2-600	(2) 4-600 KCMIL, 1#1/0 GND IN 4"C
			1000	3-500	(3) 3-500 KCMIL, 1#2/0 GND IN 3"C	1000N	3-500	(3) 4-500 KCMIL, 1#2/0 GND IN 3 1/2"C
			1200	3-600	(3) 3-600 KCMIL, 1#3/0 GND IN 4"C	1200N	3-600	(3) 4-600 KCMIL, 1#3/0 GND IN 4"C
			1600	4-600	(4) 3-600 KCMIL, 1#4/0 GND IN 4"C	1600N	4-600	(4) 4-600 KCMIL, 1#4/0 GND IN 4"C
			2000	5-600	(5) 3-600 KCMIL, 1-250 KCMIL GND IN 4"C	2000N	5-600	(5) 4-600 KCMIL, 1-250 KCMIL GND IN 4"C
			2500	7-500	(7) 3-500 KCMIL, 1-350 KCMIL GND IN 3 1/2"C	2500N	7-500	(7) 4-500 KCMIL, 1-350 KCMIL GND IN 3 1/2"C
			3000	8-500	(8) 3-500 KCMIL, 1-400 KCMIL GND IN 3 1/2"C	3000N	8-500	(8) 4-500 KCMIL, 1-400 KCMIL GND IN 3 1/2"C
			4000	10-600	(10) 3-600 KCMIL, 1-500 KCMIL GND IN 4"C	4000N	10-600	(10) 4-600 KCMIL, 1-500 KCMIL GND IN 4"C
			5000	12-600	(12) 3-600 KCMIL, 1-700 KCMIL GND IN 4"C	5000N	12-600	(12) 4-600 KCMIL, 1-700 KCMIL GND IN 4"C
			6000	15-600	(15) 3-600 KCMIL, 1-500 KCMIL GND IN 4"C	6000N	15-600	(15) 4-600 KCMIL, 1-800 KCMIL GND IN 4"C

NOTES:

1. AMPACITIES FOR FEEDER SIZES ARE BASED ON N.E.C. CODE 110-14. (TERMINATION PROVISIONS FOR EQUIPMENT RATED 100A OR LESS ARE RATED FOR USE WITH CONDUCTORS RATED 60°C. TERMINATION PROVISIONS FOR EQUIPMENT RATED GREATER THAN 100A ARE RATED FOR USE WITH CONDUCTORS RATED 75°C.).
2. CONDUIT FILL IS BASED ON 40% FILL USING SINGLE CONDUCTOR BUILDING WIRE OF INSULATION TYPES THHN, THWN, THWN-2, XHH, XHHW, AND XHHW-2 IN RMC. FOR OTHER RACEWAY TYPES REFER TO APPROPRIATE N.E.C. APPENDIX C TABLES.
3. EQUIPMENT GROUND SIZING BASED ON N.E.C. TABLE 250.122.

POWER SYMBOL LIST

SYMBOL	DESCRIPTION
	CONDUIT DOWN
	CONDUIT UP
C	CORD REEL
	DISCONNECT SWITCH - NON-FUSED
	DISCONNECT SWITCH - FUSED
	DISCONNECT SWITCH - COMBINATION MOTOR STARTER
FB	FLOOR BOX
	ELECTRICAL PANEL
	GROUNDING ROD
	GROUND
	GROUNDING BAR
J	JUNCTION BOX
M	METER
	MOTOR - SINGLE PHASE
	MOTOR - THREE PHASE
$M	MOTOR RATED SWITCH
PT	POKE-THRU
	RECEPTACLE - DUPLEX TYPE
	RECEPTACLE - DUPLEX TYPE 6" ABOVE COUNTER
USB	RECEPTACLE - DUPLEX/USB COMBINATION TYPE
	RECEPTACLE - QUADRUPLEX TYPE
	RECEPTACLE - SIMPLEX TYPE
	RECEPTACLE - SPECIALTY TYPE
T	TRANSFORMER
VFD	VARIABLE FREQUENCY DRIVE

NOTES:
1. ALL DEVICE RATINGS/SIZES SHALL BE COORDINATED WITH PLANS AND SCHEDULES.

TECHNOLOGY SYMBOL LIST

SYMBOL	DESCRIPTION
	BELL OUTLET
	CAMERA
CR	CARD READER
I	INTERCOM
	LOW VOLTAGE PANEL
	PUSH BUTTON
S S	SPEAKER - WALL MOUNTED, CEILING MOUNTED
	TECHNOLOGY OUTLET - 6" ABOVE COUNTER
	TECHNOLOGY OUTLET - FLOOR
	TECHNOLOGY OUTLET - WALL
TV	TELEVISION OUTLET
	WALL CLOCK - SINGLE FACE
	WALL CLOCK - DOUBLE FACE
S	WALL CLOCK AND SPEAKER UNIT
WAP	WIRELESS ACCESS POINT

NOTES:
1. ELECTRICAL CONTRACTOR SHALL BE RESPONSIBLE FOR BOX AND CONDUIT FOR ALL DEVICES INDICATED.
2. LOW VOLTAGE CONTRACTOR SHALL PROVIDE EXACT SPECIFICATIONS AND LOCATIONS OF ALL DEVICES.

FIRE ALARM SYMBOL LIST

SYMBOL	DESCRIPTION
F	AUDIBLE DEVICE - CEILING MOUNTED
F	AUDIBLE DEVICE - WALL MOUNTED
C	CARBON DIOXIDE ALARM
CO	CARBON MONOXIDE ALARM
F	COMBINATION AUDIBLE/VISUAL DEVICE - CEILING MOUNTED
F	COMBINATION AUDIBLE/VISUAL DEVICE - WALL MOUNTED
CS	COMBINATION CARBON MONOXIDE ALARM/SMOKE DETECTOR
	EXISTING / NEW — COMBINATION FIRE/SMOKE DAMPER (VERTICAL)
	EXISTING / NEW — COMBINATION FIRE/SMOKE DAMPER (HORIZONTAL)
S	DUCT MOUNTED SMOKE DETECTOR
FAA	FIRE ALARM ANNUNCIATOR PANEL
FACP	FIRE ALARM CONTROL PANEL
FD	FIRE DEPARTMENT COMMUNICATION OUTLET
FS	FLOW SWITCH
H	HEAT DETECTOR
I/O	INPUT/OUTPUT CONTROL MODULE
DH	MAGNETIC DOOR HOLDER
F	MANUAL PULL STATION
S S	SMOKE DETECTOR - WALL MOUNTED, CEILING MOUNTED
S	SMOKE DETECTOR WITH AUDIO
TS	TAMPER SWITCH
F	VISUAL DEVICE - CEILING MOUNTED
F	VISUAL DEVICE - WALL MOUNTED

NOTES:
1. DRAWINGS INDICATE DESIGN INTENT ONLY, FINAL LOCATIONS AND DEVICE SPECIFICATIONS SHALL BE PROVIDED BY FIRE ALARM MANUFACTURER. REFER TO PROJECT SPECIFICATIONS FOR APPROVED MANUFACTURERS.
2. FIRE DETECTION AND SIGNALING DEVICES ARE SHOWN FOR COORDINATION PURPOSES. FINAL SYSTEM DESIGN TO BE PERFORMED BY CONTRACTOR AND SUPPLIER FOR OFFICIAL SUBMISSION. COORDINATE ALL DEVICE QUANTITIES AND LOCATIONS WITH SUPPLIER PRIOR TO INSTALLATION. ELECTRICAL CONTRACTOR SHALL PROVIDE ALL NECESSARY PATHWAYS, POWER SUPPLIES AND DEVICES PER SUPPLIER CONTRACT DOCUMENTS.

ELECTRICAL ABBREVIATIONS

ABBREV.	DESCRIPTION
AFF	ABOVE FINISHED FLOOR
AWG	AMERICAN WIRE GAUGE
A	AMPERE
AF	AMPERE FUSE/AMPERE FRAME
AT	AMPERE TRIP
ATS	AUTOMATIC TRANSFER SWITCH
AIC	AVAILABLE INTERRUPTING CURRENT (AMPS)
CB	CIRCUIT BREAKER
C	CONDUIT OR CEILING MOUNTED
CU	COPPER
CT	CURRENT TRANSFORMER
DIA	DIAMETER
DISC	DISCONNECT
EWC	ELECTRIC WATER COOLER
EC	ELECTRICAL CONTRACTOR
EMT	ELECTRICAL METALLIC TUBING
EPO	EMERGENCY POWER OFF
(E)	EXISTING ELECTRICAL EQUIPMENT/WORK TO REMAIN
FA	FIRE ALARM
FACP	FIRE ALARM CONTROL PANEL
FLA	FULL LOAD AMPS
F	FUSE
G/GND	GROUND
GFCI/GFI	GROUND FAULT CIRCUIT INTERRUPTER
HOA	HAND-OFF-AUTO
HP	HORSEPOWER
IG	ISOLATED GROUND
INV	INVERTER
KV	KILOVOLT
KVA	KILOVOLT AMPERE
KW	KILOWATT
KWH	KILOWATT HOUR
LP	LIGHTING PANEL
MCB	MAIN CIRCUIT BREAKER
MDP	MAIN DISTRIBUTION PANEL
MLO	MAIN LUG ONLY
MAX	MAXIMUM
MIN	MINIMUM
NEC	NATIONAL ELECTRICAL CODE
NEMA	NATIONAL ELECTRICAL MANUFACTURERS ASSOC.
N/NEU	NEUTRAL
NF	NON-FUSIBLE
NC	NORMALLY CLOSED
NO	NORMALLY OPEN
NIC	NOT IN CONTRACT
PH/Ø	PHASE
P	POLE
PVC	POLYVINYL CHLORIDE (PLASTIC)
PF	POWER FACTOR
(R)	RELOCATED EXISTING ELECTRICAL EQUIPMENT
RP	RECEPTACLE PANEL
(RR)	REMOVE AND REINSTALL
RMC	RIGID METALLIC CONDUIT
TBB	TELEPHONE BACKBOARD
XFMR	TRANSFORMER
TYP	TYPICAL
UC	UNDERCOUNTER
UL	UNDERWRITERS LABORATORIES
UPS	UNINTERRUPTIBLE POWER SUPPLY
USB	UNIVERSAL SERIAL BUS
UON	UNLESS OTHERWISE NOTED
V	VOLT
VA	VOLT AMPERE
W	WATT
WP	WEATHERPROOF
WG	WIRE GUARD

DRAWING NOTATION

SYMBOL	DESCRIPTION
1	CONSTRUCTION KEYNOTE NUMBER 1
1	DEMOLITION KEYNOTE NUMBER 1
20	COPPER FEEDER SIZE TAG (REFER TO FEEDER SCHEDULE)
20	ALUMINUM FEEDER SIZE TAG (REFER TO FEEDER SCHEDULE)
EQUIPMENT	EQUIPMENT TAG
	EXISTING DEVICES OR EQUIPMENT
	NEW OR MODIFIED DEVICES OR EQUIPMENT
	NEW OR MODIFIED UNDERGROUND WIRING
	EXISTING SYSTEM COMPONENT TO BE REMOVED
	POINT OF NEW CONNECTION.

LIGHTING FIXTURE TAG

LIGHTING FIXTURE TYPE — L1 INV1 13'-0"
NORMAL CIRCUIT, EMERGENCY LIGHTING INVERTER, OR GENERATOR CIRCUIT (MAY NOT APPEAR ON EVERY TAG)
FIXTURE MOUNTING HEIGHT (MAY NOT APPEAR ON EVERY TAG)

LIGHTING CONTROL TAG

LIGHTING CONTROL SPACE TYPE '1' — 1A Z1
SCENE SCHEDULE ID 'A' (MAY NOT APPEAR ON EVERY TAG)
DAYLIGHTING CONTROL ZONE '1' (MAY NOT APPEAR ON EVERY TAG)

NOTE: THE TAG DOES NOT REFLECT THE QUANTITY OF CONTROL DEVICES REQUIRED IN AREA.

4 / E300
SECTION NUMBER 4
SHEET E300 ON WHICH SECTION VIEW IS PLACED

4 / E100
SECTION NUMBER 4
SECTION
SCALE: 1/4" = 1' - 0"
SHEET E100 ON WHICH SECTION IS CUT (ENLARGED PARTIAL PLAN SIMILAR)

APPLICABLE CODES AND REGULATIONS

YEAR	CODE
2015	MICHIGAN BUILDING CODE
2015	MICHIGAN ENERGY CODE
2015	MICHIGAN RESIDENTIAL CODE
2015	MICHIGAN REHABILITATION CODE
2023	MICHIGAN ELECTRICAL CODE RULES, PART 8
2023	NATIONAL ELECTRICAL CODE (NFPA 70)
2013	NFPA 20
2013	NFPA 72
2013	NFPA 101
2013	NFPA 110
2009	ICC A117.1 ACCESSIBLE AND USABLE BUILDINGS & FACILITIES
2019	DETROIT ELEVATOR CODE

LIGHTING CONTROLS LEGEND

SYMBOL	DESCRIPTION
$L	LIGHT CONTROL LOCATION
$	SWITCH - SINGLE POLE
$3	SWITCH - THREE WAY
$4	SWITCH - FOUR WAY

DRAWING INDEX

DRAWING PACKAGE NOTE:
THIS SET PROVIDES THE SCOPE OF WORK FOR THE SITE ELECTRICAL CONTRACTOR. REFER TO MODULAR DRAWING SET PROVIDED FOR REFERENCE FOR ALL OTHER BUILDING ELECTRICAL WORK COMPLETED BY MODULAR BUILDER IN FACTORY AND BY THEIR SITE SETTING TEAM; INCLUDING BUILDING CIRCUITING, BUILDING PANEL SCHEDULES, LIGHTING AND LIGHTING CONTROLS, POWER DEVICES, AND INFRASTRUCTURE FOR LOW VOLTAGE AND FIRE ALARM SYSTEMS.

KINGSCOTT
KALAMAZOO | CHELSEA | GRAND RAPIDS | ROYAL OAK

PATTENGILL MODULAR CLASSROOM BUILDING

LANSING SCHOOL DISTRICT
815 North Fairview Avenue, Lansing, MI

STATE OF MICHIGAN — SCOTT E. TOWNSEND ENGINEER No. 6201050400 — LICENSED PROFESSIONAL ENGINEER
04/19/2024

Lansing School District

ISSUANCES	DATE
Construction Documents BP03	04.19.2024

SES
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SES Project # 23 0588 03

JOB NO. 2616.05
SHEET TITLE
ELECTRICAL GENERAL INFORMATION
SHEET NO.
E0.0

LAST PRINTED: 4/19/2024 3:05:28 PM
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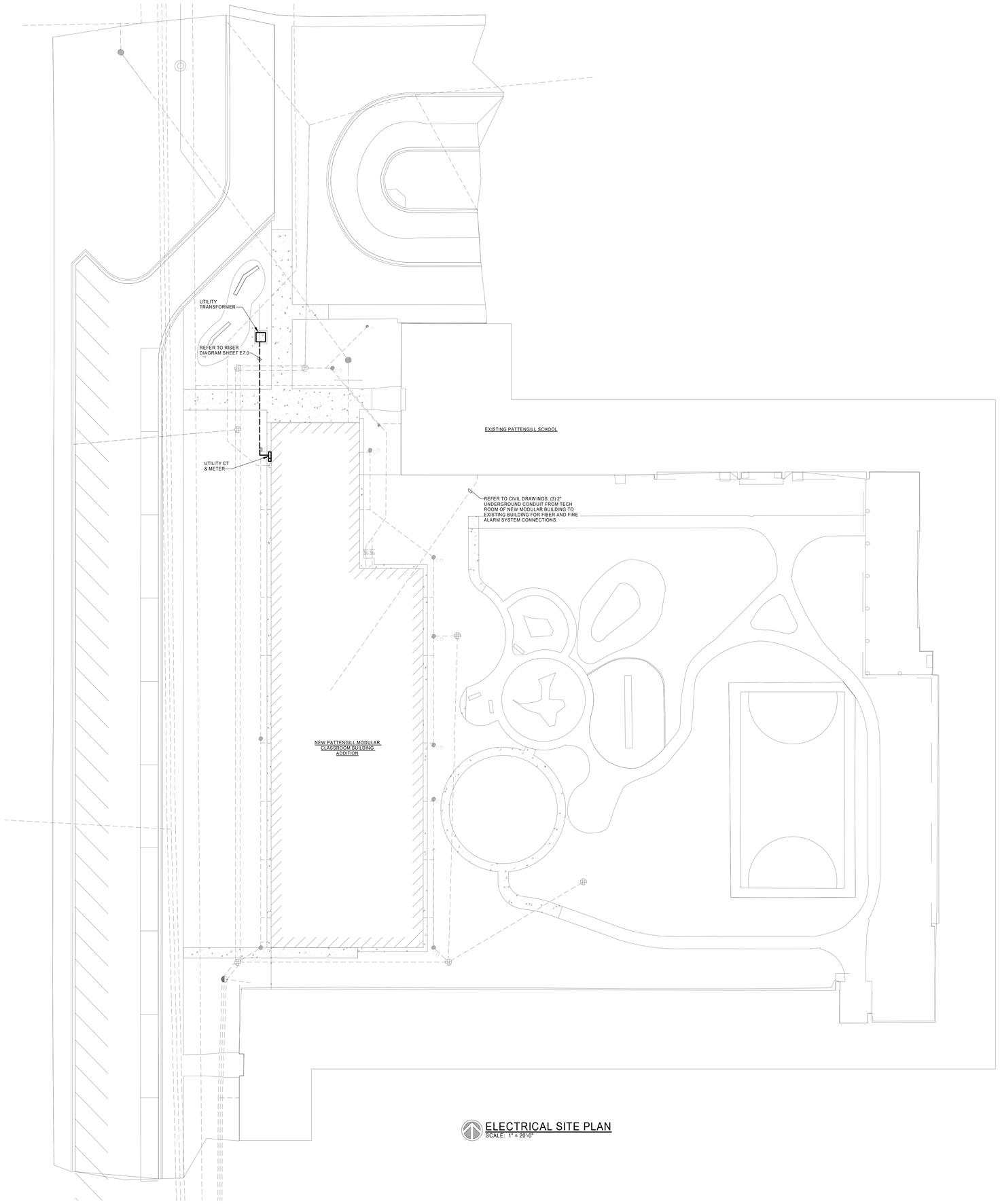
SITE PLAN GENERAL NOTES

1. FIELD VERIFY LOCATIONS OF EXISTING UNDERGROUND SERVICES TO COORDINATE ALL POLE BASE LOCATIONS AND UNDERGROUND SERVICES BEING INSTALLED UNDER THIS CONTRACT WITH CIVIL DRAWINGS PRIOR TO INSTALLATION OF POLE BASES AND CONDUIT.



ELECTRICAL SITE PLAN
SCALE: 1" = 20'-0"

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PATTENGILL MODULAR CLASSROOM BUILDING

LANSING SCHOOL DISTRICT

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04/19/2024

Lansing School District

ISSUANCES	DATE
Construction Documents BP03	04.19.2024

JOB NO. 2616.05

SHEET TITLE
ELECTRICAL SITE PLAN

SHEET NO.
ES1.0

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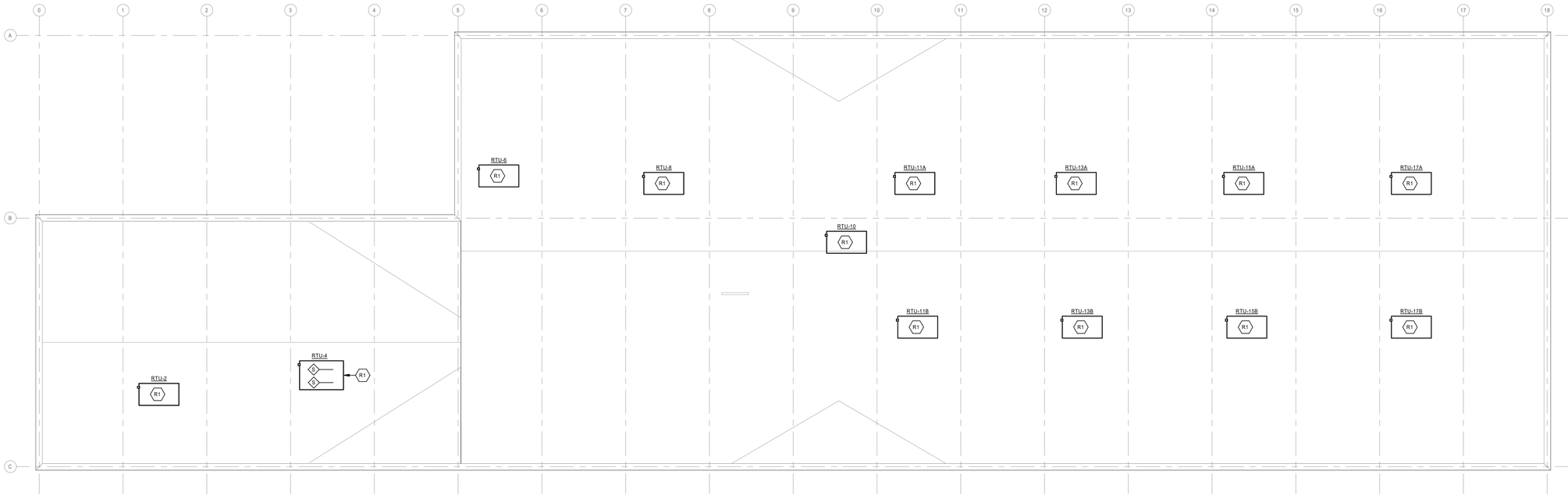
POWER KEYNOTES

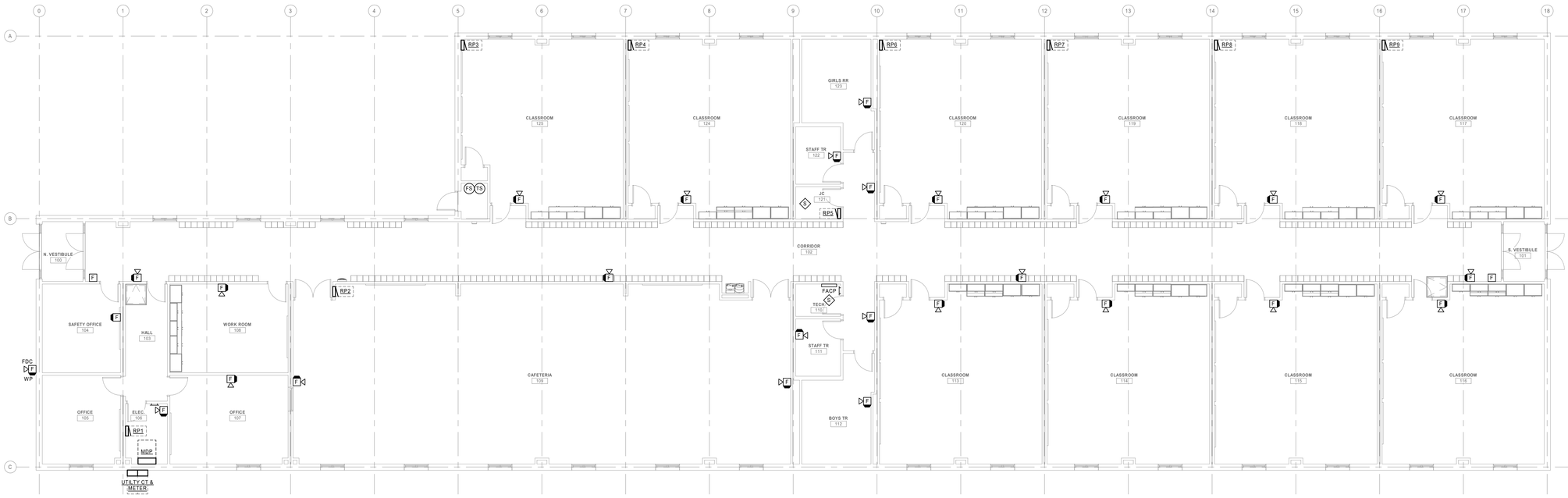
R1 FINAL ELECTRICAL CONNECTIONS FOR ROOF TOP UNIT AND SERVICE RECEPTACLE TO SERVE UNIT TO BE MADE BY SITE ELECTRICAL CONTRACTOR. MODULAR BUILDER TO PROVIDE RECEPTACLE AND UNIT DISCONNECT AS WELL AS BREAKER WITH WIRE COILED TO INSTALLATION LOCATION FOR FINAL CONNECTIONS.

POWER GENERAL NOTES

1. ALL RECEPTACLES ON EXTERIOR, IN KITCHEN, IN CONCESSION, IN LABORATORY, AND WITHIN 6'-0" OF SINK OR OTHER WATER SUPPLY SHALL BE READILY ACCESSIBLE GFCI TYPE RECEPTACLE.
2. REFER TO ARCHITECTURAL FLOOR PLANS AND ELEVATIONS TO VERIFY LOCATION OF DEVICES.
3. ALL CONDUITS SERVING 120 VOLTS OR GREATER SHALL INCLUDE A GROUND WIRE.
4. ALL CONDUITS SHALL BE ROUTED CONCEALED UNLESS NOTED OTHERWISE.
5. ALL 120 VOLT CIRCUITS SHALL UTILIZE A SEPARATE NEUTRAL.
6. ELECTRICAL CONTRACTOR TO PROVIDE ALL BACKBOXES AND CONDUIT FOR CEILING MOUNTED FIRE ALARM DEVICES. ALL OTHER BACKBOX INFRASTRUCTURE FOR FIRE ALARM DEVICES IN WALLS WILL BE PROVIDED BY MODULAR BUILDER.
7. REFER TO SHEET E7.0 FOR SCOPE BY MODULAR BUILDER.



ROOF POWER PLAN
SCALE: 1/8" = 1'-0"



FIRST FLOOR POWER PLAN
SCALE: 1/8" = 1'-0"

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PATTENGILL MODULAR CLASSROOM BUILDING

LANSING SCHOOL DISTRICT

815 North Fairview Avenue, Lansing, MI

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ENGINEER
No. 6201050498
PROFESSIONAL ENGINEER
04/19/2024

Lansing School District

ISSUANCES	DATE
Construction Documents BP03	04.19.2024

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SHEET TITLE
FIRST FLOOR AND ROOF POWER PLANS

SHEET NO.
EP1.1

Strategic Energy Solutions®
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PANEL NAME: MDP

PANEL LOCATION:	ELEC. 106	MAIN:	800 A	VOLTAGE:	120/208 Wye
ENCLOSURE:	TYPE 1	BUSSING:	800 A	PHASE:	3
MOUNTING:	WALL	GROUND BUS:	STANDARD	WIRE:	4
		NEUTRAL:	100.00%	MIN A.I.C. RATING:	42K

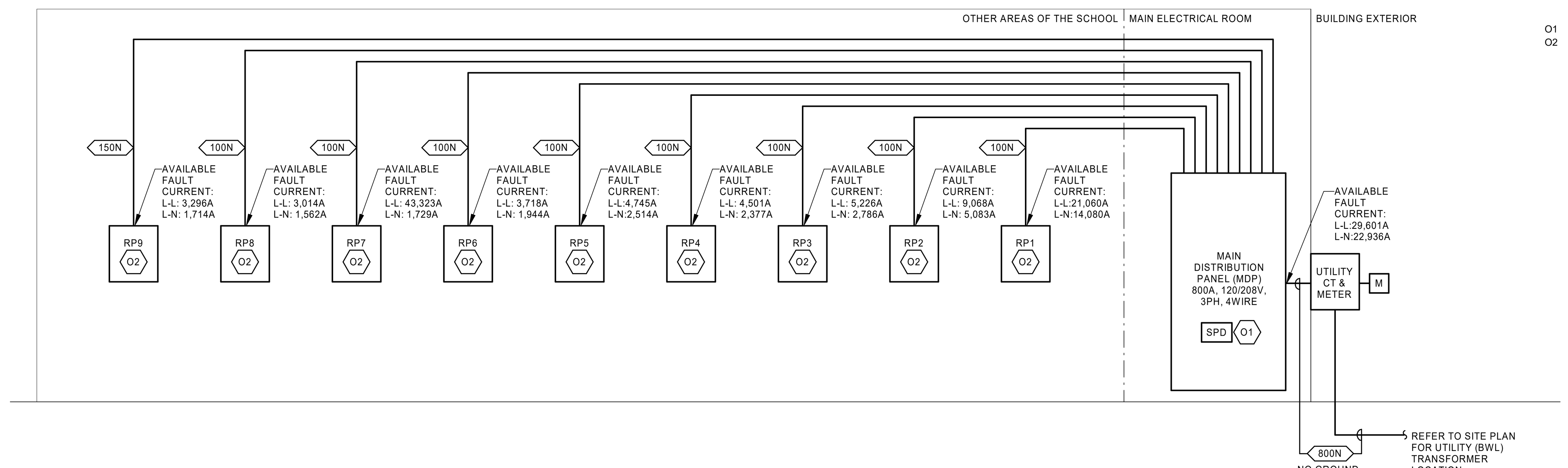
CKT	DESCRIPTION	BKR SIZE	P	A	A	B	B	C	C	P	BKR SIZE	DESCRIPTION	CKT
1				5656	7193								2
3	RP1	100 A	3			5656	7193			3	100 A	RP2	4
5								5656	7193				6
7				4563	5608								8
9	RP3	100 A	3			4563	5608			3	100 A	RP4	10
11								4563	5608				12
13				6401	8358								14
15	RP5	100 A	3			6401	8358			3	100 A	RP6	16
17								6401	8358				18
19				8754	8298								20
21	RP7	100 A	3			8754	8298			3	100 A	RP8	22
23								8754	8298				24
25				8298									26
27	RP9	100 A	3			8298							28
29								8298					30
31													32
33													34
35													36
37													38
39													40
41													42
			TOTAL LOAD:	63131 VA		63131 VA		63131 VA					
			TOTAL AMP:	526 A		526 A		526 A					

LOAD CLASSIFICATION	CONNECTED LOAD	DEMAND FACTOR	ESTIMATED LOAD	PANEL TOTALS	
POWER	189392 VA	100.00%	189392 VA		
				CONNECTED LOAD:	189 kVA
				DEMAND LOAD:	189 kVA
				TOTAL CONNECTED:	526 A
				TOTAL DEMAND:	526 A

NOTES:
PROVIDE WITH SERVICE ENTRANCE RATED MAIN BREAKER AND INTEGRAL SURGE PROTECTION.

ELECTRICAL ONE-LINE KEYNOTES

O1 PROVIDE INTEGRAL SPD.
O2 ELECTRICAL PANEL BOARD PROVIDED AND INSTALLED BY THE MODULAR BUILDER.

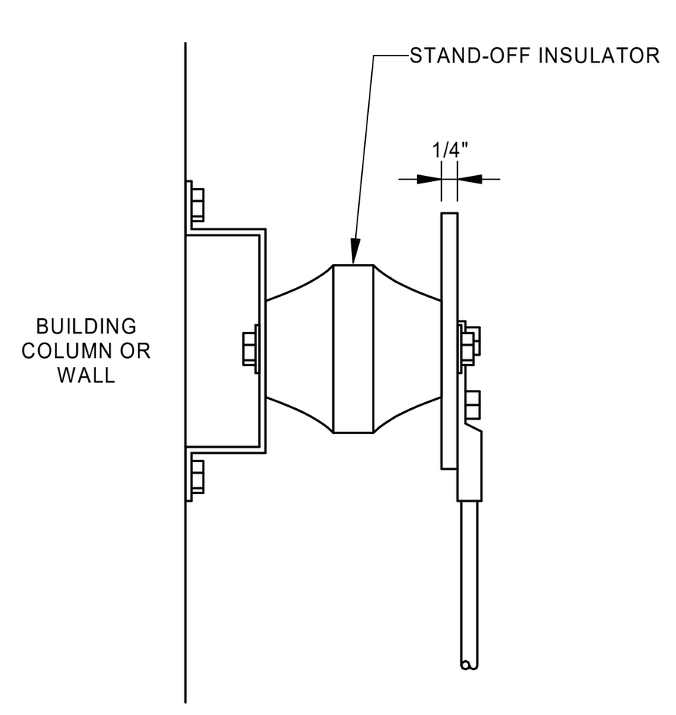


ELECTRICAL RISER DIAGRAM
NO SCALE

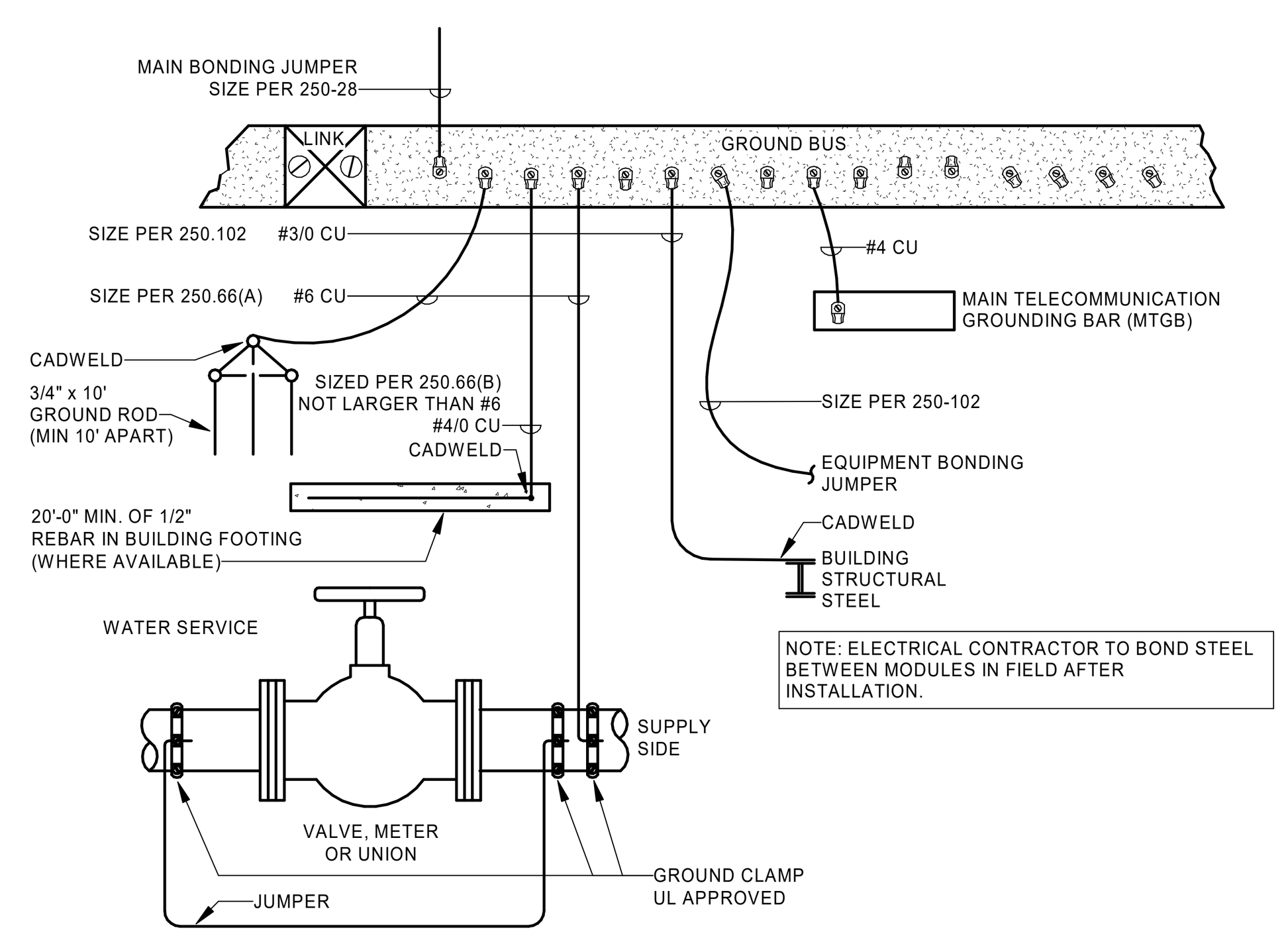
FIRE ALARM RISER DIAGRAM NOTES

1. FOR FIRE ALARM EQUIPMENT SPECIFICATION AND ADDITIONAL REQUIREMENTS, SEE SPECIFICATIONS.
2. ALL DUCT DETECTORS SHALL BE WIRED TO ACTIVATE ALARM SYSTEM AND SHUT DOWN FAN. PROVIDE INDICATOR LIGHT WHERE SMOKE DETECTORS ARE INSTALLED IN CONCEALED LOCATIONS OR ARE MORE THAN 10FT. ABOVE THE FINISHED FLOOR.
3. CANDELA RATING ARE SHOWN IN ALL ROOMS, ALL AUDIO AND VISUAL RATINGS SHALL MEET OR EXCEED NFPA REQUIREMENTS. MINOR DEVIATIONS SUCH AS STROBE RATING, MISSING OF AUDIO/VISUAL UNITS, SMOKE DETECTORS UNITS, ETC. (MAX OF 10) SHALL BE INCLUDED.
4. PROVIDE REMOTE POWER SUPPLIES AS REQUIRED FOR NOTIFICATION APPLIANCE CIRCUITS, NOT TO EXCEED 80% OF CAPACITY.
5. PROVIDE SMOKE DETECTOR ABOVE EACH REMOTE POWER SUPPLY PANEL.
6. PROVIDE BATTERY, CURRENT LOAD AND VOLTAGE DROP CALCULATIONS PER SPECIFICATIONS.
7. SEAL AROUND ALL PIPES & CONDUITS IN MASONRY AND DRYWALL WALLS.
8. ALL FIRE ALARM WIRING SHALL BE MINIMUM #4 AWG AND IN CONDUIT MIN 3/4 " IN EXPOSED CEILING AREAS, CABLE IS ACCEPTABLE ABOVE LAY-IN CEILING IN J-HOOKS.
9. FIRE ALARM CONTRACTOR SHALL BE RESPONSIBLE FOR ALL CHARGES INVOLVED IN OBTAINING APPROVAL AND CERTIFICATION FROM STATE ELECTRICAL INSPECTOR FOR A COMPLETE SYSTEM. CERTIFIED CONTRACTOR TO PAY ALL FEES REQUIRED.
10. THE ELEVATION DIAGRAM IS FOR REFERENCE PURPOSES. EXACT QUANTITIES OF DEVICES AND LOCATIONS SHALL COMPLY WITH NFPA GUIDELINES AND MEET APPROVAL OF THE STATE ELECTRICAL INSPECTOR. FIRE ALARM CONTRACTOR SHALL HAVE SHOP DRAWINGS APPROVED BY THE STATE ELECTRICAL INSPECTOR PRIOR TO COMMENCEMENT OF WORK.
11. FOR FIRE ALARM SYMBOL LEGEND SEE DRAWING E0.0.

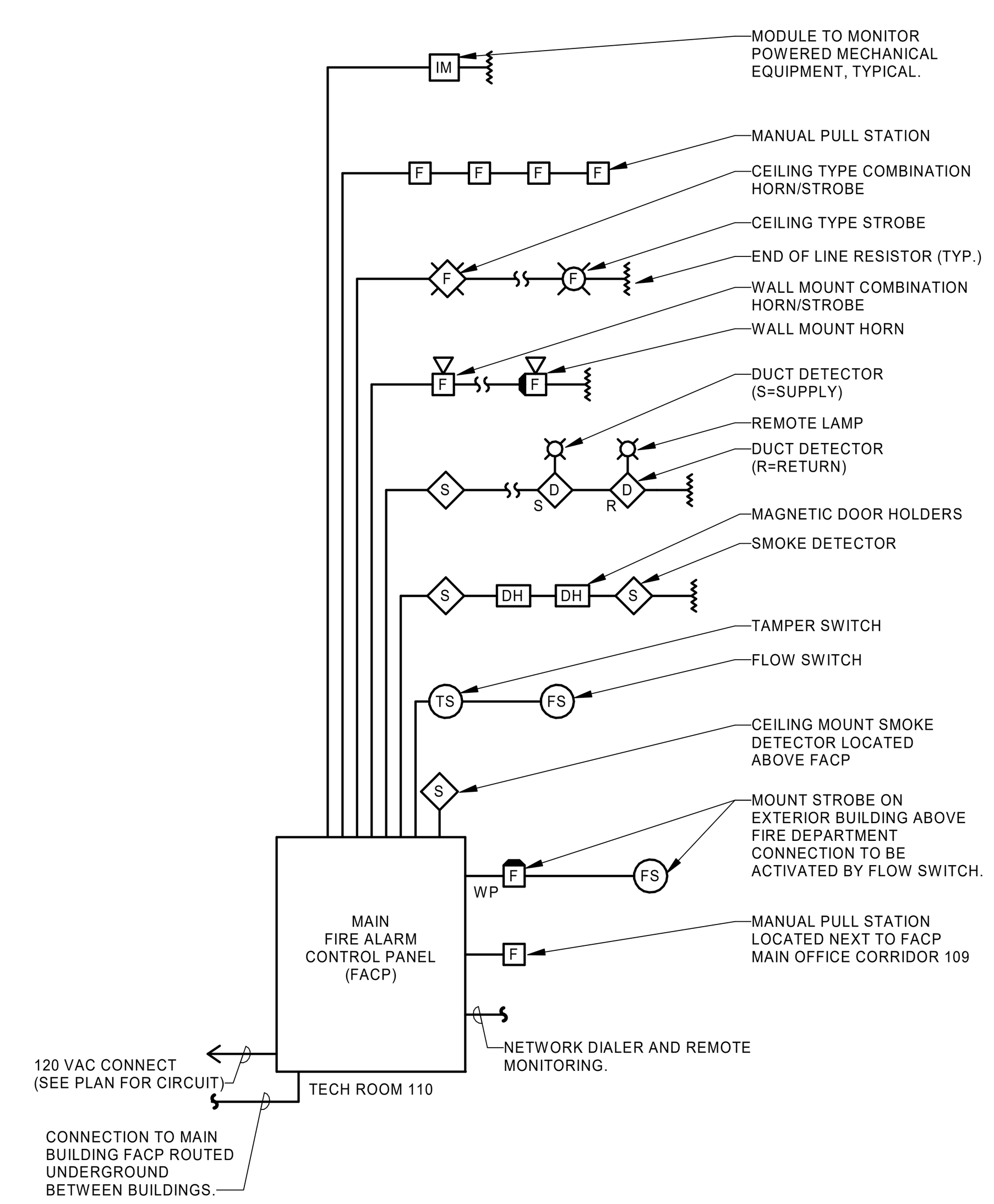
NOTE:
REFER TO PLANS FOR LOCATION OF SIGNAL DEVICES.



TYPICAL GROUND BAR SECTION DETAIL
NO SCALE



NEUTRAL/GROUNDING SYSTEM
NO SCALE



FIRE ALARM RISER
NO SCALE

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PATTENGILL MODULAR CLASSROOM BUILDING

LANSING SCHOOL DISTRICT
815 North Fairview Avenue, Lansing, MI

04/19/2024

Lansing School District

ISSUANCES	DATE
Construction Documents BP03	04.19.2024

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SES Project # 23 0588 03

JOB NO. 2616.05
SHEET TITLE
ELECTRICAL DETAILS, SCHEDULES, AND RISER DIAGRAM
SHEET NO.
E7.0

GENERAL TECHNOLOGY NOTES:

1. THESE DRAWINGS ARE DIAGRAMMATIC AND INDICATE THE GENERAL EXTENT OF THE WORK. CONTRACTORS SHALL PROVIDE ALL INCIDENTAL MATERIALS AND LABOR FOR A COMPLETE AND FULLY FUNCTIONAL SYSTEM.
2. PRIOR TO BEGINNING WORK, CONTRACTORS ARE TO REVIEW BUILDING PLANS, INSTALLATION LOCATIONS, AND SITE CONDITIONS. NOTIFY THE TECHNOLOGY DESIGNER OF ANY CONDITIONS THAT MAY: PREVENT PROPER INSTALLATION AND OPTIMAL PERFORMANCE OF THE SYSTEMS; VOID THE MANUFACTURER'S WARRANTY; OR THAT CONFLICT WITH THE INTENT OF THE PROJECT. PROCEED WITH INSTALLATION ONLY AFTER UNSATISFACTORY CONDITIONS HAVE BEEN RESOLVED. THE CONTRACTOR IS RESPONSIBLE FOR ANY ADDITIONAL WORK RELATED TO CORRECTING UNREPORTED CONFLICTS AND ISSUES, AT NO ADDITIONAL COST TO THE OWNER.
3. FIELD VERIFY LOCATIONS, CONDITIONS AND LENGTHS PRIOR TO INSTALLATION.
4. CONTRACTOR IS REQUIRED TO PROVIDE THEIR OWN PENETRATIONS, SLEEVES, AND CORES THROUGH ALL WALLS AND FLOORS. ALL SLEEVES SHALL HAVE NYLON BUSHINGS.
5. CONTRACTOR SHALL PROVIDE FIRESTOPPING ON PENETRATIONS PASSING THROUGH WALLS AND FLOORS IN WHICH THEY WORK.
6. CONTRACTOR SHALL COORDINATE TELECOMMUNICATION ROOM LAYOUTS WITH ALL IMPACTED CONTRACTORS PRIOR TO INSTALLATION.
7. CONTRACTOR SHALL COORDINATE ALL EQUIPMENT LOCATIONS AND ROUGH-IN REQUIREMENTS WITH ALL IMPACTED CONTRACTORS PRIOR TO INSTALLATIONS.
8. CONTRACTOR SHALL PROVIDE FACEPLATES AND INSERTS FOR THEIR DEVICES.
9. WHEN COLOR / FINISH OPTIONS ARE AVAILABLE, CONTRACTOR SHALL CONFIRM COLOR / FINISH WITH ARCHITECT PRIOR TO ORDERING.

T3 SHEET - STRUCTURED CABLING

SYMBOL LINE STYLES:

THICK, SOLID, COLOR-CODED - ROUGH-INS PROVIDED BY MODULAR BUILDER
THIN, DASHED, COLOR-CODED - ROUGH-INS PROVIDED BY SITE CONTRACTOR(S)

STRUCTURED CABLING COLOR CODE:

BLUE - GENERAL DATA
ORANGE - WIRELESS ACCESS
GREEN - SECURITY

SYMBOL STYLES & ABBREVIATIONS:

CABLING OUTLET / WALL PLATE

XX LOCATED IN FLOOR BOX
XX LOCATED ON WALL, LOW HEIGHT (18" AFF)
XX LOCATED ON WALL, MID HEIGHT (36"-84" AFF)
XX LOCATED ON WALL, HIGH HEIGHT (84"+ AFF)
XX LOCATED AT CEILING

OUTLET / PLATE ABBREVIATIONS
\# NUMBER OF DATA DROPS
WP WALL PHONE LOCATION, INCLUDE 1 DATA DROP & WALL PHONE PLATE
AP WIRELESS ACCESS POINT, INCLUDE 1 CAT6 DATA DROP
VS VIDEO SURVEILLANCE CAMERA LOCATION, INCLUDE 1 DATA DROP
AC ANALOG CLOCK LOCATION, INCLUDE 1 DATA DROP
DC DIGITAL CLOCK LOCATION, INCLUDE 1 DATA DROP
VI VIDEO INTERCOM LOCATION, INCLUDE 1 DATA DROP
VD VAPE DETECTOR LOCATION, INCLUDE 1 DATA DROP

DEVICES:

AP WIRELESS ACCESS POINT, CEILING MOUNTED
AP WIRELESS ACCESS POINT, WALL MOUNTED

STRUCTURED CABLING PROJECT NOTES:

1. COORDINATE DEVICE DROP LOCATIONS WITH DEVICE INSTALLATION CONTRACTOR. DEVICE INSTALLATION CONTRACTORS SHALL SUPPLY PATCH CABLE FROM THE DEVICE TO THE DATA DROP.
2. CABLING CONTRACTOR TO INSTALL OWNER-PROVIDED WIRELESS ACCESS POINTS. TERMINATE DROPS FOR CLASSROOM APS IN THE CORRIDOR. PROVIDE CONDUIT AND PATCH CABLE TO THE AP LOCATION. LABEL APS WITH OWNER-PROVIDED AT NUMBER AND THE DATA DROP LABEL.
3. INSTALL OWNER-FURNISHED UPS'S, SWITCHES, AND PHONE EQUIPMENT IN TELECOMMUNICATION ROOM CABINETS. CONTRACTOR TO PATCH ALL TERMINATED PATCH PANEL PORTS 1:1 TO THE SWITCHES. FOLLOW PATCH CABLE COLOR CODING.

T4 SHEET - CLOCK SYSTEM & PUBLIC ADDRESS SYSTEM

SYMBOL LINE STYLES:

THICK, SOLID, COLOR-CODED - ROUGH-INS PROVIDED BY MODULAR BUILDER
THIN, DASHED, COLOR-CODED - ROUGH-INS PROVIDED BY SITE CONTRACTOR(S)

CLOCK SYSTEM DEVICES:

AC DIGITAL CLOCK, SINGLE-FACE, WALL MOUNTED
DC DIGITAL CLOCK, DOUBLE-FACE, WALL MOUNTED

CLOCK SYSTEM PROJECT NOTES:

1. NATIONAL TIME MASTER CLOCK IS LOCATED IN THE MAIN OFFICE.
2. ALL CLOCK DEVICES ARE IP / PoE.

PUBLIC ADDRESS SYSTEM DEVICES:

PA PUBLIC ADDRESS SPEAKER, CEILING MOUNTED, CUT-IN / LAY-IN
PA PUBLIC ADDRESS SPEAKER, WALL MOUNTED
HN PUBLIC ADDRESS HORN, WALL MOUNTED
CB CALL BUTTON

PUBLIC ADDRESS SYSTEM PROJECT NOTES:

1. PATTENGILL HAS AN EXISTING RAULAND TELECENTER WITH HEAD END EQUIPMENT LOCATED IN THE MDF.
2. CONTRACTOR SHALL EXTEND THE EXISTING PAGING SYSTEM INTO THIS BUILDING.
3. PROVIDE ANALOG SPEAKERS WITH IP MODULES, OR IP SPEAKERS, WITH ALL REQUIRED CABLING AND ACCESSORIES, INCLUDING IP SWITCHES AND PATCH PANELS. ONE (1) DATA PORT WILL BE PROVIDED FOR CONNECTION TO THE BUILDING NETWORK WITHIN THE IDF.
4. TAP EACH SPEAKER AT THE FOLLOWING WATTAGE BASED ON SPACE / USE:
   4.1. 2 WATTS - SMALL ROOMS AND OFFICES, LESS THAN 200 SQFT.
   4.2. 5 WATTS - MEDIUM ROOMS, 200 - 500 SQFT., CORRIDORS
   4.3. 15 WATTS - BOILER ROOM HORN
   4.4. 30 WATTS - EXTERIOR HORNS & SPEAKERS, GYMNASIUM & CAFETERIA HORNS

T5 SHEET - AUDIOVISUAL SYSTEMS

SYMBOL LINE STYLES:

THICK, SOLID, COLOR-CODED - ROUGH-INS PROVIDED BY MODULAR BUILDER
THIN, DASHED, COLOR-CODED - ROUGH-INS PROVIDED BY SITE CONTRACTOR(S)

OUTLET STYLES & ABBREVIATIONS:

CABLING OUTLET / WALL PLATE

LOCATED IN FLOOR BOX
LOCATED ON WALL, LOW HEIGHT (0"-36" AFF)
LOCATED ON WALL, MID HEIGHT (36"-84" AFF)
LOCATED ON WALL, HIGH HEIGHT (84"+ AFF)
LOCATED AT CEILING

OUTLET / PLATE ABBREVIATIONS
T TEACHER STATION LOCATION: HDMI & USB TO IFP
A AUDIO INPUT LOCATION - SEE SCHEMATIC OR CALLOUT
V AUDIO AND/OR VIDEO INPUT LOCATION - SEE SCHEMATIC OR CALLOUT

DEVICES:

IFP INTERACTIVE FLAT PANEL, WALL MOUNTED
SF SOUNDFIELD SYSTEM, SURFACE-MOUNT STYLE. OWNER FURNISHED CONTRACTOR INSTALLED (OFCI)

AUDIOVISUAL SYSTEMS PROJECT NOTES:

1. ALL IFPS ARE 75" (CLEVERTOUCH IMPACT PLUS) UNLESS SIZE NOTED OTHERWISE.
2. PROVIDE HEIGHT-ADJUSTABLE WALL MOUNTS FOR IFP'S.

T6 SHEET - ACCESS CONTROL & INTRUSION DETECTION SYSTEM

SYMBOL LINE STYLES:

THICK, SOLID, COLOR-CODED - ROUGH-INS PROVIDED BY MODULAR BUILDER
THIN, DASHED, COLOR-CODED - ROUGH-INS PROVIDED BY SITE CONTRACTOR(S)

ACCESS CONTROL SYSTEM DEVICES:

VI VIDEO INTERCOM
VIM VIDEO INTERCOM MASTER STATION
CR CARD READER, WALL MOUNTED
EH ELECTRIFIED HARDWARE, REFER TO DOOR HARDWARE SCHEDULE FOR DOORS WITH BUILT-IN CARD READERS

INTRUSION DETECTION SYSTEM DEVICES:

KP KEYPAD
MS MOTION SENSOR; SHADING INDICATES DIRECTION OF VIEW, NOT COVERAGE

ACCESS CONTROL & INTRUSION DETECTION SYSTEM PROJECT NOTES:

1. CR & EH SYMBOLS SHOWN FOR GENERAL SCOPE AND LOCATIONS ONLY. ALL LOCATIONS MAY NOT BE SHOWN. REFER TO DOOR HARDWARE SCHEDULE FOR ALL LOCATIONS, DETAILS, AND REQUIREMENTS, INCLUDING BUT NOT LIMITED TO, WHAT CABLE TO PULL FOR EACH DOOR, AND WHAT HARDWARE TO INSTALL AT EACH DOOR. OTHER EQUIPMENT (EXAMPLE: INTERCOMS, GLASS BREAK SENSORS), TO BE PROVIDED BY THIS CONTRACTOR.
2. CONTRACTOR TO INSTALL, INTERCONNECT, AND CONFIGURE ADA BUTTONS ON DOORS HAVING ACCESS CONTROL.
3. CONTRACTOR TO PROVIDE AND INSTALL ALL ACCESS CONTROL POWER SUPPLIES.
4. PATTENGILL HAS AN EXISTING BUILDING LOCKDOWN BUTTON IN THE MAIN OFFICE; CONTRACTOR IS TO TIE THIS BUILDING INTO THE EXISTING BUILDING LOCKDOWN CONFIGURATION.
   WHEN BUILDING LOCKDOWN IS ENGAGED, ALL DOORS WITH ACCESS CONTROL SHALL LOCK, OVERRIDING ANY SCHEDULE AND PROHIBITING ACCESS FROM MOST CARDS. ONLY STAFF IN AN EMERGENCY ACCESS USER GROUP WILL HAVE ACCESS WITH THEIR CARDS.
5. CONFIGURE SYSTEM TO SEND ALERTS WHEN EXTERIOR DOORS ARE PROPPED OPEN.
6. PATTENGILL HAS AN EXISTING INTRUSION DETECTION SYSTEM; CONTRACTOR IS TO TIE THIS BUILDING INTO THE EXISTING BUILDING'S SYSTEM.

T7 SHEET - VIDEO SURVEILLANCE SYSTEM

SYMBOL LINE STYLES:

THICK, SOLID, COLOR-CODED - ROUGH-INS PROVIDED BY MODULAR BUILDER
THIN, DASHED, COLOR-CODED - ROUGH-INS PROVIDED BY SITE CONTRACTOR(S)

SYMBOL STYLES & ABBREVIATIONS:

VS VIDEO SURVEILLANCE CAMERA; SHADING INDICATES DIRECTION OF VIEW, NOT COVERAGE

A ONE LENS / SENSOR
B TWO LENS / SENSOR
C THREE LENS / SENSOR
D FOUR LENS / SENSOR
F FISHEYE LENS / SENSOR
\# TOTAL MEGAPIXELS FOR CAMERA; DIVIDE BY NUMBER OF SENSORS FOR *MINIMUM* PER SENSOR
VI VIDEO INTERCOM STATION (BY ACCESS CONTROL CONTRACTOR); INCLUDE FOR VIDEO RECORDING

PROJECT NOTES:

1. CONFIRM ALL MOUNTING LOCATIONS WITH TECHNOLOGY DESIGNER PRIOR TO INSTALLATION.
2. REVIEW AND CONFIRM ALL CAMERA VIEWS AND SETTINGS WITH TECHNOLOGY DESIGNER AND OWNER PRIOR TO ACCEPTANCE; ADJUST AS NECESSARY.
3. ALL EXTERIOR CAMERAS SHALL BE RATED FOR SUCH USE AND BE PROVIDED WITH HOUSING, HEATER, AND BLOWER AS NECESSARY TO OPERATE IN THE INTENDED CLIMATE.
4. ALL EXTERIOR SINGLE-LENS CAMERAS SHALL DOME-STYLE WITH A SUN SHADE.
5. INCLUDE PENDANT ARM MOUNTS FOR EXTERIOR MULTI-LENS CAMERAS DUE TO FIELD CONDITIONS OR TO OBTAIN THE DESIRED VIEW.
6. VIDEO SURVEILLANCE CONTRACTOR TO PROVIDE PATCH CABLES BETWEEN CAMERA AND DATA JACK SUPPLIED BY OTHERS. COORDINATE JACK LOCATIONS WITH STRUCTURED CABLING CONTRACTOR.
7. THE OWNER'S EXISTING SERVERS WILL BE USED FOR THE ADDITIONAL CAMERAS.

SHEET INDEX:

Barton Malow

Barton Malow Builders
26500 American Drive
Southfield, MI 48034

248.436.5000
www.bartonmalow.com

Owner:

Lansing School District
Lansing, Michigan

Project Number: TBD
Project Manager: Paul Twigg
Drawn By: Bill Dawson
Checked By: Paul Twigg

Issued For	Date
BIDS	04/25/2024

Key Plan:

Native Page Size: 42" X 30"

Scale: None

Bid Package 03
Modular Classroom Building

Pattengill

Technology Systems

T0

GENERAL TECHNOLOGY NOTES:

1. THESE DRAWINGS ARE DIAGRAMMATIC AND INDICATE THE GENERAL EXTENT OF THE WORK. CONTRACTORS SHALL PROVIDE ALL INCIDENTAL MATERIALS AND LABOR FOR A COMPLETE AND FULLY FUNCTIONAL SYSTEM.
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3. FIELD VERIFY LOCATIONS, CONDITIONS AND LENGTHS PRIOR TO INSTALLATION.
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Barton Malow

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Owner:

Lansing School District
Lansing, Michigan

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Drawn By: Bill Dawson
Checked By: Paul Twigg

Issued For	Date
BIDS	04/25/2024

Key Plan:

Native Page Size: 42" X 30"

Scale: 1/32" = 1'

0' 8' 16' 32' 64'

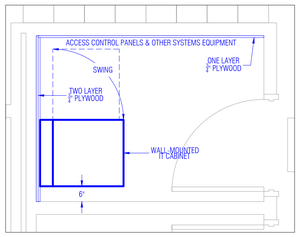
Bid Package 03
Modular Classroom Building

Pattengill

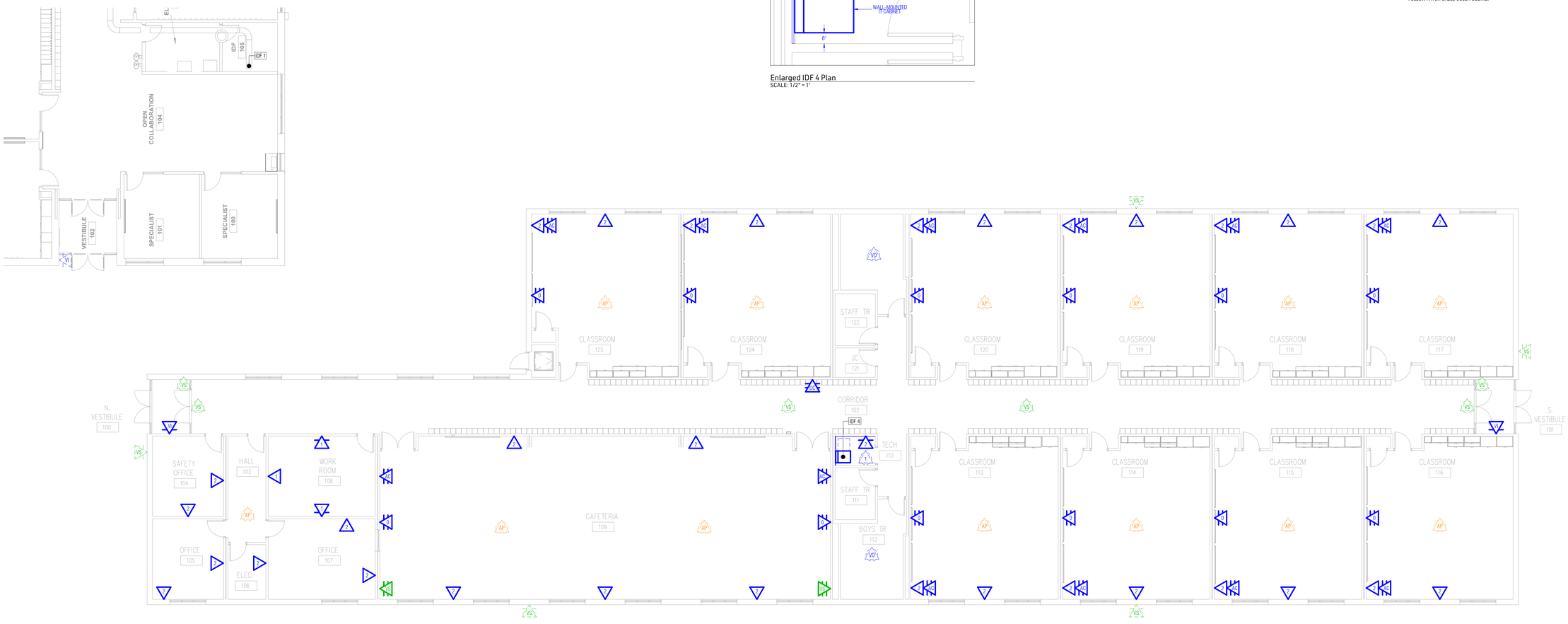
Site Plan

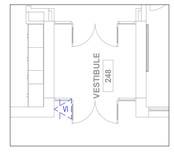
T1

N



Enlarged IDF 4 Plan
SCALE: 1/2" = 1'





Existing Building, Southeast Entry

N

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T3 SHEET - STRUCTURED CABLING

SYMBOL LINE STYLES:

- THICK, SOLID, COLOR-CODED - ROUGH-INS PROVIDED BY MODULAR BUILDER
- THIN, DASHED, COLOR-CODED - ROUGH-INS PROVIDED BY SITE CONTRACTOR(S)

STRUCTURED CABLING COLOR CODE:

- BLUE - GENERAL DATA
- ORANGE - WIRELESS ACCESS
- GREEN - SECURITY

SYMBOL STYLES & ABBREVIATIONS:

CABLING OUTLET / WALL PLATE

- XX — LOCATED IN FLOOR BOX
- XX — LOCATED ON WALL, LOW HEIGHT (18" AFF)
- XX — LOCATED ON WALL, MID HEIGHT (36"-84" AFF)
- XX — LOCATED ON WALL, HIGH HEIGHT (84"+ AFF)
- XX — LOCATED AT CEILING

OUTLET / PLATE ABBREVIATIONS

#	NUMBER OF DATA DROPS
WP	WALL PHONE LOCATION, INCLUDE 1 DATA DROP & WALL PHONE PLATE
AP	WIRELESS ACCESS POINT, INCLUDE 1 CAT6 DATA DROP
VS	VIDEO SURVEILLANCE CAMERA LOCATION, INCLUDE 1 DATA DROP
AC	ANALOG CLOCK LOCATION, INCLUDE 1 DATA DROP
DC	DIGITAL CLOCK LOCATION, INCLUDE 1 DATA DROP
VI	VIDEO INTERCOM LOCATION, INCLUDE 1 DATA DROP
VD	VAPE DETECTOR LOCATION, INCLUDE 1 DATA DROP

DEVICES:

- AP — WIRELESS ACCESS POINT, CEILING MOUNTED
- AP — WIRELESS ACCESS POINT, WALL MOUNTED

STRUCTURED CABLING PROJECT NOTES:

1. COORDINATE DEVICE DROP LOCATIONS WITH DEVICE INSTALLATION CONTRACTOR. DEVICE INSTALLATION CONTRACTORS SHALL SUPPLY PATCH CABLE FROM THE DEVICE TO THE DATA DROP.
2. CABLING CONTRACTOR TO INSTALL OWNER-PROVIDED WIRELESS ACCESS POINTS. TERMINATE DROPS FOR CLASSROOM AP'S IN THE CORRIDOR. PROVIDE CONDUIT AND PATCH CABLE TO THE AP LOCATION. LABEL AP'S WITH OWNER-PROVIDED AT NUMBER AND THE DATA DROP LABEL.
3. INSTALL OWNER-FURNISHED UPS'S, SWITCHES, AND PHONE EQUIPMENT IN TELECOMMUNICATION ROOM CABINETS. CONTRACTOR TO PATCH ALL TERMINATED PATCH PANEL PORTS 1:1 TO THE SWITCHES. FOLLOW PATCH CABLE COLOR CODING.

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Key Plan:

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0' 2' 4' 8' 16'

Bid Package 03
Modular Classroom Building

Pattengill

Composite
Structured Cabling

T3

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9. WHEN COLOR / FINISH OPTIONS ARE AVAILABLE, CONTRACTOR SHALL CONFIRM COLOR / FINISH WITH ARCHITECT PRIOR TO ORDERING.

T4 SHEET - CLOCK SYSTEM & PUBLIC ADDRESS SYSTEM

SYMBOL LINE STYLES:

THICK, SOLID, COLOR-CODED - ROUGH-INS PROVIDED BY MODULAR BUILDER
THIN, DASHED, COLOR-CODED - ROUGH-INS PROVIDED BY SITE CONTRACTOR(S)

CLOCK SYSTEM DEVICES:

AC DIGITAL CLOCK, SINGLE-FACE, WALL MOUNTED
DC DIGITAL CLOCK, DOUBLE-FACE, WALL MOUNTED

CLOCK SYSTEM PROJECT NOTES:

1. NATIONAL TIME MASTER CLOCK IS LOCATED IN THE MAIN OFFICE.
2. ALL CLOCK DEVICES ARE IP / PoE.

PUBLIC ADDRESS SYSTEM DEVICES:

PA PUBLIC ADDRESS SPEAKER, CEILING MOUNTED, CUT-IN / LAY-IN
PA PUBLIC ADDRESS SPEAKER, WALL MOUNTED
HN PUBLIC ADDRESS HORN, WALL MOUNTED
CB CALL BUTTON

PUBLIC ADDRESS SYSTEM PROJECT NOTES:

1. PATTENGILL HAS AN EXISTING RAULAND TELECENTER WITH HEAD END EQUIPMENT LOCATED IN THE MDF.
2. CONTRACTOR SHALL EXTEND THE EXISTING PAGING SYSTEM INTO THIS BUILDING.
3. PROVIDE ANALOG SPEAKERS WITH IP MODULES, OR IP SPEAKERS, WITH ALL REQUIRED CABLING AND ACCESSORIES, INCLUDING IP SWITCHES AND PATCH PANELS. ONE (1) DATA PORT WILL BE PROVIDED FOR CONNECTION TO THE BUILDING NETWORK WITHIN THE IDF.
4. TAP EACH SPEAKER AT THE FOLLOWING WATTAGE BASED ON SPACE / USE:
   - 4.1. 2 WATTS - SMALL ROOMS AND OFFICES, LESS THAN 200 SQFT.
   - 4.2. 5 WATTS - MEDIUM ROOMS, 200 - 500 SQFT., CORRIDORS
   - 4.3. 15 WATTS - BOILER ROOM HORN
   - 4.4. 30 WATTS - EXTERIOR HORNS & SPEAKERS, GYMNASIUM & CAFETERIA HORNS

N

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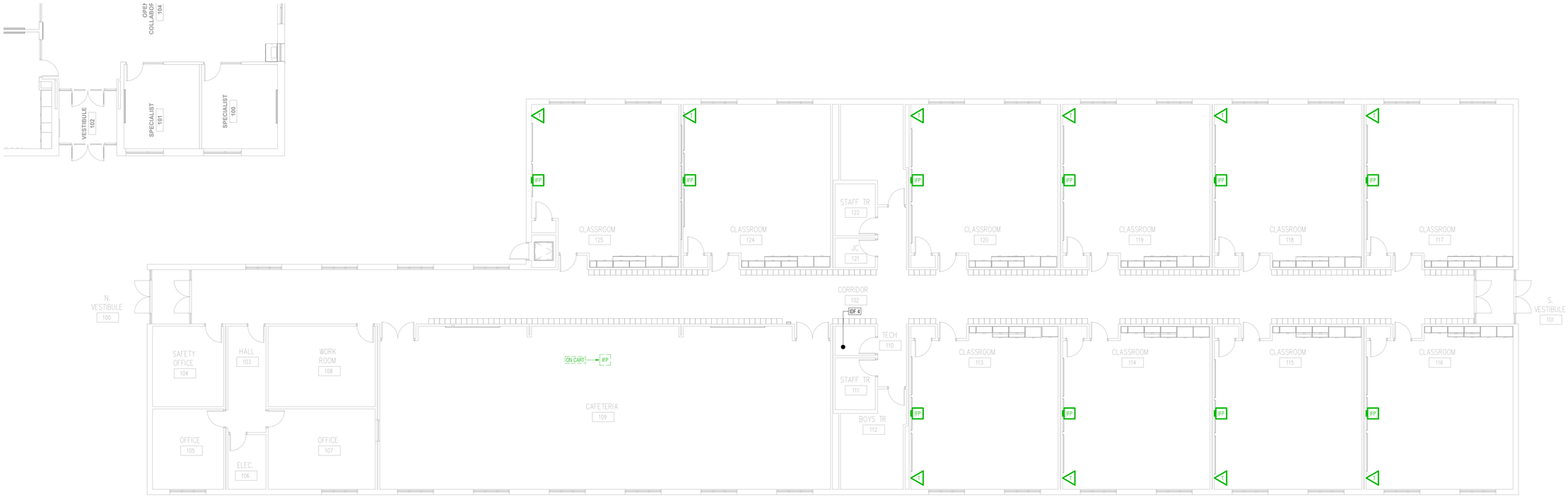
Bid Package 03
Modular Classroom Building

Pattengill

Composite
Clock System
Public Address System

T4



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T5 SHEET - AUDIOVISUAL SYSTEMS

SYMBOL LINE STYLES:

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THIN, DASHED, COLOR-CODED - ROUGH-INS PROVIDED BY SITE CONTRACTOR(S)

OUTLET STYLES & ABBREVIATIONS:

CABLING OUTLET / WALL PLATE

LOCATED IN FLOOR BOX
LOCATED ON WALL, LOW HEIGHT (0'-36" AFF)
LOCATED ON WALL, MID HEIGHT (36'-84" AFF)
LOCATED ON WALL, HIGH HEIGHT (84" = AFF)
LOCATED AT CEILING

OUTLET / PLATE ABBREVIATIONS:
T TEACHER STATION LOCATION: HDMI & USB TO IFP
A AUDIO INPUT LOCATION - SEE SCHEMATIC OR CALLOUT
V AUDIO AND/OR VIDEO INPUT LOCATION - SEE SCHEMATIC OR CALLOUT

DEVICES:

IFP INTERACTIVE FLAT PANEL, WALL MOUNTED
SF SOUNDFIELD SYSTEM, SURFACE-MOUNT STYLE, OWNER FURNISHED CONTRACTOR INSTALLED (OFCI)

AUDIOVISUAL SYSTEMS PROJECT NOTES:

1. ALL IFPS ARE 75" (CLEVERTOUCH IMPACT PLUS) UNLESS SIZE NOTED OTHERWISE.
2. PROVIDE HEIGHT-ADJUSTABLE WALL MOUNTS FOR IFP'S.

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Key Plan:

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Bid Package 03
Modular Classroom Building

Pattengill

Composite
Audiovisual Systems

T5

N

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T6 SHEET - ACCESS CONTROL & INTRUSION DETECTION SYSTEM

SYMBOL LINE STYLES:

THICK, SOLID, COLOR-CODED - ROUGH-INS PROVIDED BY MODULAR BUILDER
THIN, DASHED, COLOR-CODED - ROUGH-INS PROVIDED BY SITE CONTRACTOR(S)

ACCESS CONTROL SYSTEM DEVICES:

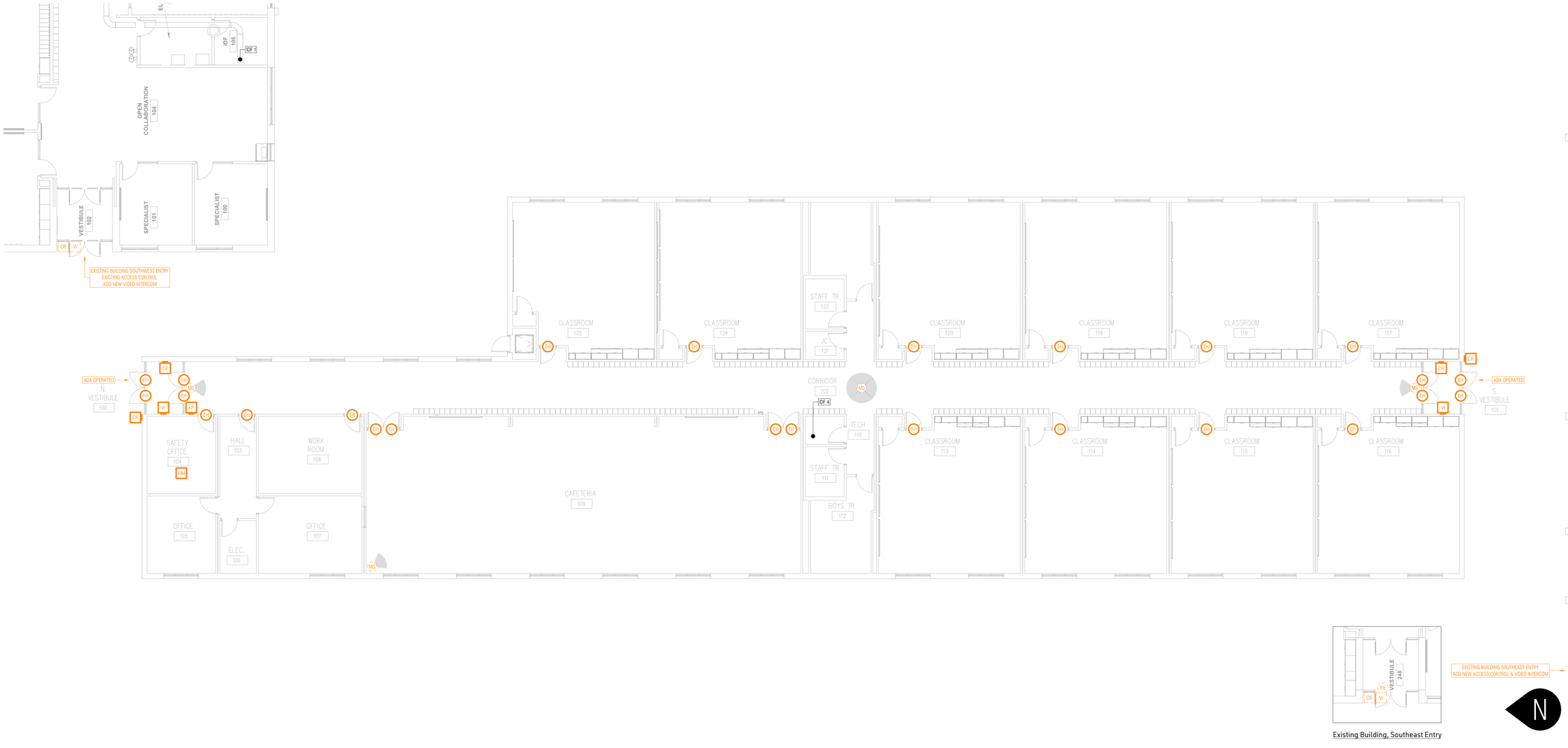
- VI — VIDEO INTERCOM
- VIM — VIDEO INTERCOM MASTER STATION
- CR — CARD READER, WALL MOUNTED
- EH — ELECTRIFIED HARDWARE, REFER TO DOOR HARDWARE SCHEDULE FOR DOORS WITH BUILT-IN CARD READERS

INTRUSION DETECTION SYSTEM DEVICES:

- KP — KEYPAD
- MS — MOTION SENSOR; SHADING INDICATES DIRECTION OF VIEW; NOT COVERAGE

ACCESS CONTROL & INTRUSION DETECTION SYSTEM PROJECT NOTES:

1. CR & EH SYMBOLS SHOWN FOR GENERAL SCOPE AND LOCATIONS ONLY. ALL LOCATIONS MAY NOT BE SHOWN. REFER TO DOOR HARDWARE SCHEDULE FOR ALL LOCATIONS, DETAILS, AND REQUIREMENTS, INCLUDING BUT NOT LIMITED TO, WHAT CABLE TO PULL FOR EACH DOOR, AND WHAT HARDWARE TO INSTALL AT EACH DOOR. OTHER EQUIPMENT (EXAMPLE: INTERCOMS, GLASS BREAK SENSORS), TO BE PROVIDED BY THIS CONTRACTOR.
2. CONTRACTOR TO INSTALL, INTERCONNECT, AND CONFIGURE ADA BUTTONS ON DOORS HAVING ACCESS CONTROL.
3. CONTRACTOR TO PROVIDE AND INSTALL ALL ACCESS CONTROL POWER SUPPLIES.
4. PATTENGILL HAS AN EXISTING BUILDING LOCKDOWN BUTTON IN THE MAIN OFFICE; CONTRACTOR IS TO TIE THIS BUILDING INTO THE EXISTING BUILDING LOCKDOWN CONFIGURATION.
   WHEN BUILDING LOCKDOWN IS ENGAGED, ALL DOORS WITH ACCESS CONTROL SHALL LOCK, OVERRIDING ANY SCHEDULE AND PROHIBITING ACCESS FROM MOST CARDS. ONLY STAFF IN AN EMERGENCY ACCESS USER GROUP WILL HAVE ACCESS WITH THEIR CARDS.
5. CONFIGURE SYSTEM TO SEND ALERTS WHEN EXTERIOR DOORS ARE PROPPED OPEN.
6. PATTENGILL HAS AN EXISTING INTRUSION DETECTION SYSTEM; CONTRACTOR IS TO TIE THIS BUILDING INTO THE EXISTING BUILDING'S SYSTEM.



Existing Building, Southeast Entry

EXISTING BUILDING SOUTHEAST ENTRY
ADD NEW ACCESS CONTROL & VIDEO INTERCOM

N

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Bid Package 03
Modular Classroom Building

Pattengill

Composite
Access Control System

T6

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T7 SHEET - VIDEO SURVEILLANCE SYSTEM

SYMBOL LINE STYLES:

THICK, SOLID, COLOR-CODED - ROUGH-INS PROVIDED BY MODULAR BUILDER
THIN, DASHED, COLOR-CODED - ROUGH-INS PROVIDED BY SITE CONTRACTOR(S)

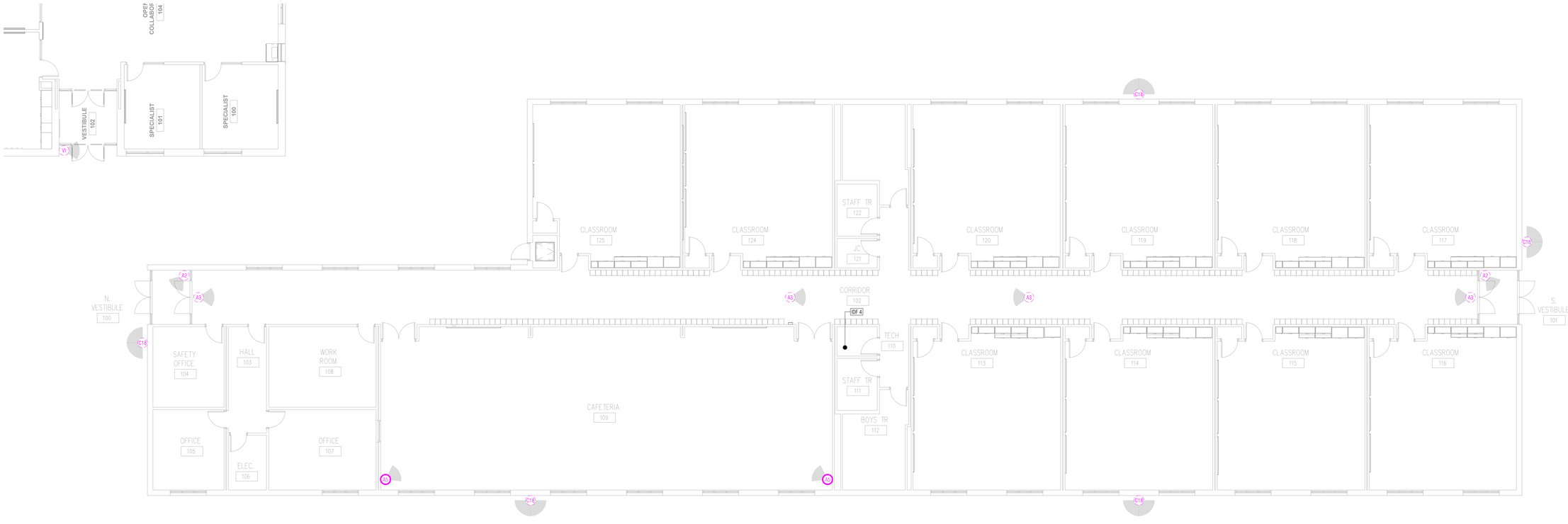
SYMBOL STYLES & ABBREVIATIONS:

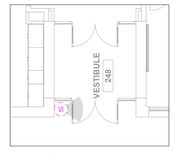
VIDEO SURVEILLANCE CAMERA; SHADING INDICATES DIRECTION OF VIEW, NOT COVERAGE

A ONE LENS / SENSOR
B TWO LENS / SENSOR
C THREE LENS / SENSOR
D FOUR LENS / SENSOR
F FISHEYE LENS / SENSOR
TOTAL MEGAPIXELS FOR CAMERA; DIVIDE BY NUMBER OF SENSORS FOR *MINIMUM* PER SENSOR
VI VIDEO INTERCOM STATION (BY ACCESS CONTROL CONTRACTOR); INCLUDE FOR VIDEO RECORDING

PROJECT NOTES:

1. CONFIRM ALL MOUNTING LOCATIONS WITH TECHNOLOGY DESIGNER PRIOR TO INSTALLATION.
2. REVIEW AND CONFIRM ALL CAMERA VIEWS AND SETTINGS WITH TECHNOLOGY DESIGNER AND OWNER PRIOR TO ACCEPTANCE; ADJUST AS NECESSARY.
3. ALL EXTERIOR CAMERAS SHALL BE RATED FOR SUCH USE AND BE PROVIDED WITH HOUSING, HEATER, AND BLOWER AS NECESSARY TO OPERATE IN THE INTENDED CLIMATE.
4. ALL EXTERIOR SINGLE-LENS CAMERAS SHALL BE DOME-STYLE WITH A SUN SHADE.
5. INCLUDE PENDANT ARM MOUNTS FOR EXTERIOR MULTI-LENS CAMERAS DUE TO FIELD CONDITIONS OR TO OBTAIN THE DESIRED VIEW.
6. VIDEO SURVEILLANCE CONTRACTOR TO PROVIDE PATCH CABLES BETWEEN CAMERA AND DATA JACK SUPPLIED BY OTHERS. COORDINATE JACK LOCATIONS WITH STRUCTURED CABLING CONTRACTOR.
7. THE OWNER'S EXISTING SERVERS WILL BE USED FOR THE ADDITIONAL CAMERAS.





Existing Building, Southeast Entry

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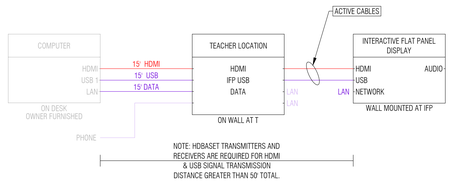
Bid Package 03
Modular Classroom Building

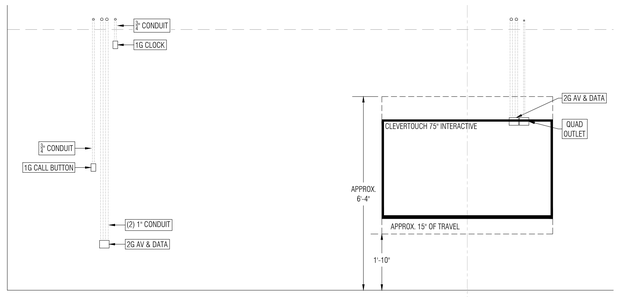
Pattengill

Composite
Video Surveillance System

T7



Typical Classroom Audiovisual System Schematic
SCALE: NONE



Typical Classroom Interactive Flat Panel & Teacher Station Elevation
SCALE: 1/2" = 1'

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BIDS	04/25/2024

Key Plan:

Native Page Size: 42" X 30"

Scale: As Noted

Bid Package 03
Modular Classroom Building

Details

Audiovisual Systems

T9

MICHIGAN DESIGN CODES:

BU	2015	MICHIGAN BUILDING CODE
ME	2015	MICHIGAN MECHANICAL CODE
PL	2018	MICHIGAN PLUMBING CODE
EL	2017	NFPA - 70 NATIONAL ELECTRICAL CODE
EN	2015	MICHIGAN ENERGY CODE (2013 ASHRAE)
FR	2015	MICHIGAN BUILDING CODE
FG	2015	INTERNATIONAL FUEL GAS CODE
AC	2015	MICHIGAN BUILDING CODE
LS	2015	MICHIGAN BUILDING CODE

M-MISCELLANEOUS:

4 FIRE SPRINKLER: N.F.P.A. "LIGHT HAZARD" SPRINKLER SYSTEM:
- SCHED. 40 BLACK OR GALV. STEEL PIPE;
- 165ºF EXPOSED HEADS w/ESCUTCHEONS;ABOVE AND BELOW CEILING
- CROSS-SEAM PIPING BY OTHERS ON SITE;
- FACTORY-INSTALLED PIPING STUBBED THRU EXTERIOR WALL; ALARM, RISER, AND FLOW SWITCH BY OTHERS ON SITE;
- SPRINKLER SYSTEM (INCL. SITE-WORK) TO BE BY LICENSED FIRE-PROTECTION CONTRACTOR.

UNIT LABELS: THIRD PARTY LABEL
DATA PLATES AND LABELS LOCATED ABOVE SUSPENDED CEILING ON THE "FRONT" WALL OF THE MODULE
MBI LABEL
LIST STATE LABELS HERE

SEALED DRAWINGS: MI

MODEL APPROVAL: REGISTERED ARCHITECT
FOR THE STATE OF MICHIGAN

BUILDING INFORMATION:

BUILDING USE GROUP -----	E
TYPE OF CONSTRUCTION -----	VB (WOOD FRAME - PROTECTED)
SQUARE FOOTAGE ------	15857 SQ FT
OCCUPANT LOAD OF BUILDING ------	317, OR LESS

BUILDING DESIGN LOADS:

FLOOR LIVE LOAD UNIFORM --------	50 PSF
FLOOR LIVE LOAD CONCENTRATED --------	2000 LBS
FLOOR IMPACT LOAD ------	N/A LBS
FLOOR LIVE LOAD (CORRIDOR)------	100 PSF
FLOOR DEAD LOAD ------	10 PSF
ROOF LIVE LOAD (SNOW) -------	30 PSF
ROOF DEAD LOAD -------	10 PSF
GROUND SNOW LOAD -------	30 PSF
FLAT ROOF SNOW LOAD -------	21 PSF
BUILDING RISK CATEGORY ------	III
SNOW IMPORTANCE FACTOR Is-------	1.1
SEISMIC IMPORTANCE FACTOR Ie-------	1.25
SNOW EXPOSURE FACTOR -------	1.00
THERMAL FACTOR -------	1.0
BASIC WIND SPEED ------	115 MPH
WIND EXPOSURE ------	C
DESIGN WIND PRESSURE ------	SEE WIND/SEISMIC CALC
SPECTRAL RESPONSE COEFFICIENT S^{DS}------	0.087
SPECTRAL RESPONSE COEFFICIENT S^{D1} ------	0.072
SITE CLASS -------	D
BASIC SEISMIC-FORCE-RESISTING SYSTEM -	A.13
DESIGN BASE SHEAR -------	SEE WIND/SEISMIC CALC
SEISMIC DESIGN CATEGORY -------	B

GENERAL SPECIFICATION NOTES:

1.) BUILDING NOT TO BE LOCATED IN A DESIGNATED FIRE ZONE.

2.) THIS BUILDING SHALL BE LOCATED MORE THAN 10 FEET AWAY FROM ANY PROPERTY LINE OR ANY INTERIOR LOT LINE BETWEEN IT AND ANY OTHER BUILDING.

3.) THIS BUILDING NOT TO BE LOCATED IN A FLOOD PRONE AREA.

4.) WHITLEY MFG. CO., INC. IS NOT RESPONSIBLE FOR THE LOCAL BUILDING CODE REQUIREMENTS OVER AND ABOVE THE ENCLOSED SPECIFICATIONS. THE SPECIFICATIONS ARE BASED ON THE DESIGN PARAMETERS OF THE CODES LISTED ABOVE.

5.) DRINKING FOUNTAINS AND SERVICE SINKS SHALL BE PROVIDED AND INSTALLED BY OTHERS ON SITE. BOTTLED WATER MAY BE PROVIDED IN LIEU OF A DRINKING FOUNTAIN.

10.) DUPLICATES OF THIS BUILDING CAN BE BUILT AS A MIRROR IMAGE

11.) DUPLICATES OF THIS BUILDING CAN BE BUILT AS A SHELL

14.) THIS BUILDING DOES NOT HAVE FIRE-RATED EXTERIOR WALLS.

15.) THIS BUILDING SHALL NOT BE LOCATED IN AREAS WITH SNOW, WIND, AND /OR SEISMIC LOADS IN EXCESS OF THOSE NOTED ABOVE IN BUILDING DESIGN LOADS..

BUILDING CODES:
1. ATTIC VENTILATION SHALL COMPLY WITH APPLICABLE CODES.
2. ALL LOCKS TO BE UNLOCKABLE FROM INTERIOR WITHOUT THE USE OF A KEY.
3. CORROSION RESISTANT FLASHING REQUIRED AT TOP AND SIDES OF DOORS, WINDOW, AND ROOF PENETRATORS.
4. SAFETY GLAZING SHALL BE INSTALLED PER APPLICABLE CODES.
5. EXTERIOR EGRESS ELEMENTS TO BE SITE PROTECTED FROM SNOW AND ICE ACCUMULATION.
6. DEALER SHALL BE RESPONSIBLE FOR ON SITE BARRIER FREE PROVISIONS INCLUDING ALL: ADA REQUIRED STEPS, RAMPS, HANDRAILS,PARKING, ETC. AND APPLICABLE SIGNAGE (INTERIOR AND EXTERIOR) FOR THE VISUALLY IMPAIRED AND NON-AMBULATORY

BUILDING CODE FIELD NOTES:
1. TIE-DOWN ANCHORING TO BE INSTALLED ON SITE PER DEALER CONTRACTUAL AGREEMENT.
2. PLUMBING AND ELECTRICAL CONNECTIONS TO BE PROVIDED AND INSTALLED ON SITE PER DEALER CONTRACTUAL AGREEMENT.
3. ALL ADA REQUIRED STEPS, RAMPS, HANDRAILS, PARKING, ETC… AND APPLICABLE SIGNAGE. (INTERIOR AND EXTERIOR) FOR THE VISUALLY IMPARED AND NON-AMBULATORY TO BE PROVIDED AND INSTALLED ON SITE PER DEALER CONTRACTUAL AGREEMENT.

ELECTRICAL :
1. ALL RECEPTACLES TO BE GROUNDING TYPE.
2. ALL WIRING TO BE PER N.E.C. TYPE MC METAL CLAD CABLE. THHN COPPER w/ GROUND; 90ºC RATED.
3. MAIN PANEL TO BE MARKED "SUITABLE FOR USE AS SERVICE EQUIPMENT", AND TO HAVE MAIN BREAKER TYPE OVERCURRENT PROTECTION.
4. PROPER THERMAL OVERLOAD PROTECTION TO BE PROVIDED FOR ALL MOTORS.
5. DISCONNECTING MEANS WITHIN SIGHT REQUIRED FOR ALL MOTORS.
6. WEATHERPROOF PROTECTION REQUIRED FOR ALL OUTDOOR LIGHTS AND RECEPTACLES.
7. PROPER WORKING CLEARANCES TO BE PROVIDED AND MAINTAINED ABOUT ALL ELECTRICAL EQUIPMENT.
8. ALL FLUORESCENT FIXTURES REQUIRE THERMAL PROTECTION.
9. COMBINATION EXHAUST FAN/LIGHT AND ALL RECESSED INCANDESCENT FIXTURES TO BE WITH THERMAL PROTECTION.
10. ALL EMERGENCY LIGHTING (IF REQUIRED) AND EXIT SIGNS WILL BE CONNECTED AHEAD OF ANY LOCAL SWITCHES PER NEC SECTION 700-12 (f).
11. ALL EMERGENCY LIGHTING HAS A BATTERY PACK TO ASSURE CONTINUED ILLUMINATION.
12. GROUNDING ELECTRODE SHALL BE INSTALLED IN ACCORDANCE WITH ARTICLE 250 N.E.C.
13. MAIN DISTRIBUTION PANEL(S) SHALL BE INSTALLED ON SITE PER DEALER CONTRACTUAL AGREEMENT.
14. SERVICE ENTRANCE CONDUCTORS TO BE MINIMUM 75oC RATED TYPE THWN COPPER
15. WATER HEATER (IF APPLICABLE) TO HAVE LOCKABLE BREAKER OR PROVIDE DISCONNECTING MEANS WITHIN SIGHT OF W.H. PER NEC 422.21 (b)
16. RECEPTS UP 18" TO BOTTOM OF BOX.

ELECTRICAL FIELD NOTES:
1. ELECTRICAL SERVICE ENTRANCE CONDUCTORS TO BE PROVIDED AND INSTALLED ON SITE PER DEALER CONTRACTUAL AGREEMENT.
2. GROUNDING ELECTRODES TO BE PROVIDED AND INSTALLED ON SITE PER DEALER CONTRACTUAL AGREEMENT.

MECHANICAL:
1. VENTILATION AIR, EXHAUST FANS AND VENTING EQUIPMENT PROVIDED IN ACCORDANCE WITH APPLICABLE CODES.
2. EXHAUST FANS TO BE INSTALLED PER APPLICABLE CODES.
3. RETURN AIR VIA RETURN AIR DUCT OR THRU GRILLE AT UNIT.
3. RETURN AIR VIA CEILING CAVITY PLENUM.
4. MECHANICAL VENTILATION PER APPLICABLE CODES.
5. DUCT COVERINGS SHALL COMPLY WITH APPLICABLE CODES.
6. DUCTS SHALL BE CONSTRUCTED PER APPLICABLE CODES.

STRUCTURAL:
1. TRUSSES, IF INSTALLED, TO BE DESIGNED FOR REQUIRED LOADS AND APPLICATION.
2. INTERIOR PARTITIONS TO BE CONSTRUCTED TO WITHSTAND A 5 PSF HORIZONTAL FORCE.
3. ALL LUMBER TO BE GRADED AND MARKED.
4. COMPRESSION PLATES REQUIRED TO ENSURE WOOD TO WOOD CONTACT @ BEARING WALL TO ROOF JOINTS.
5. DADOS AND NOTCHING SHALL NOT OCCUR IN CENTER 1/3 OF LENGTH OF WALL STUDS STUDS
6. EXTERIOR BRACING MAY BE PROVIDED WITH WOOD SIDING, 7/16 HARDBOARD SIDING, 3/8" CDX PLYWOOD W/ EXTERIOR GLUES, OR ANY APPROVED STRUCTURAL GRADE SHEATHING.

DWV:
1. DWV PIPING TO BE SCHEDULE 40 PVC.
2. PVC PIPE TO BE SECURED @ 4'-0" O.C. HORIZONTALLY & 5'-0" O.C. VERTICALLY FOR 2" DIA. AND SMALLER PIPE OR 10'-0" O.C. VERTICALLY FOR PIPE LARGER THAN 2" DIA.
3. ALL CLEAN-OUTS SHALL BE ACCESSIBLE, PROVIDED @ THE BASE OF ALL WASTE AND SOIL STACKS, AND PROVIDED SO THAT ALL HORIZONTAL PIPING CAN BE REACHED BY A CLEANOUT TOOL WITHOUT PASSING THROUGH MORE THAN 45 DEGREES OF TURN.
4. HORIZONTAL BRANCH PIPES 2 1/2" AND SMALLER IN DIAMETER TO HAVE A MINIMUM 1/4" PER FOOT SLOPE; PIPES 3" TO 6" DIAMETER TO HAVE A MINIMUM OF 1/8" PER FOOT SLOPE.
5. VENTS SHALL BE A MINIMUM OF 3" IN DIAMETER FOR 12" ABOVE AND 24" BELOW ROOF AND SHALL NOT BE LOCATED WITHIN 10' HORIZONTALLY OF ANY BUILDING AIR INTAKE OPENING.
6. ALL VERTICAL TO HORIZONTAL OR HORIZONTAL TO HORIZONTAL CHANGE OF DIRECTION SHALL BE THROUGH A LONG TURN T-Y OR COMBINATION WYE AND EIGHTH BEND.
7. ALL HORIZONTAL TO VERTICAL CHANGE OF DIRECTION SHALL BE THROUGH A SANITARY TEE, OR IF @ THE SAME LEVEL ON A VERTICAL STACK, THROUGH AN APPROVED DOUBLE FIXTURE FITTING.
8. IN CONCEALED LOCATIONS AT PLUMBING PIPING, PROTECTIVE SHIELD PLATES SHALL BE INSTALLED THAT ARE A MINIMUM 1/16" THICK STEEL AND SHALL COVER THE AREA OF THE PIPE WHERE THE MEMBER IS NOTCHED OR BORED AND SHALL EXTEND A MINIMUM OF 2 INCHES ABOVE SOLE PLATES AND BELOW TOP PLATES.

SUPPLY:
1. WATER SUPPLY LINES TO BE PEX.
2. PEX PIPE 1" DIA., OR SMALLER, TO BE SECURED @ 2'-8" O.C. HORIZONTALLY.
   COPPER PIPE LARGER THAN 1" DIA., TO BE SECURED @ 4'-0" O.C. HORIZONTALLY.
   PEX PIPE 2" DIA., OR SMALLER, TO BE SECURED @ 5'-0" O.C. VERTICALLY.
   PEX PIPE LARGER THAN 2" DIA. TO BE SECURED @ 10'-0" O.C. VERTICALLY.
3. WATER TEMPERATURE FACTORY SET @ 120 DEGREES F. (CONTROLS BEHIND COVER PANEL.)
4. A SHUT-OFF VALVE IS REQUIRED FOR EACH FIXTURE.
5. WATER HAMMER ARRESTORS SHALL BE PROVIDED AS REQUIRED WITH QUICK-CLOSING VALVES.
6. WATER HEATER TO BE EQUIPPED WITH DRAIN COCK.
7. DIELECTRIC UNIONS TO BE USED @ CONNECTIONS OF WATER LINES TO WATER HEATER.
8. COLD WATER INLET TO HAVE A SHUT-OFF VALVE ABOVE FLOOR & NEAR WATER HEATER.
9. FULL SIZE SHUT-OFF VALVE TO BE PROVIDED BETWEEN BUILDING & WATER MAIN (METER).
10. SUPPLY SYSTEM DESIGNED FOR INLET PRESSURES OF 60 TO 80 PSI.
11. WATER HEATERS WITH BOTTOM AND/OR SIDE INLET SHALL HAVE A VACUUM RELIEF VALVE INSTALLED IN THE COLD WATER INLET LINE, LOCATED ABOVE THE TOP OF THE WATER HEATER, PER MANUFACTURER'S RECOMMENDED INSTRUCTIONS.
12. IN CONCEALED LOCATIONS AT PLUMBING PIPING, PROTECTIVE SHIELD PLATES SHALL BE INSTALLED THAT ARE A MINIMUM 1/16" THICK STEEL AND SHALL COVER THE AREA OF THE PIPE WHERE THE MEMBER IS NOTCHED OR BORED AND SHALL EXTEND A MINIMUM OF 2 INCHES ABOVE SOLE PLATES AND BELOW TOP PLATES.

FIELD NOTE:

1. ALL LINES REPRESENTED BY A BROKEN LINE ON SCHEMATIC DRAWINGS SHALL BE PROVIDED AND INSTALLED ON SITE PER DEALER CONTRACTURAL AGREEMENT.

No.	Description	Date

No.	Description	Date

WHITLEY MFG. CO. INC.
201 WEST FIRST STREET
P.O. BOX 496
SOUTH WHITLEY, IN 46787
PHONE: 260.723.5131
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Whitley East LLC
64 HESS ROAD
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Whitley Mfg. Co., Inc.
dba; Modular Builders
2756 & 3089
E. FORT WAYNE ROAD
P.O. BOX 505
ROCHESTER, IN 46975
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Drawn By:	RLH
Checked By:	AP/DL
Rev:	

COVER SHEET
MOBILE MODULAR
PATTENGILL BIOTECHNICAL MAGNET SCHOOL
(13) 72' X 13'-9" AND (5) 41'-6" X 13'-9" MODULES

Serial No. 5448-5465	Date: 3-5-24
Quote No. 50589C-18	Scale: 1/4" = 1'-0"
Model No. 8092	Page No. A0.0
Job No. 2024-005-WR	

4/5/2024 4:17:34 PM

A-FRAME

NOTE: FRAME(S) TO BE MIG WELDED, INCLUDING SPRING HANGER ATTACHMENT AND HITCH CONSTRUCTION
1 TYPE: PERIMETER
2 MAIN BEAM: W12"x14# BEAM
3 X-MEMBER: W10 X 12# @ 48" O.C.
5 HITCH: BOLT-ON
6 AXLES: AS REQUIRED
7 SPRINGS: MULTI-LEAF, OVERSLUNG w/ HANGERS AND AXLE ATTACHING PARTS(NO EQUALIZERS)
8 TIRES: 8:00 X 14.5, 14 PLY
9 MISC: I BEAM CLAMPS 15'-0" O.C. MAX. (SHIPLOOSE)
10 MISC: THIS UNIT WILL HAVE STEEL TUBE COLUMNS
11 UNDER COATING: RUST INHIBITIVE LATEX TYPE PAINT, BLACK: 100% COVERAGE OF STRUCTURAL MEMBERS.

B-FLOOR

1 BOTTOM BOARD: FS-25, CLASS A, SHEPWEAVE II
2 INSULATION: R-30 KRAFT FACED FIBERGLASS BATT
3 JOISTS: 2 x 8 (#2 SPF) AT 16-IN O.C. NOMINAL LONGITUDINAL JOISTS (NO WHEEL WELLS)
4 DECKING: 3/4" T&G UNDERLAYMENT PLYWOOD (RATED 48/24) (HOLD BACK DECKING 10 1/2" AT MATELINE)
5 COVERING: NONE
5a COVERING: EPOXY FLOORING WITH INTEGRAL BASE IN BATHS ONLY
COLOR: CRASHING WAVE

C-EXTERIOR WALLS

NOTE: AT OPEN MATELINE AREAS TO BE COVERED W/VISQUEEN, INSTALL PANELING STRIPS @ 2' O.C. VERTICALLY, FOR THE FIRST SIX-FEET LENGTH OF OPEN AREA.
NOTE: DO NOT REMOVE TEMPORARY ROOF BRACING SUPPORTS AT MODULE SIDES UNTIL MODULE IS SET ON PERMANENT FOUNDATION.
1 STUDS: 2 x 6 (SPF STUD) @ 16" O.C.
SIDE WALL HT: 9'-7 5/16" STUD LENGTH: 110 13/16 IN.
END WALL HT: 9'-7 5/16" STUD LENGTH: 110 13/16 IN.
W/DBL. STUDS EACH END OF SIDEWALLS (SPF #3).
SGL. JAMBSTUD AT DOORS & WINDOWS (SPF #2);
SGL. JACKSTUD UNDER WINDOW HEADERS (SPF #2);
DBL. JACKSTUD UNDER DOOR HEADERS (SPF #2);
W/ DBL. 2 x 4 HEADERS (SPF #2), [DBL. 2 x 6 (SPF #2) HEADERS IF OVER 48" ROUGH OPENING.]
NOTE: INSTALL CONTINUOUS BLOCKING BETWEEN STUDS UP 102" TO BOTTOM OF BLOCK
2 BOTTOM PLATE: (1) 2 x 6 (#3 SPF)
3 TOP PLATE: (2) 2x6 (#3 SPF)
NOTE: TRIPLE (2X_) TAPERS ABOVE SIDE WALLS TAPER FROM 9", TO 0" AT LOW END
4 COVERING: 1/2" VINYL COV. GYP. BOARD (CLASS I F.S.)
NOTE: MATCHING VINYL COVERED BATTENS AT VERTICAL SEAMS
COLOR: NORTHWOOD MINERAL
(HOLD BACK COVERING AT MATE LINE)
5 SHEATHING: 3/8" CDX PLYWOOD OR OSB (RATED 24/0)
5a SHEATHING: WATER/WEATHER-RESISTIVE BARRIER (TYVEK OR EQUAL)
NOTE: STAGGER SHEATHING SEAMS FROM INT. WALL COVERING SEAMS--SIDEWALLS ONLY.
6 INSULATION: R-21 KRAFT FACED FIBERGLASS BATT
6a INSULATION: (R-9.3) 1 1/2" RIGID FOAM INSULATION
7 SIDING: NONE (BY OTHERS ON SITE)
9 SKIRTING: NONE, SUPPLIED AND INSTALLED BY OTHERS ON SITE

D-INTERIOR WALLS

1 STUDS: 2 x 4 (SPF STUD) @ 16" O.C.
INT. WALL HT: 8'-6" STUD LENGTH: 97 1/2"
MT. WALL HT: 9'-7 5/16" STUD LENGTH: 110 13/16"
NOTE: CORRIDOR WALLS TO BE KNEWALLED TO UNDERSIDE OF ROOF TO FORM SMOKE COMPARTMENT
2 BOTTOM PLATE: (1) 2 x 4 (#3 SPF)
3 TOP PLATE: (2) 2 x 4 (#3 SPF)
4 COVERING: 1/2" VINYL COV. GYP. BOARD (CLASS I F.S.)
NOTE: MATCHING VINYL COVERED BATTENS AT VERTICAL SEAMS
COLOR: NORTHWOOD MINERAL
(HOLD BACK COVERING AT SEAM LINE)
4b COVERING: ALTRO TEGULIS SUBWAY PATTERN IN BATHS OVER 1/2" UNFINISHED GYPSUM
COLOR: 201 FLINT
5 INSULATION: R-11 UNFACED FIBERGLASS BATT

E-ROOF

1 RAFTERS: 2 x 10 (#2SPF) AT 16" O.C.
2 MATE BEAM: W10" x 22LB/FT MAX. SPAN: 30'
NOTE: INSTALL 12"L SECTIONS OF LUMBER IN WEB AS BLOCKING TO ATTACH ROOF SIDE RAIL
NOTE: 1/2" HOLES @ 32" O.C. IN BOTTOM FLANGE TO FASTEN SHIPPING WALLS
NOTE: 1/2" DIA HOLES 48" O.C. IN TOP FLANGE TO ATTACH SILL PLATE
BE PROTECTED w/ (2) LAYERS 5/8" TYPE-X GYPSUM BOARD (CLASS I F.S.)
4 CEILING: SUSPENDED T-GRID w/ 2'x 2' LAY-IN TILE
FINISH CEILING HT: 8'-6"
NOTE: CEILING TILE, GRID TEES, & WALL ANGLE FOR MATE LINE SHIPPED LOOSE FOR INSTALLATION BY OTHERS ON SITE.
NOTE: CEILING TILE, GRID TEES, & WALL ANGLE FOR CORRIDOR SHIPPED LOOSE FOR INSTALLATION BY OTHERS ON SITE.
5 TRUE CEILING: FS-25, CLASS A, SHEPWEAVE II, ATTACHED TO UNDERSIDE
5a TRUE CEILING: (2) LAYER 5/8" TYPE "X" UNFINISHED GYPSUM BOARD SMOKE COMPARTMENT(CORRIDOR ONLY)
NOTE: CUT OUT CEILING BOARD FOR PLYWOOD COMPRESSION PLATE ABOVE ANY BEARING WALL AND/OR COLUMN. COMPRESSION PLATE TO BE 1/8" THICKER THAN TOTAL CEILING THICKNESS.
6 INSULATION: R-38 UNFACED FIBERGLASS BATT
6a INSULATION: R-38 KRAFT FACED FIBERGLASS BATT (CORRIDOR)
7 SHEATHING: 7/16" OSB w/ MULE-HIDE FR ADHESIVE OR 7/16" CLASS C FR DECKING
8 ROOFING: EPDM RUBBER 1-PC. MEMBRANE, 45 mil, **BLACK**
11 VENTS: AURA VENT SYSTEM

F-DOORS

1 EXT. DOOR: 72"W X 84"H COMMERCIAL GLASS DOOR W/ SIDELITES
R.O. 110 1/4" X 88"
HARDWARE SET 1:
a: IVES (112XY EPT) CONTINUOUS HINGE
b: VON DUPRIN (EPT10 CON) POWER TRANSFER
c: VON DUPRIN(LX-RX-QEL-98-NL-OP-110MD-CON) ELECTRIC PANIC
d: BEST (1E72 (LESS CORE) RIM CYLINDER
e: SCHLAGE (80-035) SFIC CONST. CORE
f: IVES (VR914 NL) DOOR PULL
g: GLYNN-JOHNSON (100S) OVERHEAD STOP
h: LCN (4642) SURF. AUTO OPERATOR
i: LCN (8310-801) WEATHER RING
j: LCN (8310-853T) WALL MOUNT ACTUATOR)
k: LCN (8310-867S) SURFACE MOUNT BOX
l: ZERO INTERNATIONAL (8192AA) DOOR SWEEP
m: ZERO-INTERNATIONAL (655A) THRESHOLD
n: SCHLAGE (CON-XX/XXP) WIRE HARNESS
ELECTRIFIED HARDWARE TO POWER TRANSFER
o: SHLAGE (CON-192P) WIRE HARNESS
WIRE EXTENSION FROM POWER TRANSFER TO POWER SUPPLY
p: SENTINEL (1076D-G) DOOR CONTACT
q: VON DUPRIN (PS902 900-4RL) POWER SUPPLY
HARDWARE SET 2:
a: IVES (112XY EPT) CONTINUOUS HINGE
b: VON DUPRIN (EPT10 CON) POWER TRANSFER
c: VON DUPRIN(LX-RX-QEL-98-NL-OP-110MD-CON) ELECTRIC PANIC
d: BEST (1E72 (LESS CORE) RIM CYLINDER
e: IVES (VR914 NL) DOOR PULL
f: GLYNN-JOHNSON (100S) OVERHEAD STOP
g: LCN (4040XP EDA) CLOSER
h: LCN (4040XP-18PA) PA MOUNTING PLATE
i: LCN (4040XP-61) BLADE STOP SPACER
j: ZERO INTERNATIONAL (8192AA) DOOR SWEEP
k: ZERO-INTERNATIONAL (655A) THRESHOLD
l: SCHLAGE (CON-XX/XXP) WIRE HARNESS
ELECTRIFIED HARDWARE TO POWER TRANSFER
m: SHLAGE (CON-192P) WIRE HARNESS
WIRE EXTENSION FROM POWER TRANSFER TO POWER SUPPLY
n: SENTINEL (1076D-G) DOOR CONTACT
2 INT. DOOR: 72"W X 84"H COMMERCIAL GLASS DOOR W/ SIDELITES
R.O. 110 1/4" X 88"
HARDWARE SET 3:
a: IVES (112XY EPT) CONTINUOUS HINGE
b: VON DUPRIN (EPT10 CON) POWER TRANSFER
c: VON DUPRIN(LX-RX-QEL-98-NL-OP-110MD-CON) ELECTRIC PANIC
d: BEST (1E72 (LESS CORE) RIM CYLINDER
e: SCHLAGE (80-035) SFIC CONST. CORE
f: IVES (VR914 NL) DOOR PULL
g: GLYNN-JOHNSON (100S) OVERHEAD STOP
h: LCN (4642) SURF. AUTO OPERATOR
i: LCN (8310-853T) WALL MOUNT ACTUATOR)
k: LCN (8310-867S) SURFACE MOUNT BOX
l: SCHLAGE (CON-XX/XXP) WIRE HARNESS
ELECTRIFIED HARDWARE TO POWER TRANSFER
m: SHLAGE (CON-192P) WIRE HARNESS
WIRE EXTENSION FROM POWER TRANSFER TO POWER SUPPLY
n: SENTINEL (1076D-G) DOOR CONTACT
o: VON DUPRIN (PS902 900-4RL) POWER SUPPLY
p: LCN (4040XP EDA) CLOSER
q: LCN (4040XP-18PA) PA MOUNTING PLATE
r: LCN (4040XP-61) BLADE STOP SPACER
HARDWARE SET 4:
a: IVES (112XY EPT) CONTINUOUS HINGE
b: VON DUPRIN (EPT10 CON) POWER TRANSFER
c: VON DUPRIN(LX-RX-QEL-98-NL-OP-110MD-CON) ELECTRIC PANIC
d: BEST (1E72 (LESS CORE) RIM CYLINDER
e: SCHLAGE (80-035) SFIC CONST. CORE
f: IVES (VR914 NL) DOOR PULL
g: GLYNN-JOHNSON (100S) OVERHEAD STOP
h: LCN (4040XP EDA) CLOSER
i: LCN (4040XP-18PA) PA MOUNTING PLATE
j: LCN (4040XP-61) BLADE STOP SPACER
k: SCHLAGE (CON-XX/XXP) WIRE HARNESS
ELECTRIFIED HARDWARE TO POWER TRANSFER
l: SHLAGE (CON-192P) WIRE HARNESS
WIRE EXTENSION FROM POWER TRANSFER TO POWER SUPPLY
m: SENTINEL (1076D-G) DOOR CONTACT
3 INT. DOOR: 36"W X 80"H S.C. WOOD
R.O. 37 3/4"W X 80 3/4"H (STEEL JAMBS)
FRAME THROAT: 4 7/8"
FRAME COLOR: BROWNTONE
HARDWARE:
a: IVES (5BB1HW 4.5 X 4.5) HINGES
b: SCHLAGE (LV9070BDC 03A) CLASSROOM LOCK
b: GLYNN-JOHNSON (100S) OVERHEAD STOP
c: IVES (SR64) SILENCER
4 INT. DOOR: 36"W X 80"H S.C. WOOD
R.O. 37 3/4"W X 80 3/4"H (STEEL JAMBS)
FRAME THROAT: 4 5/8"
FRAME COLOR: BROWNTONE
HARDWARE:
a: IVES (5BB1HW 4.5 X 4.5) HINGES
b: SCHLAGE (LV9082BDC 03A) INSTITUTION LOCK
c: VON DUPRIN (6211 FSE CON) ELECTRIC STRIKE
d: LCN (4040XP RW/PA TBSRT) CLOSER
e: LCN (4040XP-18PA) PA MOUNTING PLATE
f: IVES (8400 10" X 2" LDW B-CS) KICK PLATE
g: IVES (WS406/407CVX) WALL STOP
h: IVES (SR64) SILENCER
i: SCHLAGE (CON-192P) WIRE HARNESS
WIRE EXTENSION FROM ELECTRIC STRIKE TO POWER SUPPLY
j: SENTINEL (1076D-G) DOOR CONTACT
5 INT. DOOR: 36"W X 80"H S.C. WOOD
R.O. 37 3/4"W X 80 3/4"H (STEEL JAMBS)
FRAME THROAT: 4 5/8"
FRAME COLOR: BROWNTONE
HARDWARE:
a: IVES (5BB1HW 4.5 X 4.5) HINGES
b: SCHLAGE (LV9082BDC 03A) STOREROOM LOCK
d: LCN (4040XP RW/PA TBSRT) CLOSER
f: IVES (8400 10" X 2" LDW B-CS) KICK PLATE
g: IVES (WS406/407CVX) WALL STOP
h: IVES (SR64) SILENCER
i: ZERO INTERNATIONAL(488S) GASKETING
6 INT. DOOR: 72"W X 80"H S.C. WOOD
R.O. 73 3/4" X 80 3/4" (STEEL JAMBS)
FRAME THROAT: 4 5/8"
w/ 5"X20" VISION PANEL (SAFETY GLAZED)
FRAME COLOR: BROWNTONE
HARDWARE:
a: IVES (224XY) CONTINUOUS HINGE
b: VON DUPRIN (KR4954 STAB) REMOVABLE MULLION
c: VON DUPRIN (LD-98-EO) PANIC HARDWARE
d: BEST (IE74 LESS CORE) MORTISE CYLINDER
e: LCN (4040XP EDA TBSRT) CLOSER
f: LCN (4040XP-18 PA) PA MOUNTING PLATE
IVES (8400 10" X 2" LDW B-CS) KICK PLATE
h: LCN (4040XP RW/PA TBSRT) CLOSER
i: IVES (SR64) SILENCER

F-DOORS CONT.:

7 EXT. DOOR: 36"W X 80"H FLUSH FRP DOOR IN ALUMINUM FRAME
R.O. 37 3/4"W X 80 3/4" FRAME THROAT: 6 3/4"
HARDWARE:
a: IVES (112XY) CONTINUOUS HINGE
b: SCHLAGE (L9024 03A) EXIT LOCK
c: GLYNN-JOHNSON (100S) OVERHEAD STOP
d: LCN (4040XP EDA) SURFACE CLOSER
e: LCN (4040XP-61) BLADE STOP SPACER
f: ZERO-INTERNATIONAL (8192AA) DOOR SWEEP
g: ZERO-INTERNATIONAL (655 A) THRESHOLD
h: SENTINEL (1076D-G) DOOR CONTACT
8 INT. DOOR: 36"W X 80"H S.C. WOOD
R.O. 37 3/4"W X 80 3/4"H (STEEL JAMBS)
FRAME THROAT: 4 5/8"
FRAME COLOR: BROWNTONE
HARDWARE:
a: IVES (5BB1HW 4.5 X 4.5) HINGES
b: SCHLAGE (LV9070BDC 03A) CLASSROOM LOCK
d: SCHLAGE (AD300-MS-70-MT-TLR-B) ELECTRIC CLASSROOM LOCK (PROVIDED BY ACCESS CONTROL CONTRACTOR)
e: LCN (4040XP RW/PA TBSRT) CLOSER
f: LCN (4040XP-18PA) PA MOUNTING PLATE
g: IVES (8400 10" X 2" LDW B-CS) KICK PLATE
h: IVES (WS406/407CVX) WALL STOP
i: ZERO INTERNATIONAL(488S) GASKETING
9 INT. DOOR: 36"W X 80"H S.C. WOOD
R.O. 37 3/4"W X 80 3/4"H (STEEL JAMBS)
FRAME THROAT: 4 5/8"
FRAME COLOR: BROWNTONE
HARDWARE:
a: IVES (5BB1HW 4.5 X 4.5) HINGES
b: SCHLAGE (LV9070BDC 03A) CLASSROOM LOCK
d: GLYNN-JOHNSON (100S) OVERHEAD STOP
e: LCN (4040XP RW/PA TBSRT) CLOSER
f: LCN (4040XP-18PA) PA MOUNTING PLATE
g: IVES (8400 10" X 2" LDW B-CS) KICK PLATE
i: IVES (SR64) SILENCER
10 INT. DOOR: 36"W X 80"H S.C. WOOD
R.O. 37 3/4"W X 80 3/4"H (STEEL JAMBS)
FRAME THROAT: 4 5/8"
FRAME COLOR: BROWNTONE
HARDWARE:
a: IVES (5BB1HW 4.5 X 4.5) HINGES
b: SCHLAGE (LV9456BDC 03A 09-544 OS-OCC) CORRIDO W/DEADBOLT AND OUTSIDE INDICATOR
c: LCN (4040XP RW/PA TBSRT) CLOSER
d: LCN (4040XP-18PA) PA MOUNTING PLATE
e: IVES (8400 10" X 2" LDW B-CS) KICK PLATE
f: IVES (WS406/407CVX) WALL STOP
g: ZERO INTERNATIONAL(488S) GASKETING
11 INT. DOOR: 36"W X 80"H S.C. WOOD
R.O. 37 3/4"W X 80 3/4"H (STEEL JAMBS)
FRAME THROAT: 4 5/8"
FRAME COLOR: BROWNTONE
HARDWARE:
a: IVES (5BB1HW 4.5 X 4.5) HINGES
b: SCHLAGE (LV9070BDC 03A) CLASSROOM LOCK
c: GLYNN-JOHNSON (100S) OVERHEAD STOP
c: LCN (4040XP SCUSH TBSRT) CLOSER
e: IVES (8400 10" X 2" LDW B-CS) KICK PLATE
g: ZERO INTERNATIONAL(488S) GASKETING
12 CASED OPENING: 43 3/4"W X 83 3/4"H

G-WINDOWS:

1 SIZE: 48"W X 48"H H.S.
R.O. 48 1/2"W X 48 1/4"H, UP: 32"
ALUMINUM FRAME
GLAZING: DOUBLE INSULATED - CLEAR
MISC: NO BLINDS
MISC: INSECT SCREENS

H-ELECTRICAL:

1 PANELBOARD: 208/120 V,3-PH, 60Hz,4-WIRE MAIN SIZED AS REQUIRED
2 SERV. ENT.: 2" CONDUIT STUBBED THRU FLOOR
3 WIRING: MC CABLE w/ INTERLOCKING TAPE SHEATH (#12 MIN WIRE SIZE) - TYPE THHN 90oC
3a CROSS-SEAM WIRING: PIGTAIL AND JUNCTION BOX
4 INT. LIGHTS: 24" x 48" L.E.D. (LAY-IN) w/ DIFFUSER AND EMERGENCY BALAST
5 INT. LIGHTS: 24" x 48" L.E.D. (LAY-IN) w/ DIFFUSER
6 EXT. LIGHTS: LED WALL PACK (WEATHERPROOF) - UP 74"TO BOTTOM
7 EGRESS LIGHTS: EXIT/EMERGENCY LIGHT W/ BATTERY PACK & EXTERIOR REMOTE HEAD (W.P.) - UP 84" TO BOTTOM
NOTE: EXT. HEAD SHIPPED LOOSE, FOR INSTALLATION BY OTHERS ON SITE.
8 RECEPTS: 125V/20A DUPLEX UP 18" TO BOTTOM OF BOX UNLESS NOTED
9 RECEPTS: 125V/20A DUPLEX GFCI - UP 18" TO BOTTOM OF BOX UNLESS NOTED OTHER-WISE
10 HEAT TAPE RECPT: 125V/20A DUPLEX GFI (DEDICATED), INSTALLED BELOW FLOOR
11 RECEPTS: 125V/20A QUAD - UP 18" TO BOTTOM OF BOX UNLESS NOTED OTHER-WISE
NOTE: ALL RECEPTS ARE TO BE GROUNDING TYPE
12 SWITCHES: 120V/20A SINGLE POLE - UP 44" TO BOTTOM
13 SWITCHES: 120V/20A 3-WAY - UP 44" TO BOTTOM
14 SWITCHES: 120V OCCUPANCY/VACANCY SENSOR, WALL-MOUNTED - UP 44" TO BOTTOM
15 SWITCHES: 120V OCCUPANCY/VACANCY SENSOR, CEILING-MOUNTED
16 DATA DROPS: 2x4 JUNCTION BOX, UP 18"TO BOTTOM, UNLESS OTHER-WISE NOTED w/ 1/2" EMT TO CEILING CAVITY
17 DATA DROPS: 2x4 JUNCTION BOX, UP 42" TO BOTTOM, FOR SOUND FIELD DEVICES w/ 1/2" EMT TO CEILING CAVITY
18 DATA DROPS: 2x4 JUNCTION BOX, UP 96" TO BOTTOM, FOR DIGITAL CLOCK w/ 1/2" EMT TO CEILING CAVITY
19 DATA DROPS: 2x4 JUNCTION BOX, UP 84" TO BOTTOM, FOR PROJECTOR w/ 1/2" EMT TO CEILING CAVITY
20 DATA DROPS: 2x4 JUNCTION BOX, UP 96" TO BOTTOM, FOR SECURITY CAMERA w/ 1/2" EMT TO CEILING CAVITY
21 DATA DROPS: 2x4 JUNCTION BOX, UP 42" TO BOTTOM, FOR VIDEO INTERCOM w/ 1/2" EMT TO CEILING CAVITY
22 DATA DROPS: 2x4 JUNCTION BOX, UP 120" TO BOTTOM, FOR PA SPEAKER w/ 1/2" EMT TO CEILING CAVITY
23 DATA DROPS: 2x4 JUNCTION BOX, UP 120" TO BOTTOM, FOR PA HORN w/ 1/2" EMT TO CEILING CAVITY
24 CARD READER: 2x4 JUNCTION BOX, UP 42" TO BOTTOM, FOR PA HORN w/ 1/2" EMT TO CEILING CAVITY
25 PUSH BUTTON: 2x4 JUNCTION BOX, UP 42" TO BOTTOM, FOR PA HORN w/ 1/2" EMT TO CEILING CAVITY
26 FIRE ALARM: REMOTE POWER SUPPLY UP 44" TO BOTTOM
27 FIRE ALARM: ROUGH-IN ONLY FOR PULL STATION -- 2x4 BOX UP 44" TO BOTTOM, w/3/4" CONDUIT TO CEILING CAVITY
28 FIRE ALARM: ROUGH-IN ONLY FOR AUDIO/VISUAL DEVICE -- 4x4 BOX UP 80" TO BOTTOM, w/ 1/2" EMT
29 MISC: 2" CONDUIT STUBBED THRU WALL
NOTE: SEE FIRE ALARM PLAN FOR EMT SIZE(S) & LAYOUT
NOTE: FIRE ALARM SYSTEM TO BE PROVIDED AND INSTALLED ON SITE BY OTHERS, NOT BY FACTORY.
NOTE: ALL CONDUIT ROUGH-INS TO HAVE PULL WIRES INSTALLED.

J-PLUMBING:

1 WTR CLST: TANK TYPE (HANDICAPPED) W/ ELONGATED BOWL AND OPEN FRONT SEAT - UP 18" TO SEAT w/ AUTOMATIC FLUSH CONTROL
2 MOD PART: SOLID PLASTIC FLOOR MOUNTED OVERHEAD BRACED
2a MOD PART: **COLOR: 3010 DOVE GRAY**
3 URINAL SCREEN: SOLID PLASTIC DEPTH-24"
COLOR: 3010 DOVE GRAY
4 URINAL: WALL HUNG w/ FLUSH VALVE & INTEGRAL TRAP
5 LAVATORY: CHINA WALL HUNG UP 34" TO RIM
NOTE: SINGLE-FIXTURE TEMPERING VALVE REQUIRED FOR ALL ACCESSIBLE HAND WASHING FACILITIES; MAX. WATER TEMPERATURE 110oF
6 WTR HTR: 40 GALLON ELECTRIC (4500W./ 208V.)
NOTE: WATER HEATER INLET & OUTLET CONNECTIONS SHALL HAVE A DIELECTRIC UNITON AND SHUT OFF VALVE.
NOTE: WATER HTR. TO HAVE A 2-GAL. EXPANSION TANK
9 SUPPLY: PEX
NOTE: INSULATE HOT WATER & HOT WATER RETURN PIPING; INSULATE COLD WATER PIPING IN CEILING CAVITY
10 DWV: SCHEDULE 40 PVC
14 MISC. GRAB BARS (SEE FLOOR PLAN)
SIDE BAR: 42"L. BACK BAR: 36"L. VERTICAL BAR: 18"L.
HORIZONTAL GRAB BARS ARE UP 33"H TO 36"H TO TOP;
VERTICAL BAR IS UP 39" - 41" TO BOTTOM
16 MISC: 18"Wx36"H STAINLESS STEEL EDGED MIRROR - UP 38"
17 MISC: TOILET PAPER DISPENSER - UP 24"
19 MISC: FIBERGLASS MOP BASIN
20 MISC: PVC FLOOR DRAIN 3" DIA. WITH TRAP PRIMER

K-H.V.A.C.

1 HEAT/COOL: (10) 3 TON PACKAGE UNIT, 12EER/14SEER, 208/230V 3 PHASE 50 MBH GAS(CLASSROOMS)
(1) 3 TON PACKAGE UNIT, 12EER/14SEER, 208/230V 3 PHASE 100 MBH GAS(RESTROOM/CORRIDOR)
(1) 7.5 TON HP 230-3-60 180 MBH GAS (CAFETERIA)
(1) 3 TON PACKAGE UNIT, 12EER/14SEER, 208/230V 3 PHASE 50 MBH GAS(OFFICE)
3 PHASE ROOF MOUNT A/C W/ NATURAL GAS HEAT (UNIT WILL SHIPLOOSE W/ PERMANENT CURB AND FLASHING FOR INSTALLATION BY OTHERS AT THE SITE. ALL ACCESSORIES (INCLUDING HEAT STRIPS) WILL BE SHIPPED LOOSE AND WILL NEED TO BE SITE INSTALLED ALONG WITH START-UP, TESTING, AND BALANCING OF THE SYSTEM BY CUSTOMERS HVAC SUB-CONTRACTOR.)
ALL GAS LINES TO BE BY OTHERS
3 SUPPLY DUCT: SINGLE 13/16" FIBERGLASS DUCTBOARD IN ROOF
4 DIFFUSERS: 24" X 24" LAY-IN w/ADJ. DAMPER (CEILING)
5 RETURN AIR DUCT: 13/16" FIBERGLASS TRANSFER DUCT IN CEILING
6 GRILLES: 24" X 24" LAY-IN (NO DAMPER)
8 EXH. FAN: 75 CFM
8a EXH. FAN: 300 CFM
9 GRILLES: 24" X 24" LAY-IN
11 THERMOSTAT: FOR CENTRAL H.V.A.C. UNIT - UP 48" PROGRAMMABLE,
12 MISC: CO2 SENSOR - UP 48"
13 MISC: GALVANIZED DUCT AND FIRE/SMOKE DAMPERS AS REQUIRED

L-FURNITURE & INTERIOR FURNISHINGS:

1 FIRE EST. CSST-010201 SURFACE MOUNTED FIRE ESTINGUISHER CABINET
4" DEEP W/ FULL ACRYLIC WINDOW WITH LOCK UP 35 1/2" TO BOTTOM
COLOR: WHITE

TRIM PACKAGE #3 (VINYL GYPSUM W/ VINYL COVE BASE)

BASE MOLDING: NONE
INSIDE CORNER: VINYL COVERED (MATCH GYPSUM)
OUTSIDE CORNER: VINYL COVERED TRI-MOLD (MATCH GYPSUM)
WALL @ CEILING: 1 1/4" RANCH MOLDING (PRE-PAINTED)
WALL @ CEILING: SUSPENDED CEILING WALL ANGLE, WHITE
PANEL SEAMS (WALLS): VINYL COVERED (MATCH GYPSUM)
CEILING: NONE
CEILING: SUSPENDED CEILING TEE GRID, WHITE
INT. DOOR JAMB/TRIM: PAINTED STEEL,
COLOR: BROWNTONE
EXT. DOOR JAMB/TRIM: PAINTED STEEL,
COLOR: BROWNTONE
DOOR JAMBS: 5/8" PAINTED MDO STOCK
WINDOW TRIM: 2 1/4" RANCH MOLDING (PRE-PAINTED)
ALL PRE-PAINTED WOOD **COLOR: #C[illegible] GRAY OR WHITE**

No.	Description	Date

No.	Description	Date

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Drawn By:	RLH
Checked By:	AP/DL
Rev:	

SPECIFICATIONS

MOBILE MODULAR
PATTENGILL BIOTECHNICAL MAGNET SCHOOL
(13) 72' X 13'-9" AND (5) 41'-6" X 13'-9" MODULES

Serial No.	5448-5465
Quote No.	50589C-18
Model No.	8092
Job No.	2024-005-WR
Date:	3-5-24
Scale:	1/4" = 1'-0"
Page No.	A0.1

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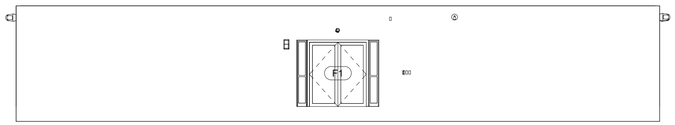
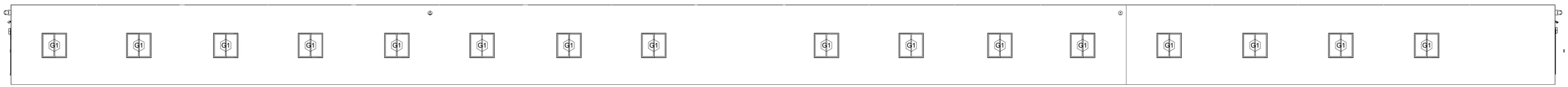


1 South Elevation
1/8" = 1'-0"



2 East Elevation
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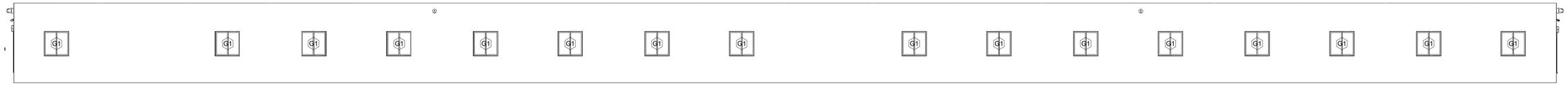
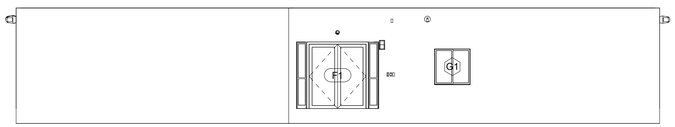


3 West Elevation
1/8" = 1'-0"



4 North Elevation
1/8" = 1'-0"

MODULAR DRAWINGS -FOR REFERENCE

No.	Description	Date

No.	Description	Date

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Drawn By: RLH
Checked By: AP/DL
Rev:

EXTERIOR ELEVATIONS

MOBILE MODULAR
PATTENGILL BIOTECHNICAL MAGNET SCHOOL
(13) 72' X 13'-9" AND (5) 41'-6" X 13'-9" MODULES

Serial No. 5448-5465	Date: 3-5-24
Quote No. 50589C-18	Scale: 1/8" = 1'-0"
Model No. 8092	Page No.
Job No. 2024-005-WR	A1.0

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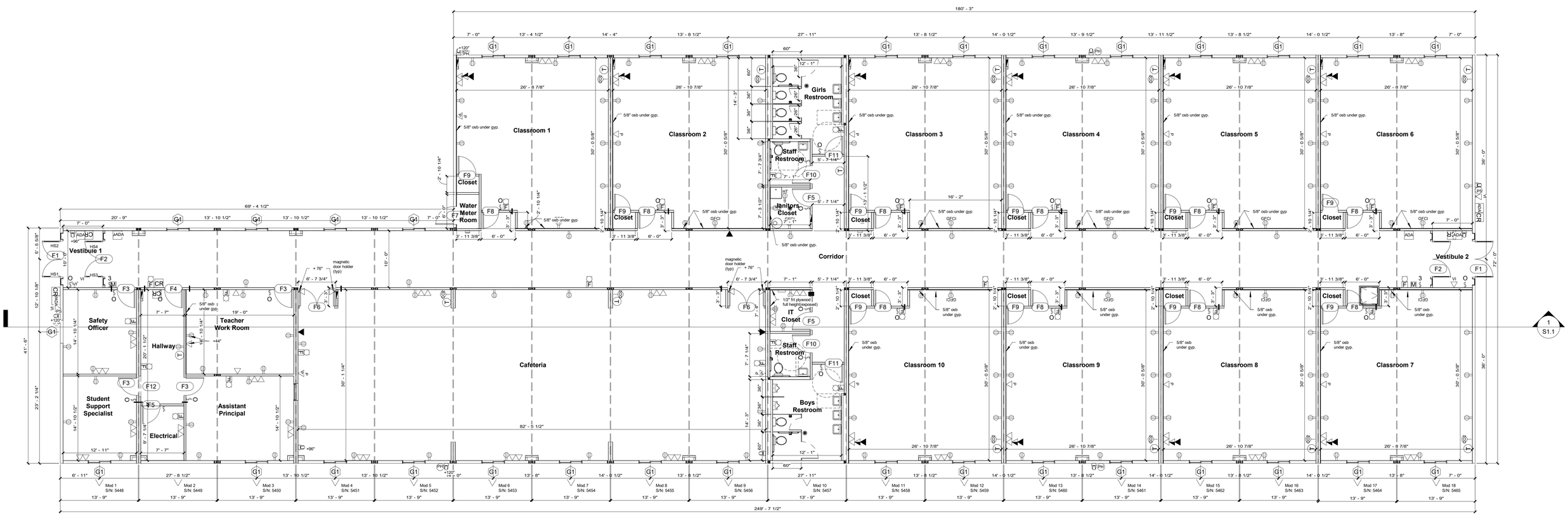
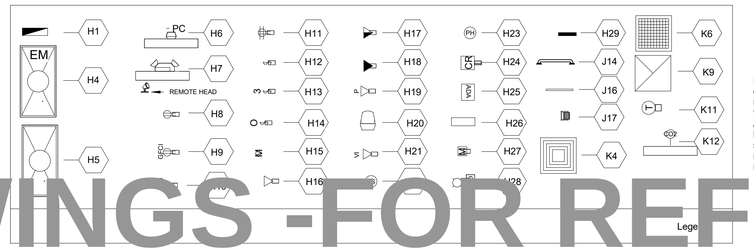


1 Floor Plan
1/8" = 1'-0"



Note: Identification hexagons on the drawings and in the symbol legend correspond to the project specifications (Sht A0.0). The letter in the hexagon matches the specification section, the number in the hexagon matches the section number.

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No.	Description	Date

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Drawn By:	RLH
Checked By:	AP/DL
Rev:	

FLOOR PLAN
MOBILE MODULAR
PATTENGILL BIOTECHNICAL MAGNET SCHOOL
(13) 72' X 13'-9" AND (5) 41'-6" X 13'-9" MODULES

Serial No.	5448-5465
Quote No.	50589C-18
Model No.	8092
Job No.	2024-005-WR
Date:	3-5-24
Scale:	As indicated
Page No.	A2.1

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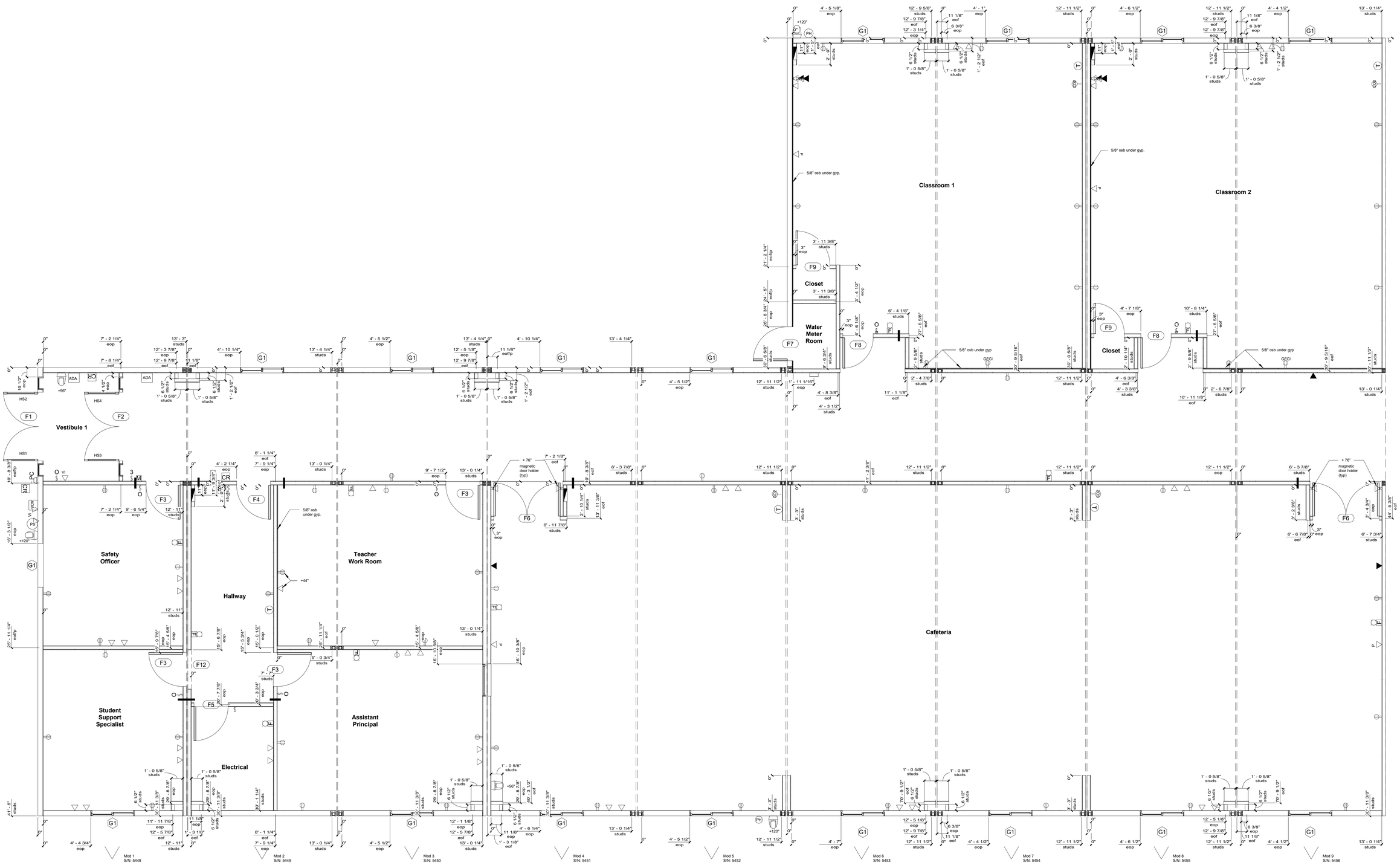

MODULAR DRAWINGS -FOR REFERENCE

1 Production Floor Plan Mods 1-9
1/4" = 1'-0"

No.	Description	Date

No.	Description	Date

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Drawn By:	RLH
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Rev:	

PRODUCTION FLOOR PLAN MODS 1-9

MOBILE MODULAR
PATTENGILL BIOTECHNICAL MAGNET SCHOOL
(13) 72' X 13'-9" AND (5) 41'-6" X 13'-9" MODULES

Serial No.	5448-5465
Quote No.	50589C-18
Model No.	8092
Job No.	2024-005-WR
Date:	3-5-24
Scale:	1/4" = 1'-0"
Page No.	A2.2

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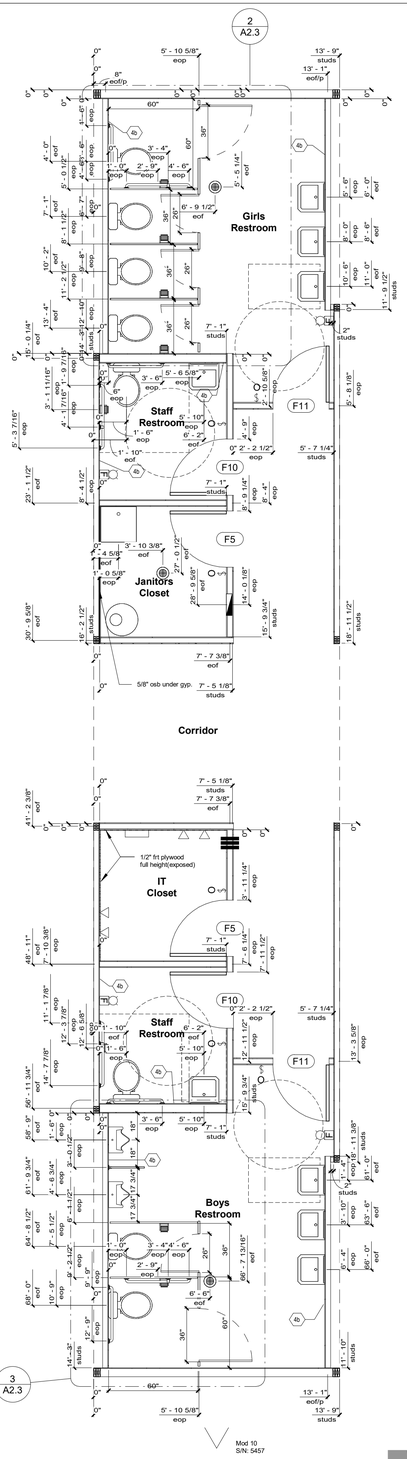
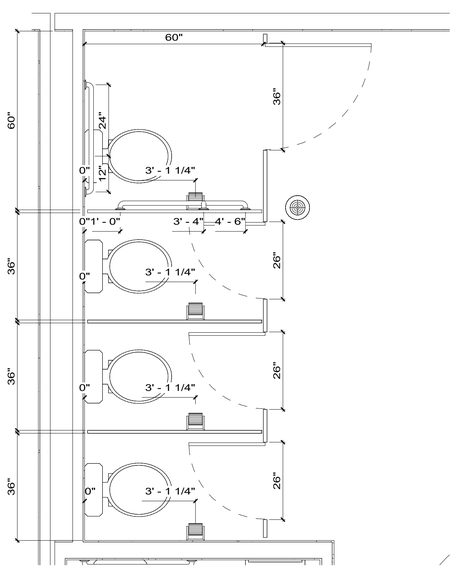
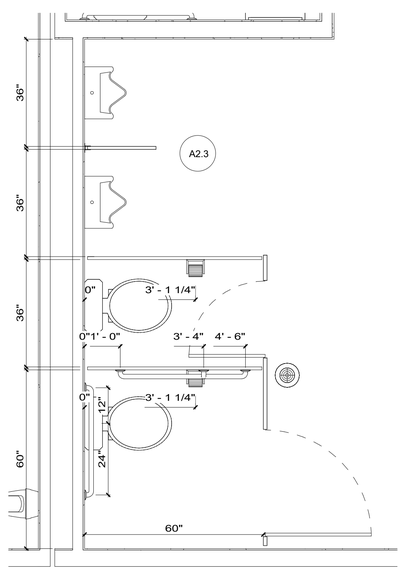


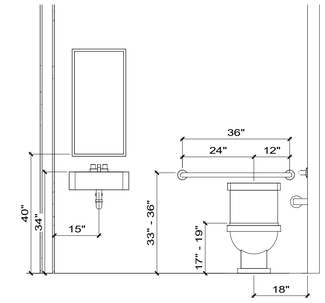
1 Production Floor Plan Mod 10
1/4" = 1'-0"



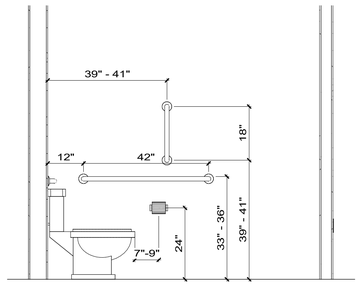
2 Girls Modesty Detail
1/2" = 1'-0"



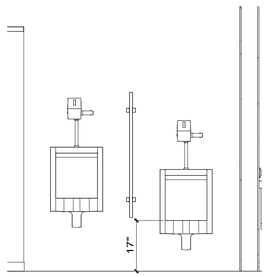
3 Boys Modesty Detail
1/2" = 1'-0"



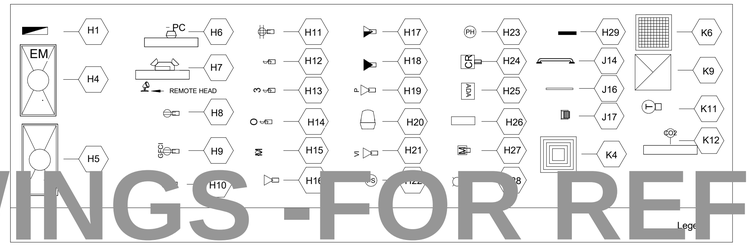
4 ADA Rearwall Elevation
1/2" = 1'-0"



5 ADA Sidewall Elevation
1/2" = 1'-0"



6 Urinal Elevation
1/2" = 1'-0"



Note: Identification hexagons on the drawings and in the symbol legend correspond to the project specifications (Shit A0.0). The letter in the hexagon matches the specification section, the number in the hexagon matches the section number.

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Checked By:	AP/DL
Rev:	

PRODUCTION FLOOR PLAN MOD 10

MOBILE MODULAR
PATTENGILL BIOTECHNICAL MAGNET SCHOOL
(13) 72' X 13'-9" AND (5) 41'-6" X 13'-9" MODULES

Serial No.	5448-5465
Quote No.	50589C-18
Model No.	8092
Job No.	2024-005-WR
Date:	3-5-24
Scale:	As indicated
Page No.	A2.3

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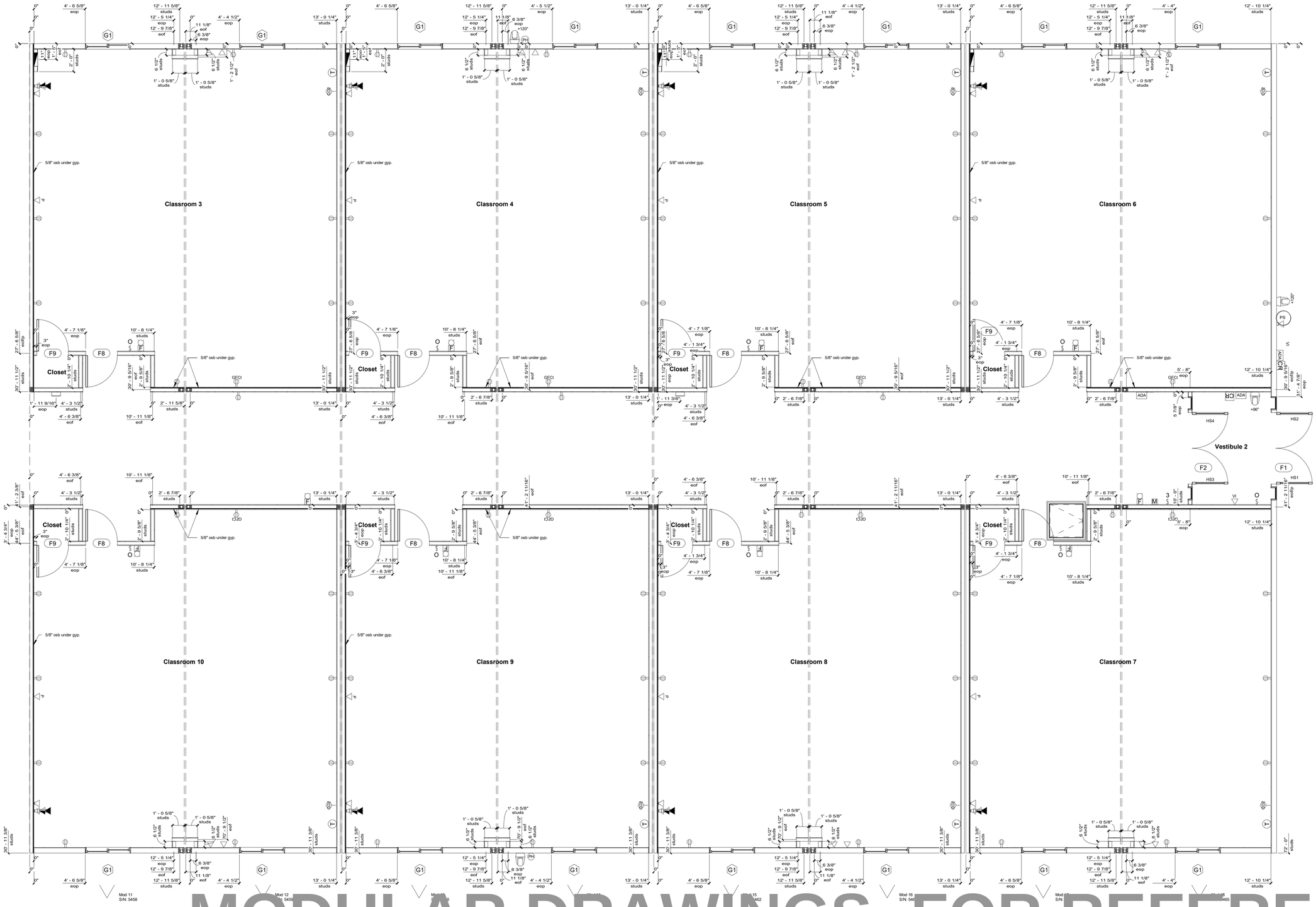

1 Production Floor Plan Mods 11-18
1/4" = 1'-0"

No.	Description	Date

No.	Description	Date

WHITLEY MFG. CO. INC.
201 WEST FIRST STREET
P.O. BOX 496
SOUTH WHITLEY, IN 46787
PHONE: 260.723.5131
FAX: 260.723.6396
www.whitleyman.com

Whitley East LLC
64 HESS ROAD
LEOLA, PA 17540
PHONE: 717.656.2081

Whitley Mfg. Co., Inc.
dba: Modular Builders
2756 & 3089
E. FORT WAYNE ROAD
P.O. BOX 505
ROCHESTER, IN 46975
PHONE: 574.223.4934

Drawn By:	RLH
Checked By:	AP/DL
Rev:	

PRODUCTION FLOOR PLAN MODS 11-18
MOBILE MODULAR
PATTENGILL BIOTECHNICAL MAGNET SCHOOL
(13) 72' X 13'-9" AND (5) 41'-6" X 13'-9" MODULES

Serial No.	5448-5465
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Model No.	8092
Job No.	2024-005-WR
Date:	3-5-24
Scale:	1/4" = 1'-0"
Page No.	A2.4

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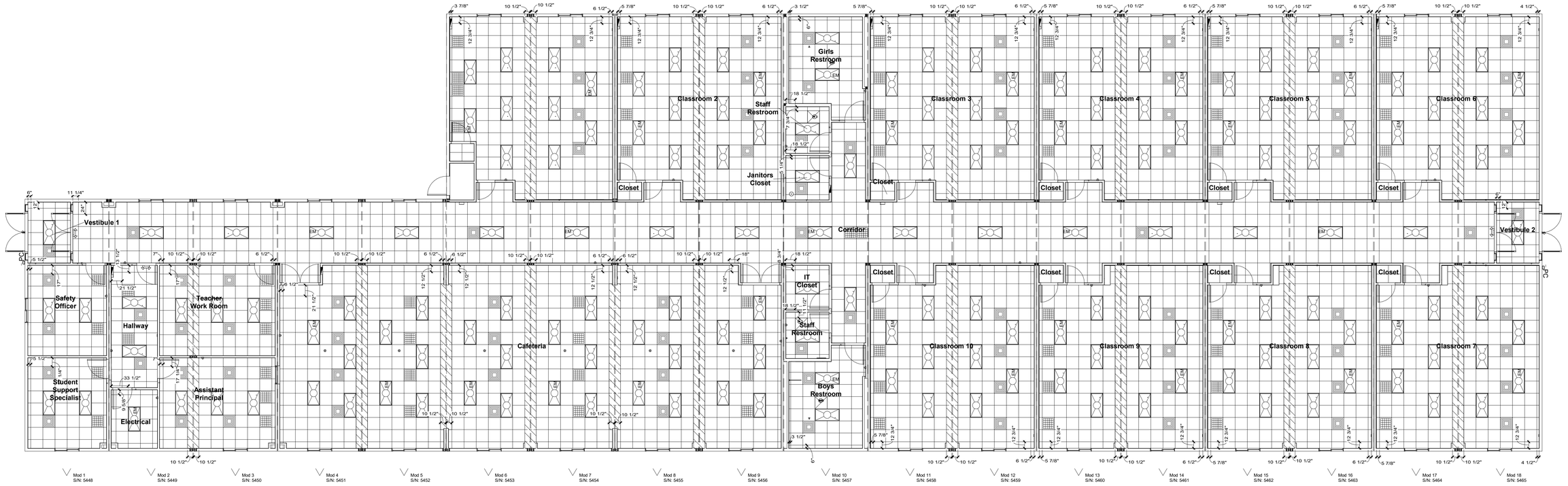
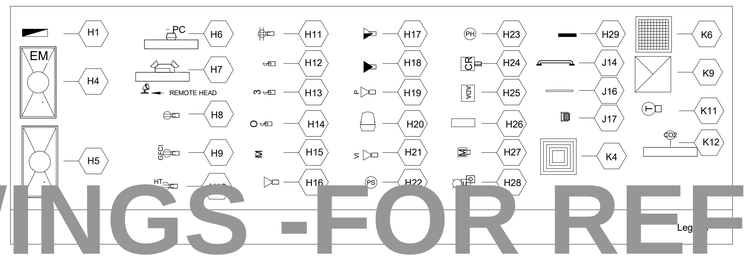


1 Ceiling Plan
1/8" = 1'-0"



Note: Identification hexagons on the drawings and in the symbol legend correspond to the project specifications (Shit A0.0). The letter in the hexagon matches the specification section, the number in the hexagon matches the section number.

No.	Description	Date

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Drawn By:	RLH
Checked By:	AP/DL
Rev:	

REFLECTIVE CEILING PLAN

MOBILE MODULAR
PATTENGILL BIOTECHNICAL MAGNET SCHOOL
(13) 72' X 13'-9" AND (5) 41'-6" X 13'-9" MODULES

Serial No.	5448-5465
Quote No.	50589C-18
Model No.	8092
Job No.	2024-005-WR
Date:	3-5-24
Scale:	As indicated
Page No.	A3.1

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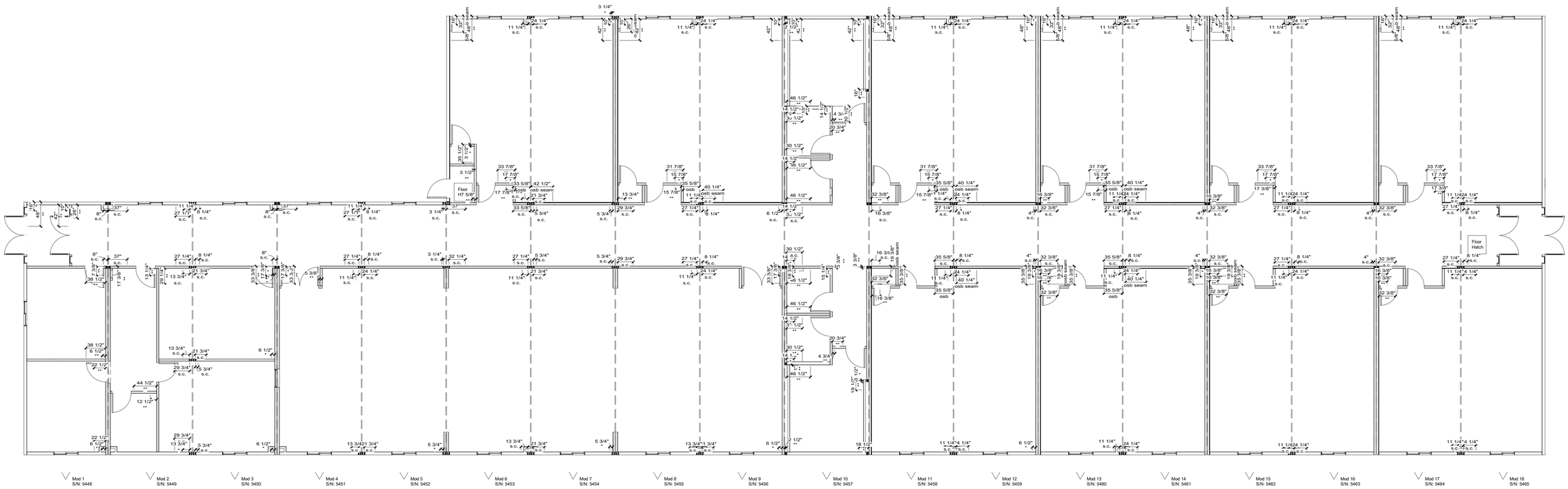

1 Gyp Seam Plan
1/8" = 1'-0"

MODULAR DRAWINGS -FOR REFERENCE

No.	Description	Date

No.	Description	Date

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Drawn By:	RLH
Checked By:	AP/DL
Rev:	

SEAM CLOSURE FLOOR PLAN

MOBILE MODULAR
PATTENGILL BIOTECHNICAL MAGNET SCHOOL
(13) 72' X 13'-9" AND (5) 41'-6" X 13'-9" MODULES

Serial No. 5448-5465	Date: 3-5-24
Quote No. 50589C-18	Scale: 1/8" = 1'-0"
Model No. 8092	Page No.
Job No. 2024-005-WR	A4.1

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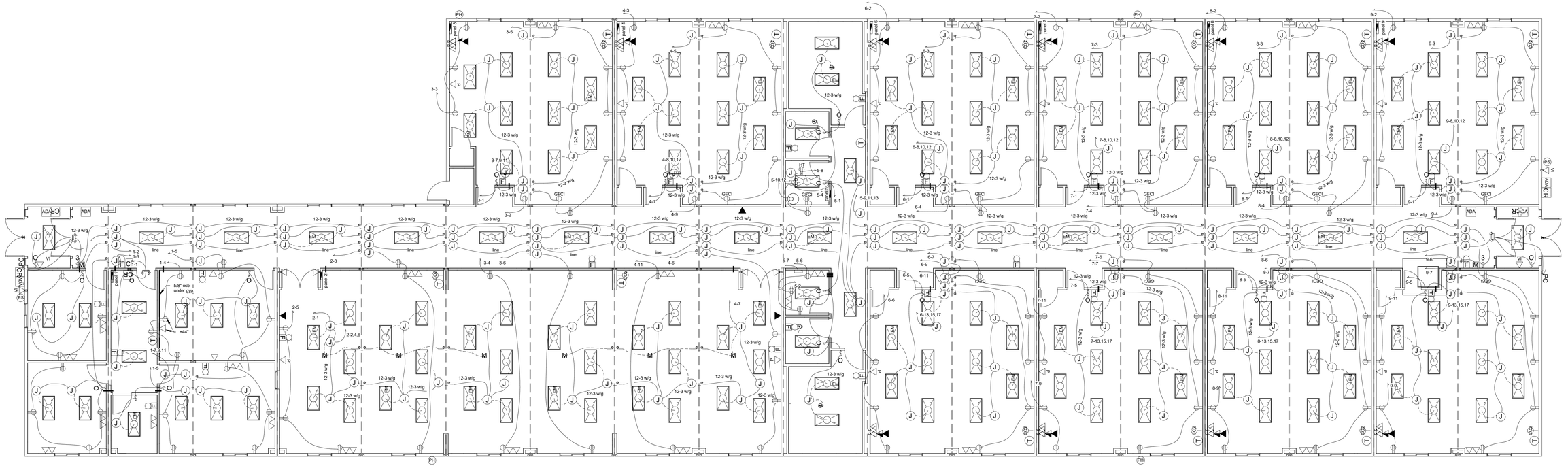
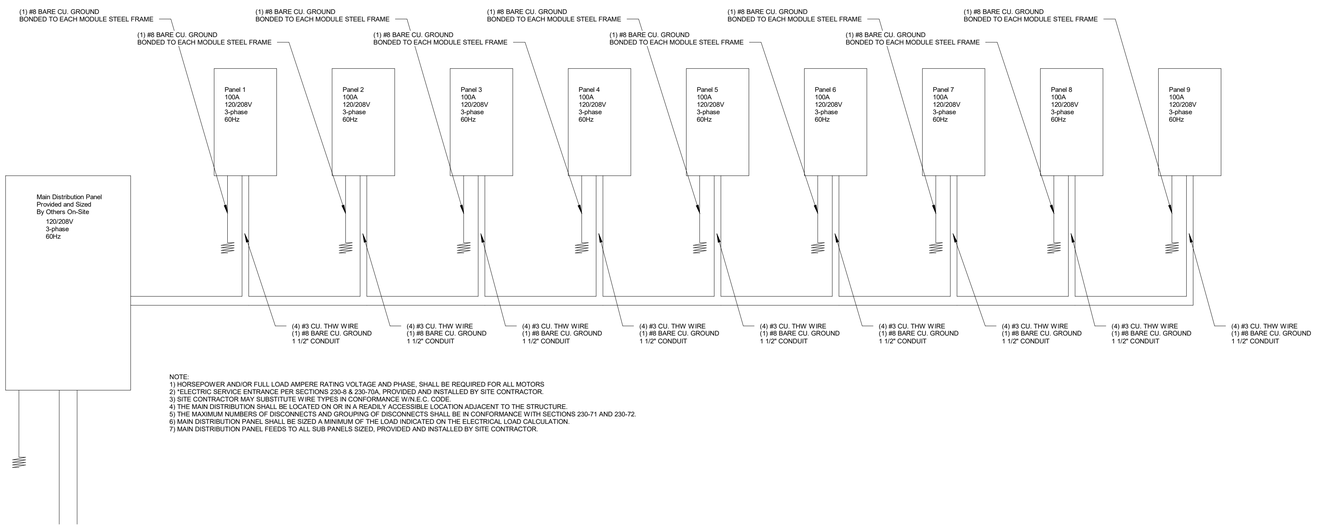
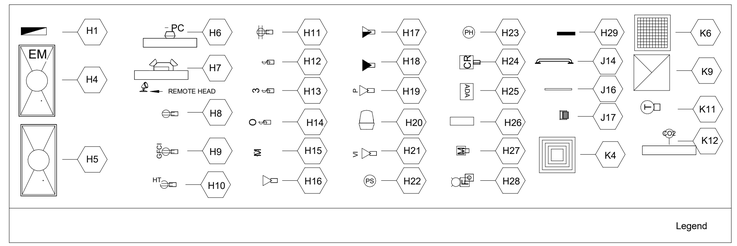


1 Electrical Plan
1/8" = 1'-0"



NOTE:
1) HORSEPOWER AND/OR FULL LOAD AMPERE RATING VOLTAGE AND PHASE, SHALL BE REQUIRED FOR ALL MOTORS
2) "ELECTRIC SERVICE ENTRANCE PER SECTIONS 230-8 & 230-70A, PROVIDED AND INSTALLED BY SITE CONTRACTOR.
3) SITE CONTRACTOR MAY SUBSTITUTE WIRE TYPES IN CONFORMANCE W.N.E.C. CODE.
4) THE MAIN DISTRIBUTION SHALL BE LOCATED ON OR IN A READILY ACCESSIBLE LOCATION ADJACENT TO THE STRUCTURE.
5) THE MAXIMUM NUMBERS OF DISCONNECTS AND GROUPING OF DISCONNECTS SHALL BE IN CONFORMANCE WITH SECTIONS 230-71 AND 230-72.
6) MAIN DISTRIBUTION PANEL SHALL BE SIZED A MINIMUM OF THE LOAD INDICATED ON THE ELECTRICAL LOAD CALCULATION.
7) MAIN DISTRIBUTION PANEL FEEDS TO ALL SUB PANELS SIZED, PROVIDED AND INSTALLED BY SITE CONTRACTOR.

2 Riser Diagram
3/4" = 1'-0"



Note: Identification hexagons on the drawings and in the symbol legend correspond to the project specifications (Sht A0.0). The letter in the hexagon matches the specification section, the number in the hexagon matches the section number.

MODULAR DRAWINGS -FOR REFERENCE

No.	Description	Date

No.	Description	Date

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Drawn By:	RLH
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ELECTRICAL PLAN
MOBILE MODULAR
PATTENGILL BIOTECHNICAL MAGNET SCHOOL
(13) 72' X 13'-9" AND (5) 41'-6" X 13'-9" MODULES

Serial No.	5448-5465
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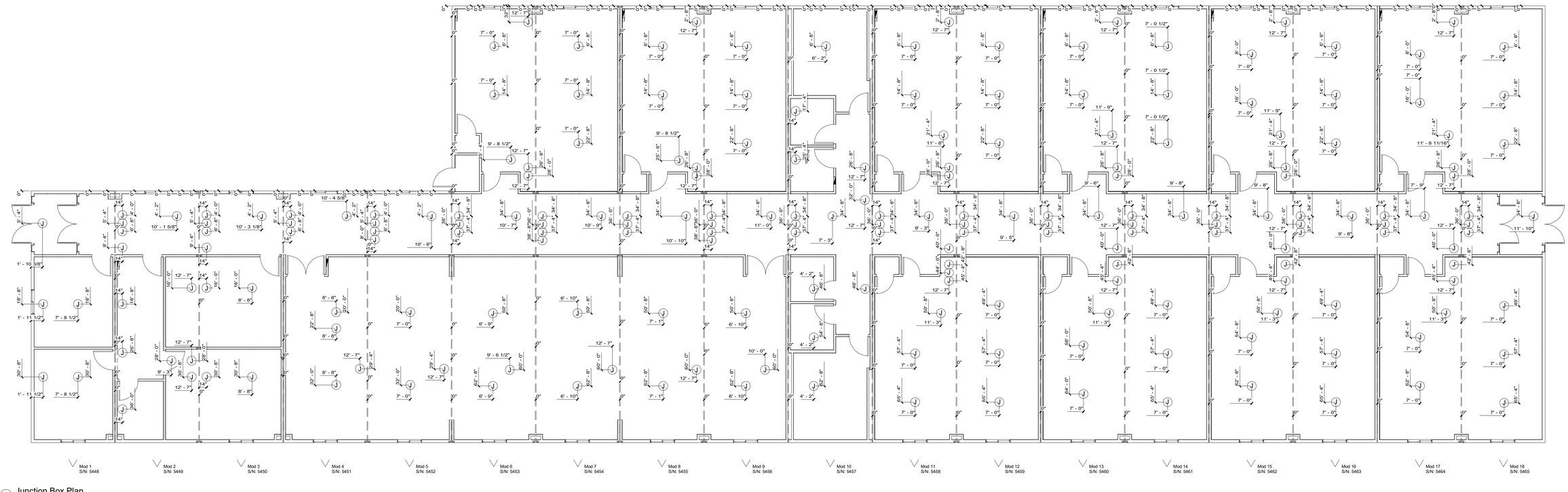

1 Junction Box Plan
1/8" = 1'-0"

MODULAR DRAWINGS -FOR REFERENCE

No.	Description	Date

No.	Description	Date

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Drawn By:	RLH
Checked By:	AP/DL
Rev:	

JUNCTION BOX PLAN

MOBILE MODULAR
PATTENGILL BIOTECHNICAL MAGNET SCHOOL
(13) 72' X 13'-9" AND (5) 41'-6" X 13'-9" MODULES

Serial No.	5448-5465
Quote No.	50589C-18
Model No.	8092
Job No.	2024-005-WR
Date:	3-5-24
Scale:	1/8" = 1'-0"
Page No.	E3.1

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WHITLEY MANUFACTURING CO., INC.
ELECTRICAL LOAD CALCULATION

MODEL # 8092
PANEL # 1
SERVICE TYPE:
3 -PHASE,
208 VOLTS

UNIT WIDTH: 41.5 FT.
UNIT LENGTH: 41.5 FT.
TOTAL SQUARE FOOTAGE: 1722.25 SQ. FT
TOTAL CALCULATED LIGHTING LOAD 6027.875 WATTS
TOTAL CONNECTED LIGHTING LOAD 2640 WATTS
TOTAL WATTS (w/ FACTOR) FOR PANEL: 16977.18 WATTS

WIRE SIZE	PNL. CIRC # #	BRKR. AMPS	DESCRIPTION	DEVICE QTY	PHASE A (BLACK)	PHASE B (RED)	PHASE C (BLUE)	DEVICE WATTAGE	TOTAL WATTS	DEMAND FACTOR	TOTAL WATTS w/ FACTOR
#12	1 -1	20A/1P	2x4 L.E.D. TROFFER	22	1232.0			56	1232	1.25	1540
			EXIT/EMERGENCY LT.	3	144.0			48	144	1.25	180
			STD. GRADE EXT. LT.	2	120.0			60	120	1.25	150
#12	1 -2	20A/1P	2x4 L.E.D. TROFFER	2	112.0			56	112	1.25	140
			RECEPTS	4	720.0			180	720	1.00	720
#12	1 -3	20A/1P	2x4 L.E.D. TROFFER	2		112.0		56	112	1.25	140
			RECEPTS	4		720.0		180	720	1.00	720
#12	1 -4	20A/1P	RECEPTS	6		1080.0		180	1080	1.00	1080
#12	1 -5	20A/1P	2x4 L.E.D. TROFFER	7			392.0	56	392	1.25	490
			RECEPTS	7			1260.0	180	1260	1.00	1260
#10	1 -7	25A/3P	HVAC 3T/ GAS, 3PH "WG"	1	2389.8			2390	2390	1.00	2390
------	1 -8	N/A	UNUSED SPACE	0	0.0			0	0	1.00	0
#10	1 -9	25A/3P	HVAC 3T/ GAS, 3PH "WG"	1		2389.8		2390	2390	1.00	2390
------	1 -10	N/A	UNUSED SPACE	0		0.0		0	0	1.00	0
#10	1 -11	25A/3P	HVAC 3T/ GAS, 3PH "WG"	1			2389.8	2390	2390	1.00	2390
------	1 -12	N/A	UNUSED SPACE	0			0.0	0	0	1.00	0
------	1 -13	N/A	UNUSED SPACE	0	0.0			0	0	1.00	0
------	1 -14	N/A	UNUSED SPACE	0	0.0			0	0	1.00	0
------	1 -15	N/A	UNUSED SPACE	0		0.0		0	0	1.00	0
------	1 -16	N/A	UNUSED SPACE	0		0.0		0	0	1.00	0
------	1 -17	N/A	UNUSED SPACE	0			0.0	0	0	1.00	0
------	1 -18	N/A	UNUSED SPACE	0			0.0	0	0	1.00	0

TOTAL WATTAGE, PHASE **"A"**= 4717.8 WATTS
TOTAL WATTAGE, PHASE **"B"**= 4301.8 WATTS
TOTAL WATTAGE, PHASE **"C"**= 4041.8 WATTS

TOTAL ACTUAL WATTAGE: 13061.3
(3-PHASE) ----------- = 36.3 AMPS X 125 % MULTIPLIER* = 47.1 **AMP's. TOTAL CALCULATED**
208V x (SQ. Rt of 3) *(continuous loads only **100 AMP. MAIN BREAKER SIZE**

NOTES:
1. The ID # is intended to identify a specifi circuit breaker or location inside the loadcente
2. Circuits shall be balanced between phases as near as possible i accordance with N.E.C.

WHITLEY MANUFACTURING CO., INC.
ELECTRICAL LOAD CALCULATION

MODEL # 8092
MOD # 2
SERVICE TYPE:
3 -PHASE,
208 VOLTS

UNIT WIDTH: 27.625 FT.
UNIT LENGTH: 41.5 FT.
TOTAL SQUARE FOOTAGE: 1146.438 SQ. FT
TOTAL CALCULATED LIGHTING LOAD 4012.531 WATTS
TOTAL CONNECTED LIGHTING LOAD 1050 WATTS
TOTAL WATTS (w/ FACTOR) FOR PANEL: 21592.74 WATTS

WIRE SIZE	PNL. CIRC # #	BRKR. AMPS	DESCRIPTION	DEVICE QTY	PHASE A (BLACK)	PHASE B (RED)	PHASE C (BLUE)	DEVICE WATTAGE	TOTAL WATTS	DEMAND FACTOR	TOTAL WATTS w/ FACTOR
#12	2 -1	20A/1P	2x4 L.E.D. TROFFER	15	840.0			56	840	1.25	1050
#6	2 -2	50A/3P	HVAC 7.5T/GAS, 3PH "WG	1	5500.1			5500	5500	1.00	5500
#12	2 -3	20A/1P	RECEPTS	3		540.0		180	540	1.00	540
	2 -4		HVAC 7.5T/GAS, 3PH "WG	1		5500.1		5500	5500	1.00	5500
#12	2 -5	20A/1P	RECEPTS	3			540.0	180	540	1.00	540
	2 -6		HVAC 7.5T/GAS, 3PH "WG	1			5500.1	5500	5500	1.00	5500
------	2 -7	N/A	UNUSED SPACE	0	0.0			0	0	1.00	0
------	2 -8	N/A	UNUSED SPACE	0	0.0			0	0	1.00	0
------	2 -9	N/A	UNUSED SPACE	0		0.0		0	0	1.00	0
------	2 -10	N/A	UNUSED SPACE	0		0.0		0	0	1.00	0
------	2 -11	N/A	UNUSED SPACE	0			0.0	0	0	1.00	0
------	2 -12	N/A	UNUSED SPACE	0			0.0	0	0	1.00	0
------	2 -13	N/A	UNUSED SPACE	0	0.0			0	0	1.00	0
------	2 -14	N/A	UNUSED SPACE	0	0.0			0	0	1.00	0
------	2 -15	N/A	UNUSED SPACE	0		0.0		0	0	1.00	0
------	2 -16	N/A	UNUSED SPACE	0		0.0		0	0	1.00	0
------	2 -17	N/A	UNUSED SPACE	0			0.0	0	0	1.00	0
------	2 -18	N/A	UNUSED SPACE	0			0.0	0	0	1.00	0
------	2 -19	N/A	UNUSED SPACE	0	0.0			0	0	1.00	0

TOTAL WATTAGE, PHASE **"A"**= 6340.1 WATTS
TOTAL WATTAGE, PHASE **"B"**= 6040.1 WATTS
TOTAL WATTAGE, PHASE **"C"**= 6040.1 WATTS

TOTAL ACTUAL WATTAGE: 18420.2
(3-PHASE) ----------- = 51.1 AMPS X 125 % MULTIPLIER* = 59.9 **AMP's. TOTAL CALCULATED**
208V x (SQ. Rt of 3) *(continuous loads only **100 AMP. MAIN BREAKER SIZE**

NOTES:
1. The ID # is intended to identify a specifi circuit breaker or location inside the loadcente
2. Circuits shall be balanced between phases as near as possible i accordance with N.E.C.

WHITLEY MANUFACTURING CO., INC.
ELECTRICAL LOAD CALCULATION

MODEL # 8092
MOD # 3
SERVICE TYPE:
3 -PHASE,
208 VOLTS

UNIT WIDTH: 27.625 FT.
UNIT LENGTH: 41.5 FT.
TOTAL SQUARE FOOTAGE: 1146.438 SQ. FT
TOTAL CALCULATED LIGHTING LOAD 4012.531 WATTS
TOTAL CONNECTED LIGHTING LOAD 700 WATTS
TOTAL WATTS (w/ FACTOR) FOR PANEL: 13701.84 WATTS

WIRE SIZE	PNL. CIRC # #	BRKR. AMPS	DESCRIPTION	DEVICE QTY	PHASE A (BLACK)	PHASE B (RED)	PHASE C (BLUE)	DEVICE WATTAGE	TOTAL WATTS	DEMAND FACTOR	TOTAL WATTS w/ FACTOR
#12	3 -1	20A/1P	2x4 L.E.D. TROFFER	10	560.0			56	560	1.25	700
#12	3 -2	20A/1P	RECEPTS	4	720.0			180	720	1.00	720
#12	3 -3	20A/1P	RECEPTS	3		540.0		180	540	1.00	540
#12	3 -4	20A/1P	RECEPTS	2		360.0		180	360	1.00	360
#12	3 -5	20A/1P	RECEPTS	3			540.0	180	540	1.00	540
#12	3 -6	20A/1P	RECEPTS	2			360.0	180	360	1.00	360
#10	3 -7	25A/3P	HVAC 3T/ GAS, 3PH "WG"	1	2389.8			2390	2390	1.00	2390
------	3 -8	N/A	UNUSED SPACE	0	0.0			0	0	1.00	0
	3 -9		HVAC 3T/ GAS, 3PH "WG"	1		2389.8		2390	2390	1.00	2390
------	3 -10	N/A	UNUSED SPACE	0		0.0		0	0	1.00	0
	3 -11		HVAC 3T/ GAS, 3PH "WG"	1			2389.8	2390	2390	1.00	2390
------	3 -12	N/A	UNUSED SPACE	0			0.0	0	0	1.00	0
------	3 -13	N/A	UNUSED SPACE	0	0.0			0	0	1.00	0
------	3 -14	N/A	UNUSED SPACE	0	0.0			0	0	1.00	0
------	3 -15	N/A	UNUSED SPACE	0		0.0		0	0	1.00	0
------	3 -16	N/A	UNUSED SPACE	0		0.0		0	0	1.00	0
------	3 -17	N/A	UNUSED SPACE	0			0.0	0	0	1.00	0
------	3 -18	N/A	UNUSED SPACE	0			0.0	0	0	1.00	0

TOTAL WATTAGE, PHASE **"A"**= 3669.8 WATTS
TOTAL WATTAGE, PHASE **"B"**= 3289.8 WATTS
TOTAL WATTAGE, PHASE **"C"**= 3289.8 WATTS

TOTAL ACTUAL WATTAGE: 10249.3
(3-PHASE) ----------- = 28.4 AMPS X 125 % MULTIPLIER* = 38.0 **AMP's. TOTAL CALCULATED**
208V x (SQ. Rt of 3) *(continuous loads only **100 AMP. MAIN BREAKER SIZE**

NOTES:
1. The ID # is intended to identify a specifi circuit breaker or location inside the loadcente
2. Circuits shall be balanced between phases as near as possible i accordance with N.E.C.

WHITLEY MANUFACTURING CO., INC.
ELECTRICAL LOAD CALCULATION

MODEL # 8092
MOD # 4
SERVICE TYPE:
3 -PHASE,
208 VOLTS

UNIT WIDTH: 27.625 FT.
UNIT LENGTH: 72 FT.
TOTAL SQUARE FOOTAGE: 1989 SQ. FT
TOTAL CALCULATED LIGHTING LOAD 6961.5 WATTS
TOTAL CONNECTED LIGHTING LOAD 1750 WATTS
TOTAL WATTS (w/ FACTOR) FOR PANEL: 16830.8 WATTS

WIRE SIZE	PNL. CIRC # #	BRKR. AMPS	DESCRIPTION	DEVICE QTY	PHASE A (BLACK)	PHASE B (RED)	PHASE C (BLUE)	DEVICE WATTAGE	TOTAL WATTS	DEMAND FACTOR	TOTAL WATTS w/ FACTOR
#12	4 -1	20A/1P	2x4 L.E.D. TROFFER	10	560.0			56	560	1.25	700
------	4 -2	N/A	UNUSED SPACE	0	0.0			0	0	1.00	0
#12	4 -3	20A/1P	RECEPTS	4		720.0		180	720	1.00	720
------	4 -4	N/A	UNUSED SPACE	0		0.0		0	0	1.00	0
#12	4 -5	20A/1P	RECEPTS	3			540.0	180	540	1.00	540
#12	4 -6	20A/1P	RECEPTS	3			540.0	180	540	1.00	540
#12	4 -7	20A/1P	2x4 L.E.D. TROFFER	15	840.0			56	840	1.25	1050
#10	4 -8	25A/3P	HVAC 3T/ GAS, 3PH "WG"	1	2389.8			2390	2390	1.00	2390
#12	4 -9	20A/1P	RECEPTS	3		540.0		180	540	1.00	540
	4 -10		HVAC 3T/ GAS, 3PH "WG"	1		2389.8		2390	2390	1.00	2390
#12	4 -11	20A/1P	RECEPTS	2			360.0	180	360	1.00	360
	4 -12		HVAC 3T/ GAS, 3PH "WG"	1			2389.8	2390	2390	1.00	2390
------	4 -13	N/A	UNUSED SPACE	0	0.0			0	0	1.00	0
------	4 -14	N/A	UNUSED SPACE	0	0.0			0	0	1.00	0
------	4 -15	N/A	UNUSED SPACE	0		0.0		0	0	1.00	0
------	4 -16	N/A	UNUSED SPACE	0		0.0		0	0	1.00	0
------	4 -17	N/A	UNUSED SPACE	0			0.0	0	0	1.00	0
------	4 -18	N/A	UNUSED SPACE	0			0.0	0	0	1.00	0

TOTAL WATTAGE, PHASE **"A"**= 3789.8 WATTS
TOTAL WATTAGE, PHASE **"B"**= 3649.8 WATTS
TOTAL WATTAGE, PHASE **"C"**= 3829.8 WATTS

TOTAL ACTUAL WATTAGE: 11269.3
(3-PHASE) ----------- = 31.3 AMPS X 125 % MULTIPLIER* = 46.7 **AMP's. TOTAL CALCULATED**
208V x (SQ. Rt of 3) *(continuous loads only **100 AMP. MAIN BREAKER SIZE**

NOTES:
1. The ID # is intended to identify a specifi circuit breaker or location inside the loadcente
2. Circuits shall be balanced between phases as near as possible i accordance with N.E.C.

WHITLEY MANUFACTURING CO., INC.
ELECTRICAL LOAD CALCULATION

MODEL # 8092
MOD # 5
SERVICE TYPE:
3 -PHASE,
208 VOLTS

UNIT WIDTH: 13.75 FT.
UNIT LENGTH: 72 FT.
TOTAL SQUARE FOOTAGE: 990 SQ. FT
TOTAL CALCULATED LIGHTING LOAD 3465 WATTS
TOTAL CONNECTED LIGHTING LOAD 560 WATTS
TOTAL WATTS (w/ FACTOR) FOR PANEL: 19196.9 WATTS

WIRE SIZE	PNL. CIRC # #	BRKR. AMPS	DESCRIPTION	DEVICE QTY	PHASE A (BLACK)	PHASE B (RED)	PHASE C (BLUE)	DEVICE WATTAGE	TOTAL WATTS	DEMAND FACTOR	TOTAL WATTS w/ FACTOR
#12	5 -1	20A/1P	2x4 L.E.D. TROFFER	8	448.0			56	448	1.25	560
			75 CFM EXH. FAN	2	177.6			89	178	1.00	178
			300 CFM EXH. FAN	2	420.0			210	420	1.00	420
#12	5 -2	20A/1P	QUAD RECEPT	1	360.0			360	360	1.00	360
#12	5 -3	20A/1P	HEATTAPE RECEPT	0		0.0		600	0	1.00	0
#12	5 -4	20A/1P	RECEPTS	3		540.0		180	540	1.00	540
------	5 -5	N/A	UNUSED SPACE	0			0.0	0	0	1.00	0
#12	5 -6	20A/1P	RECEPTS	2			360.0	180	360	1.00	360
#12	5 -7	20A/1P	FIRE ALARM REMOTE	1	480.0			480	480	1.00	480
#12	5 -8	20A/1P	HEATTAPE RECEPT	1	600.0			600	600	1.00	600
#10	5 -9	25A/3P	HVAC 3T/ GAS, 3PH "WG"	1		2389.8		2390	2390	1.00	2390
#10	5 -10	30A/2P	40 GALLON W.H.	1		2250.0		2250	2250	1.25	2813
	5 -11		HVAC 3T/ GAS, 3PH "WG"	1			2389.8	2390	2390	1.00	2390
#10	5 -12	30A/2P	40 GALLON W.H.	1			2250.0	2250	2250	1.25	2813
	5 -13		HVAC 3T/ GAS, 3PH "WG"	1	2389.8			2390	2390	1.00	2390
------	5 -14	N/A	UNUSED SPACE	0	0.0			0	0	1.00	0
------	5 -15	N/A	UNUSED SPACE	0		0.0		0	0	1.00	0
------	5 -16	N/A	UNUSED SPACE	0		0.0		0	0	1.00	0
------	5 -17	N/A	UNUSED SPACE	0			0.0	0	0	1.00	0
------	5 -18	N/A	UNUSED SPACE	0			0.0	0	0	1.00	0

TOTAL WATTAGE, PHASE **"A"**= 4875.4 WATTS
TOTAL WATTAGE, PHASE **"B"**= 5179.8 WATTS
TOTAL WATTAGE, PHASE **"C"**= 4999.8 WATTS

TOTAL ACTUAL WATTAGE: 15054.9
(3-PHASE) ----------- = 41.8 AMPS X 125 % MULTIPLIER* = 53.3 **AMP's. TOTAL CALCULATED**
208V x (SQ. Rt of 3) *(continuous loads only **100 AMP. MAIN BREAKER SIZE**

NOTES:
1. The ID # is intended to identify a specifi circuit breaker or location inside the loadcente
2. Circuits shall be balanced between phases as near as possible i accordance with N.E.C.

WHITLEY MANUFACTURING CO., INC.
ELECTRICAL LOAD CALCULATION

MODEL # 8092
MOD # 6
SERVICE TYPE:
3 -PHASE,
208 VOLTS

UNIT WIDTH: 27.625 FT.
UNIT LENGTH: 72 FT.
TOTAL SQUARE FOOTAGE: 1989 SQ. FT
TOTAL CALCULATED LIGHTING LOAD 6961.5 WATTS
TOTAL CONNECTED LIGHTING LOAD 1400 WATTS
TOTAL WATTS (w/ FACTOR) FOR PANEL: 25080.11 WATTS

WIRE SIZE	PNL. CIRC # #	BRKR. AMPS	DESCRIPTION	DEVICE QTY	PHASE A (BLACK)	PHASE B (RED)	PHASE C (BLUE)	DEVICE WATTAGE	TOTAL WATTS	FACTOR NEC 210-22c	TOTAL WATTS w/ FACTOR
#12	6 -1	20A/1P	2x4 L.E.D. TROFFER	10	560.0			56	560	1.25	700
#12	6 -2	20A/1P	RECEPTS	4	720.0			180	720	1.00	720
#12	6 -3	20A/1P	RECEPTS	3		540.0		180	540	1.00	540
#12	6 -4	20A/1P	RECEPTS	4		720.0		180	720	1.00	720
#12	6 -5	20A/1P	2x4 L.E.D. TROFFER	10			560.0	56	560	1.25	700
#12	6 -6	20A/1P	RECEPTS	4			720.0	180	720	1.00	720
#12	6 -7	20A/1P	RECEPTS	2	360.0			180	360	1.00	360
#10	6 -8	25A/3P	HVAC 3T/ GAS, 3PH "WG"	1	2389.8			2390	2390	1.00	2390
#12	6 -9	20A/1P	RECEPTS	2		360.0		180	360	1.00	360
	6 -10		HVAC 3T/ GAS, 3PH "WG"	1		2389.8		2390	2390	1.00	2390
#12	6 -11	20A/1P	RECEPTS	2			360.0	180	360	1.00	360
	6 -12		HVAC 3T/ GAS, 3PH "WG"	1			2389.8	2390	2390	1.00	2390
#10	6 -13	25A/3P	HVAC 3T/ GAS, 3PH "WG"	1	2389.8			2390	2390	1.00	2390
------	6 -14	N/A	UNUSED SPACE	0	0.0			0	0	1.00	0
	6 -15		HVAC 3T/ GAS, 3PH "WG"	1		2389.8		2390	2390	1.00	2390
------	6 -16	N/A	UNUSED SPACE	0		0.0		0	0	1.00	0
	6 -17		HVAC 3T/ GAS, 3PH "WG"	1			2389.8	2390	2390	1.00	2390
------	6 -18	N/A	UNUSED SPACE	0			0.0	0	0	1.00	0

TOTAL WATTAGE, PHASE **"A"**= 6419.5 WATTS
TOTAL WATTAGE, PHASE **"B"**= 6399.5 WATTS
TOTAL WATTAGE, PHASE **"C"**= 6419.5 WATTS

TOTAL ACTUAL WATTAGE: 19238.6
(3-PHASE) ----------- = 53.4 AMPS X 125 % MULTIPLIER* = 69.6 **AMP's. TOTAL CALCULATED**
208V x (SQ. Rt of 3) *(continuous loads only **100 AMP. MAIN BREAKER SIZE**

NOTES:
1. The ID # is intended to identify a specifi circuit breaker or location inside the loadcente
2. Circuits shall be balanced between phases as near as possible i accordance with N.E.C.

WHITLEY MANUFACTURING CO., INC.
ELECTRICAL LOAD CALCULATION

MODEL # 8092
MOD # 7
SERVICE TYPE:
3 -PHASE,
208 VOLTS

UNIT WIDTH: 27.625 FT.
UNIT LENGTH: 72 FT.
TOTAL SQUARE FOOTAGE: 1989 SQ. FT
TOTAL CALCULATED LIGHTING LOAD 6961.5 WATTS
TOTAL CONNECTED LIGHTING LOAD 1400 WATTS
TOTAL WATTS (w/ FACTOR) FOR PANEL: 26274.99 WATTS

WIRE SIZE	PNL. CIRC # #	BRKR. AMPS	DESCRIPTION	DEVICE QTY	PHASE A (BLACK)	PHASE B (RED)	PHASE C (BLUE)	DEVICE WATTAGE	TOTAL WATTS	DEMAND FACTOR	TOTAL WATTS w/ FACTOR
#12	7 -1	20A/1P	2x4 L.E.D. TROFFER	10	560.0			56	560	1.25	700
#12	7 -2	20A/1P	RECEPTS	4	720.0			180	720	1.00	720
#12	7 -3	20A/1P	RECEPTS	3		540.0		180	540	1.00	540
#12	7 -4	20A/1P	RECEPTS	4		720.0		180	720	1.00	720
#12	7 -5	20A/1P	2x4 L.E.D. TROFFER	10			560.0	56	560	1.25	700
#12	7 -6	20A/1P	RECEPTS	4			720.0	180	720	1.00	720
#12	7 -7	20A/1P	RECEPTS	2	360.0			180	360	1.00	360
#10	7 -8	25A/3P	HVAC 3T/ GAS, 3PH "WG"	1	2389.8			2390	2390	1.00	2390
#12	7 -9	20A/1P	RECEPTS	2		360.0		180	360	1.00	360
	7 -10		HVAC 3T/ GAS, 3PH "WG"	1		2389.8		2390	2390	1.00	2390
#12	7 -11	20A/1P	RECEPTS	2			360.0	180	360	1.00	360
	7 -12		HVAC 3T/ GAS, 3PH "WG"	1			2389.8	2390	2390	1.00	2390
#10	7 -13	25A/3P	HVAC 3T/ GAS, 3PH "WG"	1	3584.7			3585	3585	1.00	3585
------	7 -14	N/A	UNUSED SPACE	0	0.0			0	0	1.00	0
	7 -15		HVAC 3T/ GAS, 3PH "WG"	1		2389.8		2390	2390	1.00	2390
------	7 -16	N/A	UNUSED SPACE	0		0.0		0	0	1.00	0
	7 -17		HVAC 3T/ GAS, 3PH "WG"	1			2389.8	2390	2390	1.00	2390
------	7 -18	N/A	UNUSED SPACE	0			0.0	0	0	1.00	0

TOTAL WATTAGE, PHASE **"A"**= 7614.4 WATTS
TOTAL WATTAGE, PHASE **"B"**= 6399.5 WATTS
TOTAL WATTAGE, PHASE **"C"**= 6419.5 WATTS

TOTAL ACTUAL WATTAGE: 20433.5
(3-PHASE) ----------- = 56.7 AMPS X 125 % MULTIPLIER* = 72.9 **AMP's. TOTAL CALCULATED**
208V x (SQ. Rt of 3) *(continuous loads only **100 AMP. MAIN BREAKER SIZE**

NOTES:
1. The ID # is intended to identify a specifi circuit breaker or location inside the loadcente
2. Circuits shall be balanced between phases as near as possible i accordance with N.E.C.

WHITLEY MANUFACTURING CO., INC.
ELECTRICAL LOAD CALCULATION

MODEL # 8092
MOD # 8
SERVICE TYPE:
3 -PHASE,
208 VOLTS

UNIT WIDTH: 27.625 FT.
UNIT LENGTH: 72 FT.
TOTAL SQUARE FOOTAGE: 1989 SQ. FT
TOTAL CALCULATED LIGHTING LOAD 6961.5 WATTS
TOTAL CONNECTED LIGHTING LOAD 1400 WATTS
TOTAL WATTS (w/ FACTOR) FOR PANEL: 24900.11 WATTS

WIRE SIZE	PNL. CIRC # #	BRKR. AMPS	DESCRIPTION	DEVICE QTY	PHASE A (BLACK)	PHASE B (RED)	PHASE C (BLUE)	DEVICE WATTAGE	TOTAL WATTS	DEMAND FACTOR	TOTAL WATTS w/ FACTOR
#12	8 -1	20A/1P	2x4 L.E.D. TROFFER	10	560.0			56	560	1.25	700
#12	8 -2	20A/1P	RECEPTS	4	720.0			180	720	1.00	720
#12	8 -3	20A/1P	RECEPTS	3		540.0		180	540	1.00	540
#12	8 -4	20A/1P	RECEPTS	3		540.0		180	540	1.00	540
#12	8 -5	20A/1P	2x4 L.E.D. TROFFER	10			560.0	56	560	1.25	700
#12	8 -6	20A/1P	RECEPTS	4			720.0	180	720	1.00	720
#12	8 -7	20A/1P	RECEPTS	2	360.0			180	360	1.00	360
#10	8 -8	25A/3P	HVAC 3T/ GAS, 3PH "WG"	1	2389.8			2390	2390	1.00	2390
#12	8 -9	20A/1P	RECEPTS	2		360.0		180	360	1.00	360
	8 -10		HVAC 3T/ GAS, 3PH "WG"	1		2389.8		2390	2390	1.00	2390
#12	8 -11	20A/1P	RECEPTS	2			360.0	180	360	1.00	360
	8 -12		HVAC 3T/ GAS, 3PH "WG"	1			2389.8	2390	2390	1.00	2390
#10	8 -13	25A/3P	HVAC 3T/ GAS, 3PH "WG"	1	2389.8			2390	2390	1.00	2390
------	8 -14	N/A	UNUSED SPACE	0	0.0			0	0	1.00	0
	8 -15		HVAC 3T/ GAS, 3PH "WG"	1		2389.8		2390	2390	1.00	2390
------	8 -16	N/A	UNUSED SPACE	0		0.0		0	0	1.00	0
	8 -17		HVAC 3T/ GAS, 3PH "WG"	1			2389.8	2390	2390	1.00	2390
------	8 -18	N/A	UNUSED SPACE	0			0.0	0	0	1.00	0

TOTAL WATTAGE, PHASE **"A"**= 6419.5 WATTS
TOTAL WATTAGE, PHASE **"B"**= 6219.5 WATTS
TOTAL WATTAGE, PHASE **"C"**= 6419.5 WATTS

TOTAL ACTUAL WATTAGE: 19058.6
(3-PHASE) ----------- = 52.9 AMPS X 125 % MULTIPLIER* = 69.1 **AMP's. TOTAL CALCULATED**
208V x (SQ. Rt of 3) *(continuous loads only **100 AMP. MAIN BREAKER SIZE**

NOTES:
1. The ID # is intended to identify a specifi circuit breaker or location inside the loadcente
2. Circuits shall be balanced between phases as near as possible i accordance with N.E.C.

WHITLEY MANUFACTURING CO., INC.
ELECTRICAL LOAD CALCULATION

MODEL # 8092
MOD # 9
SERVICE TYPE:
3 -PHASE,
208 VOLTS

UNIT WIDTH: 27.625 FT.
UNIT LENGTH: 72 FT.
TOTAL SQUARE FOOTAGE: 1989 SQ. FT
TOTAL CALCULATED LIGHTING LOAD 6961.5 WATTS
TOTAL CONNECTED LIGHTING LOAD 1400 WATTS
TOTAL WATTS (w/ FACTOR) FOR PANEL: 24900.11 WATTS

WIRE SIZE	PNL. CIRC # #	BRKR. AMPS	DESCRIPTION	DEVICE QTY	PHASE A (BLACK)	PHASE B (RED)	PHASE C (BLUE)	DEVICE WATTAGE	TOTAL WATTS	DEMAND FACTOR	TOTAL WATTS w/ FACTOR
#12	9 -1	20A/1P	2x4 L.E.D. TROFFER	10	560.0			56	560	1.25	700
#12	9 -2	20A/1P	RECEPTS	4	720.0			180	720	1.00	720
#12	9 -3	20A/1P	RECEPTS	3		540.0		180	540	1.00	540
#12	9 -4	20A/1P	RECEPTS	3		540.0		180	540	1.00	540
#12	9 -5	20A/1P	2x4 L.E.D. TROFFER	10			560.0	56	560	1.25	700
#12	9 -6	20A/1P	RECEPTS	4			720.0	180	720	1.00	720
#12	9 -7	20A/1P	RECEPTS	2	360.0			180	360	1.00	360
#10	9 -8	25A/3P	HVAC 3T/ GAS, 3PH "WG"	1	2389.8			2390	2390	1.00	2390
#12	9 -9	20A/1P	RECEPTS	2		360.0		180	360	1.00	360
	9 -10		HVAC 3T/ GAS, 3PH "WG"	1		2389.8		2390	2390	1.00	2390
#12	9 -11	20A/1P	RECEPTS	2			360.0	180	360	1.00	360
	9 -12		HVAC 3T/ GAS, 3PH "WG"	1			2389.8	2390	2390	1.00	2390
#10	9 -13	25A/3P	HVAC 3T/ GAS, 3PH "WG"	1	2389.8			2390	2390	1.00	2390
------	9 -14	N/A	UNUSED SPACE	0	0.0			0	0	1.00	0
	9 -15		HVAC 3T/ GAS, 3PH "WG"	1		2389.8		2390	2390	1.00	2390
------	9 -16	N/A	UNUSED SPACE	0		0.0		0	0	1.00	0
	9 -17		HVAC 3T/ GAS, 3PH "WG"	1			2389.8	2390	2390	1.00	2390
------	9 -18	N/A	UNUSED SPACE	0			0.0	0	0	1.00	0

TOTAL WATTAGE, PHASE **"A"**= 6419.5 WATTS
TOTAL WATTAGE, PHASE **"B"**= 6219.5 WATTS
TOTAL WATTAGE, PHASE **"C"**= 6419.5 WATTS

TOTAL ACTUAL WATTAGE: 19058.6
(3-PHASE) ----------- = 52.9 AMPS X 125 % MULTIPLIER* = 69.1 **AMP's. TOTAL CALCULATED**
208V x (SQ. Rt of 3) *(continuous loads only **100 AMP. MAIN BREAKER SIZE**

NOTES:
1. The ID # is intended to identify a specifi circuit breaker or location inside the loadcente
2. Circuits shall be balanced between phases as near as possible i accordance with N.E.C.

WHITLEY MANUFACTURING CO., INC.
ELECTRICAL LOAD CALCULATION

MODEL # 8092

TOTAL BUILDING ELECTRICAL LOAD CALCULATIONS

SERVICE TYPE:
3 -PHASE,
208 VOLTS
TOTAL BUILDING AMPERAGE 525.9

MOD. #	PNL. #	MAIN BRKR. SIZE	DESCRIPTION	WATTAGE PER PHASE PHASE A	PHASE B	PHASE C	TOTAL SUB-PANEL WATTAGE	TOTAL SUB-PANEL AMP's
2	-1	**100**	SUB-PANEL, **MOD. #1**	4717.8	4301.8	4041.8	16977.2	47.1
4	-2	**100**	SUB-PANEL, **MOD. #2**	6340.1	6040.1	6040.1	21592.7	59.9
6	-3	**100**	SUB-PANEL, **MOD. #3**	3669.8	3289.8	3289.8	13701.8	38.0
8	-4	**100**	SUB-PANEL, **MOD. #4**	3789.8	3649.8	3829.8	16830.8	46.7
10	-5	**100**	SUB-PANEL, **MOD. #5**	4875.4	5179.8	4999.8	19196.9	53.3
11	-6	**100**	SUB-PANEL, **MOD. #6**	6419.5	6399.5	6419.5	25080.1	69.6
13	-7	**100**	SUB-PANEL, **MOD. #7**	7614.4	6399.5	6419.5	26275.0	72.9
15	-8	**100**	SUB-PANEL, **MOD. #8**	6419.5	6219.5	6419.5	24900.1	69.1
17	-9	**100**	SUB-PANEL, **MOD. #9**	6419.5	6219.5	6419.5	24900.1	69.1

TOTAL WATTAGE, PHASE "A" : 50265.8
TOTAL WATTAGE, PHASE "B" : 47699.3
TOTAL WATTAGE, PHASE "C" : 47879.3
TOTAL BUILDING WATTAGE 189454.8
TOTAL BUILDING AMPERAGE 525.9

NOTE:
1. AMPACITIES ARE CALCULATED BASED UPON 240 VOLT SINGLE-PHASE, OR 208 VOLT 3-PHASE CURREN AVAILABLE VOLTAGE MAY DIFFER
2. LOADS ARE CALCULATED PER N.E.C. SECTION 220
 - ALL RECEPTACLE LOADS ARE TAKEN AT A DEMAND FACTOR OF 100%, BASED UPON 180 WATTS PER TYPICA DUPLEX RECEPT.
 - LIGHTING LOADS, ELECTRIC RESISTANCE SPACE HEATING, AND STORAGE-TYPE WATER HEATERS ARE CONTINUOUS LOADS, AND ARE TAKEN AT A DEMAND FACTOR OF 125%
 -OTHER LOADS (APPLIANCES, ETC.) ARE TAKEN AT A DEMAND FACTOR OF 100%
3. DEMAND FACTOR REDUCTIONS HAVE NOT BEEN APPLIED TO "TOTAL BUILDING AMPERAGE" LISTE ABOVE. N.E.C. PERMITS REDUCTIONS IN DEMAND FACTORS WHICH MAY REDUCE TOTAL CALCULATEI BUILDING ELECTRICAL LOADS, AND THEREFORE REDUCE BUILDING ELECTRICAL SERVICE REQUIREMENT: GENERALLY, MODULAR BUILDINGS ARE NOT OF SUFFICIENT SIZE TO POSSESS USEFUL ELECTRICAL LOAI DIVERSITY. FOR THIS REASON, WHITLEY MANUFACTURING DOES NOT RECOMMEND APPLICATION OF LOAI REDUCTION FACTORS.APPLICATION OF DEMAND FACTORS, WITHOUT DUE CONSIDERATION OF BUILDINC SERVICE REQUIREMENTS, MAY RESULT IN ELECTRICAL SERVICE SIZING INADEQUATE FOR BUILDING OPERATIOI
4. [illegible]Y FA[illegible]RS AFFE[illegible] ELE[illegible]ICAL SERVICE RE[illegible]MENTS: [illegible] CONVENIE[illegible]CLE: O[illegible]PAN[illegible]DENSITY [illegible] OC[illegible]PANCY CYCLES, [illegible]IAL FUT[illegible] ELECTR[illegible]L NEEDS, [illegible] ALL AN[illegible]PAT CO[illegible]TIO[illegible] OF BUILD[illegible] US[illegible]UST BE CAREF[illegible] CONSIDERE
5. BU[illegible]ING [illegible]D USER [illegible]ULD [illegible]VIEW CONDIT[illegible] WITH [illegible]ALIFI[illegible] ELECTRICAL CO[illegible]RACTOR [illegible]ERMIN[illegible] [illegible]DEQUA[illegible] BUIL[illegible] ELECTRICA[illegible] SERVICE R[illegible]UIRE[illegible]NTS, A[illegible] WHETHER DE[illegible]ND FA[illegible] [illegible]AY BE APP[illegible]OUT C[illegible] BUILDING UTIL[illegible]DU[illegible] MARG[illegible] OR INADE[illegible]ECTRICA SERVICE.

No.	Description	Date	No.	Description	Date

WHITLEY MANUFACTURING
WHITLEY MFG. CO. INC.
201 WEST FIRST STREET
P.O. BOX 496
SOUTH WHITLEY, IN 46787
PHONE: 260.723.5131
FAX: 260.723.6396
www.whitleyman.com

Whitley East LLC
64 HESS ROAD
LEOLA, PA 17540
PHONE: 717.656.2081

Whitley Mfg. Co., Inc.
dba: Modular Builders
2756 & 3089
E. FORT WAYNE ROAD
P.O. BOX 505
ROCHESTER, IN 46975
PHONE: 574.223.4934

Drawn By: RLH
Checked By: AP/DL
Rev:

ELECTRICAL SCHEDULES
MOBILE MODULAR
PATTENGILL BIOTECHNICAL MAGNET SCHOOL
(13) 72' X 13'-9" AND (5) 41'-6" X 13'-9" MODULES

Serial No. 5448-5465
Quote No. 50589C-18
Model No. 8092
Job No. 2024-005-WR
Date: 3-5-24
Scale:
Page No. E4.1

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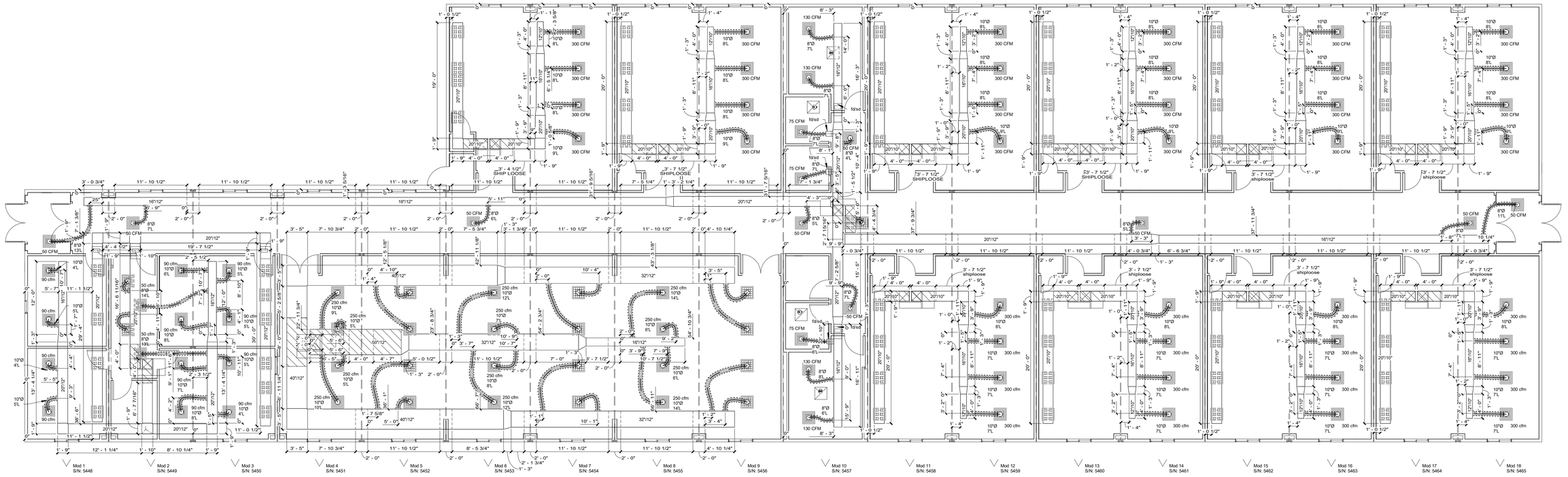
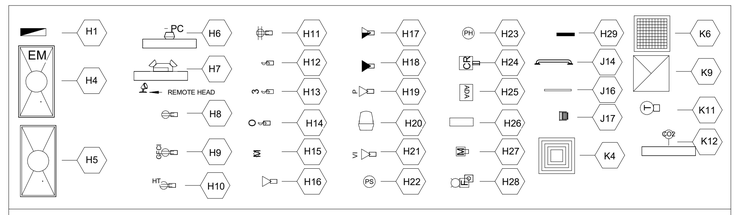


1 HVAC Plan
1/8" = 1'-0"



Legend

Note: Identification hexagons on the drawings and in the symbol legend correspond to the project specifications (Sht A0.0). The letter in the hexagon matches the specification section, the number in the hexagon matches the section number.

No.	Description	Date

No.	Description	Date

WHITLEY MFG. CO. INC.
201 WEST FIRST STREET
P.O. BOX 496
SOUTH WHITLEY, IN 46787
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Whitley Mfg. Co., Inc.
dba: Modular Builders
2756 & 3089
E. FORT WAYNE ROAD
P.O. BOX 505
ROCHESTER, IN 46975
PHONE: 574.223.4934

Drawn By:	RLH
Checked By:	AP/DL
Rev:	

MECHANICAL PLAN

MOBILE MODULAR
PATTENGILL BIOTECHNICAL MAGNET SCHOOL
(13) 72' X 13'-9" AND (5) 41'-6" X 13'-9" MODULES

Serial No.	5448-5465
Quote No.	50589C-18
Model No.	8092
Job No.	2024-005-WR
Date:	3-5-24
Scale:	As indicated
Page No.	M2.1

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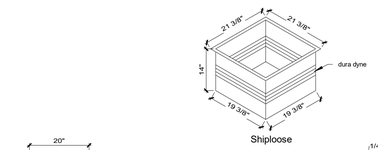
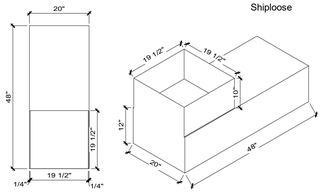
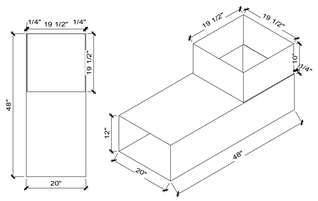


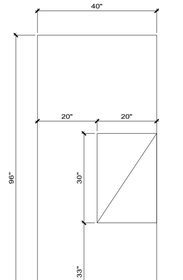
Shiploose



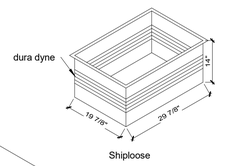
Mod 2 Galvanzed Return Duct



Mod 2 Galvanzed Supply Duct



Mod 4 Galvanized Return Duct



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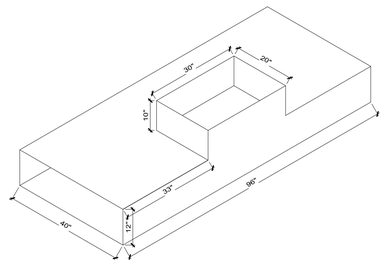
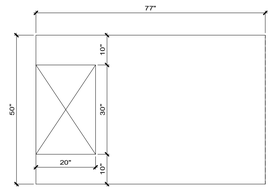
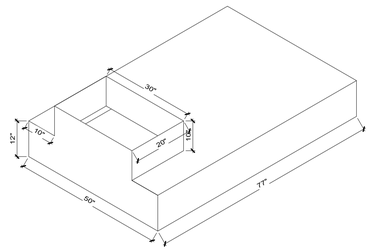
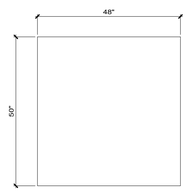
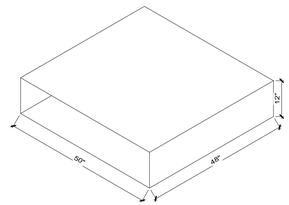




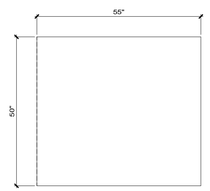


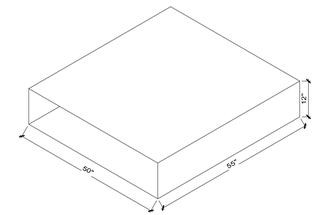
Mod 4 Galvanized Supply Duct





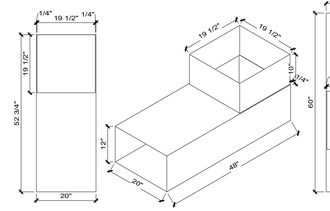
Mod 4&5 Galvanized Supply Duct
(shiploose)



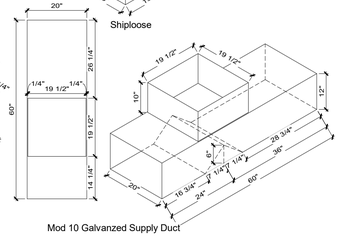


Mod 5 Galvanized Supply Duct

Shiploose

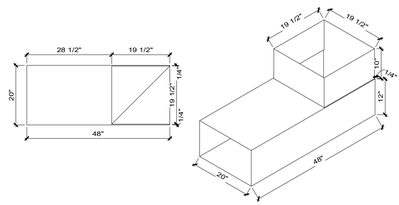


Mod 10 Galvanzed Return Duct

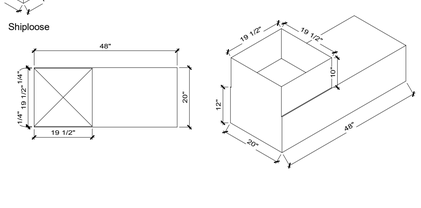


Mod 10 Galvanzed Supply Duct

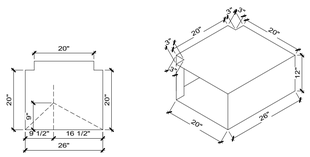
Shiploose



Classroom Galvanzed Return Duct



Classroom Galvanzed Supply Duct



Mod 2 Fiberglass Tee

1 Duct Details
1/2" = 1'-0"

MODULAR DRAWINGS -FOR REFERENCE

No.	Description	Date

No.	Description	Date

WHITLEY MFG. CO. INC.
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Drawn By:	RLH
Checked By:	AP/DL
Rev:	

DUCT DETAILS

MOBILE MODULAR
PATTENGILL BIOTECHNICAL MAGNET SCHOOL
(13) 72' X 13'-9" AND (5) 41'-6" X 13'-9" MODULES

Serial No.	5448-5465
Date:	3-5-24
Quote No.	50589C-18
Scale:	1/2" = 1'-0"
Model No.	8092
Page No.	M3.1
Job No.	2024-005-WR

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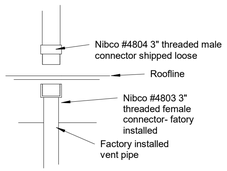
DWV:

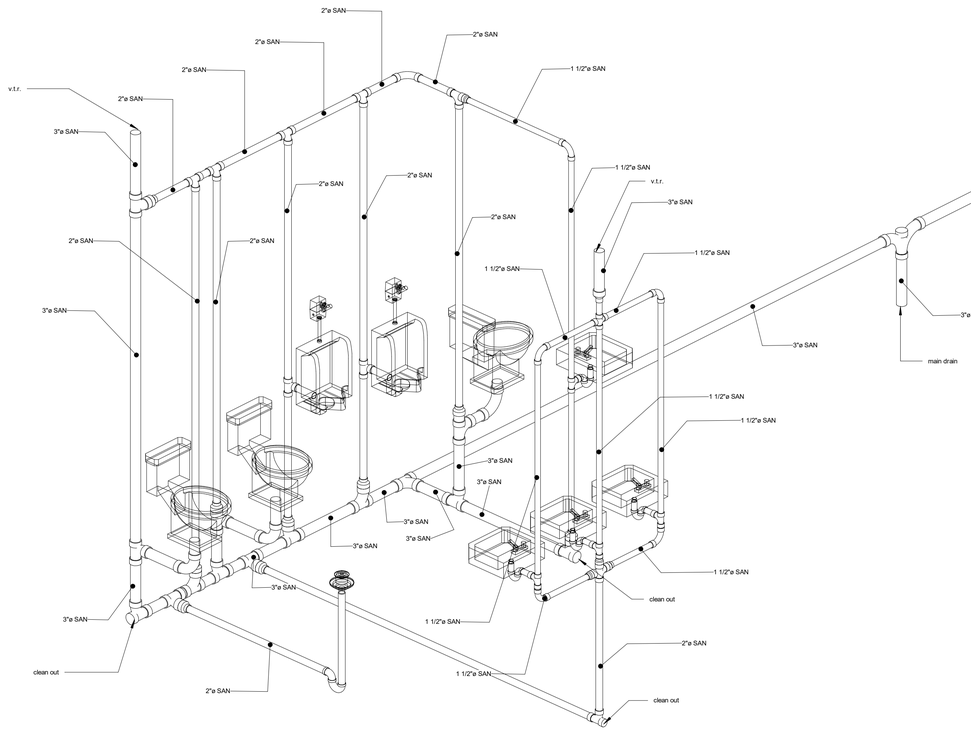
1. DWV PIPING TO BE SCHEDULE 40 PVC.
2. PVC PIPE TO BE SECURED @ 4'-0" O.C. HORIZONTALLY & 5'-0" O.C. VERTICALLY FOR 2" DIA. AND SMALLER PIPE OR 10'-0" O.C. VERTICALLY FOR PIPE LARGER THAN 2" DIA.
3. ALL CLEAN-OUTS SHALL BE ACCESSIBLE, PROVIDED @ THE BASE OF ALL WASTE AND SOIL STACKS, AND PROVIDED SO THAT ALL HORIZONTAL PIPING CAN BE REACHED BY A CLEANOUT TOOL WITHOUT PASSING THROUGH MORE THAN 45 DEGREES OF TURN.
4. HORIZONTAL BRANCH PIPES 2 1/2" AND SMALLER IN DIAMETER TO HAVE A MINIMUM 1/4" PER FOOT SLOPE; PIPES 3" TO 6" DIAMETER TO HAVE A MINIMUM OF 1/8" PER FOOT SLOPE.
5. VENTS SHALL BE A MINIMUM OF 3" IN DIAMETER FOR 12" ABOVE AND 24" BELOW ROOF AND SHALL NOT BE LOCATED WITHIN 10' HORIZONTALLY OF ANY BUILDING AIR INTAKE OPENING.
6. ALL VERTICAL TO HORIZONTAL OR HORIZONTAL TO HORIZONTAL CHANGE OF DIRECTION SHALL BE THROUGH A LONG TURN T-Y OR COMBINATION WYE AND EIGHTH BEND.
7. ALL HORIZONTAL TO VERTICAL CHANGE OF DIRECTION SHALL BE THROUGH A SANITARY TEE, OR IF @ THE SAME LEVEL ON A VERTICAL STACK, THROUGH AN APPROVED DOUBLE FIXTURE FITTING.
8. IN CONCEALED LOCATIONS AT PLUMBING PIPING, PROTECTIVE SHIELD PLATES SHALL BE INSTALLED THAT ARE A MINIMUM 1/16" THICK STEEL AND SHALL COVER THE AREA OF THE PIPE WHERE THE MEMBER IS NOTCHED OR BORED AND SHALL EXTEND A MINIMUM OF 2 INCHES ABOVE SOLE PLATES AND BELOW TOP PLATES.

FIELD NOTE:

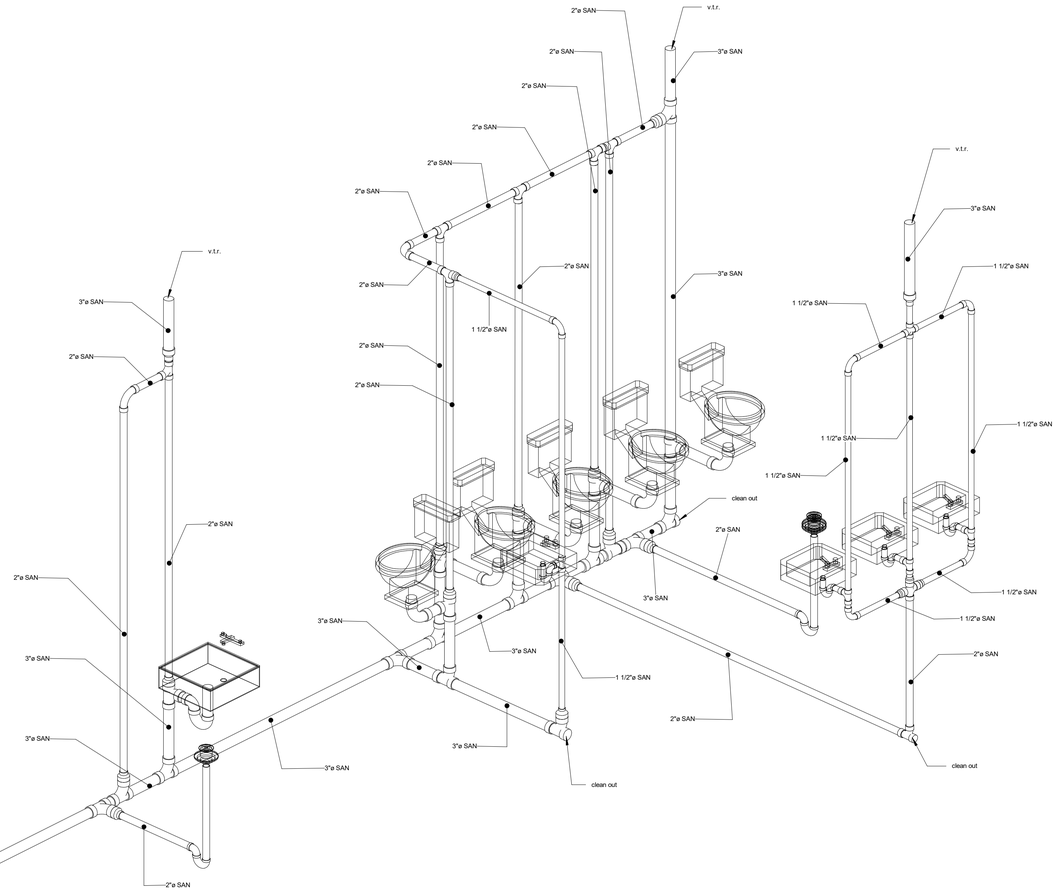
1. ALL LINES REPRESENTED BY A BROKEN LINE ON SCHEMATIC DRAWINGS SHALL BE PROVIDED AND INSTALLED ON SITE PER DEALER CONTRACTURAL AGREEMENT.



2 Vent Thru Roof Detail
1" = 1'-0"



Plumbing Schematic - P1.1



MODULAR DRAWINGS -FOR REFERENCE

No.	Description	Date

No.	Description	Date

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201 WEST FIRST STREET
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dba: Modular Builders
2756 & 3089
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Drawn By:	RLH
Checked By:	AP/DL
Rev:	

DWV SCHEMATICS
MOBILE MODULAR
PATTENGILL BIOTECHNICAL MAGNET SCHOOL
(13) 72' X 13'-9" AND (5) 41'-6" X 13'-9" MODULES

Serial No.	5448-5465
Quote No.	50589C-18
Model No.	8092
Job No.	2024-005-WR
Date:	3-5-24
Scale:	1" = 1'-0"
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SUPPLY:

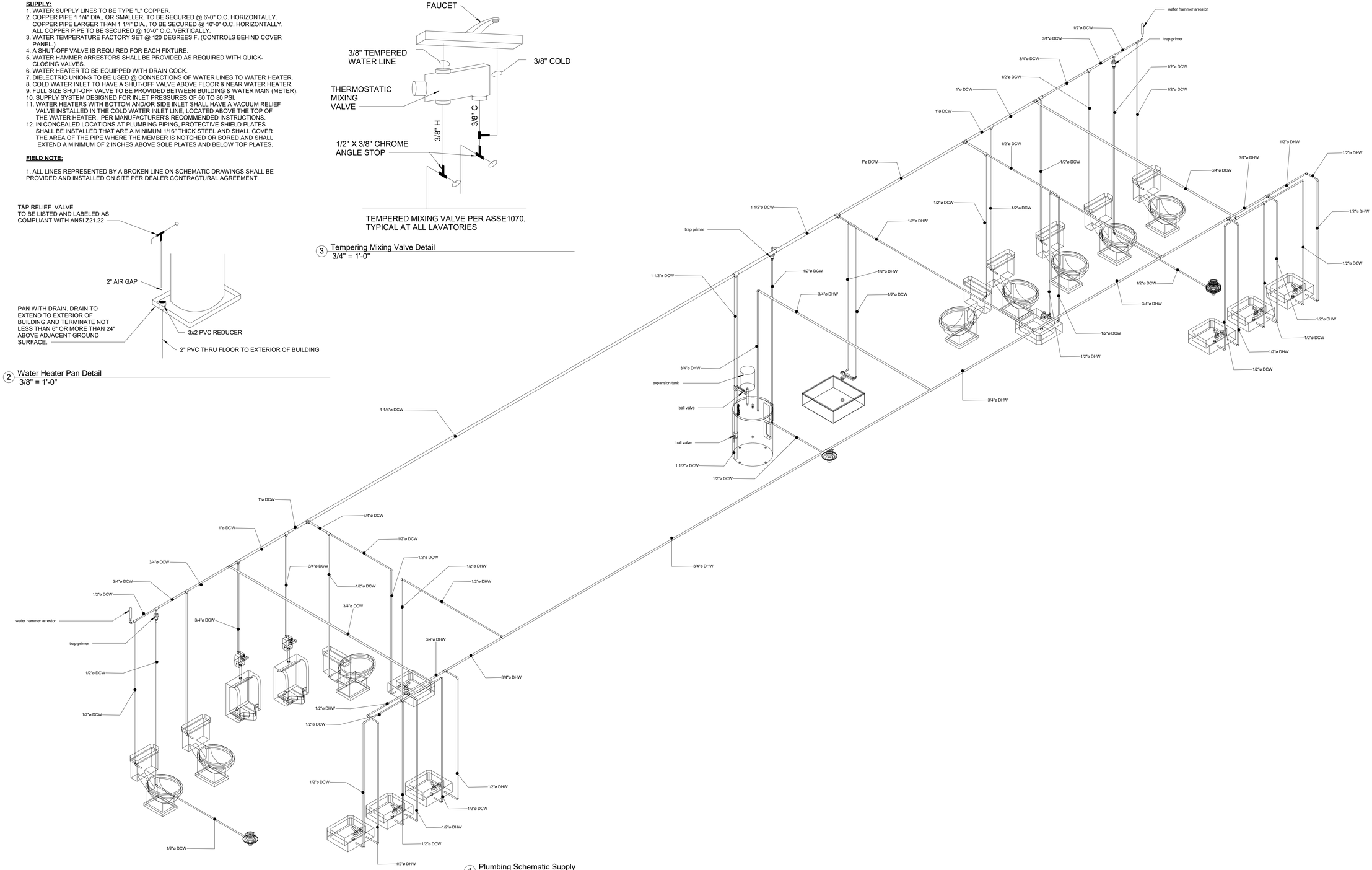
1. WATER SUPPLY LINES TO BE TYPE "L" COPPER.
2. COPPER PIPE 1 1/4" DIA., OR SMALLER, TO BE SECURED @ 6'-0" O.C. HORIZONTALLY. COPPER PIPE LARGER THAN 1 1/4" DIA., TO BE SECURED @ 10'-0" O.C. HORIZONTALLY. ALL COPPER PIPE TO BE SECURED @ 10'-0" O.C. VERTICALLY.
3. WATER TEMPERATURE FACTORY SET @ 120 DEGREES F. (CONTROLS BEHIND COVER PANEL.)
4. A SHUT-OFF VALVE IS REQUIRED FOR EACH FIXTURE.
5. WATER HAMMER ARRESTORS SHALL BE PROVIDED AS REQUIRED WITH QUICK-CLOSING VALVES.
6. WATER HEATER TO BE EQUIPPED WITH DRAIN COCK.
7. DIELECTRIC UNIONS TO BE USED @ CONNECTIONS OF WATER LINES TO WATER HEATER.
8. COLD WATER INLET TO HAVE A SHUT-OFF VALVE ABOVE FLOOR & NEAR WATER HEATER.
9. FULL SIZE SHUT-OFF VALVE TO BE PROVIDED BETWEEN BUILDING & WATER MAIN (METER).
10. SUPPLY SYSTEM DESIGNED FOR INLET PRESSURES OF 60 TO 80 PSI.
11. WATER HEATERS WITH BOTTOM AND/OR SIDE INLET SHALL HAVE A VACUUM RELIEF VALVE INSTALLED IN THE COLD WATER INLET LINE, LOCATED ABOVE THE TOP OF THE WATER HEATER. PER MANUFACTURER'S RECOMMENDED INSTRUCTIONS.
12. IN CONCEALED LOCATIONS AT PLUMBING PIPING, PROTECTIVE SHIELD PLATES SHALL BE INSTALLED THAT ARE A MINIMUM 1/16" THICK STEEL AND SHALL COVER THE AREA OF THE PIPE WHERE THE MEMBER IS NOTCHED OR BORED AND SHALL EXTEND A MINIMUM OF 2 INCHES ABOVE SOLE PLATES AND BELOW TOP PLATES.

FIELD NOTE:

1. ALL LINES REPRESENTED BY A BROKEN LINE ON SCHEMATIC DRAWINGS SHALL BE PROVIDED AND INSTALLED ON SITE PER DEALER CONTRACTURAL AGREEMENT.

2 Water Heater Pan Detail
3/8" = 1'-0"

3 Tempering Mixing Valve Detail
3/4" = 1'-0"



1 Plumbing Schematic Supply

MODULAR DRAWINGS -FOR REFERENCE

No.	Description	Date

No.	Description	Date

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Drawn By:	RLH
Checked By:	AP/DL
Rev:	

SUPPLY SCHEMATICS
MOBILE MODULAR
PATTENGILL BIOTECHNICAL MAGNET SCHOOL
(13) 72' X 13'-9" AND (5) 41'-6" X 13'-9" MODULES

Serial No.	5448-5465
Quote No.	50589C-18
Model No.	8092
Job No.	2024-005-WR
Date:	3-5-24
Scale:	As indicated
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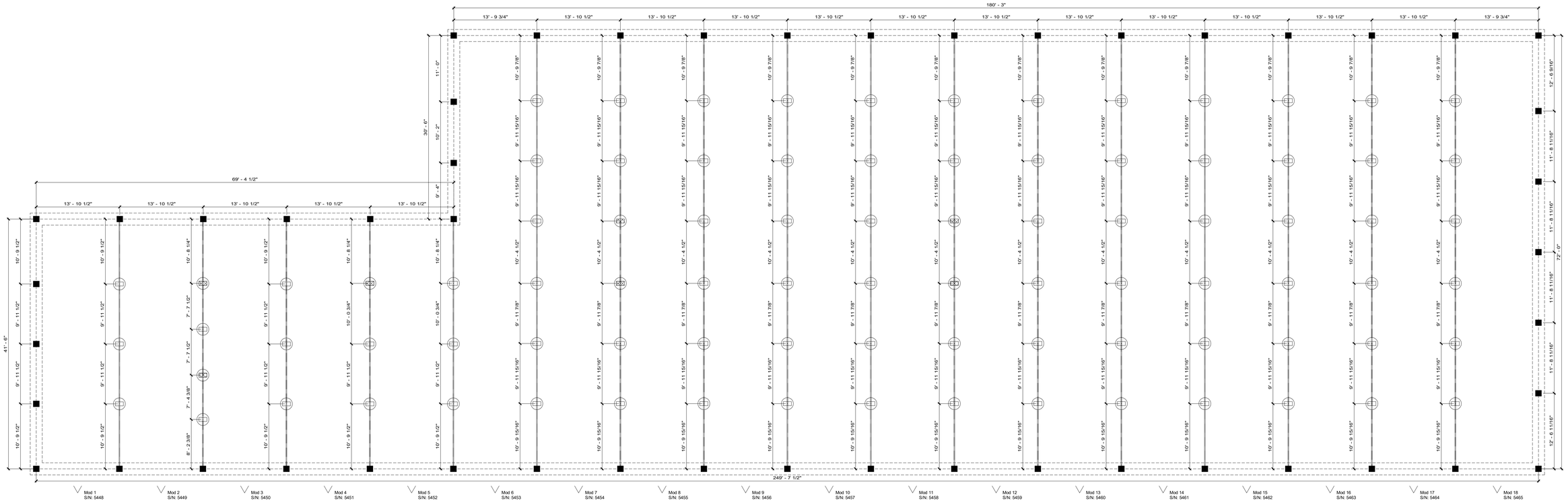
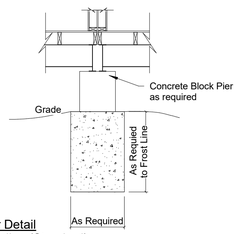
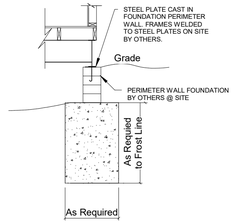


1 Foundation Plan
1/8" = 1'-0"



Pier Detail
Mateline (Standard)
(NTS)

2 Foundation 4
3/16" = 1'-0"



Perimeter Wall Detail
(NTS)

3 Foundation 5
3/16" = 1'-0"

Foundation Notes:
1. Loads in 1000 lbs.
2. Crawl space ventilation shall not be less than 1/150th of the crawl space horizontal area.
3. This is a suggested plan only. Foundations to be designed by a professional engineer per local soil and climate conditions.
4. Provide access to crawl space, Minimum 22" x 24".
5. Minimum footing depth 3'-6"; or as required by local conditions.

Field Notes:
1. All foundation work shown on this drawing to be provided and installed on site per dealer under contractural agreement.

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Drawn By:	RLH
Checked By:	AP/DL
Rev:	

SUGGESTED BLOCKING PLAN

MOBILE MODULAR
PATTENGILL BIOTECHNICAL MAGNET SCHOOL
(13) 72' X 13'-9" AND (5) 41'-6" X 13'-9" MODULES

Serial No.	5448-5465
Quote No.	50589C-18
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Job No.	2024-005-WR
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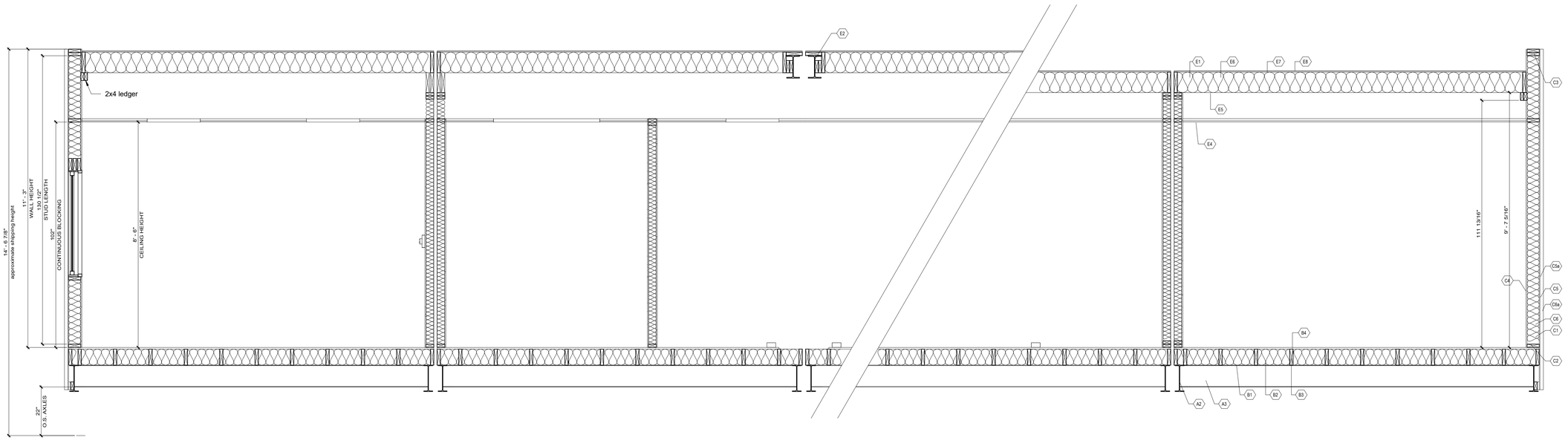

1 Cross Section
1/2" = 1'-0"

MODULAR DRAWINGS -FOR REFERENCE

No.	Description	Date

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CROSS SECTION

MOBILE MODULAR
PATTENGILL BIOTECHNICAL MAGNET SCHOOL
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Scale:	1/2" = 1'-0"
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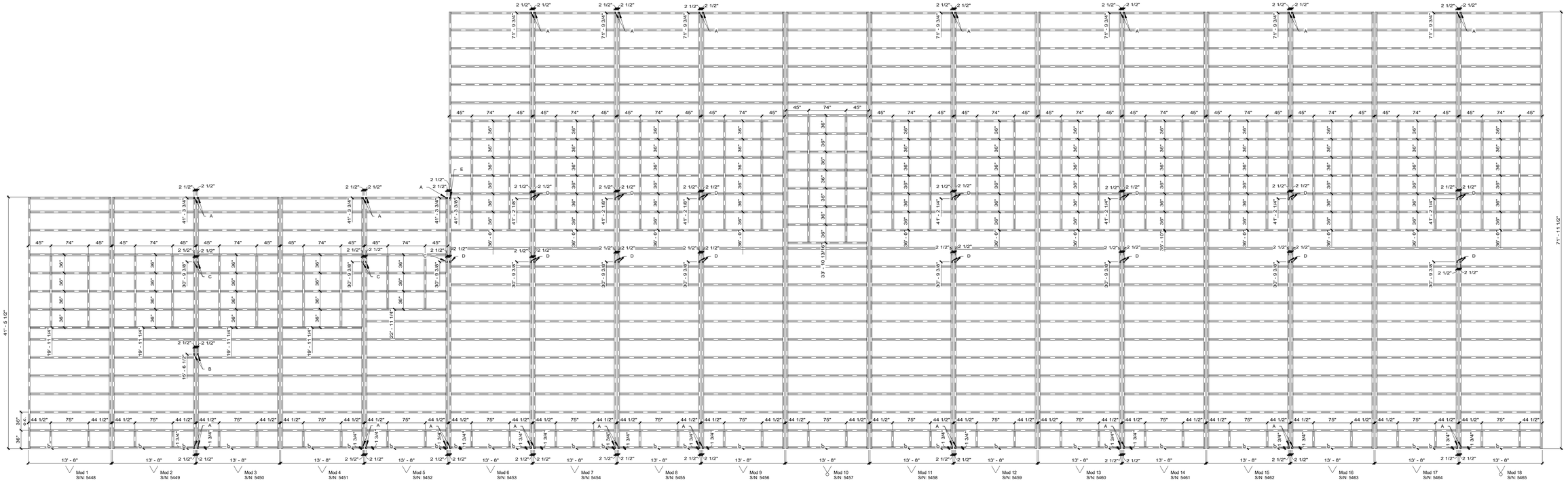
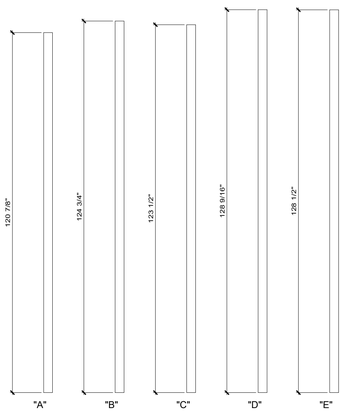
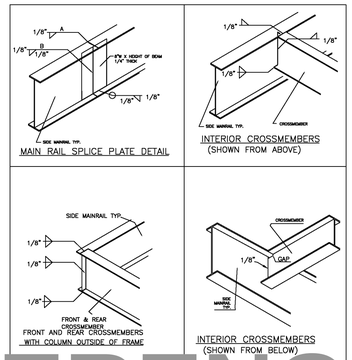


1 Frame Plan
1/8" = 1'-0"



2 Steel Column Heights
1/2" = 1'-0"



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Drawn By:	RLH
Checked By:	AP/DL
Rev:	

FRAME PLAN

MOBILE MODULAR
PATTENGILL BIOTECHNICAL MAGNET SCHOOL
(13) 72' X 13'-9" AND (5) 41'-6" X 13'-9" MODULES

Serial No.	5448-5465
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Job No.	2024-005-WR
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Scale:	As indicated
Page No.	S2.1

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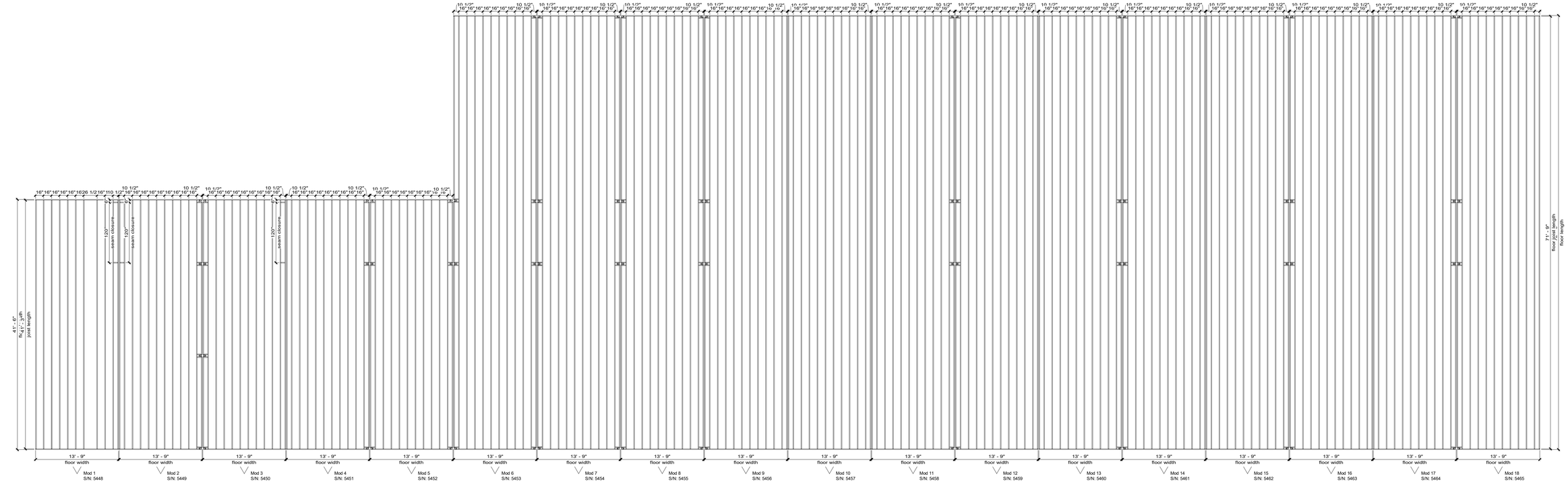

1 Floor Framing Plan
1/8" = 1'-0"

No.	Description	Date

No.	Description	Date

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Drawn By:	RLH
Checked By:	AP/DL
Rev:	

FLOOR FRAMING PLAN

MOBILE MODULAR
PATTENGILL BIOTECHNICAL MAGNET SCHOOL
(13) 72' X 13'-9" AND (5) 41'-6" X 13'-9" MODULES

Serial No. 5448-5465	Date: 3-5-24
Quote No. 50589C-18	Scale: 1/8" = 1'-0"
Model No. 8092	Page No.
Job No. 2024-005-WR	S3.1

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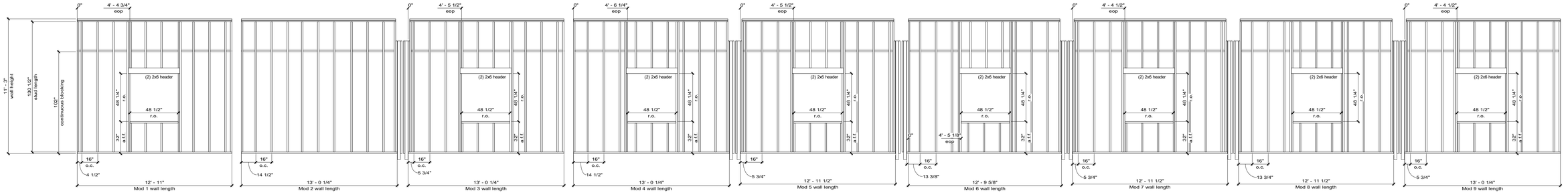
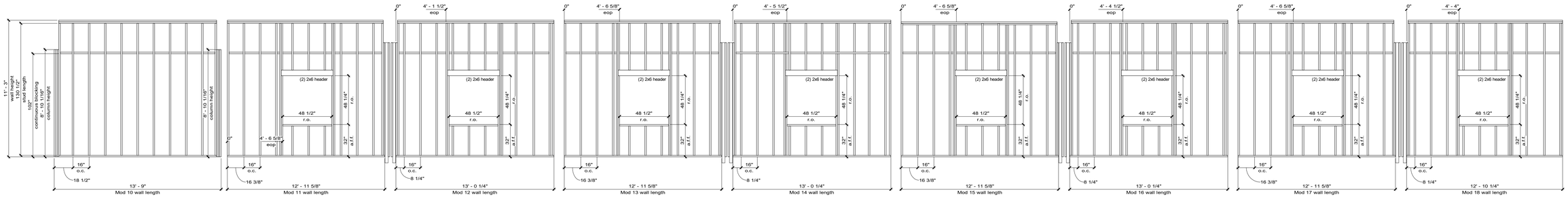
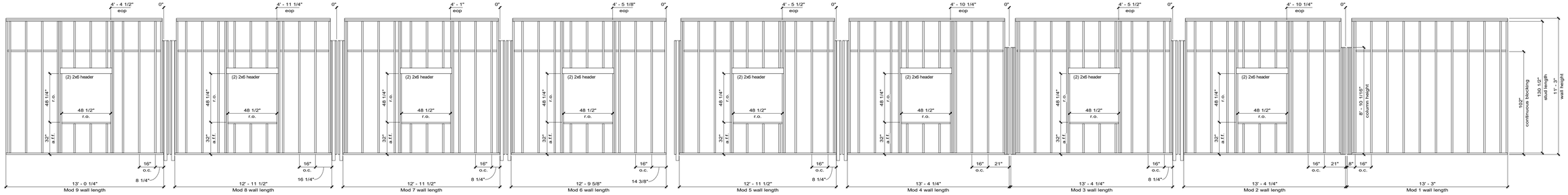


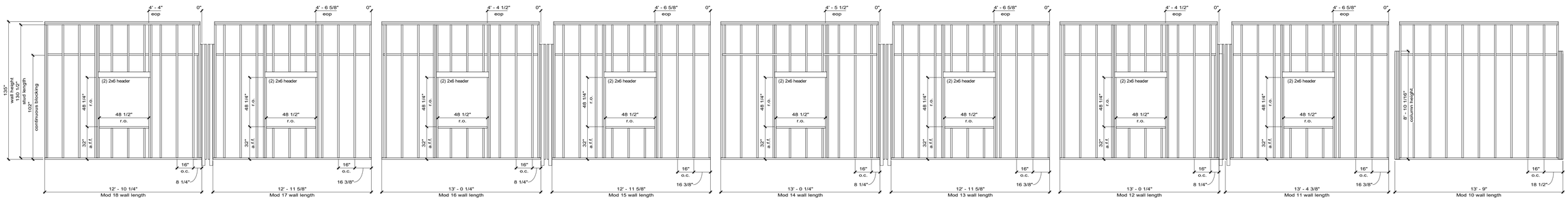
Mods 1-9 Hitch Endwall Wall Framing Elevation
1 Elevation
1/4" = 1'-0"



Mods 10-18 Hitch Endwall Wall Framing Elevation
2 Elevation
1/4" = 1'-0"



Mods 1-9 Rear Wall Framing Elevation
3 1/4" = 1'-0"



Mods 10-18 Rear Wall Framing Elevation.
4 1/4" = 1'-0"

No.	Description	Date

No.	Description	Date

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Whitley Mfg. Co., Inc.
dba: Modular Builders
2756 & 3089
E. FORT WAYNE ROAD
P.O. BOX 505
ROCHESTER, IN 46975
PHONE: 574.223.4934

Drawn By:	RLH
Checked By:	AP/DL
Rev:	

WALL FRAMING ELEVATIONS
MOBILE MODULAR
PATTENGILL BIOTECHNICAL MAGNET SCHOOL
(13) 72' X 13'-9" AND (5) 41'-6" X 13'-9" MODULES

Serial No.	5448-5465
Quote No.	50589C-18
Model No.	8092
Job No.	2024-005-WR
Date:	3-5-24
Scale:	1/4" = 1'-0"
Page No.	S4.1

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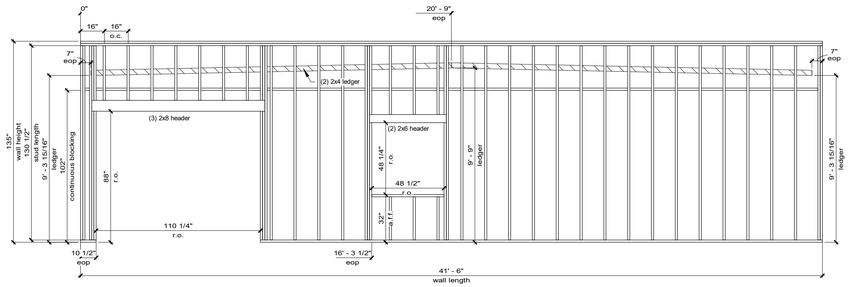
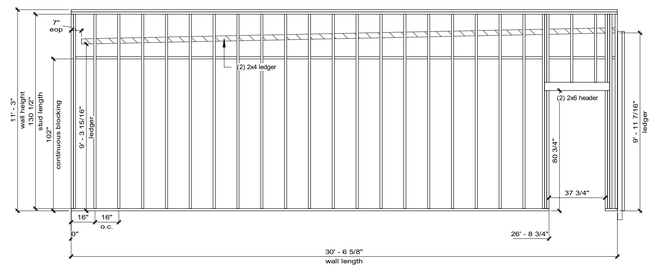
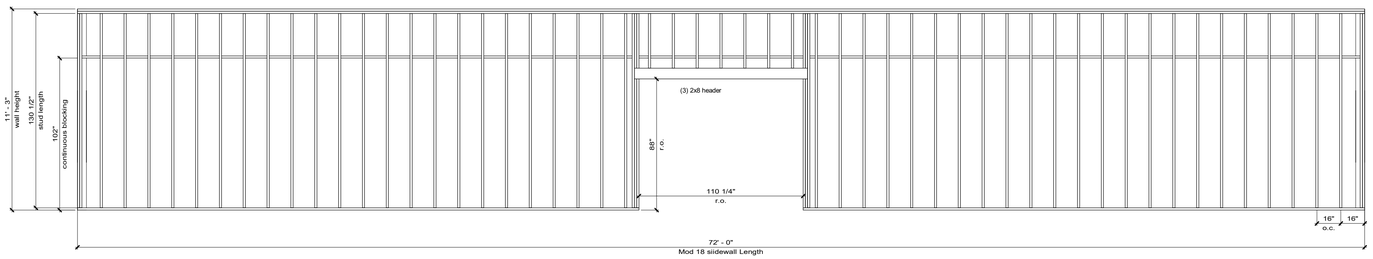


1 Mod 1 Sidewall Framing Elevation
1/4" = 1'-0"



2 Mod 6 Sidewall Framing Elevation
1/4" = 1'-0"



3 Mod 18 Sidewall Framing Elevation
1/4" = 1'-0"

MODULAR DRAWINGS -FOR REFERENCE

No.	Description	Date

No.	Description	Date

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WALL FRAMING ELEVATIONS

MOBILE MODULAR
PATTENGILL BIOTECHNICAL MAGNET SCHOOL
(13) 72' X 13'-9" AND (5) 41'-6" X 13'-9" MODULES

Serial No. 5448-5465	Date: 3-5-24
Quote No. 50589C-18	Scale: 1/4" = 1'-0"
Model No. 8092	Page No. S4.2
Job No. 2024-005-WR	

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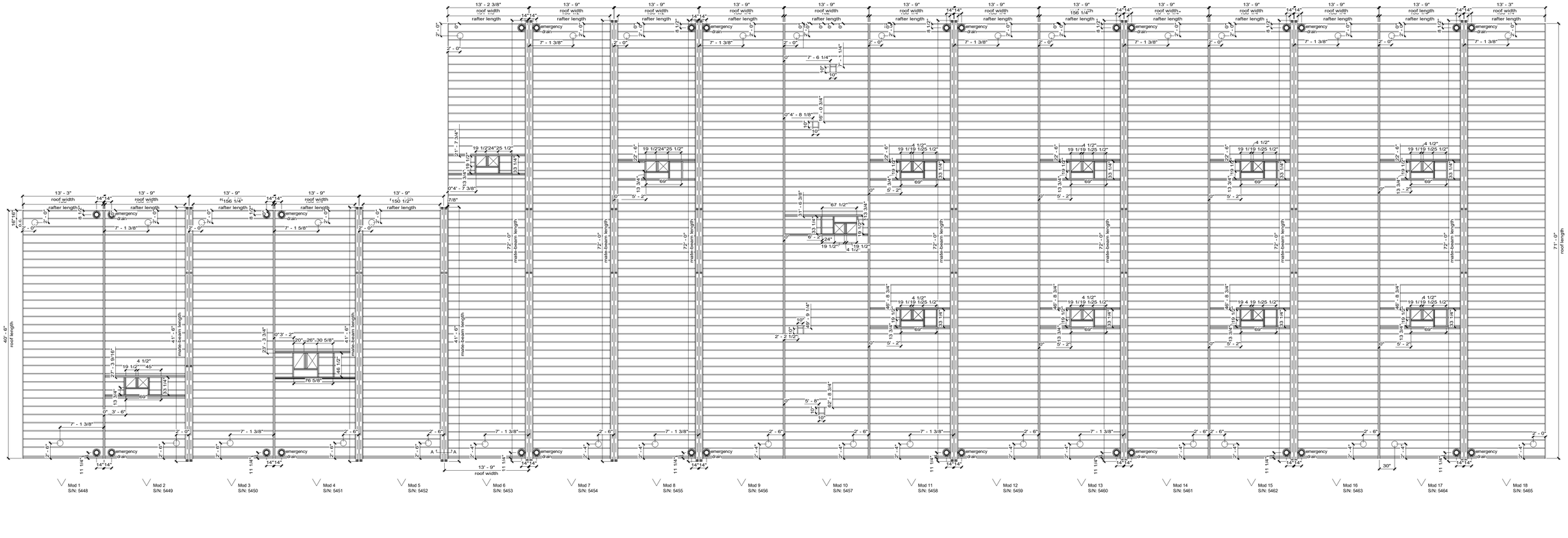
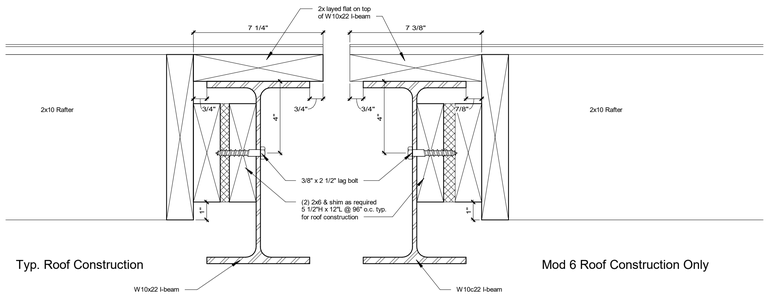
Elevation



1 Roof Framing Plan
1/8" = 1'-0"



Typ. Roof Construction

Mod 6 Roof Construction Only

2 Section A-A
3" = 1'-0"

MODULAR DRAWINGS -FOR REFERENCE

No.	Description	Date

No.	Description	Date

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ROOF FRAMING PLAN

MOBILE MODULAR
PATTENGILL BIOTECHNICAL MAGNET SCHOOL
(13) 72' X 13'-9" AND (5) 41'-6" X 13'-9" MODULES

Serial No.	5448-5465
Quote No.	50589C-18
Model No.	8092
Job No.	2024-005-WR
Date:	3-5-24
Scale:	As indicated
Page No.	S5.1

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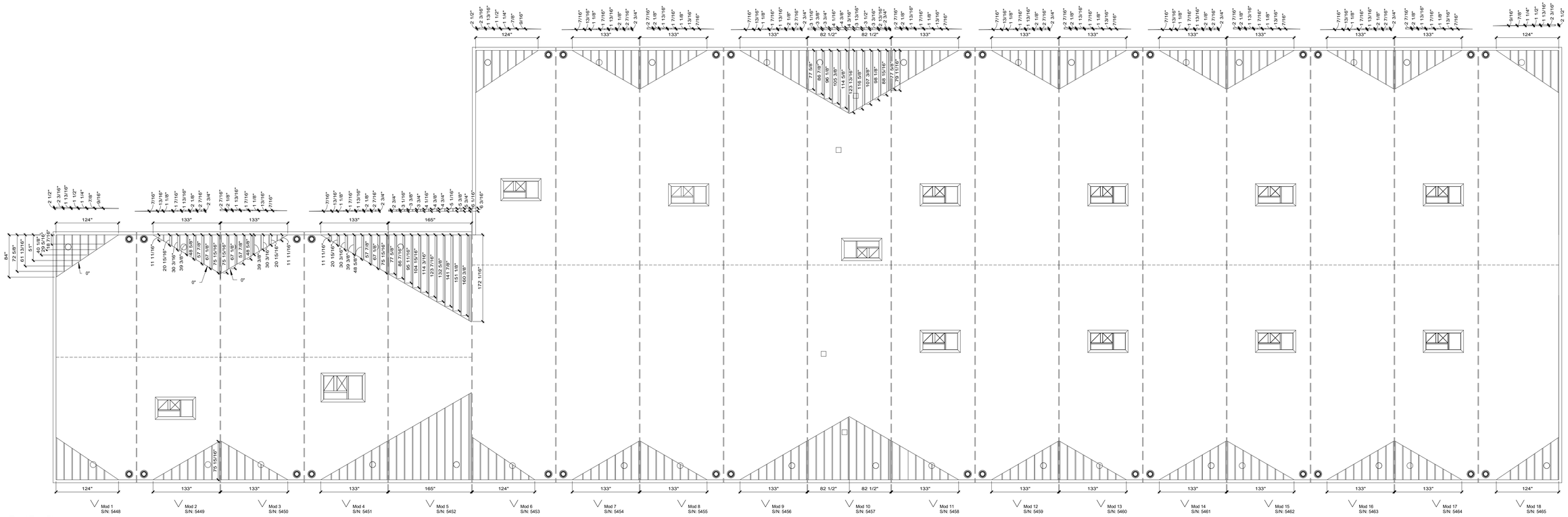

1 Roof Top Plan
1/8" = 1'-0"

MODULAR DRAWINGS -FOR REFERENCE

No.	Description	Date

No.	Description	Date

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Checked By:	AP/DL
Rev:	

ROOF TOP PLAN
MOBILE MODULAR
PATTENGILL BIOTECHNICAL MAGNET SCHOOL
(13) 72' X 13'-9" AND (5) 41'-6" X 13'-9" MODULES

Serial No.	5448-5465
Quote No.	50589C-18
Model No.	8092
Job No.	2024-005-WR
Date:	3-5-24
Scale:	1/8" = 1'-0"
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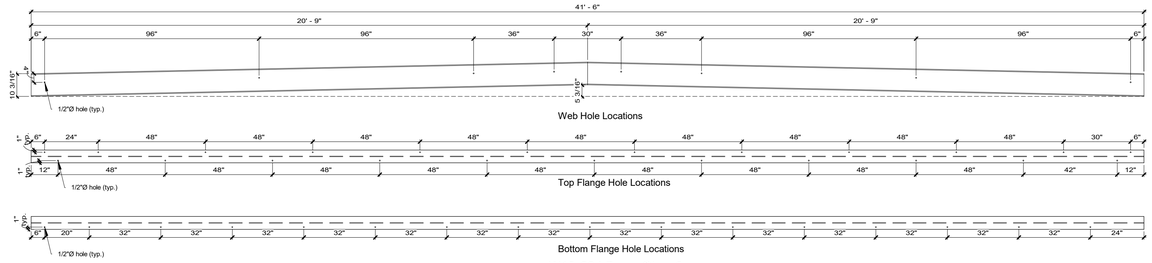
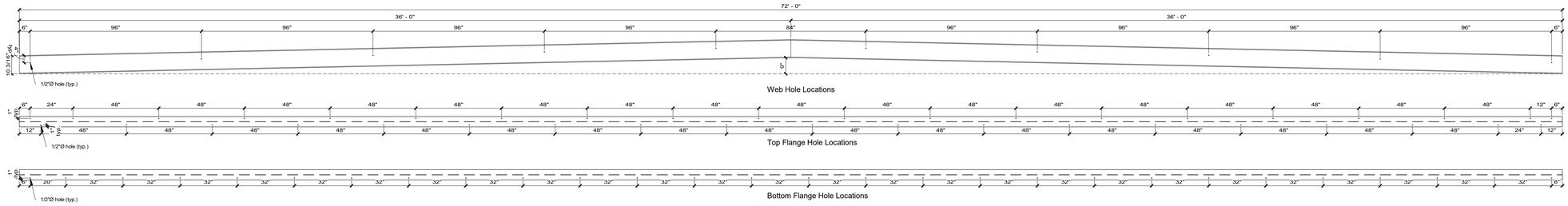


W10x22 I-Beam Qty = 6



W10x22 I-Beam Qty = 14

1 W10x22 I-Beam Details
3/8" = 1'-0"

No.	Description	Date

No.	Description	Date

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W10X22 MATE BEAM DETAILS

MOBILE MODULAR
PATTENGILL BIOTECHNICAL MAGNET SCHOOL
(13) 72' X 13'-9" AND (5) 41'-6" X 13'-9" MODULES

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Date:	3-5-24
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